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SECTION 01001 SUMMARY OF WORK

PART 1 – GENERAL

1.01 SCOPE

- A. The Work to be performed under this Contract shall consist of furnishing plants, tools, equipment, materials, supplies, and manufactured articles and furnishing labor, transportation, and services, including fuel, power, water, and essential communications, and performing work, or other operations required for the fulfillment of the Contract in accordance with the Contract Documents for the Phase III Water Main Replacement project. The Work shall be complete, and any work, materials, and services not expressly indicated or called for in the Contract Documents that may be necessary for the complete and proper construction of the Work in good faith, shall be provided by the **Contractor** as though originally so indicated, at no increase in cost to the **County**.
- B. Components of the work include the installation of a 30" DIP watermain inside the right-of-way and under the existing pavement. A portion of the project will remove the existing 24"/30" Watermain and replace with a 30" watermain in the same trench with the remainder of the existing 30" steel watermain to be abandoned in place and filled with non-shrink grout. The site conditions will not be altered from the existing. All disturbed pavement and landscaping will be replaced in kind.
- C. Components also include the replacement and installation of 8-inch DIP Water main inside the right-of-way. The existing 6-inch and smaller water mains will be abandoned in place and filled with non-shrink grout, unless otherwise noted on the plans. The site conditions will not be altered from the existing. All disturbed pavement and landscaping will be replaced in kind.
- D. The quantities shown on the bid form are estimates for the Work, including the intended construction method based upon the available information. The assigned means, methods, and quantities described herein are subject to revision by the **County** for various reasons including but not limited to, unforeseen utility conflicts/ground water, discovery of subsurface rock strata, unforeseen pipeline encasement, etc. As such, a unit price contract type has been selected to prosecute the Work and is not intended to be a guarantee for a minimum amount of work.

1.02 PROJECT LOCATION

The Work is required at the locations shown on the Approved Drawings.

1.03 WORK COVERED BY THE CONTRACT DOCUMENTS

Work shall be performed according to the requirements of the Contract Documents.

1.04 WORK COORDINATION

- A. The **Contractor** shall coordinate the Work with third parties (such as public utilities and the telephone company) in areas where such parties may have rights to underground property or facilities; and request maps or other descriptive information as to the nature and location of such underground facilities or property.
- B. The **Contractor** shall coordinate the Work with owners of private and public property where access is required for the performance of the Work.
- C. The **County** will work with the **Contractor** to assign and schedule the Work in a logical and efficient format. However, the items in this contract shall be priced such that each item may be assigned independently or combined with other items at the **County's** sole discretion in regard to both quantity and scope. The **Contractor** shall perform only those work items directed by the **County** at the prices specified herein. (For example, if the **County** determines that a line segment shall be cleaned but not televised, the same unit price for cleaning shall apply.)

1.05 CONDITIONS AT THE SITES

- A. The **Contractor** shall make necessary investigations to determine the existence and location of underground utilities.
- B. The **Contractor** shall be responsible for damage to and for maintenance and protection of existing utilities, structures, and personal property.
- C. These Contract Documents do not guarantee such utilities are in the location indicated or that they actually exist, or that other utilities are not within the area of the operations.
- D. The **Contractor** is responsible for safety at no additional cost to the **County**.
- E. The **Contractor** shall report hazardous conditions to the **County**.

+++ END OF SECTION 01001 +++

SECTION 01010 - PROJECT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

Section includes:

- A. Lands and Rights-of-Way/Easements, and Permits
- B. Access to and **Contractor's** use of the site
- C. Coordination requirements
- D. Construction procedures

1.02 LANDS AND RIGHTS-OF-WAY: EASEMENTS AND PERMITS

- A. **Contractor** shall, within 30 days of Notice To Proceed, submit to the **County** an Easement and Permit Plan listing easements and permits obtained, permits and easements yet to be obtained, the timing for obtaining required easements and permits, and conditions and mitigations associated with the easements and permits. The **Contractor** shall coordinate with the County the acquiring of easements within the accepted Construction Schedule. The Contractor shall be responsible for the acquisition of permits within the accepted Construction Schedule.

The timing of coordinating with the County the acquisition of temporary construction easements and the acquisition of permits is the responsibility of the **Contractor**. Delays and rescheduling of the Work to maintain the Construction Schedule shall be mitigated by the **Contractor** at the **Contractor's** sole cost and expense.

- B. Access to the Work shall be limited to the right-of-way or easement area provided for execution of the Work. The **Contractor** shall not enter any adjacent private property without prior written approval from the property owner. Proof of such approval shall be furnished to the **County** upon request. Additional permitting and easements required shall be obtained by the **Contractor** and the **Contractor** shall bear the cost.
- C. If the **Contractor** performs any work or service for any property owner outside the specified scope of the **Contractor's** agreement with the **County** or has any agreements with a private property owner for access to or for temporary use of property outside of the right-of-way or easement area, a written agreement shall be entered into with the private property owner(s) prior to any work or service being performed or prior to any use by **Contractor** of the private property and such agreement shall be provided to the **County**. The agreement shall contain the following language, in addition to the terms agreed to between the **Contractor** and the property owner:

"The Property Owner understands that DeKalb **County** is not a party to this Agreement, exercises no control over the means, methods, and execution of this agreement, and that DeKalb **County** assumes no responsibility for the **Contractor's** compliance with the terms of this agreement. The **Contractor** shall be solely liable for any and all claims,

demands, and judgments related to loss or damage to property or person (including death) arising from or in any way related to the **Contractor's** acts or omissions related to the agreement.”

1.03 ACCESS TO AND CONTRACTOR'S USE OF THE SITE

- A. The space available to the **Contractor** for the performance of the Work, either exclusively or in conjunction with others performing other construction as part of the project, is shown on the drawings.
- B. The **County** shall continue to utilize the existing wastewater collection system and water system during assessment and construction.
 - 1. The **County** will endeavor to cooperate with the **Contractor's** operations when the **Contractor** has notified the **County** in advance of need for changes in operations in order to accommodate construction operations.
 - 2. The **Contractor** shall conduct the Work to cause the least interference with the **County's** operations.
- C. Equipment and vehicles used by the **Contractor** on the project shall be marked with the **Contractor's** name and telephone number.

1.04 COORDINATION REQUIREMENTS

- A. Coordination with **County**:
 - 1. Limit access through occupied areas to those days and times the **County** approves. Occupied areas include areas in which the **County's** regular operations will be going on or to which the **County** requires access during the construction period.
 - 2. When the following must be modified, provide alternate facilities acceptable to the **County**:
 - a. Emergency means of egress
 - b. Utilities that must remain in operation
 - c. Informational signage
 - 3. The **Contractor** shall notify the **County** immediately of any circumstances that may jeopardize or that have interrupted utility service.
- B. Security Procedures:
 - 1. Limit access to the site to persons involved in the work.
 - 2. Provide secure storage for materials.
 - 3. Secure completed work as required to prevent loss.
- C. Coordination of Construction:
 - 1. Inform each party involved, in writing, of procedures required for coordination of the Work; include requirements for giving notice, submitting reports, and attending meetings.
 - 2. Inform the **County** in advance, with ample time, when coordination of Work is required.

- D. Utilities Notification Prior to Construction:
1. Georgia law mandates that, before beginning mechanical digging or excavation work, **Contractor** shall contact Georgia 811 by using eRequest on www.Georgia811.com or by calling 811 or 1-800-282-7411.
 2. **Contractor** may utilize EDEN (Excavation Digging Event Notification) web application that enables Members and Professional Excavators to create, manage, respond to, and edit Georgia 811 Locate Request Tickets.
 3. **Contractor** shall retain records of notification and responses during the course of the project until final Payment.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 CONSTRUCTION

A. General Examination Requirements:

1. Prior to performing work, examine the applicable substrates and the conditions under which the work is to be performed.
2. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding.
3. Notify the **County** promptly of type modifications required.
4. Before starting work that might affect existing construction, verify the existence and location of underground utilities and other underground construction.
5. Prepare preconstruction photographic documentation in conformance with the requirements of Section 01380 of these specifications.

B. General Preparation Requirements:

1. The **Contractor** shall obtain, maintain, and pay for required permits.
2. The **Contractor** shall take field measurements as required to properly conduct the work.

C. Cleaning and Protection: Keep installed work clean, and clean again when soiled by other operations.

D. Final Cleaning:

1. Remove materials and equipment that are not part of the work and any debris from the site prior to substantial completion.
2. Dispose of debris in a lawful manner.
3. Perform final cleaning after substantial completion has been certified, but before final payment.
4. Clean entire project site and grounds.

E. Substantial Completion:

1. Requirements for the **Contractor** achieving Substantial Completion are defined in the Contract Documents in GR-1 of the General Requirements.
2. Substantial Completion is typically defined to include:

- a. Completion of Work required by the Contract Documents
 - b. Operation of components and systems of the Work, including acceptance of testing and startup requirements
 - c. Closeout of quality deficiencies and non-conformances
 - d. Delivery and acceptance of spare parts, operations manuals, and vendor documentation
 - e. Completion of vendor training
 - f. Completion and delivery of “red-line” as built drawings
2. When the **Contractor** believes substantial completion has been achieved, **Contractor** shall notify the **County** in writing, requesting Substantial Completion. The **County** will verify that the contractual documentation requirements for Substantial Completion have been completed, including closeout of open NCRs. If verified, the **County** will schedule a Substantial Completion inspection and walk-through with the **Contractor**, DWM Operations, and the Designer, or will notify the **Contractor** in writing of acceptance or the reason(s) for denying Substantial Completion.
- F. Final Completion:
1. Requirements for the **Contractor** achieving Final Completion are defined in the Contract Documents in GR-9 of the General Requirements.
 2. After Substantial Completion, **Contractor** shall meet additional requirements for Final Completion and release of final payment. These requirements will be defined in the Contract and typically include:
 - a. Completion of punch list items by the **Contractor**
 - b. Demobilization from the project site
 - c. Submittal of warranties
 - d. Release of subcontractor or vendor liens
 - e. Turnover of remaining project documents required by the Contract, including final as-built drawings by the Contractor

3.02 CHANGE MANAGEMENT

A. Contract Change Process

Any firm under contract with the **County** may submit a Change Request (CR) to the **County** following the requirements of the contract. A CR may address requested changes in cost and/or schedule, as well as contract terms or scope that do not result in cost or schedule impacts.

Changes may also be initiated by the **County** in the form of a Field Order (FO). The **Contractor** shall proceed with the change unless they believe the FO entitles them to a change in contract price, time, and/or term. If so, the **Contractor** shall submit a CR within 15 days of receiving the FO.

The CR from the **Contractor** is to be accompanied by a detailed proposal describing the **Contractor**'s opinion of the CR's cost, schedule, and/or contract term impacts.

If the CR is acceptable to the **County**, the **Contractor** will be directed to submit a CO to the **County** to process. If the CR is not acceptable to the **County** then the

Contractor may negotiate the CR. If the cost and/or schedule impacts cannot be agreed, then the **County** will either instruct the **Contractor** to proceed with the change using a Unilateral Change Directive (UCD), if the change is deemed by the **County** to be needed, or the change can be terminated if the change is deemed to be not needed. If the **County** issues a UCD after failing to agree on the price of a CO, then the pricing of the change is per the contract terms.

A UCD can be initiated by the **County** only when there is an imminent threat to public safety or health, or a potential shutdown of a vital **County** function.

B. Amendment to the Contract

If the approval of a CO requires a written, formal amendment to the contract, the **County** will process the formal amendment.

C. Project Scope Change Impacts

A change to a Design /Build contract may materially change the scope of the project, including greater impact on the construction scope than the design scope. A design scope change may also materially impact the project configuration even if it is a no-cost change. Additionally, a change to one project's scope may have impacts to another project's scope.

So that a CO is not approved without understanding its full impacts beyond the affected contract scope, project scope change impacts shall be approved by the **County**. These must consider changes through every phase of the project, and/or impacts to other projects.

D. Baseline

If a CO is approved, the **Contractor** will prepare a Project Baseline Change Instruction Form to formally change the project scope, baseline schedule, and baseline budget.

E. Change Monitoring

The **Contractor** is responsible for monitoring changes to the contract. The **Contractor** will maintain a Design Change Log for each project, and will maintain a Construction Change Log that includes the change description, change status, category of change, contract, estimate of cost, estimate of schedule impact, and current process step. Change logs are updated each month and included with the Project Progress Report.

Responding to and processing changes in a timely manner is a priority. Change backlogs will be vigorously monitored and managed. Change status reports will be developed by the **Contractor** from the Change Logs to provide current status of each open change, which process step is active, and how many days remain in the process step. "Overdue" reports will be elevated to the **County** for follow-up and closure.

F. Change Status

Changes will be identified by one of the four following status descriptions:
Proposed Change is a change that has been submitted as a CR or FO, but has not yet been negotiated. Proposed changes require closure if they are deemed to be not required, or must be resolved in a timely manner if they are deemed required. The cost estimate and/or schedule impact of a proposed change will usually change as it goes through the contract change process. These changes must be reflected in the Change Log as they occur and included in monthly cost and schedule forecasts.

Pending Change is a change that has been negotiated, but has not yet received final **County** approval. These changes must be included in monthly cost and schedule forecasts.

Approved Change is a change that has received final **County** approval. The contract scope, budget, and/or schedule will be amended to include approved changes. Approved changes will be included in monthly cost and schedule forecasts until a formal re-baselining of the project schedule and/or budget is approved.

Closed Change is a change that has been formally rejected and closed by the **County**, or withdrawn by the originator.

G. Category of Change

Changes will be categorized as follows to track the types of changes that occur over the life of the project:

- **County** Requests: any change initiated by the **County**.
- Differing Site Conditions: new information not reasonably available during design, or considered “unforeseeable” through due diligence on the part of the **Contractor**.
- Design Errors: changes due to errors or deficiencies in the design.
- Design Omissions: items omitted from the design that would have been included in the original bid, had they been known.
- Regulatory Requirements: changes mandated by regulatory agencies that are different from approved permit conditions at the time the contract was approved.
- Other: changes required for all other reasons, including emergency work, adjustment of bid quantities, force majeure events, incentive payments, accepted substitutions, and changes identified during value engineering.

3.03 HEALTH AND SAFETY CONSIDERATIONS

- A. Take precautions to prevent fires and to facilitate firefighting operations.
- B. Take precautions to prevent accidents due to physical hazards.
- C. Maintain working conditions in order to keep the site and adjacent public ways free of hazardous and unsanitary conditions and public nuisances.
- D. Maintain working conditions to control rodents and other pests; prevent infestation of adjacent sites and buildings due to pests on this site.
- E. Keep public streets free of debris from this Work.

- F. Provide adequate traffic control in accordance with current MUTCD standards and the approved traffic permit.
- G. When using trenches/excavations, follow OSHA standards 29 CFR 1926.650, 29CFR 1926.651, and 29 CFR 1926.652.

3.04 ENVIRONMENTAL PROTECTION

A. General

Contractor shall conduct its operation in a manner to prevent pollution of the environment surrounding the area of work and shall be responsible for furnishing necessary items for fulfilling the work described herein.

B. Material Transport

Contractor shall comply with the Official Code **County** of DeKalb Georgia pertaining to the duties of the **Contractor** in hauling material over **County**-owned rights-of-way, as well as state and federal rights-of-way. This includes, but is not limited to, approval of proposed haul routes, prevention of dropping of materials or debris on the streets from trucks arriving and leaving the site, providing a suitable vehicle inspection and cleaning installation with permanent crew, and the removal of material spilled in public areas at no additional cost to the local government agency.

C. Waste Materials

No waste or erosion materials shall enter natural or manmade water, wastewater collection systems, or stormwater drains. Erosion materials from excavations, borrow areas, or stockpiled fill shall be contained within the work area. **Contractor** shall develop methods for control of waste and erosion, which shall include filtration, settlement, and manual removal to satisfy the above requirements.

D. Burning

No burning of waste shall be allowed.

E. Dust Control

The **Contractor** shall control the generation of dust by its operations. Control of dust shall be accomplished by water sprinkling or by other methods approved by the **County**.

F. Noise Control

The **Contractor** shall minimize the noise caused by its operations.

When required by agencies having jurisdiction, noise-producing work shall be performed in less sensitive hours of the day or week as directed by the **County**.

The **Contractor** shall provide equipment that operates with the least possible noise. The use of noisy equipment is prohibited. Hoists and compressor plants shall be electrically operated unless otherwise permitted. The air intake of compressors shall be equipped with silencers, and machinery operated by gearing shall be provided with a type of gearing designed to reduce noise. Internal combustion engines shall be equipped with mufflers in good order.

Noise generated by mobile construction equipment, stationary construction equipment, and other equipment involved in the construction of the Work shall not exceed the decibel levels indicated below. Noise generated by mobile and stationary construction equipment will be measured 3 to 6 feet from building lines, and on the A-weighting network of Type 2 general purpose sound level meter set at fast response.

	Combined Residential and Commercial
Allowable sound levels of mobile construction equipment: - From 7 a.m. to 10 p.m., Monday thru Saturday, except legal holidays - At times other than those listed above	85 dBA 70 dBA
Allowable sound levels of stationary construction equipment: - From 7 a.m. to 10 p.m., Monday thru Saturday, except legal holidays - At times other than those noted above Night work from 10 p.m. until 7 a.m. shall require an approved special permit from the County .	70 dBA 60 dBA The dBA level will be included in the approved permit.

G. Use of Chemicals

Chemicals used during construction or furnished for project operation, whether herbicide, pesticide, disinfectant, polymer, reactant, or of other classification, shall show approval of either EPA or FDA. Use of such chemicals and disposal of residues shall be in conformance with instructions.

H. Responsibility for Spills and Accidental Discharges

In the event the **Contractor** causes or has a spill or accidental discharge for which the **County** is fined by the State of Georgia Department of Natural Resources Environmental Protection Division (EPD), the **Contractor** agrees to remediate the spill or discharge immediately in accordance with current EPD regulations and to pay fines assessed against the **County** and/or **Contractor**, and pay for the **County's** cost associated with efforts to remediate the situation. The **County** shall be notified immediately of such an event.

I. Odor Control

Contractor shall provide approved temporary odor control measures as required to control objectionable odors resulting from its cleaning and/or bypass pumping operations. Approved temporary odor control measures, when required, shall include odor control filters, additional ventilation, and/or covering of manholes.

3.05 PROTECTION OF THE WORK

- A. Conduct construction operations so no part of the Work is subjected to damaging operations or influences that are in excess of those to be expected during normal occupancy conditions.
- B. Execute work and stockpile spoils and materials to prevent flooding of excavations, below grade construction, and adjacent properties due to rainwater runoff.
- C. Protect existing property not indicated to be removed.
- D. Provide temporary supports as required to prevent movement and structural failure as designed by a Registered Professional Engineer in the state of Georgia at the **Contractor's** cost.
- E. Equipment and vehicles used on DWM projects shall be clearly marked with the **Contractor's** name and telephone number. The identifying markings may be in the form of magnetic signs, decals, or painted lettering and shall be located on both sides of the equipment/vehicle. The lettering shall be legible, of a contrasting color to the background surface, and at least two inches in height. Markings shall be in place upon initiation of the work on the project site.
- F. A copy of the Project Notice to Proceed letter issued by the **County** shall be available on the job site as proof of the contractual relationship of the **Contractor** with the **County**. The letter shall be presented for review upon request by regulatory agencies or other **County** departments that visit the job site.
- G. If removal and replacement of a paved private driveway is required, the replacement shall be performed within 2 weeks of removal. The required permanent pavement replacement for public roadways shall be performed within 30 days or within 7 days if the roadway is a state highway or major **County** arterial roadway. Temporary surface maintenance is the **Contractor's** responsibility and shall be adequate for the volume and type of traffic loads imposed. Temporary asphalt cold mix application, steel traffic plates, etc. shall be utilized as necessary.

- H. The **Contractor** shall always maintain copies of permits and approved plans on the project site.

3.06 NOTIFICATION OF SERVICE INTERRUPTION

During progress of work under this Contract, it may be necessary to temporarily interrupt water, sewer, or other utility service to a limited number of customers in the vicinity of the work. It shall be the **Contractor's** responsibility to coordinate the service outage with the utility and to provide proper advance notification (a minimum of 48 hours) to the affected customers.

Due to the nature of businesses and traffic in certain projects' areas, water outages for connections, service changeovers, and other Work may not be allowed during normal work hours. The **Contractor** shall factor these considerations into bid price submitted. Coordination, special lighting, traffic control, employee overtime, special customer notification, etc. shall be included in these considerations by the **Contractor**.

++++END OF SECTION 01010++++

SECTION 01014 WORK SEQUENCE

PART 1 - GENERAL

1.01 SCOPE

- A. Work shall be scheduled and conducted by the **Contractor** so as to neither impede nor adversely affect any **County** or utility operations.
- B. The existing water transmission and distribution system is currently and continuously in operation. Those functions shall not be interrupted except as specified herein. The **Contractor** shall coordinate the Work to avoid any interference with normal operation of the water transmission and distribution system. The **Contractor** shall comply with the following general requirements:
 - 1. Provide temporary pumps and other facilities necessary to meet the requirements of this Section.
 - 2. Notify the **County** at least 48 hours before starting to relocate piping or taking existing components out of service.
- C. Penalties imposed on the **County** because of any bypass caused by the actions of the **Contractor**, its employees, or subcontractors, shall be borne in full by the **Contractor**. This includes legal fees, cleanup, remediation, and other **County** expenses resulting directly or indirectly from the bypass.

1.02 SUBMITTALS

- A. Outage Plan: In accordance with the General Conditions, the **Contractor** shall submit a detailed outage plan and schedule for any operations that necessitate removing a pipeline or structure from service. The schedule shall be coordinated with the construction schedule specified in this Section and shall meet the restrictions and conditions specified herein. The detailed plan shall describe the **Contractor's** method for maintaining operations and service, the length of time required to complete said operation, the affected facilities, and the equipment the **Contractor** shall provide.
- B. Sequence Submittal: The sequence provided in Part 3 of this Section is offered as a suggestion to the **Contractor**. The **Contractor** shall submit to the **County** for review and approval a proposed detailed sequence with appropriate times of starting and completion of tasks.
- C. Alternate Sequences: The **Contractor** may propose alternate sequences to those shown in Part 3 of this Section if they would reduce disruption of the existing facility's operation or streamline the tasks of this Contract.

1.03 QUALITY ASSURANCE

At least two weeks prior to any proposed activity that will require any portion of the water transmission and distribution system to be removed from operation, require bypassing, or interrupt flow, the **Contractor** shall schedule a meeting with DWM operating personnel to discuss the **Contractor's** detailed plan for the proposed operation. The plan shall meet the following minimum requirements:

- A. Plan shall be written in outline form and presented in a format that shows the progression of events in sequential and/or concurrent order of activity, along with the duration of each activity.
- B. The written plan shall be supplemented by understandable drawings, sketches, and details as required to show the logic of the plan.
- C. The plan shall delineate the responsibilities of the DWM operating personnel and the **Contractor**, to eliminate delays from conflicting viewpoints about responsibilities when the plan is plan implemented.
- D. After discussion of the plan at the meeting, any agreed changes shall be incorporated into the plan and a copy of the plan and details shall be distributed to DWM operating personnel, the **County**, and **Contractor** at least one week prior to commencement of activities. On the day prior to the commencement of activity, a brief meeting of involved parties shall convene to establish the starting time and initial activity of DWM operating personnel and **Contractor's** personnel.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 GENERAL

The sequence of construction is outlined for the major items of Work required. The **Contractor** shall coordinate its Work with the DWM operating personnel to minimize disruptions of system operation. The **Contractor** shall ascertain that existing facilities are protected and shall not be damaged as a result of this construction. No settlement of existing facilities shall be acceptable. All work shall be performed in a safe manner.

Unless otherwise permitted, no existing valves or equipment shall be operated by the **Contractor**.

3.02 PROPOSED CONSTRUCTION SEQUENCE

The project shall be constructed in five stages to allow continuous operation of the facilities. The five stages of construction shall generally be performed in sequence, with overlap as required to maintain the pump station in service. The five stages are:

- Stage 1 - Preparatory
- Stage 2 - New Pipe, Structures, Valves, and Connections
- Stage 3 - Modification to Existing Facilities
- Stage 4 - Cleanup and Final Restoration

3.03 REQUIRED SEQUENCES

The following items define the sequence of certain construction steps that shall occur in order to properly and safely operate and maintain the treatment facilities.

3.04 COORDINATION WITH OTHER CONTRACTORS

The performance of the project shall be coordinated with other work going on at the same time on the project site. Certain portions of the project are required to be completed so others can perform their work in a timely manner. The construction schedule prepared by the **Contractor** shall take into account the intermediate requirements depicted on the sequence diagram. The **Contractor** shall bear the responsibility for Work delays that cause delay and damages to other contractors requiring connection to Work under this contract.

3.05 LIMITS OF CONSTRUCTION

Due to the need for other contractors to be performing work on the site, the **Contractor's** access to the site may be limited. The **Contractor** shall have access to some areas of the site only during certain steps during construction. The **Contractor** shall have access to the property defined within the construction limits throughout the project. Additionally, the **Contractor** shall have access to areas within the construction limit of others for only the periods of time required to perform the work.

- A. Except where indicated otherwise on the drawings, pipeline and underground construction shall terminate at the construction limit lines indicated on the drawings. The **Contractor** reaching the construction limit first shall be responsible for adequately capping the line to allow both for testing and for easy continuation of or connection to the line by the **Contractor** continuing the line.
- B. The **Contractor** may be responsible for performing work within the construction limits of other contractors.

3.06 MISCELLANEOUS CONSTRUCTION

Miscellaneous Work necessary to complete any flow diversion required may include piping, electrical work, diversion plugs, bulkheads, equipment installation, easements, permits, and other activities. The cost for these items shall be included in the **Contractor's** base bid.

END OF SECTION 01014

SECTION 01016 OCCUPANCY

PART 1 – GENERAL

1.01 PARTIAL OCCUPANCY BY COUNTY

Whenever, in the opinion of the **County**, any section or portion of the Work is in suitable condition, it may be put into use upon the written order of the **County** and such usage shall not be held in any way as an acceptance of said Work, or any part thereof, or as a waiver of any of the provisions of these Specifications and the Contract. Pending completion and final acceptance of the Work, all necessary repairs, and replacements, due to defective materials or workmanship or operations of the **Contractor**, for any section of the Work so put into use shall be performed by the **Contractor** at **Contractor's** own expense.

END OF SECTION 01016

SECTION 01040 COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. The **Contractor** shall coordinate execution of the Work with subcontractors, other contractors working on related **County** projects, and the **County**, as required, to maintain operation of the existing facilities and satisfactory progress of the Work.
- B. Requirements of this Section shall be in addition to those stated in the General Requirements.
- C. The **County** requires a written explanation of the **Contractor's** plan for coordinating and accomplishing separate phases of the Work, supplemental to the details provided under Section 01310 - Construction Schedule.

1.02 EXISTING UTILITIES

- A. Consult with the **County** on a daily basis while the **Contractor** performs demolition, excavation, or any other alteration activity. No water or sewer function, utility, or structure is to be altered, shut off, or removed unless approved in advance, and in writing, by the **County**. The **Contractor** shall give the **County** at least 48 hours advanced notice, in writing, of the need to alter, shut off, or remove such function.
- B. Coordinate the Work with the **County** and revise daily activities to avoid adversely affecting system operations. Such revisions in the proposed work schedule shall be accomplished with no additional compensation to the **Contractor**.

END OF SECTION 01040

SECTION 01060 REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SCOPE

- A. The **Contractor** shall, without additional expense to the **County**, be responsible for obtaining National Pollutant Discharge Elimination System (NPDES) permits for discharges from this project to stormwater systems or watercourses, and for complying with any applicable federal, state, county, and municipal laws, codes, and regulations, in connection with the prosecution of the Work.
- B. The **Contractor** shall take proper safety and health precautions to protect the Work, the workers, the public, and the property of others.
- C. The **Contractor** shall be responsible for materials delivered and Work performed until completion and acceptance of the Work, except for any completed unit of construction thereof that may heretofore have been accepted.

1.02 NPDES PERMITS FOR STORMWATER DISCHARGES

- A. The Federal Water Pollution Control Act (also known as the Clean Water Act, or CWA), as amended in 1987, requires NPDES permits for stormwater discharges associated with industrial activity.
- B. On November 16, 1990, (55 FR 47990), the U.S. Environmental Protection Agency (EPA) issued regulations establishing permit application requirements for stormwater discharges associated with industrial activity. These are in Section 122.26 of Section 40 of the Code of Federal Regulations (40 CFR Part 122.26).
- C. The November 16, 1990 regulation established the following definition of "stormwater discharge associated with industrial activity" at 40 CFR 122.26(b) (14):

"Stormwater discharge associated with industrial activity" means the discharge from any conveyance that is used for collecting and conveying stormwater and which is directly related to manufacturing, processing, or raw materials storage areas at an industrial plant. For the categories of industries identified in subparagraphs (i) through (x) of this subsection, the term includes, but is not limited to, stormwater discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at 40 CFR 401); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater. The following categories of facilities are considered engaging in "industrial activity" for purposes

of this subsection:

- (x) Construction activity including clearing, grading, and excavation activities except: operations that result in the disturbance of less than five acres of total land area, which are not part of a larger common plan of development or sale
- D. These regulations are effective for activities covered by the regulation on or after October 1, 1992.
- E. The **Contractor** shall complete EPA Form 3510-2F. A "Guidance Manual for the Preparation of NPDES Permit Applications for Stormwater Discharges Associated with Industrial Activity," as published by EPA, is available to assist the **Contractor** in the application process.

END OF SECTION 01060

SECTION 01100 SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.01 CONNECTIONS TO EXISTING SYSTEMS

The **Contractor** shall perform the Work necessary to locate, excavate, and prepare for connections to the terminus of the existing systems as shown on the Drawings. The cost for this Work and for the actual connection to the existing systems shall be included in the bid price for the project and shall not result in any additional cost to the **County**. Connections shall be made only after approval by the **County**.

1.02 RELOCATIONS

The **Contractor** shall be responsible for the relocation of structures, including but not limited to light poles, signs, sign poles, fences, piping, conduits, and drains that interfere with the positioning of the Work as set out on the Drawings. The cost of such relocations shall be included in the bid price.

1.03 EXISTING UNDERGROUND PIPING, STRUCTURES, AND UTILITIES

- A. The **Contractor** shall exercise extreme care before and during excavation to locate and flag various sewer, water, gas, telephone, electrical, or other utility lines not shown on the Drawings to avoid damage. Should damage occur to an existing line, the **Contractor** shall bear the costs associated with the damage and repair the line at no cost to the **County**.
- B. The **Contractor** shall note that the locations of existing underground piping structures and utilities are shown without express or implied representation, assurance, or guarantee that they are complete or correct or that they represent a true picture of underground piping to be encountered.
- C. The **Contractor** shall notify the **County** of existing piping and utilities that interfere with new construction and shall reroute or relocate the pipeline or utility as directed before any piping and utilities not shown on the Drawings are disturbed. .
- D. The **Contractor** shall exercise care in any excavation to locate existing piping and utilities. Utilities that do not interfere with complete Work shall be carefully protected against damage. Any existing utilities damaged in any way by the **Contractor** shall be restored or replaced at the **Contractor's** expense as directed by the **County**.

1.04 CONNECTIONS TO WORK BY OTHERS

- A. Under this Contract, and as shown on the Drawings, the **Contractor** shall construct pipelines that are to be connected to pipelines constructed by others.
- B. The **Contractor** shall connect pipelines built under this Contract to pipelines constructed by others by removing the plugs and making the connection.

- C. The **Contractor** shall lay any pipelines (under this Contract) not constructed by others to the required line and grade, terminated with a plugged connection precisely at the location indicated on the Drawings, and then backfilled and marked with a yellow stake exposed a minimum of 3 feet above grade.

1.05 WATER FOR CONSTRUCTION PURPOSES

The Contractor shall be responsible for any cost of water used on the Project. A water meter and backflow device shall be obtained from DeKalb County DWM for recording water used for cleaning and other Work items requiring water.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01100

SECTION 01200 PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. The **County** shall schedule and administer a preconstruction meeting, and may schedule periodic progress meetings, and specially called meetings throughout progress of the Work. The **County** shall set the agenda for the meetings and preside at the meetings. The **Contractor** shall make physical arrangements for the meetings pursuant to the **County's** requirements. Meetings are not a pay item.
- B. Representatives of the **Contractor**, subcontractors, and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.02 PRECONSTRUCTION MEETING

- A. The **County** shall schedule a Preconstruction Meeting prior to the start of construction.
- B. The Preconstruction Meeting shall be attended by the following:
 - 1. **County's** representative(s)
 - 2. **Contractor's** Project Manager and Superintendent
 - 3. Others as appropriate or required by the **County**
- C. The Preconstruction Meeting will generally have the following agenda:
 - 1. Designation of responsible personnel
 - 2. Distribution and discussion of list of major subcontractors and suppliers
 - 3. Projected construction schedule with critical Work sequencing
 - 4. Major equipment deliveries and priorities
 - 5. Procedures and processing of:
 - a. Submittals
 - b. Requests for Information (RFIs)
 - c. Change Documents
 - 1. Requests for Proposals (RFPs)
 - 2. Work Authorizations
 - 3. Proposed Change Order Requests (CORs)
 - d. Field Decisions and Clarification Memos
 - e. Applications for Payment
 - f. Change Orders
 - 6. Procedures for maintaining Record Documents (Section 01350 - Project Document Tracking and Control Systems)

7. Periodic Meeting Schedule
8. Mobilization Form Submittal – **Contractor** shall complete and submit a Mobilizations Request form after the following have been completed:
 - a. NTP Received
 - b. Preconstruction Meeting completed and minutes reviewed and accepted
 - c. Safety Plan, Construction Quality Plan, and Permit/ Easement Plan submitted to and approved by **County**

1.03 PERIODIC PROGRESS MEETINGS

- A. Project Progress Meetings shall be held monthly throughout the project duration. The **County** may alter the timing of, or add supplemental, scheduled periodic progress meetings, at its discretion.
- B. The Project Progress Meetings shall be attended by the following:
 1. **County's** representative(s)
 2. **Contractor's** Project Manager, Superintendent, and other appropriate representative(s)
 3. Others as appropriate or required by the **County**
- C. The Progress Meetings will generally have the following agenda:
 1. Review Work progress since last meeting
 2. Discussion of Construction Schedule for next period
 3. Status of major equipment and material deliveries
 4. Construction problems affecting progress
 5. Field observations, including Safety Report(s)
 6. Status of pending RFIs and changes
 7. Stakeholder complaints/public outreach
 8. Status of permits and easements
 9. Status of invoicing
 10. Other business

1.04 OTHER MEETINGS

- A. Schedule Progress Meetings

As per Section 01310 - Construction Schedule, during weekly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule shall cover four weeks: the immediate past week, the current week, and the forthcoming two weeks. This schedule shall include activities that are complete, started, incomplete or underway, or scheduled to be performed during this four-week timeframe. Results of the Progress meetings shall be reported in the Project Progress Meetings.

- B. Specially-called meetings may be requested by either party or by other affected entities. Requests shall be made through the **County**, which shall coordinate the meeting schedule. Specially-called meetings shall be held as warranted by:
1. Unforeseen developments during construction or as needed to coordinate special events, such as tie-ins or system shutdowns
 2. Concerns regarding individual project performance and adherence to the schedule of construction

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01200

SECTION 01210 MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 SCOPE

- A. Work includes furnishing labor, equipment, tools, materials, and performing operations required to complete the Work satisfactorily, in-place, as specified, and as indicated on the Drawings.
- B. The costs of required items of work and incidentals necessary for the satisfactory completion of the Work shall be considered as included in the Total Bid. The cost of work not directly covered by the pay items shall be considered incidental to the contract and no additional compensation shall be allowed.
- C. The **Contractor** shall take no advantage of any apparent error or omission on the Drawings or Specifications, and the **County** shall be permitted to make corrections and interpretations as may be deemed necessary for fulfillment of the intent of the Contract Documents.

1.02 SUBMITTALS

- A. The **Contractor** shall submit to the **County** for approval, in the form directed or acceptable to the **County**, a complete schedule of values of the portions of the Work, including quantities and unit prices, aggregating the Contract Price. The **County** shall not approve an unbalanced breakdown providing for overpayment to the **Contractor** on items of Work that would be performed first.
- B. The **Contractor** shall submit application for payment on a form approved by the **County** showing allowances, lump sum schedule of value items, and unit price items in accordance with Section 01310.

1.03 UNIT PRICE ITEMS

- A. Payment for Work shall be in accordance with the unit price bid items in the Bid Schedule and shall be full compensation for labor, materials, and equipment required to furnish, install, construct, and test the Work covered under the unit price bid item. Work for which there is no price schedule item shall be considered incidental to the Work and no additional compensation shall be allowed.
- B. Payment shall be made only for the actual quantities of work performed in compliance with the Drawings and Specifications. The **Contractor** shall be paid an amount equal to the approved quantity times the applicable unit price. Any unused balance of the unit price work shall revert to the **County** upon completion of the project.
- C. All unit price work shall be considered as part of the Work to be performed within the time limits specified elsewhere for Substantial Completion and Project Completion. No increase in contract time shall be allowed for increases in quantities of unit price work performed beyond the quantities shown in the Bid Schedule, unless it can be

demonstrated that the additional Work performed under the unit price item is on the critical path of the Project Schedule and has produced an increase in time to the Contract.

1.04 MEASUREMENT OF QUANTITIES

- A. Final payment quantities shall be determined from the record drawings. The As-Built Drawings lengths, dimensions, quantities, etc. shall be determined by a survey after completion of the required Work. The precision of final payment quantities shall match the precision shown for that item in the Bid Schedule. Measurements shall be taken according to the United States standard measurements and in the manner as specified in these Specifications.
- B. Measurement Devices
1. Scales shall be inspected, tested, and certified by the applicable weights and measures department within the past year, and shall be of sufficient size.
 2. Metering devices shall be inspected, tested, and certified by the applicable department within the past year.
 3. Volume shall be determined by cubic dimension by multiplying mean length by mean width by mean height or thickness.
 4. Area shall be determined by square dimension by multiplying mean length by mean width or height.
 5. Linear measurement shall be measured by linear dimension, along the item centerline or mean chord.
 6. Stipulated price measurement shall include items measured by number, weight, volume area, length, or combination thereof as appropriate.

Item	Method of Measurement
AC	Acre - Field Measure
AL	Allowance
CY	Cubic Yard - Field Measure within limits specified or shown, or measured in vehicle by volume, as specified
EA	Each - Field Count
GAL	Gallon - Field Measure
HR	Hour
LB	Pound(s - Weight Measure by Scale
LF	Linear Foot - Field Measure
LS	Lump Sum - Unit is one; no measurement will be made
SF	Square Foot
SY	Square Yard
TON	Ton - Weight Measure by Scale (2,000 pounds)
VF	Vertical Foot - Field Measure

PART 2 – UNIT PRICE BID ITEMS

2.01 DUCTILE IRON WATER DISTRIBUTION PIPE (DIP, 6”-30”), PUSH-ON JOINT

- A. Measurement for payment of furnishing and installing ductile iron water distribution pipe shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of ductile iron water distribution pipe, including but not limited to furnishing, transporting, storing, and installing the pipe; thrust blocks or concrete collars; electromagnetic pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material; excavation support system, free boring under driveways or trees, utility support system, dewatering, temporary water service, backfilling, and compaction; concrete cap; cleaning, treating, and testing; site restoration; and other specified work.
- B. Depth of installation is as indicated on the drawing details, or defined in the specifications, or as directed by the **County**. Excavation is unclassified.

2.02 DUCTILE IRON WATER DISTRIBUTION PIPE (DIP, 6’-30”), PUSH-ON JOINT, ADDITION FOR DEEP BURY, 1-4 FEET DEEPER THAN SHOWN ON THE DRAWINGS

- A. Measurement for payment of Ductile Iron Water Distribution Pipe, Push-On Joint (size) Diameter, Addition for Deep Bury, 1 to 4 feet deeper than shown on the drawings shall be on a per linear foot basis. Payment for installing water main pipe at a lower grade than indicated shall be based upon the actual depth as instructed by the **County**, in accordance with the provisions of the contract documents. Payment for water main installed at depths greater than that shown in the drawings shall be made in addition to the unit prices in this section. Payment shall constitute full compensation for labor, materials, and equipment necessary to install the water distribution pipe at a depth greater than 4 feet.
- B. Depth of installation is as indicated on the drawing details or defined in the specification, or as directed by the **County**. No extra compensation shall be made for depths greater than 4 feet or not shown on the approved drawings without approval from the **County**. Excavation is unclassified.

2.03 RESTRAINED JOINT DUCTILE IRON FITTINGS

Measurement for payment to furnish and install ductile iron fittings shall be at the unit price bid per ton for such approved fittings furnished. Weight shall be based on published weights provided by the fitting manufacturer. Payment for furnishing and installing fittings shall constitute full compensation for work required to furnish and install the fittings, including but not limited to: providing and installing joint restraint; purchasing, transporting, storing, and delivering to the worksite the necessary materials, tools, equipment, and labor; saw cutting asphalt pavement, excavation, dewatering, backfilling, compaction, concrete cap, site restoration, and cleanup; removal and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system; dewatering, temporary water service, cleaning, treating, and testing; and other specified work.

2.04 POLYETHYLENE PIPE WRAP

Measurement for payment of furnishing and installing polyethylene pipe wrap shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place.

2.05 CATHODIC PROTECTION

Payment for the installation of the cathodic protection system shall be made under on a per each basis. Payment shall be based on actual quantity of each cathodic protection system furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for all tools, materials, equipment and labor necessary for the installation of the cathodic protection system as shown on the drawings. Cathodic protection system does **not** include polyethylene pipe wrap, which shall be paid under separate bid item(s).

2.06 FURNISH AND INSTALL GATE VALVES WITH VALVE BOX AND EXTENSION, 6-INCH TO 16-INCH

Measurement for payment to furnish and install gate valves shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for work necessary to install the valves, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension, concrete collar, if required; and other specified work.

2.07 FURNISH AND INSTALL GATE VALVES WITH VAULT AND EXTENSION, 20-INCH TO 30-INCH

Measurement for payment to furnish and install gate valves shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for work necessary to install the valves, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement of valve and concrete vault, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension, concrete collar, valve box and marker, if required; and other specified work.

2.08 AIR VACUUM RELEASE VALVE WITH VAULT

Measurement for payment to furnish and install air vacuum release valve shall be on a per each basis. Payment shall be based upon actual quantity of each valve furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for work necessary to install the valves, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, delivery to the work areas, surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement of valve and concrete vault, backfilling and compaction; cleaning, treating

and testing; cleanup, including valve box, extension, concrete collar, if required; and other specified work.

2.09 FIRE HYDRANT ASSEMBLY AND FLUSHING HYDRANT ASSEMBLY

Measurement for payment for removing or furnishing and installing fire hydrant and flushing hydrant assemblies shall be at the unit price bid per each and shall include, but is not limited to transporting, storing, furnishing, and installing. Payment for furnishing and installing fire hydrant and flushing hydrant assemblies shall be made at the unit price per each and shall constitute full compensation for the construction of fire hydrant assemblies, installed complete, including fire and flushing hydrant, fire and flushing hydrant extensions, fire and flushing hydrant tee, required linear feet of 6-inch restrained joint ductile iron piping, restrained valves, and valve boxes and markers; concrete collars and thrust blocks; gravel pockets, and fittings. A backflow preventer may be required based on distance from the main line with approval from the **County**. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; removal of any existing hydrants, excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension; concrete collar, if required; and other specified work.

2.10 FURNISH AND INSTALL TAPPING SLEEVE AND VALVE

Measurement for payment to furnish and install tapping sleeves and valves shall be based upon actual quantity, each, of tapping sleeves and valves furnished, installed complete, in accordance with the requirements of the Contract Documents. Payment for furnishing and installing tapping sleeves and valves shall be made at the unit price per each and shall constitute full compensation for the complete installation of the tapping sleeve, valve, and valve box. This also includes surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction; cleaning, treating and testing; cleanup, including valve box, extension; concrete collar, valve cover and marker, if required; and other specified work.

2.11 CONNECT TO EXISTING WATER LINES

Measurement and payment for connecting to existing water lines is on a per each basis. The cost of all labor, materials, equipment, etc. necessary for making the connection to existing water lines with solid sleeves or other manner shall be included in the unit price bid for Connections to Existing Water Mains.

2.12 COPPER SERVICE LINE INSTALLATION

Measurement for payment for furnishing and installing 1-inch or 2-inch copper water service lines shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of copper service line from the water main to the meter stop in the meter box at the property line, including but not limited to furnishing, transporting, storing, and installing the pipe; thrust blocks or concrete collars; electromagnetic pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material;

excavation support system, free boring under driveways or trees, utility support system, dewatering, temporary water service, backfilling, and compaction; concrete cap; cleaning, treating, and testing; site restoration; and other specified work.

2.13 WATER SERVICE

A. SERVICE LINE REPLACEMENT

Measurement for payment for water service transfer shall be on a per each basis for the actual number of water services transferred from an existing water main to a new, relocated water main. Payment for water service transfer shall constitute full compensation for the complete transfer of the water service from the main to the meter; the meter shall not be relocated. This item shall include main line tap, fittings, piping, and restoration to transfer the service, including pressure testing and disinfection, and connection to the meter. Work shall be performed by a licensed plumber. This includes surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction; cleanup; and other specified work.

B. RELOCATION OF EXISTING WATER METER

Measurement for payment for water service relocation is on a per each basis. Payment shall constitute full compensation for work necessary to relocate the service, including relocation of the water meter. This includes, but is not limited to: the purchase, delivery to the work site, on-site storage, delivery to the work areas, surface preparation, placement, and cleanup required for the complete relocation of the water service from the main to the property line. The existing meter and appurtenances shall be reset as directed by the **County**. This item shall include devices, fittings, piping, and restoration to relocate the service, and includes removal of the existing service, pressure testing and disinfection, including connection to the relocated meter. Work shall be performed by a licensed plumber. This includes surface preparation, saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements and excavated material; excavation support system, utility support system, dewatering, temporary water service, placement, backfilling and compaction; and other specified work.

2.14 ROCK EXCAVATION

Measurement for payment for rock excavation shall be on a per cubic yard basis, if exceeded what is included in the bid tab. Payment shall constitute full compensation for work necessary for rock excavation in accordance with the Plans and Specifications, including, but not limited to, labor, materials, and equipment.

- A. For pipeline excavation, the volume of rock excavation shall be calculated by multiplying allowable specified trench width times the horizontal distance along the survey centerline times vertical height, rounded to nearest cubic yard, of rock excavation.
- B. For other structures, including manholes, maximum width shall be 24 inches beyond

each edge of the completed structure. Depth for payment purposes shall be no deeper than 12 inches below the bottom of the manhole or structure.

- C. No payment shall be made for rock excavation below the required grade or outside the width pay limits as specified in Section 02324 - Trenching and Trench Backfilling.
- D. Payment shall include the cost of removal and lawful disposal of the rock from the site.
- E. Payment for rock excavation associated with micro-tunneling, directional drilling, tunnel construction, and tunnel access shaft shall be considered incidental to the respective Work.

2.15 ASPHALT SPEED HUMP REPAIR/REPLACEMENT

Measurement for payment for asphalt speed hump repair/replacement shall be on per each basis. Payment shall be full compensation for furnishing labor, materials, tools, testing, and equipment necessary to install Type B Base for Asphalt Speed Hump Replacement, and shall include furnishing, hauling, demolition, preparation, placement of Type B base materials, bit tack coat, and prime coat for permanent asphalt speed hump. Pavement thickness shall be as shown on the standard details.

2.16 ASPHALT PAVEMENT REPLACEMENT

- A. Measurement for payment for Type B Base for Permanent Asphalt pavement replacement shall be at the unit price bid per ton. Payment shall be full compensation for furnishing labor, materials, tools, testing, and equipment necessary to install Type B Base for Permanent Asphalt Pavement Replacement, and shall include furnishing, hauling, milling, preparation, placement of Type B base materials, bit tack coat, and prime coat for permanent asphalt paving. Pavement thickness shall be as shown on the standard details.
- B. All pavement damaged outside the payment width shall be repaired as specified by the **County** and no additional payment shall be allowed for such work outside the payment width.

2.17 CONCRETE CURB AND GUTTER, CONCRETE CURB, AND CONCRETE VALLEY GUTTER, GRANITE CURB

- A. Measurement for payment of concrete curb and gutter, concrete curb, or reset granite curb, and concrete valley gutter shall be made on a per linear foot basis.
- B. Payment shall constitute full compensation for work necessary to install the curb and gutter, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, and delivery to the work areas; excavation, backfilling, compaction, placement, and restoration of property; disposal of existing materials, and joints; special construction at driveways and other entrances or points; and cleanup. Payment shall include approaches through curb and gutter indicated on the Plans.

2.18 CONCRETE DRIVEWAY/SIDEWALK

Measurement for payment for concrete driveway/sidewalk removal and replacement shall be per square yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish concrete sidewalk, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; joints and special construction at driveways or other entrances and points; hauling and placing materials; and incidentals necessary to complete the Work. Payment shall include approaches through curb and gutter indicated on the Plans.

2.19 CONCRETE GROUT

Measurement for payment for concrete abandon existing water main in place with grout shall be per cubic yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish grout installation, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.20 CONCRETE ENCASEMENT

Measurement for payment for concrete encasement on proposed and existing utilities shall be per cubic yard. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and finish concrete installation, and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.21 PAVEMENT MARKING, SIGNING AND STRIPING

- A. Measurement and payment for pavement striping shall be on a per linear foot basis.
- B. Measurement and payment for pavement arrows and lettering shall be on a per each basis.
- C. Measurement and payment for removal and replacement or for new roadway signage shall be on a per each basis.

2.22 REMOVE AND REPLACE RETAINING WALL

Payment for this item will be at a lump sum bid price and the existing walls shall be replaced in kind. The length shall be measured in place after replacement. Existing walls shall be removed only where necessary for carrying out the work or as directed by the Engineer. Where the existing wall materials are unsuitable for replacement, the **Contractor** shall furnish new materials, the costs of which are to be included in the bid price. Bid price shall include all labor, material, tools and equipment to carry out the work. No payment will be made except when walls is replaced.

2.23 DUCTILE IRON WATER DISTRIBUTION PIPE, RESTRAINED JOINT

- A. Measurement for payment of furnishing and installing ductile iron water distribution pipe shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of ductile iron water distribution pipe, including but not limited to furnishing, transporting, storing, and installing the pipe; thrust blocks or concrete collars;

electromagnetic pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material; excavation support system, free boring under driveways or trees, utility support system, dewatering, temporary water service, backfilling, and compaction; concrete cap; cleaning, treating, and testing; site restoration; and other specified work.

- C. Depth of installation is as indicated on the drawing details, or defined in the specifications, or as directed by the **County**. Excavation is unclassified.

2.24 STORM DRAINAGE SYSTEM

- A. Storm Drain Culverts: Payment for culverts, reinforced concrete pipe, corrugated metal pipe, or ductile iron pipe as appropriate, shall be made for the actual lengths constructed and authorized by the Engineer.
- B. Appurtenances: Payment for appurtenances will be at the unit price bid for each respective structure properly constructed. No separate payment will be made for energy dissipaters.
- D. Concrete Flumes: Concrete flumes shall be paid for at the unit price bid for each flume. No additional payment will be made for the difference in cost for the different flumes.

2.25 EROSION AND SEDIMENTATION CONTROL AND TREE PROTECTION

- A. No separate payment shall be made for temporary and/or permanent erosion and sedimentation controls, except as noted below. Items for payment shall include those controls and protection for the Project Site. All other temporary and/or permanent erosion and sedimentation control costs shall be included in the unit price bid for the item to which it pertains.
- B. No payment shall be made for any portion of the Project for which temporary erosion and sedimentation controls are not properly maintained.
- C. Silt Fence: Measurement for payment of furnishing and installing silt fence shall be on a linear foot basis. All costs for silt fences including installation, maintenance, repair and removal, shall be included in the unit price bid for Silt Fence. Measurement shall be made of actual quantity constructed which had been authorized by the Engineer. Fence constructed to replace damaged fence shall not be eligible for payment.
- D. Tree Protection: Measurement for payment of furnishing and installing tree fence shall be on a linear foot basis. All costs for tree protection including installation, maintenance, repair and removal, shall be included in the unit price bid for Tree Protection. Measurement shall be made of actual quantity constructed which had been authorized by the Engineer. Tree protection constructed to replace tree protection shall not be eligible for payment.
- E. Rip Rap: The cost of rip rap, including materials, placement, maintenance, and filter fabric, as shown on the Drawings, specified or directed by the Engineer shall be included in the price bid for Rip Rap.

- F. Inlet Sediment Traps: Measurement for payment for inlet sediment traps shall be on per each basis. All costs for silt control gates, including installation, maintenance, repair and removal, shall be included in the unit price bid for Inlet Sediment Traps. Quantities for payment shall be based on actual quantity constructed and authorized by the Engineer.
- G. Grassing: Payment for grassing shall be on a per acre basis. Partial payment will be made based on the estimated area of grass established (not just seeded) divided by the estimated total area to be grassed.
- H. Mulching: Payment for mulching shall be on a per ton basis. Partial payment will be made based on the estimated area of mulch installed.
- I. Sod: Payment for Sod shall be on a per square yard basis. Partial payment will be made based on the estimated area of grass established (not just seeded) divided by the estimated total area to be grassed.
- J. Water Quality Monitoring, Sampling, and Inspections: Payment for compliance with NPDES permit requirements shall be made under a lump sum bid to be paid monthly in equal payments. The lump sum bid shall be full compensation for compliance with NPDES requirements as described in Specification Section 01060 including the employment of an Environmental Professional for specified services. This item is inclusive of all associated fees to the Georgia Environmental Protection Division (EPD), DeKalb County, and other agencies as necessary for the compliance with erosion control requirements as specified and shown on drawings and required by law or regulation.

2.26 TRAFFIC CONTROL

Payment for traffic control shall be made at the lump sum price bid to be paid monthly in equal payments for all traffic control required for all force main work, including all lane closures, sign boards, cones, jersey barriers, detours, signage and other incidentals required by the government entity controlling the right-of-way.

2.27 TREE REPLACEMENT

Measurement and payment for tree replacement shall be made on a per each basis. Payment shall be full compensation for furnishing labor, materials, tools, and equipment necessary to install and replacement trees and shall include: excavation, backfilling, compaction, and restoration of property; disposal of existing materials; hauling and placing materials; and incidentals necessary to complete the Work.

2.28 ABANDON EXISTING VALVE BOX

Measurement and payment for abandonment of existing valve box shall be made on a per each basis. Payment shall constitute full payment for work necessary to abandon existing valve box including closure of the valve, removal of valve stem, removal of valve box frame and cover, filling of

hole with concrete and restoration of pavement.

2.29 MOBILIZATION/DEMobilIZATION

The lump sum amount for MOBILIZATION will be eligible for payment upon the completion of all related preparatory work after transportation of the materials and equipment necessary for the first 45 days of the Contract Time.

2.30 REMOVE/RESET MAILBOXES.

Measurement and payment for removal and resetting of existing mailboxes shall be on a per each basis.

2.31 FURNISH AND INSTALL WATER VALVE COVER AND DISC

Measurement for payment to furnish and install water valve cover and disc shall be on a per each basis. Payment shall be based upon actual quantity of each valve cover and disc furnished and installed, in accordance with the requirements of the Contract Documents. Payment shall constitute full compensation for work necessary to install the valve cover and disc, including, but not limited to: the purchase, delivery to the Work Site, on-site storage, delivery to the work areas, placement, , concrete pad, if required; and other specified work.

2.32 POLYVINYL CHLORIDE PIPE, PUSH-ON JOINT

- A. Measurement for payment of furnishing and installing polyvinyl chloride pipe shall be on a linear foot basis as determined by measurement along the centerline of the pipe in place. Payment shall constitute full compensation for work necessary for installation of polyvinyl chloride pipe, including but not limited to furnishing, transporting, storing, and installing the pipe; thrust blocks or concrete collars; electromagnetic pipe location along the pipeline route; saw cutting asphalt pavement, excavation, removal, and disposal of asphalt or concrete pavements, and excavated material; excavation support system, free boring under driveways or trees, utility support system, dewatering, backfilling, and compaction; concrete cap; cleaning, treating, and testing; site restoration; and other specified work.
- E. Depth of installation is as indicated on the drawing details, or defined in the specifications, or as directed by the **County**. Excavation is unclassified.

2.33 TRAFFIC LOOP REPLACEMENT

Measurement for payment for removal and replacement of traffic loops shall be on a per each basis.

2.34 REMOVE/REPLACE 30-INCH WATER MAIN IN SAME TRENCH

Measurement for payment to remove and dispose of existing 24-inch/30-inch water transmission main shall be paid on a linear basis as determined along the centerline of the pipe in place.

2.35 DISCONNECT 8" TIE-INS FROM EXIST. 30"

Disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is shown on the plans or directed by the Utility Owner or GDOT Project Manager. Provide a watertight pipe or cap or plug and resistant mechanism to seal off existing mains indicated to remain in service. If water main is to be abandoned or removed and not specified to be grout filled, seal ends with a pipe cap or plug or with a masonry plug and minimum 6-inch (150mm) cover of concrete on all sides around the end of the pipe.

PART 3 – ALLOWANCES

3.01 ALLOWANCES

- A. The allowances specified in the Bid Schedule are to establish a fund to pay the cost of items for which the **County** could not establish accurate quantities and/or detailed scope of work. The **Contractor** shall submit for review and approval by the **County** a proposed cost of services prior to performance of the Work. This Work shall be completed only at the written direction of the **County** after the cost of such Work has been approved
- B. The **Contractor** shall be responsible for the payment for these services to the appropriate payee providing such service, and shall submit evidence of payments to the **County** prior to their inclusion in the progress payments.
- C. The **County** shall make payment for invoices submitted by the **Contractor** subject to the Contract Documents. **Contractor** shall not receive any additional compensation for bond or insurance costs for work executed using allowance funding.
- D. Allowance allocations shall only be paid to the **Contractor** for completed work authorized by the **County**. Allowance dollar amounts not expended shall revert to the **County** at the completion of the project. Should the final allowance costs be less than the specified amount of the allowance, the Contract shall be adjusted accordingly by change order. The amount of change order shall not recognize any changes in handling costs at the site, labor, overhead, profit, and other expenses caused by the adjustment to the allowance item.

3.02 COUNTY-DIRECTED COMPLIANCE TESTING

When an allowance has been established as the value of this item, this allowance shall be used to pay the costs, where the amounts are determined as specified in General Requirements Section GR-5, Changes in the Work and Change Orders, for supplemental confirmation testing where directed by the **County**.

3.03 COUNTY-DIRECTED SITE RESTORATION (Private Property)

- A. When an allowance has been established as the value of this item, this allowance shall be used to pay the costs, where the amounts are determined as specified in General Requirements Section GR-5, Changes in the Work and Change Orders for additional site restoration work on private property not shown on the drawings or described in the specifications as directed by the **County**.

- B. The costs of final grading, site restoration (consisting of grassing, shrub, and tree plantings, and maintenance thereof, shown in the Drawings and/or required by the Specifications) are not covered in this allowance item, and shall be included in the appropriate unit price Bid Items. The re-grassing or re-sodding of property disturbed by the **Contractor** as well as the restoration of the landscaping and structures shall be part of the **Contractor's** unit price bid amounts under the appropriate items.

3.04 UNFORESEEN UTILITY CONFLICTS

When an allowance has been established as the value of this item, this allowance shall be used to pay the costs, where the amounts are determined as specified in General Requirements Section GR-5, Changes in the Work and Change Orders for utility conflicts as directed by the **County**. This allowance shall be used to pay the cost of: relocating utilities or other structures not shown on the Drawings, or reasonably anticipated based upon a pre-bid inspection of project conditions and the work site; additional work to resolve unforeseen utility conflicts; or demolishing structures not shown on the Drawings.

PART 3 – PRODUCTS (NOT USED)

PART 4 – EXECUTION (NOT USED)

END OF SECTION 01210

SECTION 01300 SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Preparing and processing of submittals for review and action.
 - 2. Preparing and processing of informational submittals.
- B. Submit the following for the **County's** review and action:
 - 1. Shop drawings
 - 2. Product data
 - 3. Samples
 - 4. Submittals indicated as "for approval"
- C. Submit the following as informational submittals:
 - 1. Structural design information required by the contract documents
 - 2. Certificates
 - 3. Coordination drawings
 - 4. Reports
 - 5. Qualification statements for manufacturers/installers
 - 6. Submittals indicated as "for information only"
- D. Specific submittals are described in individual sections.
- E. Do not commence Work that requires review of any submittals until receipt of returned submittals with an acceptable action.
- F. Do not allow submittals without an acceptable action marking to be used for the project.
- G. Submittals shall be submitted to the **County** by a flash or jump drive. No email submittals shall be allowed for approval. One copy of each submittal shall be uploaded by the **Contractor** into the software program named by the **County**. The **County** may determine that certain submittals also shall be submitted in hard copy form.

1.02 DEFINITIONS

- A. "Shop drawings" are drawings and other data prepared by the entity that is to do the Work, specifically to show a portion of the Work.
- B. "Product data submittals" are standard printed data that show or otherwise describe

a product or system, or some other portion of the Work.

- C. "Samples" are actual examples of the products or Work to be installed.
- D. "Informational submittals" are those identified in the Contract Documents as for information only.

1.03 FORM OF SUBMITTALS

- A. Sheets larger than 8-1/2 by 14 Inches:
 - 1. Maximum sheet size: 24 by 36 inches (except for full-size pattern or template drawings).
 - 2. Number of copies:
 - a. Submittals for review: Three blue or blackline prints
 - b. Informational submittals: Three blue or blackline prints
- B. Small sheets or pages:
 - 1. Minimum sheet size: 8-1/2 by 11 inches
 - 2. Maximum sheet size for opaque copies: 11 by 17 inches
 - 3. Number of copies shall be the same as for larger sheets
- C. Samples:
 - 1. Two sets of each shall be submitted with the original submittal.
 - 2. One set shall be returned.
 - 3. If additional sets are needed by other entities involved in Work represented by the samples, these shall be submitted with original submittal.

1.04 COORDINATION OF SUBMITTALS

Coordinate submittals and activities that shall be performed in sequence or of different types for the same product or system so that the **County** has enough information to properly review each submittal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 TIMING OF SUBMITTALS

- A. Transmit each submittal at the time indicated on the approved construction schedule.
- B. Deliver each submittal requiring approval in time to allow for adequate review and processing time, including resubmittals if necessary; failure of the **Contractor** in this respect shall not be considered as grounds for an extension of the contract time.
- C. Deliver each informational submittal prior to start of the Work involved, unless the

submittal is of a type that cannot be prepared until after completion of the Work; submit promptly.

- D. If a submittal must be processed within a certain time in order to maintain the progress of the Work, state so clearly on the submittal.
- E. If a submittal must be delayed for coordination with other submittals not yet submitted, the **County** may, at its option, either return the submittal with no action or notify the **Contractor** of the other submittals that shall be received before the submittal can be reviewed.

3.02 SUBMITTAL PROCEDURES - GENERAL

- A. **Contractor** review: Sign each copy of each submittal certifying compliance with the requirements of the contract documents.
- B. Notify the **County**, in writing and at time of submittal, of points upon which the submittal does not conform to the requirements of the contract documents, if any.
- C. Preparation of submittals:
 - 1. Label each copy of each submittal with the following information:
 - a. Project name
 - b. Date of submittal
 - c. **Contractor's** name and address
 - d. Supplier's name and address
 - e. Manufacturer's name
 - f. Specification section where the submittal is specified
 - g. Numbers of applicable drawings and details
 - h. Other necessary identifying information
 - 2. Submittals to receive **County's** action marking: Provide blank space on the label or on the submittal itself for action marking: minimum 4 inches wide by 5 inches high.
- D. Transmittal of submittals:
 - 1. Submittals shall be accepted from the **Contractor** only.
 - 2. Submittals received without a transmittal form shall be returned without review or action.
 - 3. Transmittal form: The **Contractor** shall use a form acceptable to the **County**, with space provided on the form for:
 - a. Project name
 - b. Submittal date
 - c. Transmittal number
 - d. Specification section number
 - e. To:
 - f. From:
 - g. **Contractor's** name

- h. Subcontractor's and supplier's names
 - i. Manufacturer's name
 - j. Submittal type (shop drawing, product data, sample, informational submittal).
 - k. Description of submittal
 - l. Action marking
 - m. Comments
4. The **Contractor** shall complete a separate transmittal form for each submittal, also including the following:
- a. Other relevant information
 - b. Requests for additional information

3.03 SHOP DRAWINGS

- A. Content: Include the following information:
1. Dimensions, at accurate scale
 2. All field measurements that have been taken, at accurate scale
 3. Names of specific products and materials used
 4. Details, identified by contract document sheet and detail numbers
 5. Compliance with the specific standards referenced
 6. Coordination requirements, including the relationship to adjacent or critical Work
 7. Name of preparing firm
 8. Design calculations
- B. Preparation:
1. Reproductions of contract documents are not acceptable as shop drawings.
 2. Copies of standard printed documents are not acceptable as shop drawings.
 3. Documents shall be identified as indicated for submittals.
 4. Space for **County's** action marking shall be adjacent to the title block.

3.04 PRODUCT DATA

- A. Submit product data submittals for each system or unit of Work as one submittal.
- B. When product data submittals are prepared specifically for this Project (in the absence of standard printed information), submit such information as shop drawings, and not as product data submittals.
- C. Content:
1. Submit manufacturer's standard printed data sheets.
 2. Identify the particular product being submitted; submit only pertinent pages.
 3. Show compliance with properties specified.

4. Identify which options and accessories are applicable.
5. Include recommendations for application and use.
6. Show compliance with the specific standards referenced.
7. Show compliance with specified testing agency listings; show the limitations of their labels or seals, if any.
8. Identify dimensions, which have been verified by field measurement.
9. Show special coordination requirements for the product.

3.05 SAMPLES

- A. Samples:
 1. Provide samples that are the same as the proposed product.
 2. Where selection is required, provide the full set of options.
- B. Preparation:
 1. Attach a description to each sample.
 2. Attach name of manufacturer or source to each sample.
 3. Where compliance with specified properties is required, attach documentation showing compliance.
 4. Where there are limitations in availability, deliveries, or other similar characteristics, attach descriptions of such limitations.
 5. Where selection is required, the first submittal may be a single set of options; after return of submittal with selection indicated, submit standard number of sets of selected item.
- C. Keep final sample set(s) at the Project Site, available for use during progress of the Work.

3.06 REVIEW OF SUBMITTALS

- A. Submittals for approval shall be reviewed, marked with appropriate action, and returned. Submittals are reviewed for conformance with project design concept and for compliance with standard of quality established in the Contract Documents. This review shall not relieve the **Contractor** from responsibilities for correctness of detail and dimension, nor from deviation from Contract Document requirements, except as noted and accepted in writing by the **County** at the time of submittal.
- B. Informational submittals shall be reviewed.
- C. Action markings for submittals for approval shall be as follows:
 1. NO EXCEPTIONS TAKEN (NET): Indicate that the submitted item is released for manufacture
 2. MAKE CORRECTIONS NOTED (MCN): Indicate that the submitted item is released for manufacture with the submittal complying with the comments
 3. AMEND AND RESUBMIT (AAR): Indicates that the submittal shall be revised

or a new submittal complying with the comments made shall be prepared.

4. REJECTED (REJ): Indicates that the submitted item does not comply with contract requirements and that another selection shall be made and the submittal process repeated.
5. SUBMIT SPECIFIED ITEM(s) (SSI): Indicates that the submittal shall submit specified item(s) based on the specifications or as stated by the County

3.07 RETURN, RESUBMITTAL, AND DISTRIBUTION

- A. Submittals shall be returned to the **Contractor** by mail.
- B. The **Contractor** shall address resubmittals in the same manner as original submittals, with changes other than those requested by the **County**, clearly indicated.
 1. Exception: Transmittal number for resubmittal shall be the number of the original submittal plus a letter suffix.
 2. Resubmittals shall be submitted within 14 days of **Contractor's** receipt of rejected submittal.
- C. Distribution: The **Contractor** shall make one copy for project record documents.

END OF SECTION 01300

SECTION 01310 CONSTRUCTION SCHEDULE (Large Project)

PART 1 – GENERAL

1.01 SCOPE

- A. Timely performance is of the essence on this Project. The **Contractor** may schedule its Work to complete the Project or any part of the Project earlier than is stipulated in the Contract and the milestone requirements. However, under no circumstances shall the **Contractor** be entitled to added compensation for delays that occur during the originally stipulated contract period.
- B. The **County** has purchased the **Contractor's** entire scheduled time period by virtue of this Contract and further stipulates that only those delays that meet the tests set forth in GR-6 of the General Requirements shall be considered for adjustment and only to the extent that they delay the Work past the originally contractually stipulated milestones.

1.02 PROCEDURES

- A. The Work under this Contract shall be planned, scheduled, executed, reported, and accomplished using the Precedence Diagramming Critical Path Method (CPM). The Work required by this section includes the requirement to prepare, maintain, and update the detailed schedules as described in this section. The CPM schedules shall be prepared in such a manner as to permit the orderly planning, organization, and execution of the Work and be sufficiently detailed to accurately depict all the Work required by the Contract. **Contractor** shall resource (labor, material, and equipment) and cost load its schedule as specified herein.
- B. **Contractor** hereby agrees that in the process of preparing its baseline schedule and monthly updates, it shall consult with all key subcontractors and suppliers to obtain concurrence with the feasibility and achievability of **Contractor's** planned start dates, sequencing, durations, and completion dates. A copy of the computer input files, in PRX or XER format, shall be submitted on USB flash drive(s) containing fully detailed logs with each submittal. The procedures, technical details, and **Contractor's** participation and responsibilities shall be as hereinafter described.
- C. **Contractor** is responsible for determining the sequence of activities; the time estimates for the detailed construction activities; and the means, methods, techniques and procedures to be employed. The schedules identified herein shall represent the **Contractor's** best judgment of how it shall prosecute the Work in compliance with the Contract requirements. **Contractor** shall maintain a current and accurate schedule that is properly and timely monitored, updated, and revised as Project conditions may require and as required by the Contract Documents.
- D. **Contractor's** Construction Schedule shall be prepared using the latest version of Oracle Primavera P6 Enterprise Project Portfolio Management (P6) Release 8. Any and all costs incurred by the **Contractor** in researching, training, and/or educating

its personnel in CPM and/or P6 (or the utilization of outside consultants) shall be part of the **Contractor's** bid price and not reimbursed separately by the **County**

1. The Project Network Schedule Diagram, mathematical analyses, written narrative, and monthly updates will be reviewed by the **County**. Items will be reviewed for compliance with these Specifications and accurate reporting by the **Contractor** of Work in place, resource loading, and Work activity durations.
2. The **Contractor** shall submit to the **County** an accepted final CPM construction schedule and final schedule of values, including allowance Items, allocated to the CPM schedule activities within 45 days of Notice to Proceed. Requirements for the final CPM construction and final schedule of values are further described hereinafter. **Contractor's** Application for Payment shall not be approved until the final CPM Schedule and Schedule of Values have been accepted. The Contract Baseline Schedule submittal shall not show any progress until it is accepted by the **County**

1.03 STANDARDS

- A. Definition: CPM, as required by this Section, shall comply with the standards outlined in the Associated General **Contractors'** publication, "Construction Planning and Scheduling," unless specifically changed by this Section.
- B. PM Construction Schedule: The **Contractor's** CPM Construction Schedule shall include a graphic time scaled logic network, computerized tabular reports, and resource loading as described below. To be acceptable, the schedule shall demonstrate the following:
 1. A logical succession of Work from start to finish. This logical succession, when accepted, is the **Contractor's** Work plan and, contrary to normal CPM standards, is designated as early start/early finish solely to accommodate the P6 software.
 2. Clear definition of each activity including cost, manpower, equipment, and material quantities as resources. The assigned dollar value (cost loading) of each activity shall cumulatively equal the contract price.
 3. Proper interfacing of related activities including submittals, major material and equipment deliveries, procurement, required permits, and other constraints, such as equipment or manpower/crew availability. Submittal dates shall include review periods and permit schedules shall include agency review and issue dates. The narrative shall explain the rationale for all constraints, lags, and unusual relationships.
 4. Agreement with the interim milestones, schedule coordination requirements, and completion dates shall be as indicated in the Contract Documents.
- C. CPM Graphic Logic Network
 1. The CPM graphic logic network or diagram shall be in the form of a time-scaled diagram of the customary precedence diagram and may be divided into a number of separate pages with suitable notation relating the interface

points among the pages. Individual pages shall not exceed 34 inches by 44 inches. At a minimum, notation on each activity line shall include activity descriptions, total float, and durations.

2. All construction activities and procurement shall be indicated in a time-scaled format, and a calendar shall be shown on all sheets along the entire sheet length. Each activity shall be plotted so the beginning and completion dates of said activity can be determined graphically by comparison with the calendar scale. A legend shall be included to clearly distinguish between critical and non-critical path activities and progress to date.
- D. Duration: The duration indicated for each activity shall be in units of whole working days and shall represent the single best time considering the scope of the Work and resources planned for the activity including time for holidays and inclement weather. The calendar for the network shall be in calendar days. Except for certain non-labor activities, such as submittal preparation and review, curing concrete, delivering and fabrication of materials, or other activities described specifically in the Contract, activity durations shall not exceed 14 days, be less than one day, nor exceed \$50,000 in value, unless otherwise accepted by the **County**.
- E. The Interim Schedule and Contract Baseline Schedule shall show dependencies (or relationships) between each activity. Each activity shall have a successor and predecessor, except for the project start and finish milestone. The use of date constraints shall be limited to Contract milestones and Contract completion dates only, unless approved by the **County**.
- F. Contract Baseline Schedule shall contain or be able to demonstrate that the following items have been addressed: 1) the Project's name; 2) the **Contractor's** name; 3) revision or edition number; 4) activities of completed Work; e) activities relating to different areas of responsibility, such as subcontracted Work that is distinctly separated from that being done by the **Contractor** directly; 5) labor resources distinguished by craft or crew requirements; 6) equipment and material resources distinguished by equipment and material requirements; 7) distinct and identifiable subdivisions of Work, such as cleaning, pre-liner installation inspection, CIPP installation; 8) locations of Work within the contract limit lines that necessitate different times or crews to perform; 9) outage schedules for existing utility services that will be interrupted during the performance of the Work; 10) phases; and 11) interim milestones and the Contract completion dates.
- G. Computerized Tabular Reports: Reports shall include the following for each activity depicted in the schedule.
1. Activity ID
 2. Activity description
 3. Duration (original and remaining)
 4. Early start date
 5. Early finish date
 6. Total float

7. Percent complete
 8. Activity cost and resources
 9. Actual start date
 10. Actual finish date
- H. Project Information: Each report shall be prefaced with the following summary data:
1. Project name
 2. **Contractor**
 3. Type of tabulation (initial or updated)
 4. Project duration
 5. Project scheduled completion date
 6. Projected completion date

1.04 ACCEPTANCE

- A. The finalized CPM Construction Schedule shall be acceptable to the **County** when it provides an orderly progression of the Work from Notice to Proceed to Final Completion in accordance with the Contract requirements, adequately defines the **Contractor's** Work plan, provides a workable arrangement for processing submittals in accordance with the requirements, and properly allocates resource values for manpower, major materials, equipment and costs to each activity (free of unbalances in resources) as determined by the **County**. Manpower may be represented as composite crews in the CPM construction schedule. The network diagram and tabular reports, when accepted by the **County**, shall constitute the CPM construction schedule until revised and re-accepted.
- B. When the CPM Construction Schedule has been accepted, the **Contractor** shall submit to the **County**:
1. Three copies of the CPM graphic logic network
 2. Three copies of a computerized, tabular report in which activities have been sequenced by early starting date
 3. Two copies of the schedule on a USB Flash Drive
 4. Three copies of the narrative
- C. The **County's** review and acceptance of the **Contractor's** CPM Construction Schedule is for conformance to the requirements of the Contract Documents only. Review and acceptance by the **County** of the **Contractor's** CPM Construction Schedule does not relieve the **Contractor** of any of its responsibility whatsoever for the accuracy or feasibility of the CPM Construction Schedule, or of the **Contractor's** ability to meet interim milestone dates and the Contract completion date, nor does such review and acceptance expressly or impliedly warrant, acknowledge, or admit the reasonableness of the logic, durations, and resource value loading of the **Contractor's** CPM Construction Schedule.

- D. The **Contractor** shall participate in a conference with the **County** to review the **County's** comments on the schedule and evaluation of the proposed network diagram, mathematical analyses, and monetary value of activities. The intent is to reach a clearer understanding of the CPM and achieve consensus on any revisions to be made. Any revisions necessary as a result of this review shall be resubmitted to the **County** within 10 calendar days after the conference. The accepted schedule shall then be used by the **Contractor** for planning, organizing, and directing the Work, and for reporting progress. If the **Contractor** desires to make changes in its method of performing the Work, it shall notify the **County** in writing, stating the reason for the changes. The **Contractor** shall receive written acceptance of the change prior to putting the change into the accepted schedule.

1.05 QUALIFICATIONS

- A. The **Contractor** shall demonstrate competence in the use of CPM scheduling through the submission of a fully compliant CPM construction schedule with the initial CPM submission. In the event the **Contractor** fails to so demonstrate competence in the CPM scheduling, the **County** may direct the **Contractor** to employ the services of a scheduling firm that can demonstrate competence. The **Contractor** shall comply with such directive.
- B. The **Contractor** shall use the services of a scheduler who has verifiable training and credentials in preparing and maintaining computerized CPM Construction Schedules using P6 software as specified herein. The scheduler shall qualify within the planning period.
1. Required Experience: Performed CPM scheduling on at least two completed construction projects of value at least 75 percent as large as this one and having at least 75 percent as many schedule items as this one. Scheduling of both projects shall have been done using the latest version of P6 Release 8 or equal.
 2. Submit to the **County** the following:
 - a. Descriptions of at least two projects of the value and complexity above.
 - b. Copy of a CPM schedule from one of the previous projects.
 - c. Names and telephone numbers of facility **County** representative, design engineer, and construction manager for each project.
 - d. Evidence supporting the above qualifications.

1.06 SUBMITTAL REQUIREMENTS

- A. Initial submittal, revisions, and monthly updates of the network diagram, mathematical analyses, and written narrative shall be submitted in three hard copies and two data copies on a USB flash drive. Submittals shall not be accepted unless they are complete as described herein.
- B. The **Contractor** shall submit the following:
1. A CPM time scaled logic network, computer generated using the latest version of P6 Release 8.

2. Computerized tabular reports:
 - a. Activity sort by early start, organized by facility or area
 - b. Predecessor/successor listing
 - c. Activity code dictionary
 - d. Resource code dictionary
3. Basis of schedule narrative describing the logic and reasoning of the schedule. The narrative shall summarize the overall approach to construction sequencing, including but not limited to: 1) anticipated lost days due to weather; 2) the rationale for all constraints, lags, and unusual relationships; 3) the definition of labor and crews; 4) a list and durations for all major pieces of equipment and resources; and 5) Work proposed to be performed on any other than single-shift 5-day workweek basis
4. Resource value allocation by activity.
5. Breakdown of specific cost amount for each component of multi-component activities in the CPM schedule in spreadsheet format (using Microsoft Excel) showing component unit quantities as well as costs. Such breakdown, when accepted by the **County**, shall constitute the schedule of values for the Project.
6. USB flash drive copy of entire schedule, narrative, and spreadsheet.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SCHEDULE ORIENTATION SESSION

- A. **Contractor** shall, upon notification from the **County**, attend a Schedule Orientation Session relating to the schedules and reports requirements for this Contract. The Schedule Orientation Session is designed to review in detail, the objectives of the schedules and reports requirements and the requirements. **Contractor** shall arrange for its Project Manager, Superintendent, and Scheduler to attend the Schedule Orientation Session.
- B. The following items shall be discussed during the Schedule Orientation Session: 1) the procedures and requirements for the preparation of the Contract Baseline Schedule, and monthly updates by **Contractor**; b) how the requirements of the Contract Documents will be monitored and enforced by the **County**; c) how long-lead items and time requirements for the Work by subcontractors shall be identified and included in the Contract Baseline Schedule; d) testing and startup; e) coding and logic for the Contract Baseline Schedule; and f) identification and scheduling of shop drawings and other submittals.

3.02 SCHEDULE OF VALUES

- A. Submittals

1. **Contractor** shall allocate a dollar value for each activity on the Contract Baseline Schedule. The dollar value for the activity shall be the cost of the Work, including labor, materials, and equipment. Allowances shall be loaded on activities specifically included for this purpose. No activity on the Contract Baseline Schedule shall exceed a value of \$50,000, unless approved by the **County**. The sum of all activity costs shall equal the Contract Price. **Contractor** shall revise the resource and value loading as necessary to gain the acceptance of the **County**
 2. The final schedule of values shall incorporate all comments associated with the **Contractor's** schedule/schedule of values submittals.
 3. Submit documentation to support the values with data that shall substantiate their correctness, as requested by the **County**.
 4. The schedule of values, when accepted by the **County**, shall be used as the only basis for the **Contractor's** applications for payment. The total price paid for mobilization shall be as approved by the **County**, but in no case shall it exceed 4 percent of the total Part I and Part 2 bid amount.
 5. The schedule of values shall be derived from the assigned progress schedule activity values and identified by activity ID.
- B. Form and content of Schedule of Values
1. Identify the schedule of values submittal with:
 - a. Title of Contract and location
 - b. Contract Number
 - c. Name and address of **Contractor**
 - d. Date of submission
 2. The **Contractor's** Schedule of Values shall list the installed value of the component parts of the Work in sufficient detail to serve as the basis for computing values for progress payments during construction.
 3. Identify accounts with the location code and area code as defined in the P6 Release 8 format and list the number and title of the respective major Section of the Specifications.
 4. All accounts in the Schedule of Values shall be derived from the activities in the progress schedule. Account data pertaining to the Schedule of Values shall, at a minimum, include the following for each account:
 - a. CPM Activity number
 - b. **County's** Standard Code listed on the Bid Schedule
 - c. Account representative quantities (linear feet of CIPP, linear feet of cleaning, tons of debris, etc.), unit costs, person-hours, item and account dollar value
 - d. WBS code (as used by Primavera Project Planner scheduling software), including location, responsibility and area codes.
 - e. Specification Section Number

- f. Account Type: Lump Sum (LS), Unit Price (UP), Allowance (AL), or Change Order (CO)
- C. Unit Price Accounts (UP): Payment for Unit Price Accounts shall be based upon actual quantities of Work performed in compliance with the Contract Documents, as verified and accepted by the **County**. Whenever the actual quantity differs from the estimated quantity on the Unit Price Accounts, the **Contractor** shall notify the **County** in writing. Quantity over- and under-runs shall be tracked on the Schedule of Values.
- D. Allowance Accounts (AL): Payment for Allowance Accounts shall be based upon invoices submitted by the **Contractor** subject to conditions and limitations of the Contract Documents. Refer to Section 01210 - Measurement, and Payment, for requirements. The Allowance shall be adjusted to the actual amount paid for such services, and adjusted by CO, either at the end of that phase of the Work or at the completion of the Work. The **County** shall have sole discretion on determining when to make adjustments to the Allowance.
- E. A new account will be added to the Schedule of Values for approved CO work. Payment for Time and Expense CO work shall be based upon the General and Supplementary Conditions of these Specifications.
- F. The sum of all Account Values listed in the Schedule of Values shall equal the total Contract Price, excluding allowance Items.

3.03 MONTHLY APPLICATION FOR PAYMENT

- A. Monthly Application for Payment: **Contractor** shall provide monthly Schedule Update, monthly Payment Report, and monthly Narrative Report as its monthly Application for Payment package.
- B. Monthly Schedule Update: The **Contractor** shall submit, at intervals of 30 calendar days, an update of all activities in the as-planned CPM schedule. Update shall be created by updating the mathematical analyses and the corresponding computerized network diagram of the Schedule.
 - 1. The schedule shall be updated by entering the following: Actual start and completion dates of completed activities and the actual start date and remaining duration of activities in progress.
 - 2. The updated network diagram shall be submitted in the same format as noted in Section 1.02 - Procedures, with the calendar starting from the date of the update.
 - 3. The updated mathematical analysis shall be submitted in the same format noted in Section 1.02 - Procedures.
 - 4. The schedule update shall include an update of the cash flow projections in the same format as the original approved submittal.
 - 5. The schedule update shall state the percentage of the Work actually completed and scheduled as of the report date.

- C. The Monthly Payment Report shall show the activities or portions of activities completed during the reporting period, their total monetary values and the monetary values earned as a basis for the **Contractor's** Application for Payment. A mutually agreed upon percent complete shall be assigned to each completed and partially completed activity to be used for calculating the monetary value earned to date. For activities underway, the percent complete shall not be related to the remaining duration.
- D. A monthly narrative report shall be submitted, including, but not limited to, the following:
 - 1. Description of Work accomplished.
 - 2. Summary of safety and quality issues occurring during the month and corrective actions taken.
 - 3. **Contractor** evaluation of actual progress versus progress planned.
 - 4. If the project is behind schedule, progress along all paths with negative float, along with the reasons for the delay.
 - 5. A description of all revisions made to the schedule, including: all accepted added, deleted, and revised activities; all logic revisions; and all duration revisions.
 - 6. A description of the problem areas, current and anticipated delaying factors and their impact, and an explanation of corrective actions taken or proposed.
- E. If the **Contractor** fails to submit any of the required components of the Application for Payment, the **County** shall withhold approval of the Application for Payment until such time as the **Contractor** submits the required components.

3.04 PROGRESS MEETINGS AND LOOK-AHEAD SCHEDULES

- A. For the weekly progress meetings, the **Contractor** shall submit a Look-Ahead Schedule. This schedule shall cover 4 weeks: the immediate past week, the current week, and the forthcoming 2 weeks. This schedule shall include all activities that are complete, started, are incomplete or underway, or scheduled to be worked during this 4-week timeframe. This schedule shall list all activities from the accepted CPM construction schedule that are complete, are scheduled for Work during the period, are currently planned to be worked, even if out of sequence, and Work that is unfinished but scheduled to be finished. Actual start and completion dates shall be provided for the Work that has been completed the prior week; forecast start and finish dates shall be provided for the Work that is in process or upcoming.
- B. The **Contractor** shall review the Project Schedule and progress of Work and comparison with the latest approved baseline schedule. This shall include an analysis of Work accomplished since previous meeting, offsite fabrication status and issues, material delivery status and issues, actual and potential schedule slippage, problems arising from proposed changes, and other factors that might affect the Work

- C. Each activity noted above shall be identified by activity number corresponding to the accepted CPM Construction Schedule and detailed description of the activity.
- D. The Look-Ahead Schedule shall be delivered to the **County** 24 hours prior to the weekly progress meeting.
- E. The Look-Ahead Schedule shall be in a format approved by the **County**.
- F. Tabular reports for manpower and equipment resources shall be provided for and with each Look-Ahead Schedule.

3.05 CPM CONSTRUCTION SCHEDULE REVISIONS

- A. The **County** may direct and, if so directed, the **Contractor** shall propose, revisions to the CPM construction schedule upon occurrence of any of the following instances:
 - 1. The actual physical progress of the Work falls more than 5 percent behind the accepted CPM Construction Schedule, as demonstrated by comparison to the accepted monthly CPM Construction Schedule updates or as determined by the **County** if a current accepted CPM Construction Schedule does not exist.
 - 2. The **County** considers milestone or completion dates to be in jeopardy because of “activities behind schedule.” “Activities behind schedule” are those that have not or cannot be started or completed by the dates shown in the CPM Construction Schedule, regardless of the existence of positive float on the activity.
 - 3. A CO has been issued that changes, adds, or deletes scheduled activities, or that affects the time for completion of scheduled activities.
- B. When instances requiring revision to the CPM construction schedule occur, the **Contractor** shall submit the proposed revised CPM Construction Schedule within 10 working days after receiving direction from the **County** to provide such schedule. No additional payment shall be made to the **Contractor** for preparation and submittal of proposed revised CPM Construction Schedules. However, if the **County** accepts the proposed revised CPM Construction Schedule, it shall replace and supersede all previous CPM Construction Schedules and substitute for the next monthly CPM Construction Schedule update that would otherwise be required.
- C. Revisions to the CPM Construction Schedule shall comply with all of the same requirements applicable to the original schedule.

3.06 SCHEDULE RECOVERY

- A. If a revised CPM Construction Schedule accepted by the **County** requires the **Contractor** to employ additional manpower, equipment, hours of Work or Work shifts, or to accelerate procurement of materials or equipment, or any combination thereof, as schedule recovery measures to meet Contract milestones, the

Contractor shall implement such schedule recovery measures without additional charge to the **County**.

- B. Furthermore, if efforts to recover are not deemed effective as determined by the **County**, or if prior to submittal of the recovery schedule, the **County** determines that critical milestones are in jeopardy, the **County** may direct the **Contractor** to implement the above or any other recovery efforts at no additional costs to the **County**.

3.07 TIME IMPACT ANALYSIS REQUIREMENT

- A. When the **Contractor** experiences delays and a time extension is requested, the **Contractor** shall submit to the **County** a written Time Impact Analysis illustrating the influence of all changes or all delays on the current Project completion date. The time impact analysis shall be constructed on an As-Built Schedule Analysis approach. The As-Built Schedule that is created shall incorporate all actual start and finish dates, actual durations of activities, and actual sequences of construction (referred to as the As-Built Logic) current as of the time the Time Impact Analysis is performed. This Time Impact Analysis shall incorporate all delays (including **County**, **Contractor**, and third party delays without exception) in the timeframe that they actually occurred with actual logic ties.

The As-Built Schedule data shall be obtained from the most recent approved monthly schedule update. The As-Built Schedule shall be created as an early start schedule with the actual start and finish dates coinciding with the early start and finish dates from the most recent approved monthly schedule update. The As-Built Schedule shall show the original activity durations equal to the actual duration and the actual logic driving all activities. The **County** shall validate this As-Built Schedule. All requests for time extension shall be based upon an analysis of this As-Built Schedule. The critical path shall be established and all **County**-caused delays on the critical path shall be identified. The time extension shall be based solely upon the cumulative duration of all **County** and third-party-caused delays that are on the critical path. Any time extensions to the project's Interim Milestone Dates, if any, shall be non-compensable time extensions only.

- B. Each Time Impact Analysis shall demonstrate the estimated time impact based on the events of delay, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest approved update of the project schedule, in effect at the time the change or delay was encountered.

END OF SECTION 01310

SECTION 01350 PROJECT DOCUMENT TRACKING AND CONTROL SYSTEM

1.01 SCOPE

- A. The **Contractor** shall utilize the **County's** Project Document Tracking and Control System (DTCS), SharePoint. The primary function of the system is to facilitate timely processing and approval of contract documentation in coordination with the overall Project Schedule established by these Specifications and the **Contractor**. The **Contractor** shall utilize this system for document tracking and control. The software will:
1. Facilitate communication between the **County** and **Contractor**.
 2. Support turnaround time with regard to responses and approvals.
 3. Provide a central location for Project information to support Project participants in performing their tasks based on the latest Project data.
 4. Provide a standard system of project administration with accountability.
- B. The **Contractor** shall utilize the web-based system that resides on the DWM server to generate documents in the proper format for submission to the **County**. The **Contractor** shall access the system using a compatible web browser from the **Contractor's** administrative field office location, and/or other locations where Work associated with the Project is being performed.
- C. The **Contractor** shall be required to generate Project documents and records utilizing the aforementioned system. The **Contractor** shall be required to transmit and submit the Project documents within the system to the **County**.
- D. The **Contractor** shall utilize a high-capacity scanner capable of scanning 11 x 17 documents, double-sided, onsite for the entire duration of the Project. Documents shall be scanned in and attached to the appropriate Contract Manager document, including submittals, shop drawings, operations & maintenance manuals, and other documents requested by the **County**.
- E. The **Contractor** shall utilize the document control system to create and maintain Project documents, including, but not limited to the following:
1. Company Directory: Addresses, Phone Numbers, Personnel Contacts, etc.
 2. Drawings Log: Current Drawing revision log
 3. Submittals Integrated with Project Schedule through Activity codes
 4. Transmittals
 5. Risk Register
 6. Requests for Information (RFIs)
 7. Requests for Proposal (RFPs)
 8. Work Authorization Requests (WARs)
 9. Work Authorizations (WAs)
 10. Change Order Requests (CORs)

11. Change Orders (COs)
12. Daily Reports (Daily Diaries)
13. Field Decisions, Field Orders (FOs), and Clarification Memos
14. Notice of Non-Compliance
15. Construction issue memos
16. Punch lists
17. Meeting Minutes and agendas
18. Correspondence
19. Work Plans
20. Startup Plans
21. Equipment Operations & Maintenance training
22. Spare parts lists

F. The **Contractor** shall utilize the complete capabilities of the DTCS to meet the requirements of this Section. The **Contractor** shall provide a highly trained and experienced construction project controls person knowledgeable in construction Work sequencing, productivity, scheduling, and application of the Primavera P6 software system. This person, along with the **Contractor's** management team, shall work closely with the **County** to deliver the documents outlined in this Section.

G. Software Support

The **Contractor** shall be required to establish an internet connection using DSL or better to connect to the DTCS to permit the forwarding and receipt of documents.

1. The Contract Manager software supports and the **Contractor** shall utilize Microsoft Outlook .
2. The **Contractor** shall also provide 2 days of consulting services in the base bid for troubleshooting and maintenance of the DTCS at any location designated by the **County** or at the **Contractor's** administrative field office (if authorized by the **County**). Troubleshooting, maintenance, upgrade, configuration, and setup shall be performed by a **County** approved project management system implementation company based on a scope pre-defined by the **County**. The **Contractor** shall utilize the custom data fields, dictionaries, and coding systems as required by the **County**.

H. The **Contractor** shall meet with the **County** within 15 days after the Contract is awarded to discuss access requirements and the **Contractor's** plan to utilize DTCS and execute the document control functions herein.

I. Access through the internet to the DTCS shall be operational within 30 days following the pre-construction meeting date. This shall be operational from the **Contractor's** administrative field office location.

1.02 COMPANY DIRECTORY

The **Contractor** and the **County** shall monitor and manage the Company Directory. The directory shall include Company name, Company abbreviation, contact names, address, phone numbers, and e-mail addresses.

1.03 DRAWING LOG

The **County** will maintain a log of initial “issued for construction” drawings in the DTCS. Information shall include drawing number, title and revision number. In addition to logging the initial project drawing list, the **County** will maintain a log on the DTCS of subsequent revisions to these drawings and any sketches resulting from clarification memos, RFPs, WARs, WAs, RFIs, Field Orders, and Change Orders (COs). It shall be the **Contractor’s** responsibility to utilize the latest drawings and sketches in the performance of the Work.

1.04 SUBMITTALS/SHOP DRAWINGS

- A. Requirements: This section specifies supplemental requirements to GR-24 and Section 01300, Submittals, related to the processing of submittals and shop drawings. The **Contractor** shall utilize the DTCS to log and track submittals, as well as generate associated transmittal letters.
- B. Submittals and Product Data: A list of required submittals shall be entered into the DTCS by the **Contractor**. Submittals shall be incorporated into packages, with numbering as follows: XXXXX-YYY, where X denotes the applicable specification section and Y denotes the individual submittal number for that particular specification section, beginning with 001. The **Contractor** shall log and track submittals utilizing the DTCS. Each review cycle shall be entered into the DTCS. The **Contractor** shall identify as activities in the CPM schedule, to include data submittals, as well as those involving complex reviews and long lead deliveries, and procurement items required for construction activities. Submittal schedule information shall be updated monthly with the **Contractor’s** updated project CPM schedule.
- C. Samples: A list of required sample submittals shall be entered into the DTCS by the **Contractor**. Sample submittals shall be identified as individual submittals within the submittal packages, with numbering as specified above.
- D. Guarantees/Warranties: A list of required Guarantee/Warranty submittals shall be entered into the DTCS by the **Contractor**. These submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.
- E. Work Plans, Startup Plans, O&M Submittals, and Spare Parts: Testing, Startup, and O&M submittals shall be entered into the DTCS by the **Contractor**. These submittals shall be identified as individual submittals within the submittal packages identified with numbering as specified above.
- F. Submittal Procedures: The **Contractor** shall prepare submittal packages utilizing the submittal numbering system, description, and packaging conventions described above. Submittals prepared by the **Contractor** that fail to follow the conventions described above, will be returned “amend and resubmit.” Should the **Contractor** determine that a submittal is required and is not covered by the listing within the DTCS, the **Contractor** shall consult with the **County** to determine the submittal number, description, and packaging that shall be

required.

1.05 CORRESPONDENCE

The **County** shall monitor and manage the correspondence, Non-Compliance Notices, Field Decisions and Clarification Memos, and Construction Issue Memo logs. The **Contractor** shall generate Project correspondence within the DTCS, and forward the correspondence to the **County**.

1.06 TRANSMITTAL LOG

The **Contractor** and the **County** will monitor and manage the transmittal log. Project transmittals shall be created electronically, automatically sequentially numbered, and logged into the DTCS system as they are created. The **Contractor** shall utilize the system to create transmittals for items transmitted to the **County**, Resident Inspection Staff, and other contractors.

1.07 RISK MANAGEMENT PLAN AND RISK REGISTER

Contractor shall provide a detailed and specific description of their approach to the management of risks associated with the Project, including permitting, design, construction, and testing and the **County's** operation and maintenance of the Project. Such risks shall include those allocated under the Contract to the County as well as those allocated to the **Contractor**.

Contractor is to develop and maintain a Risk Management Plan that can be used by the **County** to understand and evaluate the **Contractor's** understanding of the biggest risks and challenges to the Project, and how it intends to mitigate such risks. The **Contractor** shall provide sufficient information to enable the **County** to understand this evaluation. The Risk Management Plan shall include:

- A. A detailed risk register that identifies Project risk, the likelihood of such risk manifesting itself on the Project, the severity of such risk and a mitigation plan for such risk.
- B. An identification of and elaboration upon features of the **Contractor's** Design (if Design-Build type delivery) and Construction Plan that the **Contractor** considers unique and/or innovative relative to reducing or eliminating Project risk.

The **Contractor, County and Construction Manager** will review the Risk Register during the Project's progress meetings. The **Contractor** shall update the project Risk Register and provide these updates to the project team through the DTCS system on a monthly basis.

1.08 REQUEST FOR INFORMATION & ANSWERS

The **Contractor** shall be responsible for generating RFIs on the DTCS system. The **Contractor** shall notify the **County** when an RFI is submitted. The **County** will monitor and manage the RFI log. The **County** will generate an Answer document in response to each RFI and forward them to the **Contractor**. The DTCS shall track "Ball in Court" for RFIs and Answers, as well as date of original generation and response date. In addition, the RFIs shall reference the relative Specification Section and Drawings. The DTCS shall identify the date of the request and the originator, responsible party for a response and the date of the response.

1.09 CHANGE DOCUMENTS

Change documents include Request for Proposals (RFPs), Work Authorization Requests (WARs), Work Authorizations (WAs), Change Orders Requests (CORs), and Change Orders (COs). Change documents will be monitored and managed by the **County** utilizing the DTCS. The DTCS shall track "Ball in Court" status of change documents.

1.10 DAILY REPORTS

The **Contractor** is responsible for creating daily reports (daily diaries) utilizing the DTCS. The **Contractor** shall enter the Daily Reports into the DTCS by 10:00 a.m. of the subsequent day that the **Contractor** or any subcontractor performs Work. Daily reports shall be logged into the DTCS by the **Contractor**. The **Contractor** shall also provide one signed hard copy of daily reports on a weekly basis. Required information shall include the **Contractor**, Date, Day, Temperature, Precipitation, Sky, Wind, Work Activity, Equipment, Field Force, Visitors, Materials, and Scheduled Activities utilizing the Primavera schedule activity codes. Daily reports that fail to link Work activities to the active Project schedule shall not be acceptable.

1.11 PUNCH LISTS

The **County** will monitor and manage punch lists, and will create punch lists to be forwarded to the **Contractor**. The **Contractor** shall address the punch list items that have been assigned to the **Contractor** and forward updates to the **County**. Once accepted as complete, the **County** will access the punch list in the DTCS and close it out.

1.12 MEETING MINUTES AND AGENDA

The **County** will monitor and manage the meeting minute process. The **County** will forward meeting minutes to the **Contractor** electronically. The **County** will log the meeting minute items into the DTCS within 3 days of the meeting date.

1.13 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

The **Contractor** is responsible for creating progress payment applications directly from the project scheduling software and then forwarding them to the **County** electronically,

along with hard copies, by 4:00 p.m. at the end of each update/billing period. The **Contractor** shall also simultaneously provide a separate submittal of the updated progress schedule (P6 or latest version at the time of purchase), as specified in Section 01310.- Progress Payments, Schedule of values shall be developed as defined in Section 01310 within the Pay Application and shall be coordinated with the **County's** Project Manager. Maintenance of the "As-Built" record documents by the **Contractor** shall be verified before processing shall be approved. Failure of a **Contractor** to maintain project record documents, maintain current and properly prepared daily reports, or submit the project schedule update per Section 01310 shall be just cause for withholding the monthly or final payment.

+++END OF SECTION 01350+++

SECTION 01351 PUBLIC OUTREACH

PART 1-GENERAL

1.01 SCOPE

The **Contractor** shall provide personnel, services, and materials necessary to meet the requirements and responsibilities related to the DWM Public Outreach Office (DWMPOO) and the Public Communications & Outreach Team Leader (PCOTL), as specified hereinafter, during performance of Work. The **Contractor** supports the outreach efforts as specified herein and required.

1.02 STAFFING

- A. The **Contractor** shall designate a PCOTL who meets the required minimum qualifications and experience below. The duties of the PCOTL shall be to perform Customer Service-related functions and to continuously coordinate and provide information and services as required to the **County's** Construction Manager, Public Outreach staff, and others as necessary.
1. The PCOTL shall have been employed on at least two satisfactorily completed (waterline, sewer line, or pumping station) construction projects.
 2. The PCOTL shall have had responsibility for receiving, logging, tracking, responding, and resolving customer/citizen complaints and claims, providing notices to and personal interaction with affected customers/citizens regarding project impact and projected work schedules of the **Contractor**, and reviewing project schedules and "look-ahead" to determine projected areas of impact from the Work.
 3. The PCOTL shall have a minimum of 2 years of experience in performing this type of work on similar projects.
 4. The PCOTL shall attend an orientation session presented by DWMPOO focusing on established protocols and procedures for conducting public outreach activities prior to, during and post-construction.
 5. The PCOTL shall be assisted by sufficient staff, employed by the **Contractor**, to quickly resolve incidental complaints on-site during the project.

PART 2-PRODUCTS (NOT USED)

PART 3-EXECUTION

3.01 PUBLIC INFORMATION KICK-OFF MEETING

- A. Prior to commencement of Work under the Contract and following the Preconstruction Meeting, the **Contractor**, the PCOTL, and the **County** shall attend a meeting hosted by the DWMPOO. At this meeting, the **Contractor's** responsibilities and the relationship with the DWMPOO and the functions and responsibilities of the PCOTL employed by the **Contractor** as required under Section 1.02 A, above will be discussed. The **Contractor's** PCOTL and backup individual(s) shall be identified to the DWM's Call Center and the DWMPOO with 24/7 contact telephone numbers provided.

3.02 RESPONSIBILITIES OF THE PCOTL

- A. The duties of the **Contractor's** PCOTL shall be as defined below and may be expanded by the **County's** Construction Manager as needed. Responsibilities of the **Contractor's** PCOTL shall include, but not be limited to, the following elements.
1. Receiving, logging, tracking, and resolving customer/citizen complaints and Claims, either received directly, by the **County** or its authorized representative, and providing periodic updates and reports as specified. The **Contractor's** Complaints Log shall be coordinated with the Complaints Log maintained by the DWMPOO at least weekly.
 2. Developing a plan for providing notice to affected customers/citizens in the event there are scheduled service outages or other work elements required for the performance of Work under the Agreement that are scheduled that shall have an impact on the neighborhood or property owners, and executing such plan once approved by DWMPOO. In no case will customers/citizens be contacted by Contractor without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.
 3. Attending and participating in scheduled project progress meetings for discussion, updates, review of Complaints Log and potential resolution to customer/citizen complaints, claims, review of schedules, and other matters, as required.
 4. Attending and participating in periodic public meetings and working with the DWMPOO to promote and prepare necessary project information in advance of these meetings.

In the event Work is required on private property where an easement has been acquired, the PCOTL shall notify the property owner at least 14 days in advance of commencement of the Work in writing, a copy shall be provided to the DWMPOO. In no case will customers/citizens be contacted by Contractor without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.

Prior to commencement of work in any neighborhood, the PCOTL shall provide notice to the Public Outreach Office and at the Public Outreach Office's direction and with its coordination, notify the customers/citizens 14 to 30 days in advance. In addition, 72 hours prior to actual commencement of the work, the PCOTL shall notify the customers/citizens via door or mailbox hangers as hereinafter provided for in this Section. Such notices shall be coordinated with the **County's** Construction Manager and Public Outreach Office. In no case will customers/citizens be contacted by Contractor without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.

The PCOTL shall be responsible for managing those notifications within the context of the Project Schedule and the approved project procedures. The PCOTL shall assist the **County** site staff with the resolution of public outreach-related items that might delay or disrupt the project work.

The PCOTL shall be on 24-hour call, 7 days a week, and be equipped with a mobile phone. In the event the PCOTL is away from work, the **Contractor** shall designate a second individual to handle the responsibilities and functions who shall be fully familiar and aware of the duties and prosecution of the Work.

The **Contractor**/PCOTL shall report and log complaints to the DWMPOO Call Center within 6 hours of receipt. Conversely, calls received by the Info Line will be transmitted to the PCOTL within 24 to 48 hours of receipt and the PCOTL shall perform follow-up within 24 hours with resolution after receipt of the notice. Upon receipt of the information, the Call Center will create a file to document the incident.

The **Contractor's** PCOTL shall maintain a Project Complaint Log fully detailing customer/citizen complaints/claims, questions, and resolutions. Complaints/inquiries received in the field by the work crew regarding the project shall be documented by the PCOTL and entered into the Project Log, even if resolved immediately. This Complaint Log shall be available to the **County's** Construction Manager and the Public Outreach Office in its updated state for review or reference when needed. The Log shall be submitted on a monthly basis with the progress payment request.

Where property owners make damage claims, the PCOTL, according to a plan reviewed and approved by DWMPOO, shall coordinate the activities of the **Contractor's**, subcontractor's, or vendor's insurance provider(s) during the investigation and repair process and obtain the complainant's signoff to conclude and close the file. The **County** shall be informed in writing upon resolution of any complaint by the **Contractor** or its designated representative and copied on the sign-off documents. The PCOTL shall track any and all insurance damage claims, payments, settlements, etc., on the Project, whether they are the responsibility of the **Contractor** or subcontractors, or are disputed. This Damage Claim Log shall be separate from the Complaint Log, but shall be cross-referenced if the damage results in a complaint.

The PCOTL shall assist the **Contractor's** Traffic Control Manager in coordination of street closures, detours, and traffic pattern changes with the **Contractor's** field management staff, the **County's** Construction Manager, Public Outreach Office, and the Department of Public Works or the GDOT. The PCOTL shall check the notice status with the **Contractor's** Traffic Control Manager each morning and confirm that notifications to the **County's** Traffic Control center are current and accurate for police, fire, and emergency vehicle access. The PCOTL shall also assist in the coordination on the signal changes involved with temporary traffic plans. This includes, but is not limited to, maintaining safe residential and business access, mail delivery, and garbage pick-up, providing temporary and /or alternate services and relocation coordination for school bus, MARTA stops, and any other temporary facilities needed to keep neighborhood safety, security, and services within acceptable limits. These items and their coordination shall be required as part of the detailed work plans, site-specific safety plans, traffic management plans, erosion and sedimentation plans, and project schedules. In no case will customers/citizens be contacted by Contractor without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.

As required, the PCOTL shall provide notice to the affected areas at least 3 weeks in advance of the scheduled closures, detours, and traffic pattern changes.

In the event there is an emergency involving the public or a situation where media inquiries and responses are possible, the **County's** Public Outreach Office shall be notified immediately. The Public Outreach Office will then coordinate with the **County's** Media Relations Manager for appropriate action. **Under no circumstance and at no time shall the PCOTL, any employee, subcontractor, or vendor of the Contractor make any comments to the media regarding the project.**

The PCOTL shall be responsible for holding media relations training and management with the onsite staff. Procedures shall be developed within the site-specific safety plan to establish guidelines for managing any media response to an emergency issue. The entire site staff shall be trained on them.

3.03 ISSUES MANAGEMENT TRACKING

- A The **Contractor** shall develop, implement and maintain an organized and comprehensive issues management strategy for tracking customer/citizen complaints, claims, and inquiries. Should the **Contractor** choose to use tracking software, usage licenses shall also be purchased at no cost to the **County**. Related information shall be updated on a daily basis by the PCOTL. Tracking information and responses shall be coordinated with the DWMPOO. Reports shall be provided as weekly updates on all activities and on specific cases within 24 hours when requested.
- B Information recorded shall include, but not be limited to, the following:
1. Date complaint/claim/inquiry received
 2. Name, address and telephone number of individual filing complaint/claim/inquiry
 3. Nature of complaint/claim/inquiry
 4. Address where problem is located if different than above
 5. Action required, date, action taken, date action completed

6. Follow-up with person who filed under number 2 above to verify satisfaction or status
7. Documents associated with actions taken
8. Any information regarding resolution with the **Contractor's**, subcontractor's, or vendor's Insurance Company shall be fully documented

In no case will customers/citizens be contacted by Contractor without DWMPOO approval of both the communication plan and of any literature provided to customers/citizens.

3.04 DOOR HANGERS

The **Contractor** shall produce door hangers required for notice to customers/citizens and residents from the template provided by the **County's** Public Outreach Team (see example at the end of this Section) as specified above in paragraph 3.02. Door hangers shall be utilized for notification in the event of, but not limited to, the following events:

- A. Planned service disruption/outages
- B. Road closures/detours/traffic pattern changes
- C. Access/entrance to property
- D. Work startup
- E. Smoke testing
- F. Blasting

The DWMPOO shall be notified 24 hrs in advance of any door hanging activity by the **Contractor**.

3.05 IMPACTED AREA ADDRESS DATABASE

- A. The **Contractor** shall provide the DWMPOO with a database of addresses and phone numbers (and names if available) of project-affected residences, businesses, and facilities at least 3 weeks prior to project startup. The database will be used by the Public Outreach Team for regular citizen communications and notifications.
- B. The **Contractor** and **County** shall copy the **DWMPOO** on correspondence and Right-of-Entry Agreements with citizens and property owners.

3.06 SCHEDULE

- A. The **Contractor** shall provide the DWMPOO with a copy of the detailed project schedule following approval by the **County**.
- B. Biweekly, the **Contractor** shall provide a list of properties:
 1. That shall be affected by the **Contractor's** activities within the upcoming 4 weeks.
 2. Where work is ongoing in the right of way in front or in the back of the property.
 3. Where site restoration activities are ongoing.

- C. The **Contractor** shall inform the **DWMPOO** through the weekly progress meetings and in writing of any project schedule changes or changes in “disruptive work” such as blasting, road closures, etc., that would have significant impact on citizens or require prior citizen notification. The PCOTL shall notify the Public Outreach Team of any “disruptive” activities affecting the public that occur on the jobsite within 4 hours of their occurrence.

3.07 MEDIA RELATIONS AND JOB SITE INQUIRIES

- A. As specified above in paragraph 3.01, only authorized persons with the **County** shall release information in response to media inquiries. The **Contractor’s** field personnel shall at all times have project information cards available that shall be provided to media and citizens if inquiries are made onsite. Media and citizen inquiries shall be directed to the DWPOO via the Project Information email and/or phone line.
- B. Project information cards shall be produced by the **Contractor** from the template provided by the Public Outreach Team. A sample information card is provided at the end of this Section.

3.08 VEHICLE SIGNS AND PROJECT SITE SIGNAGE

- A. The **Contractor** shall place pre-approved magnetic signs on job-site project vehicles. The signage template shall be approved by the **County** Communications Office. Signs shall be produced by the **Contractor**.
- B. All project Sites shall have pre-approved project signs that read in accordance with the template provided by the DWMPOO. Signs shall be produced by the **Contractor**. Some of the signs shall be mounted on moveable skids so they can be relocated as the project progresses on various streets in the project area. Sizes will vary, but shall be smaller than the 96”x 48” size project signs shown. Size shall be as directed by the **County**.

3.09 NOTIFICATIONS

The **Contractor** shall provide the following notifications to the DWMPOO to facilitate its communication with affected citizens through hand-distributed flyers or mailers:

- A. Anticipated work start date – notify at least 4 weeks prior to start of construction so that DWMPOO can send out mailer or door hanger 2 weeks prior and/or distribute notification letter 72 hours before construction begins.
- B. Service disruptions - notify DWMPOO at least 2 weeks in advance so that door hanger can be produced and distributed at least 72 hours prior to the start of disruption.
- C. Full Road Closure - notify DWMPOO at least 2 weeks in advance so that door hanger or notification letter can be produced and distributed at least 72 hours prior to the start of closure.

- D. Significant work in a neighborhood, such as blasting, directional drilling, trenchless installation, open cut, etc., shall require letter or door hanger notification of the DWMPOO at least 72 hours in advance.
- E. The **Contractor** shall provide the following door hanger notifications and the manpower to deliver them at a minimum:
 - 1. Service disruptions: notice to citizens 72 hours prior to disruption.
 - 2. Full Street or Parital Closure: notify fire, police, other emergency services, and other authorities 72 hours prior to street closure.
 - 3. Significant work in neighborhood, such as blasting, directional drilling, and trenchless installation, open cut, etc.: notify citizens via door hangers or letter 72 hours in advance.
- F. The **Contractor** shall be fully responsible for notification to emergency-related services for detours, closures (partial or full) or traffic pattern changes and shall be detailed in their traffic control plan and implemented through the **Contractor's** Traffic Control Manager and per permitting requirements.
- G. The **Contractor** shall be fully responsible for distributing notifications a minimum of 72 hours in advance of service outages for schools, nursing homes, hospitals, medical clinics, assisted living facilities, or other types of facilities. **Contractor** shall also make personal contact with facility representatives no later than 60 minutes prior to the outage.
- H. The **Contractor** shall at all times coordinate with the DWMPOO and Call Center to provide detailed schedules and street locations for service disruptions or street closures to ensure that DWM Customer Service Call Center is well equipped to provide adequate response to citizen inquiries.

3.10 RESOLUTION OF COMPLAINTS AND CLAIMS

- A. Failure of the **Contractor** to resolve any legitimate complaint or claim filed resulting from the work performed under this contract, following notice in accordance with the General Requirements, shall result in resolution of the complaint or claim by the **County**. The **Contractor** shall be charged for the associated cost in accordance with the applicable General Requirements of the contract. No additional payment shall be made to the **Contractor** for any costs associated with complaint or claim resolution, same being incidental to the various contract items that are bid. Failure to manage the issues and items adequately to minimize public complaints and impacts shall be cause for increasing the retainage, withholding payment, and/or Notice and Termination of the **Contractor** for cause if more than 10 percent of the noticed complaints or claims past 30 days are without decisive resolution and scheduling of recovery work.

+++END OF SECTION 01351+++

SECTION 01380 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.01 SCOPE OF WORK

The **Contractor** shall clearly document site conditions along the entire project site prior to the start and upon the completion of the project/contract by use of digital video recording. The cost of the photographic documentation shall be included in the Contract Price.

The **Contractor** shall submit monthly color progress photos along the entire line of the active Work site. Monthly record progress photographs shall be submitted with monthly payment requisition. Photographs shall document construction within roadways, rights-of-way, and easements,

The **Contractor** shall engage the services of an experienced professional photographer, approved by the **County**, to take videos, color photographs of the site as directed by the **County**.

1.02 PROCEDURES

- A. The digital video recording and periodic still photographs shall be taken from identifiable reference points along the Work corridor. The same reference points shall be used through the life of the project/contract to achieve an accurate record of construction.
- B. The **Contractor** shall adequately document areas of sensitivity such as landscaped areas, lake or stream banks, or areas surrounding existing structures.
- C. Each photograph, video, or digital file of such submitted shall be dated, identified, and captioned, referencing the location, project name, project number, and pertinent information to clearly describe the scene.
- D. Recording shall be done with adequate lighting. Written authorization by the **County** to proceed with video documentation at any areas shall be done with consideration of existing environmental conditions. The designee of the **County** will accompany the photographer during the video and photo sessions.
- E. **Contractor** shall notify **County** of the time and place for video recording and digital photography. **Contractor** shall provide access and accommodation to the **County** representative during the photographic documentation process. The **County** reserves the right to reject any photograph that is not clear or definitive. Any photograph so rejected shall be subtracted from the total exposures required under this Contract.
- F. The Lynx Photo Management software shall be utilized by the **County** and the **Contractor** for the duration of the Project. The daily construction photographs shall be the permanent visual record of the pre-construction conditions, daily construction site activities, and the completion of construction Work. The **Contractor** shall submit to the **County** no fewer than four record photos for each

activity ID listed in the project schedule per the last schedule update. Applicable photos shall accompany each Pay Application.

1.03 VIDEOS

- A.** The project corridor shall be documented by digital video recordings.
- B.** All digital video recordings shall be in color and shot with a 1080 HD (1920 x 1080) using MPEG-4 program stream encoding (ISO-IEC 14496-14) camera and shall be a clear, stable image with no interference. Black and white recordings shall not be accepted. The video shall be provided on Digital Video Discs (DVDs) or USB Flash Drives and shall conform to currently recognized standards for video recordings. Specifically, the recordings shall be in focus and properly illuminated with good contrast. The picture shall be clear and possess accurate color levels and balance (tint) without outside interference. All recordings shall also include a clear and distortion free audio narration that clearly identifies all, important features of the project, including stationing along pipeline construction, and is in synchronization with the video. The recording shall bear a continuous "date and time stamp" that is electronically recorded by the camera.
- C.** A record of the contents of each recording shall be provided on a run sheet, identifying each chapter segment of the recording. The run sheet shall be provided in paper copy as well as on the flash drive or hard drive.

1.04 PHOTOGRAPHS

- A.** The file format for digital photographs shall be Tagged Image File Format (TIFF).
- B.** Digital cameras shall produce records with true optical resolution. Images shall not be resized or interpolated to a higher resolution from a lower resolution.
- C.** Photographic images shall be provided as 8 bit per channel RGB color images.
- D.** Digital camera files shall be captured as 12 megapixel files or greater in size with a minimum pixel array of 5,000 pixels by 3,500 pixels.
- E.** Three color 8" x 10" (or 8-1/2" x 11") glossy prints of each photograph shall be produced. One set of digital images shall be furnished on a DVD along with the glossy prints. All disks shall have a label that includes project information as well as the date, and whether these are pre-construction, construction, or post-construction photographs.
- F.** The prints shall have indelibly printed on their reverse side the information listed below. The same information shall be printed on a sheet of paper in a clear sleeve to be included in the binder holding the prints and DVD+R. The information shall also be provided in a Microsoft Excel spreadsheet that shall be included on the DVD. Additionally, this information shall be embedded in each digital photo file using the IPTC/XMP (International Press Telecommunications Council's/Adobe Extensible Metadata Platform) Standard.

1. Project number

2. Project name
 3. Contract number and description
 4. Photo number
 5. View and description, indicating:
 - a. Location of camera
 - b. General description of what the photograph represents
 6. Whether this is a pre-construction, construction or post-construction photograph
 7. Date picture was taken
 8. Name of photographer
 9. **County** witness
- G. The **Contractor** shall transmit one electronic copy of each photo to the Engineer for use in preparing descriptions. The photos with descriptions will be returned to the **Contractor** for printing and mounting.
- H. The prints shall be suitably mounted and labeled in loose-leaf type binders with protective covers for the prints. The binders shall be equipped with a pocket suitable for storing the DVDs. The materials shall meet the requirements of ISO 18902:2013 "Imaging materials - Processed Imaging Materials – Albums, Framing and Storage Materials."

1.05 SUBMITTALS

- A. The **Contractor** shall furnish to the **County** for approval one copy of the video digital file taken of existing conditions prior to start of the Project and before the submittal of the first request for payment. The video digital file shall be assembled upon completion of the Project and shall be furnished to the **County** for approval prior to submittal of the final request for payment. No pay requests shall be processed before the submittal of the respective video records.
- B. **Contractor** shall utilize **County** Lynx Photo Management Software to submit videos and progress photographs in electronic format for the duration of the project in accordance with Section 01350.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 USE OF PHOTOGRAPHS AND VIDEOS

- A. Upon their creation, the photographs, prints, DVDs, and videos resulting from the Work under this Contract shall become the exclusive property of the **County**.
- B. Neither the **Contractor** nor the photographer nor the video recording firm shall retain any rights pertaining to the photographs, prints, CDs/DVDs, or videos, nor shall they reproduce or otherwise publish or disseminate any of the photographs, aerials, prints, CDs/DVDs, or videos taken under this Contract without the prior written approval of the **County**.
- C. The photographs, prints, CDs/DVDs, and videos shall be considered "Work made for hire" under applicable provisions of the Copyright Act, and the **County** shall be the copyright owner thereof and of the aspects, elements, and components thereof in which copyright protection might subsist. To the extent that such materials do not qualify as "Work made for hire," the **Contractor** hereby irrevocably transfers, assigns, and conveys exclusive copyright ownership in and to such materials to the **County**, free and clear of any liens, claims, or other encumbrances. The agreements between the **Contractor** and the photographer and videotaping firm shall include a provision containing these requirements.

+++END OF SECTION 01380+++

SECTION 01400 Contractor's Work Quality

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. **Contractor's** Quality Assurance / Quality Control Requirements
- B. Experience and Qualifications of Supply and Service Companies
- C. Quality of Materials, Equipment, and Work
- D. Defective Work, Equipment, or Materials
- E. Welding Certification and Welding Inspection
- F. **Contractor's** Surveyor
- G. Field Measurements

1.02 PAYMENT

No separate payment shall be made for performing any Work of this Section and costs thereof shall be deemed incidental to the Work and included in the prices bid for the Contract, unless otherwise specified in the Detailed Specifications.

1.03 RELATED SECTIONS

Detailed Specification 01410.

1.04 DESCRIPTION

- A. Experience and Qualifications of Supply and Service Companies: The **Contractor** shall require subcontractors, materialmen, and equipment service providers to comply with the accepted Health, Safety & Security Plan, and Quality Assurance requirements under the Contract.
- B. Quality of Materials, Equipment and Work
 - 1. All materials, fixtures, fittings, supplies, and equipment furnished under this Contract shall be new, of standard first grade quality, of the best workmanship, correctly designed, and be intended for the use for which they are offered. Materials or equipment that, in the opinion of the **County**, are inferior or of a lower grade than indicated, specified or required, or are obsolete, shall not be accepted.
 - 2. All Work of assembly, installation, and construction shall be done in a neat, first-class, and skillful manner. If the quality of the material, fixtures, fittings, supplies, equipment or Work required by the Drawings does not agree with that required by the Specifications, the better quality shall be supplied. In asking for prices on, or placing orders for, materials, fixtures, fittings, supplies, and equipment intended for use or installation under this

Contract, the **Contractor** shall provide the manufacturer or dealer with such complete information from these Specifications as may in any case be necessary. In every case, it shall quote in full to each such manufacturer or dealer the text of this subparagraph, as well as the text of such other portions of the Specifications, as are appropriate.

3. At all times while Work under this Contract is being performed, the **County** shall have access to all parts of the **Contractor's** or manufacturers' plants or other locations where the forgings, plates, materials, fixtures, fittings, supplies, or any other articles required under this Contract are manufactured, assembled, tested, or inspected. The **County** shall be permitted to witness any or all of these operations, as the **County** may deem necessary to determine that the Work is being performed in accordance with the Specifications and the approved shop drawings. The cost, if any, of providing such access shall be considered part of the normal expense of conducting business and therefore non-reimbursable.
4. The **County** shall be furnished with full facilities for inspecting the Work and ascertaining that it is being done strictly in accordance with the requirements of the Specifications, Drawings, and the intent of this Contract.
5. The **Contractor** shall provide a suitable space for the **County** and the **County's** authorized representatives conveniently located near that part of each plant where materials or equipment to be furnished under this Contract are being manufactured, assembled, or shop tested. Each space shall be furnished with facilities for the making and the keeping of records and correspondence. The reasonable use of a photocopier, telephone, and fax shall be provided, as required by the **County**. Long distance communications shall be made using **County** mobile telephones at no cost to the **Contractor**.

6. The **Contractor** shall give notice in writing to the **County** sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction in the event that the **County** intends to perform Witness Shop Testing and Quality Assurance Inspection. Such notice shall contain the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the **County** will: decide upon its intent to inspect the Work or notify the **Contractor** that inspection will be waived. In those instances where the **County** inspector(s) arrive at the agreed-upon location, at the agreed-upon date and time, and find that the article(s) to be inspected are not ready for inspection, the inspector(s) shall return to their home office and the expenses incurred shall be borne by the **Contractor** and shall be deducted from the **Contractor's** next payment, unless otherwise determined by **County**.
 7. Inspection of the Work by the **County** is made solely for the benefit of the **County**. The inspection of the Work shall not relieve the **Contractor** of any of its obligations to fulfill the Contract as herein prescribed, and defective Work shall be repaired or replaced at the **Contractor's** sole expense.
- C. Defective Work, Equipment, or Materials
1. All defective or imperfect Work, equipment, or materials furnished by the **Contractor** that is discovered before the Final Acceptance of the Work, or during a warranty period, shall be removed immediately even though it may have been overlooked by the **County** and approved for payment. The **Contractor** shall repair such defect, without compensation, in a manner satisfactory to the **County**.
 2. Unsuitable materials and equipment shall be rejected, notwithstanding that such defective Work, materials, and equipment may have been previously overlooked by the **County** and accepted or approved for payment.
 3. If any workmanship, materials, or equipment are rejected by the **County** as unsuitable or not in conformity with the Specifications or Drawings, the **Contractor** shall promptly replace such materials and equipment with acceptable materials and equipment at no additional cost to the **County**. Equipment or materials rejected by the **County** shall be tagged as such and shall be immediately removed from the site.
 4. The **County** may order tests of imperfect or damaged Work equipment, or materials to determine the required functional capability for possible acceptance, if there is no other reason for rejection. The cost of such tests shall be borne by the **Contractor**, and the nature, tester, extent, and supervision of the tests shall be as determined by the **County**. If the results of the tests indicate

that the required functional capability of the Work, equipment, or material was not impaired, the Work, equipment, or materials may be deemed acceptable, in the discretion of the **County**. If the results of such tests reveal that the required functional capability of the questionable Work, equipment, or materials has been impaired, then such Work, equipment, or materials shall be deemed imperfect and shall be replaced. The **Contractor** may elect to replace the imperfect Work, equipment, or material instead of performing the tests.

5. If, in the making of any test, it is ascertained by the **County** that the material or equipment does not comply with the Contract, the **Contractor** will be notified thereof, and it will be directed to refrain from delivering said material or equipment, or to promptly remove it from the site or from the Work and replace it with acceptable material without cost to the **County**. Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Contract, the **Contractor** shall immediately proceed to furnish the named material or equipment.

D. Welding Certification and Welding Inspection

1. For Work performed within the limits of the **County**, field welding required under this Contract shall be performed by certified welders:
 - a. Certification for Welding – For field and shop welding, the following welding qualification provisions shall apply:
 - i. For field welding, required permits and safety plans shall be in place and adhered to.
 - ii. For shop welding: welding shall be performed in accordance with the relevant Work-specific requirements in the Specifications and Drawings.
 - iii. If existing certification is not approved or not submitted, then the welders/welding shop/tack welders shall be qualified in accordance with the above procedures and tests, as administered by an inspection agency approved by the **County**. The costs associated with the required tests for certification and/or retests, if any, shall be borne by the **Contractor**. The **County** shall be given a notice of not less than 5 business days prior to such tests and may elect to witness any or all of these tests. The costs associated with witnessing these tests shall be borne by the **Contractor**.
 - b. Any deviation from the above shall not be permitted without a written waiver from the **County** or its designee.
2. All welding, including welder certification, shall be performed in accordance with the requirements of AWS D1, ASME IX (and the applicable construction code), and as approved by the **County**.

3. Welding inspection shall be in accordance with the latest rules of the American Welding Society, and the following shall apply:
 - a. All welds shall be inspected visually in accordance with Section V of the ASME Code.
 - b. All stainless steel partial penetration groove welds shall be inspected and approved by means of Liquid Penetrant Examination (PT) in accordance with Appendix 8 of Section VIII, Division 1 of the ASME Code. Welds failing the inspection shall be made good and re-inspected by PT.
 - c. All carbon steel partial penetration groove welds shall be inspected and approved by means of Magnetic Particle Examination (MT) in accordance with Appendix 6 of Section VIII, Division 1, of the ASME Code. Welds failing the inspection shall be made good and re-inspected by MT.
 - d. On full penetration welds, both the root pass and the final weldment shall be inspected by means of MT or PT as applicable.
 - e. Unless otherwise approved, inspection of welds shall be conducted by an inspection agency approved by the **County**.
 - f. Unless waived by the **County**, full-penetration welds shall be inspected by Radiographic Examination (RT) in accordance with ASME Code, Section VIII, Division I, Paragraph UW-51.
 - g. The **County** may elect to witness any or all of the welding inspection. Notice shall be given to the **County** not less than 5 business days prior to welding and inspection of those items specifically designated by the **County**. The costs associated with the welding inspection by the **County** inspectors and any additional testing required by the **County** shall be borne by the **Contractor**.

E. **Contractor's** Surveyor

1. The **Contractor** shall retain the services of a licensed land surveyor to perform survey Work, including, but not limited to, establishing line and grade, in advance of the construction; and to perform other surveying services for the Work included under the Contract. The surveyor shall be subject to the approval of the **County**. Survey drawings shall be submitted to the **County** for approval.
2. The **Contractor** shall erect, install, and maintain survey platforms, targets, benchmarks, and similar facilities to be used by the **County** in the performance of its inspection services; and shall perform survey Work required before, during, and after construction.

- F. Field Measurements
 - 1. The **Contractor** shall take the necessary measurements in the field to determine the exact dimensions for Work and verify pertinent data and dimensions shown on the Contract Drawings.

1.05 QUALITY ASSURANCE / QUALITY CONTROL PLAN

- A. The **Contractor** shall establish and execute a Quality Assurance/Quality Control (QA/QC) Plan for the services and equipment that will be supplied under this Contract. The plan shall provide the **Contractor** with adequate measures for verification and conformance to defined requirements by its personnel and subcontractors, fabricators, suppliers, and vendors. The **County's** review and acceptance of the **Contractor's** QA/QC plan shall not relieve the **Contractor** from any of its obligations for the performance of the Work. The **Contractor's** assigned QA/QC personnel are subject to the **County's** review and continued acceptance. No Work covered by the QA/QC plan shall start until the **County's** written acceptance of the **Contractor's** QA/QC plan has been obtained.
- B. The **Contractor's** quality control organization with lines of authority and reporting structure. The Construction Quality staffing shall include a Construction Quality Manager and a supporting staff as applicable to the project. The reporting structure shall clearly provide for direct reporting access by the Construction Quality Manager to the **Contractor's** principal officers.
- C. The names, qualifications (in resume format), duties, responsibilities, and authorities of the Construction Quality Manager and staff. Construction Quality personnel qualifications (in resume form), including copies of each member's applicable certificates of training and/or qualification.
- D. A copy of a letter to the Construction Quality Manager signed by a principal officer of the **Contractor's** firm that describes the responsibilities of the Construction Quality Manager and establishes his/her authority, including authority to stop Work that does not conform with the Contract Documents. The Construction Quality Manager shall issue letters of direction to other Construction Quality staff outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the CIP PMT and CM.
- E. A copy of a letter to the Construction Quality Manager signed by a principal officer of the **Contractor's** firm that describes the responsibilities of the Construction Quality Manager and establishes his/her authority, including authority to stop Work that does not conform with the Contract Documents. The Construction Quality Manager shall issue letters of direction to other Construction Quality staff outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the CIP PMT and CM.

1.06 SUBMITTALS

- A. Within 15 days after the commence Work date given in the Notice to Proceed (NTP), the **Contractor** shall provide its QA/QC plan to the **County** for approval. At a minimum, the plan shall consist of the following quality elements:
1. Responsibilities
 2. Management and Production Instructions
 3. Material Control
 4. Marking and Material Identification
 5. Setup and Operational Procedures
 6. Non-Conformances
 7. Painting
- B. Additionally, when required by the **County**, the **Contractor** shall submit the following information prior to his entering into a supply or service subcontracts:
1. Contract number, supplies or services to be provided and a general description of the proposed item(s), such as trade name, type, etc.
 2. The name and address of the manufacturer or service company and the location of the plant where supplies will be manufactured and tested as required, or at which the services will be performed.
 3. Experimental and test data required to support the claimed performance of the supplies.
 4. A description of the testing plant, including the hydraulic, electrical and other facilities, in sufficient detail to show that the plant is adequately equipped for performing the tests, if such testing is required.
 5. All additional information that the **County** may deem necessary in order to determine the ability of the supply or service company to produce the item as called for by the Specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

1.01 Quality Deficiency and Non-Conformance Documentation

Quality Deficiencies and Non-Conformances are defined as documentation, drawings, material, and equipment or Work not conforming to the specified requirements or procedures. The **County** will implement and maintain a three-tier non-conformance process, as follows:

- A. Deficiency Notice (DN) – The lowest level of non-conformance reporting. It documents the deficient condition and provides the **Contractor** 72 hours, or before the Work is covered, to correct the issue before it is elevated to the next

level of reporting. It is issued for deficiencies that can be easily corrected without an engineering resolution. An example would be incorrect formwork dimensions observed prior to placement of concrete.

- B. Non-Conformance Report (NCR) - The second level is an NCR that documents deficient Work that has not been corrected, or that would require an engineering solution to remedy. NCRs shall be answered in writing by the **Contractor** within 24 hours. The **Contractor** shall not be allowed to progress items for payment if it has open NCRs.
- C. Corrective Action Request (CAR) – The highest level of non-compliant reporting. CARs are issued for programmatic and repetitive non-compliant conditions. Examples of CARs would be using the wrong drawing revision in the field (programmatic) and a condition where the same type of Work has multiple NCR issues over a short period of time (repetitive). CARs cannot be answered by the **Contractor** field staff. They shall be transmitted to the **Contractor's** senior level management for response.

+++END OF SECTION 01400+++

SECTION 01410 TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.01 SCOPE

- A. Testing shall be performed to determine that materials provided for the Work meet the specified requirements, in accordance with the requirements of the Specifications. Such testing includes, but is not necessarily limited to:
 - 1. Cement
 - 2. Aggregate
 - 3. Concrete
 - 4. Concrete block
 - 5. Pipe
 - 6. Steel and metals
 - 7. Welding
 - 8. Soil compaction
 - 9. Bituminous pavement

- B. Requirements for testing may be described in various sections of these Specifications; where no testing requirements are described, however if the **County** decides that testing is required to demonstrate compliance with specified material or performance standards, the **County** shall require testing to be performed under current pertinent standards for testing.

- C. Employment of a testing laboratory shall in no way relieve the **Contractor** of its obligation to perform Work meeting the requirements of the Contract.

- D. The independent testing laboratory shall be selected and paid by the **Contractor** and approved in writing by the **County** before any testing services are performed.

- E. The **Contractor** shall pay directly for the services of the independent testing laboratory, approved by the **County**, for all testing required under this Contract.

1.02 LABORATORY DUTIES

- A. Cooperate with **County** and **Contractor**.

- B. Provide qualified personnel promptly on notice.

- C. Perform specified inspections, sampling, and testing of materials and methods of construction.
 - 1. Comply with specified standards, ASTM, other recognized authorities and as specified.

 - 2. Ascertain compliance with requirements of Contract Documents.

- D. Promptly notify the **County** and **Contractor** of irregularity or deficiency of Work that is

observed during performance of services.

- E. Promptly submit three copies (two copies to **County** and one copy to **Contractor**) of report of inspections and tests in addition to those additional copies required by the **Contractor**, including:
 - 1. Date issued
 - 2. Project title and number
 - 3. Testing laboratory name and address
 - 4. Name and signature of inspector
 - 5. Date of inspection or sampling
 - 6. Record of temperature and weather
 - 7. Date of test
 - 8. Identification of product and Specification section
 - 9. Location of Project and test
 - 10. Type of inspection or test
 - 11. Results of test
 - 12. Observations regarding compliance with Contract Documents
- F. Perform additional services as required.
- G. Laboratory shall not be authorized to:
 - 1. Release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Approve or accept any portion of Work.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Cooperate with laboratory personnel; provide access to Work and/or manufacturer's requirements. **Contractor** shall not charge for downtime due to required testing.
- B. Provide to laboratory, preliminary representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities:
 - 1. To provide access to Work to be tested
 - 2. To obtain and handle samples at the site
 - 3. To facilitate inspections and tests
 - 4. Build or furnish a holding box for concrete cylinders or other samples as required by the laboratory
- E. Notify laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- F. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample or samples shall be selected by such

laboratory or agency or the **County** and shipped to the laboratory by the **Contractor** at **Contractor's** expense.

- G. Copies of the correspondence between the **Contractor** and testing agencies shall be provided to the **County**.

1.04 QUALITY ASSURANCE

Testing, when required, shall be in accordance with all pertinent codes and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM).

1.05 PRODUCT HANDLING

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in progress of the Work.

1.06 FURNISHING MATERIALS

The **Contractor** shall be responsible for furnishing all materials necessary for testing.

1.07 CODE COMPLIANCE TESTING

Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the **Contractor**, unless otherwise provided in the Contract Documents.

1.08 CONTRACTOR'S CONVENIENCE TESTING

Inspection or testing performed exclusively for the **Contractor's** convenience shall be the sole responsibility of the **Contractor**.

1.09 SCHEDULES FOR TESTING

- A. Establishing Schedule
 - 1. The **Contractor** shall, by advance discussion with the testing laboratory, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be onsite to provide the required testing.
 - 2. Provide all required time within the construction schedule.
- B. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the testing laboratory as required.

1.10 TEST AND CERTIFICATIONS

- A. General: As a minimum, the following tests shall be performed and the following certifications provided:

1. Cement: Certified test results by cement manufacturer or by independent laboratory shall be furnished as required by the **County**.
 2. Aggregate and Mortar Sand: Certified test results by aggregate producer or by independent laboratory shall be furnished as required by the **County**.
 3. Concrete
 - a. At least five standard 6-inch cylinders shall be taken each day for each 100 cubic yards or fraction thereof for each class of concrete used.
 - b. The number of cylinders, the point of sampling, and the method of securing the samples shall be determined by the **County**.
 - c. All samples shall be taken to the testing laboratory for laboratory curing.
 - d. Two of the laboratory cured samples shall be tested at 7 days, two samples tested at 28 days; one sample held in reserve.
 - e. Test all concrete in accordance with ASTM C31-69, C39-71, and C-172.
 - f. Slump Tests
 - (1) Perform slump tests on the job in accordance with ASTM standards.
 - (2) One slump test shall be performed for each 25 cubic yards of concrete.
 - (3) More slump tests shall be performed if deemed necessary by the **County**.
 - g. Perform air entrainment tests in accordance with the following standards:
 - (1) Field tests - ASTM C 173
 - (2) Laboratory tests - ASTM C 231
- B. Precast and Concrete Block for Buildings
1. Block and precast may be visually inspected on the site by the **County**.
 2. The **County** reserves the right to have the concrete block tested by an independent laboratory.
- C. Steel and Miscellaneous Metal: Reinforcing steel, structural steel, and miscellaneous metal may be inspected visually on the site by the **County**.
- D. Welding: 1 percent minimum of all structural welds during construction shall be inspected either visually or by an independent laboratory as required by the **County**.
- E. Compaction of Earthwork
1. The compaction shall be tested by the **County** or by an independent laboratory.
 2. The testing shall be performed in a manner in accordance with these Specifications.
- F. Bituminous Concrete: The material testing for the bituminous concrete shall be performed by an independent laboratory as deemed necessary by the **County**.

1.11 TAKING SPECIMENS

Unless otherwise provided in the Contract Documents, all specimens and samples for tests shall be taken by the testing laboratory or the **County**.

1.12 TRANSPORTING SAMPLES

The **Contractor** shall be responsible for transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.

+++END OF SECTION 01410+++

SECTION 01540 SECURITY AND SAFETY

Part 1 - GENERAL

1.01 SECURITY PROGRAM

- A. The **Contractor** shall protect the Work, including field office trailers and contents, from theft, vandalism, and unauthorized entry.
- B. The **Contractor** shall initiate a site security program at the time of mobilization onto the Work site that provides adequate security for material stored and installed onsite.
- C. The **Contractor** shall maintain the security program throughout the Contract duration.
- D. The **Contractor** and subcontractors shall be wholly responsible for the security of its storage compound and laydown areas, and for plant, material, equipment, and tools at times.
- E. The **Contractor** shall provide the **County** with a list of 24-hour emergency phone numbers, including chain of command.

1.02 ENTRY CONTROL

- A. The **Contractor** shall restrict entry of unauthorized personnel and vehicles onto the Project site.
- B. The **Contractor** shall allow entry only to authorized persons with proper identification.
- C. The **Contractor** shall maintain an Employee Log and Visitor Log and make the log available to the **County** upon request. This log shall be submitted to the **County** bi-weekly, or as necessary.
- D. The **Contractor** shall require visitors to sign the Visitor Acknowledgment of the Program Site Rules/Visitor Log, which includes a release form. Copies of these forms shall be submitted to the **County** bi-weekly and maintained in the **Contractor's** security files on-site. See the end of this Section.
- E. The **Contractor** shall require each employee to sign the Employee Acknowledgment of Project Site Rules Log included at the end of this Section. Employees, subcontractor employees, and lower-tier **Contractor** employees will receive a new employee orientation. Signing the Employee Log by the employee is certifying that the orientation training has been received.
- F. The **County** has the right to refuse access to the site or request that a person or vehicle be removed from the site if found violating any of the Project safety, security, or conduct rules.

1.03 BARRICADES, LIGHTS, AND SIGNALS

- A. The **Contractor** shall furnish and erect such barricades, fences, lights, and danger signals and shall provide such other precautionary measures for the protection of persons or property, and of the Work as necessary. Barricades shall be painted in a

color that is visible at night. From sunset to sunrise, the **Contractor** shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any Work under construction.

- B. The **Contractor** shall be held responsible for damage to the Work and any resulting injuries due to failure of barricades, signs, and lights. Whenever evidence is found of such damage, the **Contractor** shall immediately remove the damaged portion and replace it at the **Contractor's** cost and expense. The **Contractor's** responsibility for the maintenance of barricades, signs, and lights shall not cease until the Project has been accepted by the **County**.

1.04 RESTRICTIONS

The **Contractor** shall not allow cameras on site or photographs taken without approval of the **County**, except as required under Section 01380.

1.05 CONTRACTOR SAFETY/HEALTH AND SECURITY PLAN

- A. Within 30 days of Notice To Proceed, and prior to the performance of any Work, the **Contractor** shall prepare and submit a Contract-specific Health, Safety, and Security Plan signed by an officer of the **Contractor's** organization. Adequacy is the responsibility of the **Contractor**.
- B. The **County** will review the **Contractor's** Health, Safety, and Security Plan for the adequacy of the plan. The plan shall:
1. Identify the person(s) responsible for implementation and enforcement of Health, Safety, and Security rules and regulations for this Project.
 2. Address safe Work procedures for the activities within the **Contractor's** scope of Work.
 3. Include a new employee orientation program to address job- and site-specific rules, regulations, and hazards.
 4. Include the **Contractor's** Drug-Free Work Place Policy describing the substance abuse prevention and testing program.
 5. Include provisions to protect the **Contractor's** employees, other persons, and organizations possibly affected by the Work from injury, damage, or loss.
 6. Comply with current Fed/OSHA regulations; the Health, Safety, and Security Plan; the facility safety program (when applicable); and locally accepted safety codes, regulations, and practices.
 7. Include a site-specific emergency action and evacuation plan.
 8. Include Hazard Communication/Right-To-Know Program.
 9. Include security procedures for the **Contractor's** Work, tools, and equipment.
 10. Include the capability of providing the **County** with documentation to show compliance with the plan, plus accidents, and investigation reports.
 11. Address other contract-specific requirements, including the Unique Requirements of these specifications.

- C. Prior to the start of Work, **Contractor** shall provide Job Safety Analyses (JSAs) for unique Work activities necessary to prosecute the scope of Work.
- D. Review of the **Contractor's** Health, Safety, and Security Plan by the **County** shall not impose any duty or responsibility upon the **County** for the **Contractor's** performance of the Work in a safe manner.
- E. The **Contractor** shall be fully responsible for the safety and health of its employees, its subcontractors, and lower tier contractors during performance of its Work.
- F. The **Contractor** shall provide the **County** with safety reports, training records, competent person list, and accident reports prepared in compliance with Fed/OSHA and the Project Health, Safety, and Security Plan.

1.06 PROJECT SAFETY COORDINATOR

- A. The **Contractor** shall be responsible for the safety of the **Contractor's** and **County's** employees, the **County's** personnel and other personnel at the Work site. The **Contractor** shall identify a Project Safety Coordinator (PSA) on the job with an appropriate office on the job site to maintain and keep available safety records and up-to-date copies of pertinent safety rules and regulations.
- B. The Project Safety Coordinator shall:
 - 1. Comply with applicable health and safety requirements of governing legislation.
 - 2. Schedule and conduct safety meetings and safety training programs as required by law and included in the **Contractor** Health, Safety, and Security Plan for personnel engaged in the Work.
 - 3. Post appropriate notices regarding safety and health regulations at locations that afford maximum exposure to personnel at the job site.
 - 4. Post the name(s), address and hours of the nearest medical doctor(s), names and addresses of nearby clinics and hospitals, and the telephone numbers of the fire and police departments.
 - 5. Post appropriate instructions and warning signs with regard to hazardous areas or conditions.
 - 6. Have proper safety and rescue equipment adequately maintained and readily available for any contingency. This equipment shall include such applicable items as: proper fire extinguishers, first aid kits, safety ropes, and harnesses; stretcher, life preservers, oxygen breathing apparatus, resuscitators, gas detectors, oxygen deficiency indicators, explosion meters; and other equipment mandated by law.
 - 7. Inspect each Work crew at least once daily in accordance with an Inspection Checklist Report Form to make sure that workers are wearing their appropriate personal safety equipment; machines, tools, and equipment are in safe operating condition; Work methods are not dangerous; and the Work site and Work methods are free of hazards.
 - 8. Submit to the **County**, upon request, copies of inspection checklist report forms; safety records, safety inspection reports, and certifications from regulating agencies and insurance companies.

9. Immediately notify the **County** of a serious accident, followed by a detailed written report within 24 hours. "Serious accident" is defined as that requiring an absence of Work of more than two days and/or hospitalization.
10. Immediately notify the **County** in the event of a fatal accident.
11. Immediately notify the **County** of any accident claim against the **Contractor** or any subcontractor, followed by a detailed written report on the claim, and its resolution.
12. Review safety aspects of the **Contractor's** submittals as applicable.

VISITOR ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By signing this Visitor's Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

In consideration of my receipt of a visitor's pass as issued by the **County** directly or indirectly for the **County**, I waive on behalf of myself, my heirs, employer, legal representatives and assigns and hereby release and discharge the **County**, Program Manager, Designer, and its subcontractors and consultants and each of its directors, officers, employees, representatives, and agents from any and all claims, actions, causes of action, or any charge of any kind whatsoever that may arise or could arise in the future as a result of my being present at the facility including injury, death, or property damage whether or not caused by the fault or negligence of any of the parties released hereunder.

I further acknowledge that I have been briefed on specific hazards, hazardous substances that are on site, and the site emergency action procedure.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of **County** property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing **County** property
- Failure to use sanitary facilities
- Failure to report accidents or job-related injuries
- Being under the apparent influence of drugs, alcohol, or other intoxicants or in possession of drugs, alcohol, or other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat/safety glasses, and safety vests
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [Site Specific]
- Failure to use designated gates

I have read, understand, and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

VISITOR LOG

THE SIGNING OF THIS LOG ACKNOWLEDGES I HAVE READ, UNDERSTAND, AND AGREE TO ABIDE BY THE PROJECT RULES OUTLINED ABOVE. **THIS IS NOT A VEHICLE ACCESS PERMIT.**

VISITOR'S NAME PRINT	SIGNATURE	COMPANY VISITED	DATE	IN	OUT

EMPLOYEE ACKNOWLEDGMENT OF THE PROJECT SITE RULES

By signing this Employee Log, I acknowledge that I understand and agree to abide by the project rules outlined below.

PROHIBITED ACTIVITIES

- Unauthorized removal or theft of **County** property
- Violation of safety or security rules or procedures
- Possession of firearms or lethal weapons on jobsite
- Acts of sabotage
- Destruction or defacing **County** property
- Failure to use sanitary facilities
- Failure to report accidents or job-related injuries
- Under the apparent influence of drugs, alcohol, or other intoxicants or in possession of drugs, alcohol or, other intoxicants on the property
- Wearing shorts or tennis shoes on the jobsite
- Failure to wear a hardhat/safety glasses and safety vest
- Gambling at any time on the project
- Fighting, threatening behavior, or engaging in horseplay on the project
- Smoking in unauthorized areas on the project
- Open fire cooking or making unauthorized fires on project property
- Selling items or raffles without authorization
- Use of unauthorized cameras on the project
- Use of radio or television in the construction area
- Failure to park personal vehicle in authorized parking area
- Failure to wear designated identification [Site Specific]
- Failure to use designated gates

I have read, understand, and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

EMPLOYEE LOG

BY SIGNING THIS LOG ACKNOWLEDGMENT, I HAVE READ AND UNDERSTAND, AND AGREE TO ABIDE BY THE PROJECT RULES OUTLINED ABOVE AND ANY STATE, FEDERAL, LOCAL, OR ANY OTHER CONTRACT OBLIGATIONS THAT MAY APPLY. I FURTHER ACKNOWLEDGE THAT I HAVE BEEN ORIENTED AS TO THE SITE-SPECIFIC HAZARDS, ANY HAZARDOUS SUBSTANCES I MAY BE EXPOSED TO WHILE ON THE SITE, AND THE SITE/COMPANY EMERGENCY ACTION PROCEDURES, BY A REPRESENTATIVE OF THE COMPANY.

EMPLOYEES (PRINT)	SIGNATURE	COMPANY NAME	DATE
<i>Signature of Company Representative:</i>		<i>Date Signed:</i>	

1.07 BADGING PROCEDURES

In an effort to promote safety and security, all individuals working on any DeKalb County Department of Watershed Management –construction projects site must wear a County issued ID badge. The ID badging program plays a key role in Watershed Management’s safety and security efforts on construction sites. The ID badge will provide proof of authorization to be on the construction site, and aid DWM staff in affirming the employee has received safety training before commencing work. Although a contractor may only be required to visit our sites/property on an infrequent basis, badging is still a requirement. This standard applies to all contractors and subcontractors working on (DWM) projects, and individuals must have their assigned badge on their person at all times. Personnel without a current badge will not be allowed to continue to work. All workers must obtain and display an identification badge issued by the County’s Safety Representative before reporting to work on any (DWM) construction project. All contractors and subcontractors vendors or their transient onsite visitors, which are not fulltime employees of the site, shall be escorted while onsite as a visitor by a Department of Watershed Management badged contractor

A. Prior to Badging:

- All contractor and subcontractor employees are required to attend safety training before
- receiving a badge,
- The **contractor is responsible** for conduction and/or arrangement of their employees
- training,
- Prior safety training will qualify-provided the training was received within 12 months
- prior to the start of work on the (DWM) construction project(s),
- Whereas, the OSHA 10 hour and 30 hour training does not expire, actual date of training
- must be less than 12 months prior to the start of work on the (DWM) construction
- project(s) to qualify as “current,”
- Suggested safety topics are included on page 3,
- Employees should have adequate knowledge of all company safety rules and applicable OSHA standards,
- Contractor’s training should include general construction safety and the specific
- safety concerns/hazards employees may encounter at the Watershed Management construction site,
- Personal instruction, safety videos, and on-line training are permissible,
- Upon completion, employees should have a basic knowledge of safety, know the
- company’s views about safety, know safety concerns specific to Watershed
- Management’s construction projects and know what PPE to use on the jobsite.
- PPE shall be supplied by the contractor,
- Before training commences, the contractor must provide the DMW’ Safety Division
- Representative their safety training outline.
- A copy of each employee’s training certificate(s) or training certification signed by a
- company management representative.

B. Badging:

- Once the contractor’s employees have completed their training requirements, they must provide training documentation to the DWM’s Safety Division representative,

- Training rosters / sign-in sheets must include course name, the participating students' printed name, attendees signed name, printed name of instructor, instructor's signature and date of training,
- Contractor's proof of training documentation must outline the topics covered in training/training objectives,
- E-mail to:
 - Daniel Neuman - daneuman@dekalbcountyga.gov
 - Anthony Franco - alfranco@dekalbcountyga.gov
 - Julian Reasonover – jareasonover@dekalbcountyga.gov
- After receipt of the sign-in sheet, the safety representative will register the employee in the badging system, then, the employee is eligible to receive the badge,
- All contractor and subcontractor employees are required to provide proper form photo identification prior to receiving a Dekalb County Watershed Management badge.

Acceptable forms of photo identification are as follows:

- * ID cards issued by federal, state, local governmental agencies
- *TWIC (Transportation Worker Identification Credential)
- * Any I-9 Acceptable Documents(with accompanying photo)
- * Driver License or Identification card issued by a state motor vehicle department with a photo that clearly identifies the individual.
- Field verification will be done randomly by the DWM Safety staff to ensure employees were trained and following County, OSHA & State regulations.
- Only those employees registered in the badging system are eligible to receive a badge,
- Badging will take place at the DeKalb County Watershed Management, Safety Division, 1641 Roadhaven Drive, Stone Mtn., 30083.

Badging hours are Tuesdays and Thursday from 9:00am to 12:00pm.

Badges are valid until the expiration date shown on the badge. If a worker changes companies or projects, the badge must be surrendered and a new badge will be issued if needed. If applicable, the new employer will provide the employee certification that the safety training is completed. After verification by the safety representative, the badging database will be updated and a new badge issued.

C. Lost-Badge Replacement – Contractor must notify DMW' Safety Division immediately, if a badge is lost, stolen or an employee is no longer employee with the contractor

D. Safety Topics Suggestions:

- Company Safety Policy/Rules (including Accident Reporting Policy)
- Basic Safety
- Personal Protective Equipment requirements & proper use
- Fall Protection
- Back/Lifting Safety
- Trenching & Excavation
- Traffic Control/Traffic Safety (Flagging)
- Aerial Lifts
- Ladder Safety
- Housekeeping

- Confined Space & Confined Space Rescue
- Hazardous Materials
- Globally Harmonized Hazard Communication Standard (GHS)
- Hand & Power tools
- Scaffolding
- Crane safety
- Other relevant OSHA standards

E. Additional Training Requirements – Additional training requirements maybe requested if there is a change in the contractor’s scope of work or responsibilities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01540

SECTION 01550 TRAFFIC REGULATION

PART 1 - GENERAL

1.01 SCOPE

The Work specified in this section includes the provision of products, permits, services, procedures, and personnel by the **Contractor** to effect traffic control during the Work.

1.02 TRAFFIC CONTROL MANAGER REQUIREMENTS

- A. The **Contractor** shall designate a qualified individual as the Traffic Control Manager (TCM) who shall be responsible for selecting, installing, and maintaining traffic control devices in accordance with the Plans and Specifications and the Manual of Uniform Traffic Control Devices (MUTCD). A written resume documenting the experience and credentials of the TCM shall be submitted and accepted by the **County** prior to beginning any Work that involves traffic control. The TCM shall be available on a 24-hour basis to perform his or her duties. If the Work requires traffic control activities to be performed during the daylight and nighttime hours, it shall be necessary for the **Contractor** to designate an alternate TCM. An alternate TCM shall meet the same requirements and qualifications as the primary TCM and be accepted by the **County** prior to beginning any traffic control duties. The TCM's traffic control responsibilities shall have priority over other assigned duties.
- B. As the representative of the **Contractor**, the TCM shall have full authority to act on behalf of the **Contractor** in administering the Traffic Control Plan. The TCM shall have appropriate training in safe traffic control practices in accordance with Part VI of the MUTCD. In addition to the TCM, other individuals making decisions regarding traffic control shall meet the training requirements of Part VI of the MUTCD. The TCMs shall supervise the initial installation of traffic control devices. The **County**, prior to the beginning of construction, will review the initial installation. Modifications to traffic control devices as required by sequence of operations or staged construction shall be reviewed by the TCMs.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS, AND DEVICES

- A. The **Contractor** shall provide post-mounted and wall-mounted traffic control and informational signs as specified and required by local jurisdictions.
- B. The **Contractor** shall provide automatic traffic control signals as approved by local jurisdictions.
- C. The **Contractor** shall provide traffic cones and drums, and flashing lights as approved by local jurisdictions.
- D. The **Contractor** shall provide flagmen equipment as required by local jurisdictions.

PART 3 - EXECUTION

3.01 PERMITS

- A. The **Contractor** shall obtain permits from authorities having jurisdiction over road closures before closing any road. The **Contractor** shall use forms provided by authorities having jurisdiction (DeKalb County Department of Public Works, Georgia Department of Transportation, etc.).
- B. The **Contractor** shall either fax or hand carry any permit applications to the DeKalb County Department of Public Works. Permit applications shall indicate the time (in days); length (in feet); the number of lanes; and the purpose of the closure.
- C. All permits are approved for operations during off-peak hours, 9:00 a.m. to 4:00 p.m., unless special approval is received from the **County**.
- D. Operations between the hours of 6:00 p.m. and 10:00 p.m. and Saturdays, and Sundays shall require approval by the **County**.
- E. Full street closure permits shall require 96 hours' advance notice prior to road closure. The following additional information shall be provided by the **Contractor** prior to approval:
 - 1. The recommended detour route with signage and Traffic Management Plan as per the MUTCD.
 - 2. A copy of the resident and/or business notification letters about the closure. The residents/businesses located between the detour routes shall be notified about the closure at least 5 business days prior to the proposed closure.
- F. The DeKalb County Department of Public Works will return full road closure permit applications to the **Contractor**. The Fire Chief, Chief of Police, DeKalb Hospital, MARTA, and the DeKalb County Board of Education shall be notified in writing at least 72 hours before commencing road closure activities.

Lane closure permits are issued during operating hours Mondays through Fridays. The DeKalb County Department of Public Works will return lane closure permit applications to the **Contractor**. The **Contractor** shall provide a minimum of 48-hour notice prior to closure. The **Contractor** shall continuously maintain the safety of the traveling public during lane closures in accordance with the requirements of the MUTCD and as stipulated by public officers.

3.02 PREPARATION OF TRAFFIC CONTROL PLANS

The Traffic Control Plan drawings included with the Contract Documents shall only be considered as a guide and are not intended to contain the traffic regulation details that shall be required by the specifications, permitting agencies, and the MUTCD. The **Contractor** shall develop detailed staging and traffic control plans for performing specific areas of the Work including, but not limited to: requirements for certified flagmen, additional traffic control devices, traffic shifts, detours, paces, lane closures, or other activities that disrupt traffic flow. The **Contractor** shall submit these plans in accordance with the Specifications to receive final approvals from permitting agencies and provide required traffic control devices as required by both the permitting agencies and these specifications at no additional cost to the **County**.

3.03 CONSTRUCTION PARKING CONTROL

- A. The **Contractor** shall control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and **County's** operations.
- B. The **Contractor** shall monitor parking of construction personnel's vehicles in existing facilities and maintain vehicular access to and through parking areas.
- C. The **Contractor** shall prevent parking on or adjacent to access roads or in non-designated areas.

3.04 MAINTENANCE OF TRAFFIC

- A. Whenever and wherever, in the **County's** opinion, traffic is sufficiently congested or public safety is endangered, the **Contractor** shall furnish uniformed officers to direct traffic and to keep traffic off the highway area affected by construction operations.
- B. When the Contract requires the maintenance of vehicular traffic on an existing road, street, or highway during the **Contractor's** performance of Work that is otherwise provided for in the Plans and these Specifications, the **Contractor** shall keep such road, street, or highway open to traffic and shall provide such maintenance as may be required to safely accommodate traffic. The **Contractor** shall furnish, erect, and maintain barricades, warning signs, flagmen, and other traffic control devices in conformity with the requirements of the Georgia Department of Transportation and other local jurisdictions. The **Contractor** shall also construct and maintain in a safe condition any temporary connections necessary to ingress to and egress from abutting property or intersecting roads, streets, or highways. The **Contractor** shall maintain traffic in accordance with any traffic control plans furnished with and made a part of the Plan assembly.
- C. The **Contractor** shall make its own estimate of labor, materials, equipment, and incidentals necessary for providing the maintenance of traffic as specified in this section.
- D. Unless specified in the Plans or these Specifications, and subject to the approval of the **County**, the cost of maintaining traffic specified in this section shall be considered incidental to the Work and no separate measurement or payment shall be made.

3.05 UNIFORMED POLICE OFFICER FOR TRAFFIC CONTROL

- A. The **Contractor** shall provide uniformed police officers to regulate traffic when construction operations encroach on public traffic lanes, as approved by the **County**.
- B. Officers shall be currently employed by a local jurisdiction, be in full uniform and have full arrest power while working.
- C. Officers shall be employed and paid by the **Contractor**.
- D. Officers' shall be responsible for directing traffic within the construction site.

3.06 FLAGMEN

The **Contractor** shall provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroaches into public traffic lanes.

3.07 FLASHING LIGHTS

The **Contractor** shall use flashing lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 HAUL ROUTES

- A. The **Contractor** shall consult with authorities and establish public thoroughfares to be used for haul routes and site access.
- B. The **Contractor** shall confine construction traffic to designated haul routes.
- C. The **Contractor** shall provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.09 ROAD CLOSURES ON COUNTY ROADS

- A. No street, road, or highway shall be closed without the permission of the owner of any street, road, or highway and the fire department having jurisdiction. Prior to closing a street, road, or highway, signs shall be posted for a minimum of 7 days prior to actual closing, forewarning of the imminent closing. The **County** shall determine the information to be placed upon the signs by the **Contractor**. Where traffic is diverted from the Work, the **Contractor** shall provide materials and perform Work for the construction and maintenance of required temporary roadways, structures, barricades, signs, and signalization.
- B. To obtain approval to close a road or street maintained by the **County**, the **Contractor** shall proceed as follows:
 - 1. The **Contractor** shall obtain approval of the traffic plan from the **County**. The traffic plan shall be in accordance with the requirements of the Georgia Department of Transportation and DeKalb County.
 - 2. The **Contractor** shall obtain a utility permit.
 - 3. The **Contractor** shall apply in writing to the **County** and obtain a permit to close the road on a specific date.
 - 4. The **Contractor** shall obtain a permit from the **County** before posting closure signs. Signs shall be posted for 7 days prior to the first day of closure. Signs shall be acceptable to the **County**.
 - 5. The **County** will handle emergency road closures.

3.10 PROCEDURES FOR TRAFFIC DETOUR ROUTE PLAN

- A. The **Contractor** shall provide a sketch map to the **County**, showing the traffic detour route plan. The sketch map need not be drawn to scale, but should resemble, as closely as possible, the actual location. The sketch map shall be drawn in a manner so as to provide emergency agencies a better understanding of

the detour for quick response. The sketch map shall include directional arrows showing the flow of traffic.

- B. The **Contractor** shall erect "Road Closed Ahead" signs before the start point of the detour indicating the name of the street closed.
- C. The **Contractor** shall erect "Detour" signs with appropriate directional arrows at intersection along the detour route until the end of the detour, when the traffic is back to the original street.
- D. The **Contractor** shall erect an "End Detour" sign at the end of the detour.
- E. The **Contractor** shall erect an accessory plate indicating the name of the street being detoured to accompany each "Detour" and "End Detour" sign.
- F. The **Contractor** shall apply appropriate traffic control measures in accordance with the requirements of the MUTCD and **County** codes.

3.10 BARRICADES AND WARNING SIGNS

- A. The **Contractor** shall furnish, erect, and maintain barricades and warning signs for hazards necessary to protect the public and the Work. When used during periods of darkness, such barricades, warning signs, and hazard markings shall be suitably illuminated or reflectorized.
- B. For vehicular and pedestrian traffic, the **Contractor** shall furnish, erect, and maintain barricades, warning signs, lights, and other traffic control devices in conformity with the requirements of the Georgia Department of Transportation and DeKalb County.
- C. The **Contractor** shall furnish and erect barricades and warning signs for hazards prior to commencing Work that requires such erection and shall maintain the barricades and warning signs for hazards until their dismantling is directed by the **County**.

3.11 REMOVAL

The **Contractor** shall remove equipment and devices when no longer required and repair damage caused by installation.

END OF SECTION 01550

SECTION 01600

GENERAL MATERIAL AND EQUIPMENT REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

- A. The **Contractor** shall use the latest version of the manufacturer's product line of installed materials and equipment at the time of purchase. The **Contractor** shall not purchase materials and equipment that have been outdated by newer versions at the time of purchasing. Materials and equipment that show any signs of extended storage such as corrosion, scratches, and dents shall not be accepted.
- B. The **Contractor** shall use equipment for performing the Work that conforms to the latest version of applicable safety standards including, but not limited to, OSHA requirements. **Contractor** shall not exceed or ignore any requirements or recommendations of the equipment manufacturer. Equipment not meeting requirements of this Section shall be barred from use on the project.
- C. The **Contractor** shall install material and equipment that meets or exceeds the latest applicable code requirements, including, but not limited to: Underwriters Laboratory, Standard Building Code, and OSHA, as well as requirements of these Specifications. Where there is conflict with requirements of the Contract Documents and code requirements, the **Contractor** shall comply with the more stringent requirements with no additional compensation to the **Contractor**.

PART 2 - MATERIALS AND EQUIPMENT

2.01 ANCHOR BOLTS

- A. The **Contractor** shall use anchor bolts that are ANSI Type 316 stainless steel unless otherwise specified or indicated, and shall conform to requirements of this Section and the material articles in the appropriate Sections where they are used.
- B. The **Contractor** shall use anchor bolts supplied by the manufacturer or fabricator of the specific material or equipment to be installed.
- C. Design criteria for anchor bolts:
 - 1. When the size, length, or load carrying capacity of an anchor bolt, expansion anchor, or concrete insert is not shown on the Drawings, provide the size, length and capacity required to carry the design load times a minimum safety factor of four.
 - 2. Determine design loads as follows:
 - a. For equipment anchors, use the design load recommended by the manufacturer and approved by the **County**.
 - b. For pipe hangers and supports, use half the total weight of pipe, fittings, valves, accessories, and water contained in full pipe,

between the hanger or support in question and adjacent hangers and supports on both sides.

- c. Allowances for vibration are included in the safety factor specified above.
- d. Anchors shall develop ultimate shear and pull-out loads of not less than the following values in concrete:

<u>Bolt Diameter (Inches)</u>	<u>Min. Shear (Pounds)</u>	<u>Min. Pull-Out Load (Pounds)</u>
1/2	4,500	6,300
5/8	6,900	7,700
3/4	10,500	9,900

- 3. Embedment depth shall be minimum 6 inches for epoxy anchors and 4 inches for steel expansion anchors, unless noted otherwise on the drawings.

D. Anchor Type and Manufacturer

- 1. Where epoxy anchors are noted on the drawings, provide ANSI Type 316 stainless steel threaded rod with Speed Bond #1 epoxy injection as manufactured by Prime Resins, Inc. or approved equal.
- 2. For other applications, provide ANSI Type 316 steel expansion anchors from one of the following manufacturers:
 - a. Hilti, Incorporated
 - b. Ramset, Incorporated
 - c. Approved equal
- 3. Install anchors per manufacturer's recommendations and this Section.

Drilled anchorage holes are to be blown out with compressed air before installing anchor.

2.02 CONNECTION BOLTS

- A. Materials shall be as specified in other Sections of the Specifications, or as shown on the Drawings. Where materials are not specified or shown on the Drawings, they shall be of ANSI Type 316 stainless steel, with ANSI Type 316 stainless steel nuts and washers.
- B. Unless otherwise specified, stud, tap, and machine bolts and nuts shall be ANSI Type 316 stainless steel and shall conform to the requirements of ASTM Standard Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners, Designation A307-80. Hexagonal nuts of the same quality of metal as the bolts shall be used. Threads shall be clean cut and shall conform to ANSI Standard B1.1-1989 for Unified Inch Screw Threads (UN and UNR Thread Form).

2.03 CONCRETE INSERTS

Concrete inserts for hangers shall be designed to support safely, in the concrete that is used, the maximum load that can be imposed by the hangers used in the inserts. Inserts for hangers shall be of a type that permits adjustment of the hangers both horizontally (in one plane) and vertically and locking of the hanger head or nut. Inserts shall be galvanized, then epoxy phenolic primed and top coated with PVC, using thermal bond process.

2.04 SLEEVES

- A. Unless otherwise indicated on the Drawings or specified, openings for the passage of pipes through floors and walls shall be formed of sleeves of standard-weight, stainless-steel pipe. The sleeves shall be of ample diameter to pass the pipe and its insulation, if any, and to permit such expansion as may occur. Sleeves shall be of sufficient length to be flush at the walls and the bottom of slabs and to project 4 inches above the finished floor surface. Threaded nipples shall not be used as sleeves.
- B. Sleeves in exterior walls below grade or in walls to have liquids on one or both sides shall be as detailed on the Approved Drawings and specified in other sections.
- C. Sleeves shall be set accurately before the concrete is placed or shall be built in accurately as the masonry is being built.

2.05 ELECTRICAL EQUIPMENT ENCLOSURES

Items of electrical equipment that are furnished with process equipment shall conform to the requirements specified under the appropriate electrical sections of the specifications. Enclosures for electrical equipment such as switches, starters, etc., shall conform to the requirements specified under the appropriate electrical sections of the specifications.

2.06 EQUIPMENT DRIVE GUARDS

Equipment driven by open shafts, belts, chains, or gears shall be provided with acceptable all-metal guards enclosing the drive mechanism. Guards shall be constructed of epoxy paint coated, galvanized sheet steel or galvanized woven wire or expanded metal set in a frame of galvanized steel members. Guards shall be secured in position by steel braces or straps that will permit easy removal for servicing the equipment. The guards shall conform to applicable safety codes and regulations.

2.07 NAMEPLATES

- A. The **Contractor** shall provide each piece of equipment, with the exception of the items mentioned below, with a substantial nameplate of non-corrodible metal, securely fastened in place and clearly and permanently inscribed with the manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate.
- B. This requirement shall also apply to standard, manually operated gate, lobe, check, and plug valves.

- C. Each process valve shall be provided with a substantial tag of noncorrodible metal securely fastened in place and inscribed with an identification number in conformance with the tag numbers indicated on the Process and Instrumentation Drawings.

2.08 LUBRICANTS

During testing and prior to acceptance, the **Contractor** shall furnish lubricants necessary for the proper lubrication of equipment furnished under this Contract.

2.09 PROTECTION AGAINST ELECTROLYSIS

Where dissimilar metals are used in conjunction with each other, the **Contractor** shall provide suitable insulation between adjoining surfaces to eliminate direct contact and any resultant electrolysis. The insulation shall be bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators, or washers, or other approved acceptable materials.

2.10 TRANSPORTATION, HANDLING, STORAGE, AND PROTECTION

A. Packing and Shipping:

1. Product and materials shall be shipped and handled in ways that shall prevent damage.
2. Equipment shall be protected against damage from moisture, dust, handling, or other cause during transport from manufacturer's premises to the project site. Bearing housing, vents, and other types of openings shall be wrapped or otherwise sealed to prevent contamination by grit and dirt.
3. Ship equipment, material, and spare parts in assembled units except where partial disassembly is required by transportation regulations or for protection of components.
4. Pipe and appurtenances shall be handled, stored, and installed as recommended by the manufacturer. Pipes shipped with interior bracing shall have the bracing removed only when recommended by the pipe manufacturer.
5. Stiffeners shall be used where necessary to maintain shapes and to give rigidity.
6. Each item or package shall be marked with the number unique to the specification reference covering the item. Spare parts shall be packed in containers bearing labels clearly designating contents and pieces of equipment for which intended.

B. Acceptance at Site:

- C. Damaged items shall not be permitted as part of the Work except in cases of minor damage that have been satisfactorily repaired and are acceptable to the **County**.

- D. Damage shall be corrected to conform to the requirements of the Contract before the assembly is incorporated into the Work.

- E. The **Contractor** shall bear the costs arising out of dismantling, inspection, repair, and reassembly.
- F. Storage and Protection:
 - 1. During the interval between the delivery to the site and installation, equipment and materials shall be stored in an enclosed space affording protection from weather, dust, and mechanical damage and providing favorable temperature, humidity, and ventilation conditions to protect against equipment deterioration. Manufacturer's recommendations shall be adhered to in addition to these requirements.
 - 2. Equipment and materials to be located outdoors may be stored outdoors if protected against moisture condensation and ultraviolet (UV) degradation. Equipment shall be stored at least 6 inches above ground. Temporary power shall be provided to energize space heaters or other heat sources for control of moisture condensation. Space heaters or other heat sources shall be energized without disturbing the sealed enclosure.

2.11 UNIT RESPONSIBILITY

- A. Equipment systems made up of two or more components shall be provided as a unit by the responsible manufacturer. Unless otherwise specified, the **Contractor** shall obtain each system from the supplier of the driven equipment, and the supplier shall provide components of the system to enhance compatibility, ease of construction, and efficient maintenance. The **Contractor** shall be responsible to the **County** for performance of systems in accordance with the provisions of the General Requirements of the Contract Documents.
- B. Where the detailed specifications require the **Contractor** to furnish a certificate of unit responsibility, such certificate shall be executed by the manufacturer. No other submittal material shall be processed until the Certificate of Unit Responsibility has been received and has been found to be satisfactory.

END OF SECTION 01600

SECTION 01610 TRANSPORTATION AND HANDLING

PART 1 GENERAL

1.01 SCOPE

- A. The **Contractor** shall provide transportation of equipment, materials, and products furnished under these Contract Documents to the Work site. In addition, the **Contractor** shall provide preparation for shipment, loading, unloading, handling, and preparation for installation, as well as other Work and incidental items necessary or convenient to the **Contractor** for the satisfactory prosecution and completion of the Work.
- B. Equipment, materials, and products damaged during transportation or handling shall be repaired or replaced by the **Contractor** at no additional cost to the **County** prior to being incorporated into the Work. Acceptance of damaged goods is at the discretion of the **County**.

1.02 TRANSPORTATION

- A. Equipment shall be suitably boxed, crated, or otherwise protected during transportation.
- B. Where equipment will be installed using existing cranes or hoisting equipment, the **Contractor** shall confirm that the weights of the assembled sections do not exceed the actual capacity of the cranes or hoisting equipment.
- C. Small items and appurtenances such as gauges, valves, switches, instruments, and probes that could be damaged during shipment shall be removed from the equipment prior to shipment, packaged, and shipped separately. Openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.03 HANDLING

- A. Equipment, materials, and products shall be carefully handled to prevent damage or excessive deflections during unloading or transportation.
- B. Lifting and handling drawings and instructions furnished by the manufacturer or supplier shall be strictly followed. Eyebolts or lifting lugs furnished on the equipment shall be used in handling the equipment. Shafts and operating mechanisms shall not be used as lifting points. Spreader bars or lifting beams shall be used when the distance between lifting points exceeds that permitted by standard industry practice.
- C. Under no circumstances shall equipment or products such as pipe, structural steel, castings, reinforcement, lumber, piles, poles, etc., be thrown or rolled off of trucks onto the ground.
- D. Slings and chains shall be of size and capacity rating to safely support the weights of items to be unloaded. Slings and chains shall be regularly inspected and tagged as in good conditions in accord with OSHA requirements. Slings and chains shall be padded

as required to prevent damage to protective coatings and finishes.

+++END OF SECTION 01610+++

SECTION 01800 MAINTENANCE

PART 1 - GENERAL

1.01 DESCRIPTION

- A. **Contractor** shall maintain stored and installed equipment and materials until Final Acceptance of the Work as defined by the General Requirements. Work includes, but is not limited to:
1. Perform required maintenance.
 2. Repair and maintain protective coatings.
 3. Repair and replace scratched and damaged materials and equipment.
 4. Maintain and operate new equipment placed into service.
- B. Work, per this Section, starts on the date the equipment and materials are received and continues until the Date of Final Acceptance.
- C. **Contractor** shall monitor equipment storage, and subsequently, the operation and material functionality on a continual basis during the specified time period. Deterioration of materials or malfunction of equipment shall be followed by swift repair action to minimize the damage. Such repair shall include repair and technical services by an independent contractor if the **County** deems the **Contractor's** efforts are ineffective at correcting the problem.
- D. All costs for maintenance and repair of stored and installed equipment and materials, including costs from an independent contractor, during the specified time period shall be the sole responsibility of the **Contractor**.

+++END OF SECTION 01800+++

SECTION 02000 SITE WORK

PART 1 - GENERAL

1.01 DESCRIPTION

These general site work requirements apply to all site work operations. Refer to specification sections for specific product and execution requirements.

1.02 QUALITY ASSURANCE

- A. Comply with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials.
- B. Obtain and pay for all required inspections, permits, and fees. Provide notices required by governmental authorities.

1.03 PROJECT CONDITIONS

- A. Locate and identify existing underground and overhead services and utilities within contract limit work areas. Provide adequate means of protection of utilities and services designated to remain. Repair utilities damaged during site work operations and all cost associated with the damaged utility are the **Contractor's** expense.
- B. Arrange for disconnection disconnect and seal or cap all utilities and services designated to be removed or abandoned before start of site work operations. Perform all work in accordance with the requirements of the applicable utility company or agency involved.
- C. When uncharted or incorrectly charted underground piping or other utilities and services are encountered during site work operations, notify the **County** and the applicable utility company immediately to obtain procedure directions. Cooperate with the applicable utility company in maintaining active services in operation.
- D. Locate, protect, and maintain benchmarks, monuments, control points, and project engineering reference points. Reestablish disturbed or destroyed items at the **Contractor's** expense.
- E. Perform site work operations and the removal of debris and waste materials to assure minimum interference with streets, walks, and other adjacent facilities.
- F. Obtain governing authorities' written permission when required to close or obstruct street, walks, and adjacent facilities. Provide alternate routes around closed or obstructed traffic ways when required by governing authorities.
- G. Control dust caused by work. Dampen surfaces as required. Comply with pollution control regulations of governing authorities.
- H. Protect existing buildings, paving, and other services or facilities on site and adjacent to the site from damage caused by site work operations. Cost of repair and all cost associated with the damages including restoration of damaged items are at Contractor's expense.

- I. Protect and maintain streetlights, utility poles and services, traffic signal control boxes, curb boxes, valves and other services, except items designated for removal. Remove or coordinate the removal of traffic signs, parking meters, and postal mailboxes with the applicable governmental agency. Provide for temporary relocation when required to maintain facilities and services in operation during construction work.

- J. Preserve from injury or defacement all vegetation and objects designated to remain.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

Materials and equipment: As selected by the **Contractor**, except as indicated in contract documents.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Examine the areas and conditions under which site work is performed. Do not proceed with the work until unsatisfactory conditions are corrected.

- B. Consult the records and drawings of adjacent work and of existing services and utilities that may affect site work operations.

END OF SECTION 02000

SECTION 02020 USE OF EXPLOSIVES

PART 1 - GENERAL

1.01 SCOPE

- A. This section covers the use of explosives and blasting. Limit the use of explosives in the work to the practicable minimum by utilizing mechanical means of excavation to the maximum feasible extent. Blasting shall be limited and shall be approved by the **County**.
- B. Related Work Specified Elsewhere:
 - 1. Section 01380 - Photographic Documentation
 - 2. Section 02000 - Site Work
 - 3. Section 02140 - Dewatering
 - 4. Section 02324 - Trenching and Trench Backfill
- C. Definitions:

Controlled blasting is excavation of rock in which the blast hole size, spacing, depth and burden, and the charge size, depth and delay sequence are carefully planned and controlled to excavate the rock to the required limits. Controlled blasting minimizes overbreak and fracturing of the rock beyond the design lines.

1.02 GENERAL

- A. Perform blasting only with permits from the appropriate jurisdictional agencies. Necessary permits include an Explosives License issued by the Georgia Safety Fire Commissioner, and users' permits obtained from DeKalb County. Obey all local, State, Federal and other Governmental regulations applying to transportation, handling, storage and use of explosives, including the requirements of the DeKalb County Fire Department, the State of Georgia and applicable regulations of the Occupational Safety and Health Administration.
- B. Perform blasting operations in trenches, shafts and other open excavations only during daylight hours. Perform blasting operations only during the hours 7:00 a.m. to 10:00 p.m. No blasting shall be performed on Saturdays, Sundays or on the public holidays observed by the **County**. If an emergency prevents a blast being fired during the permitted hours and the holes are loaded, the blast shall be fired as soon as safety allows. In the event that blasting is found necessary outside the permitted hours, the **Contractor** shall receive approval from the County and inform local residents within hearing and vibration range and the jurisdictional agencies prior to firing,
- C. Furnish, install and operate at each site where blasting is being performed, using electric methods of initiation, an approved short-range, high accuracy thunderstorm monitor and lightning warning system. System shall be constantly be monitoring the electrical field of the atmosphere for pre-emptive notification of

nearby lightning strikes. The system shall connect to system lighting and audible devices to alert of incoming lightning activity. The system shall have the capability to send test messages and email alert notifications. The system shall have adequate provisions for transmitting alarms from the device to all locations where preparation for blasting, using electric initiation, are in progress. Install and maintain the system in accordance with the manufacturer's recommendations. Test the entire monitoring and alarm system for satisfactory operation at intervals not exceeding two (2) weeks, and suspend blasting operations until any defects have been corrected.

- D. Employ the services of a blasting consultant, satisfactory to the **County** and experienced in predicting and evaluating the effects of blasting on nearby structures, such that vibration levels at these structures do not exceed a level that will damage the structures or their contents, or cause undue alarm to their occupants. Employ the blasting consultant to plan and evaluate blasting operations.
- E. Preconstruction Video Survey and Inspections
1. **Contractor** is expressly advised that the protection of buildings, structures, bridges, utilities, and related work adjacent and in the vicinity of its operations, wherever they may be, is solely its responsibility. Existing condition inspection of buildings, bridges or other structures in the immediate vicinity of any blasting operations shall be performed by and be the responsibility of the **Contractor**. The inspection corridor shall extend within a 500-foot radius of all proposed blasting operations. The **Contractor** shall retain an independent consultant, specializing in preconstruction surveys, to conduct the required inspections. The video survey and inspections shall conform to the requirements of Section 01380 - Photographic Documentation.
 2. Prior to the start of blasting operations, the **Contractor** shall have the independent preconstruction survey consultant, make an examination of the interior and exterior of the adjacent structures, buildings, facilities, etc., and record by notes, measurements, photographs, etc., conditions which might be aggravated by blasting or other operations. Repairs or replacement of all conditions disturbed by the construction shall be made to the satisfaction of the owners or agents of adjacent buildings, structures, facilities, etc., and to the satisfaction of the County. This does not preclude conforming to the requirements of the insurance underwriters. Two (2) copies of surveys, photographs, videos, reports, etc., shall be submitted to the **County**.
 3. The cost of all pre-construction video surveys and inspections shall be borne by the **Contractor**.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements Conditions of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. At least sixty (60) days prior to commencement of blasting operations, a copy of all applicable licenses and permits for the purchase, transportation, storage and use of explosives.
2. At least sixty (60) days prior to commencement of blasting operations, a Blasting Monitoring Plan that shall include:
 - i. Name of the Blasting Vibration Consultant who will be responsible for establishing the monitoring program and interpreting the vibration readings;
 - ii. Names of the trained personnel provided to operate the monitoring equipment; the type and model of blasting seismograph proposed for use;
 - iii. Number and location of proposed monitoring stations; the methods to be used to coordinate blast detonation with recording of the blast; and
 - iv. Steps to be taken if blasting vibrations exceed or seem likely to exceed the vibration limits.
 - v. Name, make, and model of the short-range, high accuracy thunderstorm monitor and lightning warning system, including details on the alert warning system.
3. At least sixty (60) days prior to any blasting operation, provide:
 - i. Initial blast design for that location including number, location, diameter, depth and inclination of drill holes on a scale drawing of the excavation or heading face;
 - ii. Type and weight of explosive in each hole; delay arrangement showing delay period in each hole; total weight of explosive in the blast and maximum charge per delay; the method of detonation; calculations of peak particle velocities and air blast overpressures; and the precautions to be taken to prevent flying rock or other debris.
 - iii. Manufacturers' data sheets shall be provided for all explosives and accessories to be used.
 - iv. Name and qualifications of the independent preconstruction survey consultant.
 - v. Preconstruction Video Survey and Inspections.
 - vi. Written controlled blasting techniques.
4. At least thirty (30) days prior to any blasting operation, provide Blasting Safety Plan including:
 - i. Health and Safety requirements of all governing legislation;
 - ii. Certificates from all regulating agencies and relevant insurance companies;
 - iii. Outline of safety training program for the **Contractor's** and County's personnel;
 - iv. Communication and warning procedures;
 - v. Samples of all report and inspection forms; and lightning protection plan.
5. Within the working day following each blast, the **Contractor** shall provide

the blasting records and information for each blast detonated:

- a. A complete description including the location, date and exact time of the blast; name and signature of person in responsible charge of loading and firing and their blaster permit number; details of each blast as listed above for the initial blast design and any departures from the blast design; comments regarding any misfires, unusual results or unusual effects; any other records required by applicable regulations; and the name and signature of the person preparing the report.
- b. The monitoring record including the location, date, and exact time of the blast; general weather conditions; the locations of seismographs and type of ground on which they were located, instrument identification and their distances from the blast; the measured peak particle velocities; air blast overpressure records, if appropriate; and the name and signature of the observer.

1.04 QUALITY ASSURANCE

Work Experience:

- A. The blasting consultant shall have at least ten (10) years of blasting experience. The blasting consultant shall be on call throughout the entire period that blasting is performed and shall be available at the site within two (2) days at any time that the blasting consultant's services may be necessary as determined by the County.
- B. Blasting supervisors shall have a minimum of five (5) years' experience in supervising the loading and firing of charges for the excavation of shafts and trenches and shall have all necessary licenses and permits required by the appropriate jurisdictional agencies.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Use only non-nitroglycerine explosives.
- B. Store explosives and detonators in the manufacturers' boxes with date codes to allow the **County** to determine their age of the materials. All explosives and detonators used in the work shall be less than one (1) year old. Blasting products shall not be brought onto the site if the date codes are missing. When in the **County's** opinion any blasting product is either of excessive age or in a deteriorated condition, that material shall not be used until its age or quality can be shown to be satisfactory.

2.02 EQUIPMENT

- A. Use dust suppressant measures with air-powered or air-flush rock drilling equipment.

- B. Wet down the muck pile after blasting to control dust during mucking operations.

PART 3 - EXECUTION

3.01 GENERAL

- A. Firing shall be permitted only after the proper precautions have been taken for the protection of all persons, work, and property.
- B. The following limits on peak particle velocities and air blast overpressure, or such lower limits as established by the **Contractor's** Blasting Vibration Consultant, shall apply:
 - 1. At structures and utilities in the vicinity of blasting operations, the peak particle velocity resulting from blasting shall not exceed:
 - a. Frequency < 3 Hz: 0.2 inches/second.
 - b. Frequency 3 - 10 Hz: 0.5 inches/second.
 - c. Frequency 10 - 40 Hz: varying linearly 0.5 to 1.0 inches/second.
 - d. Frequency > 40 Hz: 1.0 inches/second.

The above limits are adopted from modified blasting level criteria given in U.S. Bureau of Mines Recommendations RI-8507.
 - 2. In the permanent concrete work, the peak particle velocities resulting from blasting shall not exceed two (2) inches per second.
 - 3. At the nearest structure subject to damage from air blast overpressure, the mean peak air blast overpressure shall not exceed 0.01 psi. Measure readings for peak particle velocity in three (3) orthogonal directions by equipment approved by the **County** that is either continually recording or triggered by a preset level of vibration. Determine particle velocity in each frequency range by spectral analysis. Zero crossing method to determine frequency is not acceptable.
- C. Blasting within fifty (50) feet of permanent concrete work will be permitted only after approval of the **Contractor's** plans showing the relative positions of the concrete, the area to be blasted and the blasting technique to be employed. All concrete work shall be protected by limiting the size of blasts, covering blasts and by other means until it is established that there is no danger of damage caused by either vibration or flying rock.
- D. Exercise all possible care in drilling and blasting operations to ensure the stability of the remaining rock and to keep overbreak to a minimum. Written controlled blasting techniques to be used shall be submitted to the **County** for approval.
- E. At each work site where blasting is being performed, erect signboards of adequate size stating that blasting operations are taking place in the work site and such signs shall be clearly visible at all points of access to the work site.

- F. Monitor the first blast at each location as a test case, and modify the initial blast design for that location if the monitoring record indicates that the vibration and air blast overpressure limits were exceeded or may be exceeded in subsequent blasts. Resubmit the blast design to the **County**. Continue vibration recording and air blast overpressure monitoring for every blast, and further adjustments to the blast design shall be made when the records indicate vibration or air blast overpressure in excess of the established limits.
- G. Before the firing of any blast where flying material may result in damage to persons, property, or the work, cover the rock to be blasted with suitable matting and overburden to prevent flying debris. After a blast is fired, remove all loose and shattered rock or other loose material that may endanger the structure or the workers, and make the excavation safe before continuing with the work. Carry out similar checks on previously excavated sections at least every 48 hours and recheck the support system, tightening lagging, and blocking, and adding rock dowels, mesh and other support measures as required. Before drilling new blast holes, thoroughly clean the face and examine the face for holes containing undetonated explosive.
- H. In the event that damage occurs due to blasting work, suspend all blasting immediately and make a report to the **County**. Before resuming blasting, adjust the blast design and resubmit it to the **County**, and take any other appropriate measures to control the effects of blasting.
- I. If blasting causes excessive overbreak or excessive fracturing of the surrounding rock, or is otherwise detrimental to the work, modify the blast design as necessary to achieve the desired result, and resubmit it to the **County**.

+++ END OF SECTION 02020 +++

SECTION 02050 DEMOLITION

PART 1 - GENERAL

1.01 SCOPE

A. General:

1. This section covers the labor, equipment, and materials necessary for the work associated with the demolition or removal of pipes, manholes, catch basins, pavement, houses, and other structures within the construction easements shown on the Plans, including all necessary excavation and backfilling.
2. Where removing structural tile and brick from existing structures, the work shall include all patching and reconditioning to restore the remaining tile or brick to its existing state and to provide a proper joint for joining the existing to new construction.
3. Where concrete is cut from existing structures under this Section to permit setting or inserting pipes, flumes, equipment or appurtenances, the work shall include all re-concreting, dressing and finishing of openings to the required lines and dimensions or as necessary for the placing and fixing of inserts. This repair is to meet all structural and leakage requirements and shall use non – shrink material.
4. The **Contractor** shall remove from existing structures and salvage, store or dispose of as specified hereinafter, all valves and piping, mechanical equipment, plumbing, heating, electrical, and ventilating fixtures, pipes, ducts, wires, and equipment, doors and windows, floor grating and cover plates, steel stairs, pipe railing, and the like that are not to remain in service in the finished work, whether or not shown on the Drawings and/or specified herein.
5. The work specified herein and shown on the Drawings is intended to give a general idea of the scope of this work but must not be construed as covering it entirely. The **Contractor** shall visit the site and judge the amount of work required and the problems anticipated in the performance of the work.
6. Requirements for removal and abandonment of site utilities are specified in Section 02000.

B. Asbestos Abatement:

1. The **Contractor** shall furnish all labor, materials, facilities, equipment, services, employee training and testing, and waste transportation and disposal for the removal of asbestos-containing materials (ACM) at the

site of the Work. Asbestos could possibly be encountered in demolition of houses, structures, and piping to be demolished.

2. All asbestos removal work shall be performed in accordance with the requirements established by the EPA, OSHA, Georgia Department of Transportation, NIOSH and State of Georgia EPD regulations; and any other applicable Federal, State and local regulations governing ACM abatement. Whenever there is a conflict or overlap of the above references, the most stringent provisions shall apply.
3. The **Contractor**, or an asbestos abatement subcontractor acceptable to the **County**, must be licensed in Georgia to perform asbestos abatement and meet other qualification requirements specified in this section. The **Contractor** shall include a program for protective equipment, breathing apparatus, work area security, and all other aspects dealing with health and safety in his Health, Safety, and Security Plan. This information may be called for elsewhere in these Specifications, however a submittal is required.

C. Related Work Specified Elsewhere:

1. Section 01210 - Measurement and Payment
2. Section 02000 - Site Work

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 Submittals. In addition, the following specific information shall be provided:
1. The **Contractor** shall submit to the **County** a schedule of demolition, detailed methods of demolition to be used for each structure, copies of authorization, and permits to demolish the structures.

PART 2 - PRODUCTS

2.01 GENERAL

- A. The **Contractor** shall provide all materials and equipment in suitable and adequate quantities as required to accomplish demolition work.

PART 3 - EXECUTION

3.01 SAFETY REQUIREMENTS

- A. All work shall be performed in conformance with the laws and regulations pertaining to safety established by Federal, State, and local governments and other authorities having jurisdiction.

3.02 UTILITIES

- A. The **Contractor** shall be responsible for maintaining all appropriate utility services during the demolition operations.
- B. Total shutdown of the existing utilities to perform any new construction, to make the required structural or piping modifications, and/or to make or install the required service or system modifications, will not be permitted, except by written request and approval of the **County**.
- C. Prior to making any piping or connections or modifications to existing facilities, the **Contractor** shall obtain specified timing and schedule approval from the **County**.

3.03 EQUIPMENT TO BE SALVAGED BY THE COUNTY

- A. The following is a partial list of materials to be removed and salvaged. The **County** will identify other materials to be salvaged during the course of the Work. Equipment on this list will be removed by the **Contractor** before the demolition work begins and delivered to a site specified by the **County**.
 - 1. Frames, Grates, and Manhole Covers
 - 2. Fire Hydrants
 - 3. Valves
 - 4. Pumps
 - 5. Meters
 - 6. Backflow Devices

3.04 REMOVAL AND STORAGE OF EQUIPMENT FOR REUSE

- A. No structure shall be removed without the approval and consent of the **County** unless shown on the Plans to be removed. The **Contractor** shall maintain all equipment in the same condition as when it was removed. The condition of the structure shall be determined prior to removal by the **County**. The **Contractor** assumes the responsibility for assuring that the material is properly stored and maintained.

3.05 DEMOLITION

- A. The Plans define the portion of the structures to be removed. Unless otherwise shown on the Plans, the **Contractor** shall not make rough cuts or breaks that exceed the limits of demolition shown.
- B. All equipment, materials, and piping, except as specified hereinbefore, within the limits of the demolition shall become the property of the **Contractor**.

3.06 REMOVAL OF EXISTING PIPING

- A. Where existing piping is in conflict with new piping or construction, rerouting or redesign shall be as directed by the **County**.

3.07 REMOVAL OF ASBESTOS-CONTAINING MATERIALS

- A. The **Contractor** shall provide all services to perform the work as follows:
1. Remove asbestos containing materials as required by applicable codes and regulations.
 2. Isolate each work area and erect temporary staging, containment barriers, and decontamination facilities as required.
 3. Remove all ACM from the work area.
 4. Thoroughly clean each work area and perform clearance air testing using NIOSH Method 7400.
 5. Remove all temporary staging, partitions, and other items installed to perform the work.
 6. Dispose of ACM in accordance with applicable Federal, State, and local laws and regulations.

3.08 BACKFILLING

- A. The **Contractor** shall backfill all demolished areas to existing ground level as to create positive sheet runoff.
- B. Backfill material shall meet the requirements of Section 02315 - Excavation and Backfill, as applicable. Backfill compaction shall be in accordance with the applicable requirements of Section 02324 – Trenching and Trench Backfilling and Section Structures. Rock and debris shall not be used as backfill material. In all areas not backfilled to ground level, the **Contractor** shall erect safety barriers around the excavation and not allow water to accumulate.

3.09 DISPOSAL OF DEMOLITION DEBRIS

- A. The **Contractor** shall dispose of demolition debris in accordance with the requirements of Section 02000 - Site Work.

+++ END OF SECTION 02050 +++

SECTION 02060 CRUSHED STONE AGGREGATE

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes installation of crushed stone aggregate; and any other similar, incidental, or appurtenant operation that may be necessary to properly complete the Work.
- B. The **Contractor** shall provide all services, labor, materials, and equipment required for all installation of crushed stone aggregate and related operations necessary or convenient to the **Contractor** for furnishing complete Work as shown on the Plans or specified in these Contract Documents.
- C. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 02324 - Trenching and Trench Backfilling
 - 3. Section 02920 - Site Restoration
 - 4. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these specifications.
 - 1. AASHTO M147 - 65 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses.
 - 2. AASHTO T180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in) Drop.
 - 3. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - 4. ASTM D698 – 00a - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³; 600 kN-m/m³).
 - 5. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soils Using Modified Effort (56,000 ft-lbf/ft³; 2,700 kN-m/m³).
 - 6. ASTM D2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

7. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Coarse aggregate shall be crushed stone of a quality equal to the best Stone Mountain Granite, of solid composition, free from dirt and adherent coatings, and suited for the class of its intended usage.
- B. Unless otherwise specified elsewhere in these Specifications or directed by the **County**, gradation of coarse aggregate shall conform to size Number 467, Number 57, or Number 67 as described in ASTM C33.
- C. The nominal maximum size of coarse aggregate used in concrete shall not be larger than one-fifth (1/5) of the narrowest dimension between sides of the forms, one-third (1/3) of the depth of slabs, or three-fourths (3/4) of the minimum clear spacing between reinforcing bars as described in ACI 68-50.
- D. Sand shall be clean and sharp, free from all deleterious substances, and shall conform to the requirements of ASTM C33.

PART 3 - EXECUTION

3.01 EXAMINATION

The **Contractor** shall verify that subgrade has been inspected and that gradients and elevations are correct and dry.

3.02 AGGREGATE PLACEMENT

- A. The **Contractor** shall place coarse aggregates in areas shown on the Plans or directed by the **County**.
- B. The **Contractor** shall place and compact coarse aggregate in accordance with the requirements of and Section 02324 - Trenching and Trench Backfilling.
- C. The **Contractor** shall level and contour surfaces to elevations and gradients indicated on the Plans.
- D. The **Contractor** shall add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.
- E. The **Contractor** shall add water to assist compaction. If excess water is apparent, the **Contractor** shall remove aggregate and aerate to reduce moisture content.
- F. The **Contractor** shall use mechanical vibrating tamping in areas inaccessible to compaction equipment.

3.03 TOLERANCES

- A. Flatness: Maximum variation of one-quarter ($\frac{1}{4}$) inch measured with a ten- (10-) foot metal straight edge.
- B. Scheduled Compacted Thickness: Within one-quarter ($\frac{1}{4}$) inch.
- C. Variation from True Elevation: Within one-half ($\frac{1}{2}$) inch.
- D. Base: Compacted to ninety-five (95) percent modified proctor density as determined by ASTM D1557.

+++ END OF SECTION 02060 +++

SECTION 02110 CLEARING AND GRUBBING

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required for all clearing and grubbing including, but not limited to, the removal from the Site of trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the construction area and understood by generally accepted engineering practice not to be suitable for construction of the type contemplated.
- B. The extent of route clearing is that minimum degree of clearing necessary to carry out all construction activities, including construction of appurtenances and other additional clearing needed for access purposes. The route clearing shall not exceed the easement, temporary easement, or the signed right of entry agreement.
- C. Clearing and grubbing operations shall be coordinated with temporary and permanent erosion control requirements.
- D. Clearing operations include, but are not limited to, the following:
 - 1. Protection of existing trees and other vegetation,
 - 2. Removal of trees and other vegetation,
 - 3. Clearing,
 - 4. Removing above-grade improvements,
 - 5. Removing underground improvements,
 - 6. Restoring damaged improvements,
 - 7. Protecting above-grade and underground improvements,
 - 8. Erosion control of disturbed areas.
- E. Related Work Specified Elsewhere:
 - 1. Division 1, General Requirements.
 - 2. Section 02125, Temporary and Permanent Erosion and Sediment Control
 - 2. Section 02050, Demolition
 - 4. Section 02200, Earthwork

1.02 JOB CONDITIONS

- A. Protection of Existing Improvements:
 - 1. Provide barricades, coverings, or other types of protection necessary to prevent damage to existing improvements.
 - 2. Protect improvements on adjoining properties as well as those on the project site. Restore existing improvements damaged by this work to their original condition, as acceptable to the **County** or property owner, as required. Replace property line monuments (such as iron pins) removed

or disturbed by clearing operations under the direction of a Land Surveyor licensed in the State of Georgia. A submittal is required with data showing the survey and sealed by the licensed land surveyor.

- B. Protection of Existing Trees and Vegetation:
1. Protect existing trees and other vegetation to avoid cutting, breaking or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip lines, foot or vehicular traffic, and parking of vehicles or equipment within drip line. Provide temporary fences, barricades, or guards as required to protect trees and vegetation that will be left standing.
 2. Provide protection for tree roots over one and one-half (1-1/2) inches in diameter that are cut during any construction operation. Coat the cut faces with emulsified asphalt or other acceptable coating that has been specially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed tree roots with wet burlap to prevent roots from drying out; provide earth cover as soon as possible.
 3. Repair or replace damaged trees and vegetation resulting from any construction operation in a manner acceptable to the **County**. A qualified arborist approved by the **County** shall perform tree damage repair at no cost to the **County**. Replace damaged trees that cannot be repaired and restored to full-growth status, as determined by the **County**.

PART 2 – PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 EXISTING TREES AND VEGETATION

Avoid cutting or injuring trees and vegetation outside easement line and outside areas to be cleared. The **Contractor** shall be responsible for damages outside these lines.

3.02 CLEARING AND GRUBBING

- A. Clearing operations shall begin no more than seven (7) days before beginning construction work for any area.
- B. Materials to be cleared, grubbed and removed from the project site include but are not limited to vegetation, trees, stumps, roots, lawns, shrubbery, gardens, paving, miscellaneous structures, debris, and abandoned utilities to the minimum practicable extent to complete the work. Limit clearing to a single lane work route without provision for construction vehicles to pass utility operation. Determine and stake limitations of construction easement or right-of-way prior to commencement of work and keep construction activity within such limits.
- C. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all areas to be graded so that topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so that further picking and raking will not be required.

- D. All stumps, roots, foundations, and planking embedded in the ground shall be removed and disposed of. Stumps and roots larger than one (1) inch shall be grubbed and removed to a depth not less than four (4) feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material. Piling and butts of utility poles shall be removed to a minimum depth of two (2) feet below the limits of excavation for structures, trenches and roadway subgrade or two (2) feet below finish grade, whichever is lower.
- E. Landscaping features shall include, but are not necessarily limited to: fences, cultivated trees, cultivated shrubbery, property corners, man made improvements, subdivision, and other signs shall be moved off the easement. The **Contractor** shall take extreme care in moving landscape features and shall reestablish these features as directed by the **County**.
- F. Surface rocks and boulders shall be grubbed from the soil and removed from the site or used as fill in accordance with Section 02200 - Earthwork.
- G. Where the tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.
- H. Any work pertaining to utility poles shall comply with the requirements of the appropriate utility.
- I. All fences adjoining any excavation or embankment that, in the **Contractor's** opinion, may be damaged or buried, shall be carefully removed, stored, and replaced. Any fencing that is damaged shall be replaced with new fence material of equal or better quality and construction. The **Contractor** shall be responsible for the new fence material cost if the **County** deems the **Contractor** was negligent.
- J. Stumps and roots shall be grubbed and removed to a depth not less than two feet below grade. All holes or cavities that extend below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as the surrounding material
- K. Burying or burning of residual materials and organics shall not be allowed.
- L. The **Contractor** shall utilize special precautions required for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within the construction area but not directly within excavation and/or fill limits. The **Contractor** shall be responsible for repair or replacement of any items damaged as a result of its operations.
- M. Remove lawn sod by cutting into maximum size that can be handled without tearing, stripping sod and underlying topsoil, and stockpiling for use in restoring the surface area. Water sod and otherwise maintain sod in viable, growing condition. Alternative means of lawn sod replacement may be approved by the **County**.
- N. Remove above-grade structures only where shown on the Drawings or as authorized by the **County**.

3.02 HOLES AND DEPRESSIONS

- A. Fill holes, depressions, and voids created or exposed by clearing operations with non-organic soil material approved by the **County**, unless further excavation or earthwork is indicated.
- B. Place fill material in horizontal layers not exceeding six (6) inches loose-depth and compact to a ninety-five (95) percent standard Proctor.

3.03 DISPOSAL OF WASTE MATERIALS

- A. Disposal General Requirements: Dispose cleared matter daily so as to maintain site in a safe and neat condition throughout the contract period. Owners of the property may remove merchantable timber, buildings, or other items from the work site before the **Contractor** begins operations, and no assurance exists that any such material will be on the work site when the **Contractor** begins work.
- B. On-Site Disposal:
 - 1. When authorized by the **County**, cut tree trunks and limbs, over two inches in diameter, into forty-eight- (48-)inch lengths and neatly stack within work limits on the same property as that on which the tree originally grew.
 - 2. On undeveloped property, distribute brush, trees, and limbs less than two inches in diameter, within the work area from which cut, as directed by the **County**. On developed property, remove all such clearing waste and properly dispose of it off-site.
- C. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site secured by the **Contractor** and shall be disposed of in accordance with all requirements of federal, state, county and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property except with written consent of the property owner. In no case shall any material or debris be left on the project site, shoved onto abutting private properties, or buried on the project site.

3.04 CONSTRUCTION ACCESS ROUTE ON EASEMENT

- A. When shown on the Drawings or directed by the **County**, a construction access route shall be built on the sewer easement for the purpose of accessing manholes and performing all other necessary work within the easement.
- B. The Construction access route shall be cut (10) ten feet wide, minimum, and (6) six inches deep below existing grade. Filter fabric shall be placed at the bottom of the cut, and surge stone shall be placed on top of the fabric, filling the six- (6-) inch depth along the roadway.
- C. The filter fabric for use under the stone shall be as specified in Section 02125.
- D. Surge stone shall be 4" to 6" size (4X6) rip rap type stone, or equivalent. Use sound, tough, durable stones resistant to the action of air and water. Slabby or

shaley pieces will not be acceptable. Specific gravity shall be two (2.0) or greater. Stones shall have less than sixty-six (66) percent wear when tested in accordance with AASHTO T-96.

3.06 TREE REMOVAL ON EASEMENTS

- A. The contractor shall confirm ownership of all on-site trees within the easement before work commences and submit a tree removal and disposal plan to the **County**.
- B. The **County's** written approval shall be obtained prior to the removal of any trees from the easement.
- C. All trees that need further processing (wood chips) on-site or disposal off-site must be processed or disposed of in conformance with Federal, State, and local rules and regulations.
- D. The **Contractor** must acquire any additional permits prior to commencement of any type of work done in the easement
- E. Stemmed vegetation, such as brush, shrubs, and trees shall be removed at or near the ground level, leaving the root systems intact.
- F. Trees shall be felled into the cleared construction area or areas to be cleared and not onto vegetation that will be preserved.
- G. Trees that have fallen into water bodies, or beyond the construction area, shall be removed immediately. All damage and remediation costs shall be the **Contractor's** responsibility.

+++ END OF SECTION 02110 +++

SECTION 02125

TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. This section includes requirements for the provision, maintenance, and subsequent removal of temporary and/or permanent erosion and sediment controls as shown on the approved plans.
- B. The temporary erosion and sediment controls specified herein shall be coordinated with the permanent erosion controls, to assure economical, effective, and continuous erosion and sediment control during construction within acceptable limits. Acceptable limits are as established by the Georgia Erosion and Sedimentation Control Act of 1975, as amended, Section 402 of the Federal Clean Water Act, and applicable codes, ordinances, rules, regulations, and laws of local and municipal authorities having jurisdiction.
- C. Land disturbance activities shall not commence until the Land Disturbance Permit Stream Buffer variance, and Notice of Intent, if applicable, have been properly issued and all required meetings have taken place.
- D. This section requires the **Contractor** to design project specific devices and practices to meet requirements of the related work and references listed below in conjunction with the **Contractor's** own means, methods, and techniques, schedules and sequences of work, and actual conditions encountered. Design shall be performed by professionals experienced and familiar with storm water and drainage characteristics as well as the requirements of references listed below.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Erosion and Sediment Control Plan
- B. Section 02485 - Seeding
- C. Section 02486 - Sodding
- D. Section 02490 - Trees, Shrubs, and Groundcovers

1.03 REFERENCES

- A. DeKalb **County** Soil Erosion and Sedimentation Control Ordinance.
- B. DeKalb **County** Comprehensive Stormwater Management and Stormwater Quality Ordinance.
- C. Manual for Erosion and Sediment Control in Georgia, as published by the Georgia Soil and Water Conservation Commission (current edition).
- D. Federal Clean Water Act.
- E. Georgia Erosion and Sedimentation Act of 1975, as amended.
- F. Georgia Department of Natural Resources, Environmental Protection Division General NPDES Permit # 100002.

1.04 QUALITY ASSURANCE

The **Contractor** shall provide at least one (1) representative involved in the project's land disturbing activities that has successfully completed the erosion and sediment control education and certification program as administered by the Georgia Soil and Water Conservation Commission; this "certified person" shall have completed as a minimum, the Level 1A (Fundamentals) course. A "certified person" shall be present onsite **at all times** when work is being performed. Failure to maintain a certified person onsite at all times may result in a stop work order or other appropriate enforcement action.

1.05 SUBMITTALS

- A. Within fifteen (15) days after the date of the Notice to Proceed, the **Contractor** shall submit a narrative description, working drawings and schedule for proposed temporary erosion and sedimentation controls to the local authority and Engineer for approval. The description and working drawings shall meet the requirements of the Georgia Erosion and Sedimentation Act of 1975 (as amended) and local soil erosion and sedimentation control ordinances. All fines imposed for improper erosion and sedimentation control shall be paid by the **Contractor**.
- B. Land disturbance activity shall not commence until the erosion and sedimentation control plans are approved. The **County** will provide a reproducible drawing of plan sheets to the **Contractor** for **Contractor's** use if necessary. The reproducible drawing will not bear the Design Engineer's seal or logo and is provided only for the **Contractor's** convenience in obtaining land disturbance permits.
- C. The description and working drawings shall indicate controls that will minimize erosion and prevent the off-site transport of sediment in storm water and drainage from the jobsite areas.
- D. Submit a written plan to the **County** for both temporary and permanent grassing. The plan shall include selection of species, dates, and rates of application for seeding, fertilizer, and mulching.
- E. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 of these Specifications. Unless otherwise noted, all submittals shall be produced at the Pre-Construction Meeting. In addition, the following information shall be submitted to the **County**:
 - i. Certification credentials of all persons that have completed the Georgia Soil and Water Conservation Commission's erosion and sediment control education and certification program and that will be involved in the project shall be provided to the **County** prior to the start of any land disturbing activities.

PART 2 – PRACTICES AND PRODUCTS

2.01 GENERAL

- A. The following paragraphs generally describe the erosion and sediment control

practices and products typically employed on a utility construction project. The detailed requirements for these, as well as for other measures which may be needed to achieve effective erosion control, shall be as specified in the Standards and Specifications for General Land Disturbing Activities of the Manual for Erosion and Sediment Control in Georgia.

- B. The paragraph titles and alphanumeric codes refer to specific structural and vegetative type practices included in the aforementioned Standards. All practices shall be considered as temporary erosion and sediment control features, except the channel stabilization, gabions and grassing/sodding, trees, shrubs, and groundcovers, which are considered as permanent measures.

2.02 STRUCTURAL PRACTICES

A. CONSTRUCTION EXIT - Co

1. A construction exit consists of a stone-stabilized pad with a geotextile underliner located at any point where traffic will be leaving a construction site to a public right-of-way, street, alley, sidewalk, or parking area.
2. Construction exits are used to reduce or eliminate transport of mud from the construction area.
3. Construction exits shall consist of graded one and one-half- to three and one-half- (1.5- to 3.5-) inch stone meeting National Stone Association grade R-2. The geotextile underliner shall be a non-woven fabric equal to No. C-45NW as manufactured by Contech Construction Products, Inc. or approved equal.

B. CHANNEL STABILIZATION (RIPRAP) - Ch

1. Channel stabilization consists of structures to stabilize an open channel for water conveyance. Such stabilization is typically applied in those locations where the channel banks and bed have been disturbed by excavation for a pipeline crossing.
2. Channels shall be stabilized using a rock riprap lining. The lining shall consist of filter bedding stone and graded riprap stone. Sizes of stone shall be as classified by either the National Stone Association (N.S.A.) or the Department of Transportation (D.O.T.). Riprap stone shall be equal to Georgia Department of Transportation Type 1 or Type 3. Filter bedding stone shall be graded stone not exceeding six (6) inches in diameter. An appropriate geotextile fabric may be substituted for filter stone.

C. GABIONS – Ga

Gabions are large, multi-celled mesh boxes used in channel revetments, retaining walls, abutments, check dams, etc. Boxes shall be constructed of PVC coated wire mesh and filled with four to eight (4" to 8") inch pieces of durable stone. Stone placement shall be principally by hand or gentle mechanical dumping in no more than twelve (12) inch layers with PVC coated wire cross and

diagonal supports in each cell to retain and support basket sides at those intervals. Minimum size for box gabions shall be 6'-0" x 3'-0" x 3'-0". Minimum size for Reno Mattresses shall be 9'-9" x 6'-6" x 0'-9". Gabions shall be manufactured by Maccaferri, USA or approved equal.

D. TEMPORARY STREAM CROSSING - Sr

1. A temporary stream crossing is a structure installed across a flowing stream for use by construction equipment.
2. Structures may include bridges, round pipes, and pipe arches. The structure shall be large enough to convey the full bank flow of the stream and be designed by the **Contractor** to withstand flows from a two- (2-) year, twenty-four- (24-) hour frequency storm.

E. CHECK DAMS - Cd

1. Check dams are barriers composed of stone or hay bales placed across a natural or constructed drainage way to prevent erosion in areas of concentrated flows.
2. Stone check dams shall not be utilized where the drainage area exceeds five acres. Hay bale check dams shall not be used where drainage areas exceed two (2) acres. Check dams shall not be installed in live streams.
3. Stone check dams should be constructed of graded size two- to ten- (2- to 10-) inch stone.

F. SEDIMENT BARRIER

1. STAKED HAYBALES - Sd1

Hay bale barriers are placed in a single row on natural ground where the most likely erodible areas are located to restrain sediment particles carried by sheet flow.

2. SILT FENCE - Sd1

- a. Silt fences are temporary measures to retain suspended silt particles carried by sheet flow.
- b. Silt fence consists of silt fabric, as specified in the Georgia Department of Transportation list #36, wood or steel posts, and wire or nail fasteners.
- c. Type A silt fence is a non-woven thirty-six- (36-) inch-wide filter fabric and shall be used on developments where the life of the project is greater than or equal to six (6) months. The flow rate (gallon/minute/square foot) is twenty-five (25). Additionally, Type A fabric has a color mark.

- d. Type C silt fence is a woven thirty-six- (36-) inch-wide filter fabric with wire reinforcement. The wire reinforcement is necessary because this fabric allows almost three times the flow rate as Type A silt fence. The flow rate (gallon/minute/square foot) is seventy (70). Additionally, Type C fabric does not have a color mark.

G. INLET SEDIMENT TRAP - Sd2

1. Inlet sediment traps are temporarily protective devices formed around a storm drain inlet to trap sediment.
2. Inlet sediment traps are used to prevent sediment from leaving a site or from entering storm drain systems prior to permanent stabilization of the disturbed area.

H. ROCK FILTER DAM - Rd

1. Rock filter dams are installed across small non-actively flowing drainageways and are applicable for projects that involve grading activity directly in those drainageways.
2. Rock filter dams consist of riprap faced with smaller rock on the upstream side for additional filtering affect.

I. STREAM DIVERSION - PIPED DIVERSION (DV1), PUMPED DIVERSION (DV2), ENGINEERED DIVERSION STRUCTURES (DV3))

1. Installation of water and sewer pipelines designed to cross natural streams shall be accomplished only in "dry channel" conditions (i.e. in the absence of stream flow in the work area). Provisions shall be implemented to divert a constant quantity and quality of stream waters around the construction area by means of adequately sized pipes, pumps, or engineered diversion structures or other methods proposed by the **Contractor** and approved by the **County**. These diversion devices will be maintained throughout the duration of construction within the stream channel. The structures shall be designed by professionals familiar with storm water / drainage characteristics and applicable requirements to withstand flows from a two- (2-) year, twenty-four- (24) hour frequency storm event unless otherwise noted on the drawings. Stream diversion devices shall not be removed until all disturbed areas of the stream channel bottom and banks are returned to original contours and stabilized to prevent erosion. The planning, scheduling, and sequencing of work by the **Contractor** shall be described in a detailed submittal to the **County** for approval. The final implementation schedule will only be determined in conjunction with forecasted weather conditions for the period anticipated for diversion.
 - a. Piped Diversion - Dv1
Piped diversions shall be installed and implemented in conjunction with and as an extension of Temporary Stream Crossings - (Sr). Pipes shall be sized as shown on the drawings with sufficient

coordination and planning as to their locations, elevations, etc. to allow subsequent water/sewer pipeline construction to occur in “dry channel” conditions.

Necessary sandbags or other sealing devices, dewatering, etc. shall be provided to accomplish this piped diversion as well as other “Best Management Practices” to ensure that erosion and sedimentation is controlled.

b. Pumped Diversion - Dv2

Pumped diversions shall be installed and implemented in conjunction with and as an extension of Temporary Stream Crossings -(Sr). Pumps and piping shall be sized as shown on the drawings with sufficient coordination and planning as to their locations, elevations, etc. to allow subsequent water/sewer pipeline construction to occur in “dry channel” conditions.

Necessary sandbags or other sealing devices, dewatering, discharge sediment basins, sediment filter socks, “floc logs,” “dirt bags,” etc. shall be provided to accomplish this pumped diversion as well as other “Best Management Practices” to ensure that erosion and sedimentation is controlled.

c. Engineered Diversion Structure - Dv3

Engineered diversion structures such as “Aqua Barrier” by Nilex, Inc., “Portadam” by Portadam Inc, interlocked sheet piling, riprap cofferdams, etc. shall be installed and implemented to allow subsequent water/sewer pipeline construction to occur in “dry channel” conditions. Sequential work elements may be involved to allow the construction area to progress across a stream, and ensuring that the previously completed segment is reasonably restored and stabilized.

Necessary sandbags, geotextiles, linings, or other sealing devices, dewatering, etc, shall be provided to accomplish this manner of diversion as well as other “Best Management Practices” to ensure that erosion and sedimentation is controlled.

2.03 - VEGETATIVE PRACTICES

A. GENERAL

1. Disturbed areas shall be stabilized as construction progresses. For sanitary sewers or water mains installed within easements, the construction corridor shall not exceed one thousand (1,000) linear feet without stabilization. All other projects shall not exceed three hundred (300) linear feet without stabilization

B. DISTURBED AREA STABILIZATION (WITH MULCHING ONLY) - Ds1

1. This practice is applicable where disturbed areas, temporarily idle, have not

been established to final grade and/or where permanent vegetative cover is delayed for a period not to exceed six (6) months.

2. Mulch materials shall consist of dry straw or hay, wood chips, erosion control matting or netting, or polyethylene film. The mulch should be uniform, spread over the designated area from two to four (2 to 4) inches thick.
3. Any and all disturbed areas that have not yet reached final grade shall be stabilized with mulch or temporary grassing within fourteen (14) calendar days of disturbance.

C. DISTURBED AREA STABILIZATION (WITH TEMPORARY SEEDING) - Ds2

1. Temporary seeding is a measure consisting of seeding and mulching to reduce erosion. All disturbed areas shall be seeded when and where necessary to reduce erosion.
2. This practice is applicable where disturbed areas, temporarily idle, have not been established to final grade and/or where permanent vegetative cover is delayed for up to six (6) months.
3. Temporary seeding consists of a grass or grass-legume mixture suitable to the area and season of the year.

D. DISTURBED AREA STABILIZATION (WITH PERMANENT VEGETATION) - Ds3

See Section 02485 – Seeding
See Section 02486 – Sodding
See Section 02490 – Trees, Shrubs, and Groundcovers

1. Permanent (perennial) vegetation shall consist of planted grasses, trees, shrubs, and/or perennial vines; a crop of perennial vegetation appropriate for the time of year and region (or to match, in kind, pre-existing maintained vegetation); or a crop of annual vegetation and seeding of target crop perennials appropriate for the region (or to match, in kind, pre-existing maintained vegetation), such that within the growing season a seventy (70) percent coverage by perennial vegetation shall be achieved.
2. This practice is applicable on disturbed areas at final grade.
3. Permanent perennial vegetation shall be applied on rough graded areas that will be undisturbed for more than (6) months.

E. DISTURBED AREA STABILIZATION (WITH SODDING) - Ds4

See Section 02485 – Seeding
See Section 02486 – Sodding

1. This practice shall consist of ground preparation, furnishing lime and fertilizer and placement of sod.
 2. Sod shall be from local area and delivered to the job site in either industry standard blocks or rolls. Sod shall not be delivered to the job site more than twenty-four (24) hours prior to installation. Sod shall be hand placed with edges butted and cut as required to fit the placement area. The finished installation shall be rolled with a lawn roller and thoroughly watered. The sod will be watered daily for the first five days after installation.
 3. Sod shall be anchored on slopes steeper than three to one (3:1).
- F. EROSION CONTROL MATTING AND BLANKETS - Mb
1. This practice is a protective covering (blanket) or soil stabilization mat used to stabilize disturbed areas until permanent vegetation on steep slopes, channels, or shorelines can be established.
 2. Concentrated flow areas, all slopes steeper than two and one-half to one (2.5:1) and with a height of ten (10) feet or greater, and cuts and fills within stream buffers, shall be stabilized with the appropriate erosion control matting or blankets.
 3. All blanket and matting materials shall be on the Georgia Department of Transportation Qualified Products List (QPL #62 for Blankets, QPL #49 for Matting).
- G. JOINT PLANTING STABILIZATION (rip-rap and willow stakes)
- Joint planting is a system that installs live willow stakes between rip-rap (type 3) placed previously along the stream bank. It is installed to increase the effectiveness of the rock system by forming a living root matt in the base upon which rock has been placed and improve the environmental function and aesthetics of the rock bank. The rock shall be principally placed by hand or gentle mechanical dumping. Willow stake density of installation shall be 3 to 5 cuttings per square yard. Cuttings shall be two (2) inches in diameter and three and one-half (3.5) feet in length. The cutting shall be freshly cut and alive. Two thirds (2/3) of live stake shall be in the ground below the previously placed rock. Only native species willow stakes shall be used.

PART 3 - EXECUTION

3.01 GENERAL

- A. At the Preconstruction Conference, the **Contractor** shall submit a schedule for accomplishing the temporary erosion control work for specific conditions to be encountered on the project.
- B. The **Contractor** shall install all erosion and sediment control devices as required by actual field conditions, as shown on the approved plans, or as directed by the **County** or by any agency having jurisdiction in the locale of the project.

- C. The erosion and sediment control devices shall be installed by the **Contractor** before land disturbing activities begin.
- D. The **County** has the authority to direct the **Contractor** to provide immediate, additional temporary erosion control measures to prevent contamination of adjacent waterways and drainage ways. Additional erosion control measures may be used to correct conditions that develop during construction that were not foreseen during the design stage or that are needed prior to installation of the permanent erosion control features.
- E. The **County** may limit the area of excavation in progress based on the **Contractor's** capability and progress in keeping the finish grading, mulching, and seeding current, in accordance with the accepted schedule. Should seasonal limitations make such coordination unrealistic, temporary erosion control measures, such as mulching or temporary seeding, shall be taken immediately to the extent feasible and justified.
- F. The **Contractor** shall incorporate all permanent erosion control features (grassing and sodding) into the project at the earliest practicable time.

3.02 INSTALLATION

- A. Erosion control measures shall be designed by professionals familiar with storm water / drainage characteristics, installed, and maintained in accordance with the "Manual for Erosion and Sediment Control in Georgia" published by the Georgia Soil and Water Conservation Commission.

3.03 INSPECTION

- A. Upon completion of installation, the **County** or local government authority shall inspect the erosion and sediment control devices for proper installation, flaws, defects, or other damage. The **Contractor** shall repair or replace, at its expense, the unacceptable portions as directed by the **County** or local government authority.
- B. All erosion and sediment control devices shall be inspected by the **Contractor** at least weekly and after each rainfall occurrence.
- C. All projects that require compliance with General NPDES Permit 100002 guidelines shall have inspections and monitoring in accordance with the specific Comprehensive Monitoring Plan.

3.04 MAINTENANCE

- A. The **Contractor** shall maintain the erosion and sediment control devices until the project is completed and all disturbed areas are stabilized. Maintenance of the devices shall include: removal and disposal of silt accumulation; replacement of damaged or deteriorated devices; other repairs; and the installation of additional devices should those devices installed prove to be inadequate. The **Contractor** shall provide this maintenance at no additional cost to the **County**.

Silt shall be cleaned out once it has accumulated to half the height of the device or when half of the available sediment storage capacity has been attained.

3.05 REMOVAL

- A. Temporary erosion and sediment devices shall remain in place until such time as a satisfactory stand of grass has been established, unless the **County** or local government authority directs earlier removal. Damaged or otherwise unusable devices shall be removed from the site and disposed of properly.
- B. After erosion and sediment device removal, the **Contractor** shall dress out any disturbed areas in the vicinity of the removed device and grass according to these Specifications.

+++ END OF SECTION 02125 +++

SECTION 02140 DEWATERING

PART 1 - GENERAL

1.01 SCOPE

- A. Construct all permanent Work in areas free from water. Design, construct, and maintain all dikes, levees, cofferdams, diversion, and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove temporary works after they have served their purpose.
- B. The **Contractor** shall be responsible for the stability of all temporary and permanent slopes, grades, foundations, materials, and structures during the course of the Contract. Repair and replace all slopes, grades, foundations, materials, and structures damaged by water, both surface and sub-surface, to the lines, grades and conditions existing prior to the damage at no additional cost to the **County**.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 CARE OF WATER

- A. Except where the excavated materials are designated as materials for permanent work, material from required excavation may be used for dikes, levees, cofferdams, and other temporary backfill if approved by the **County**.
- B. Furnish, install, maintain, and operate necessary pumping and other equipment for dewatering the various parts of the Work and for maintaining the foundation and other parts free from water as required for constructing each part of the Work.
- C. Install all drainage ditches, sumps, and pumps to control excessive seepage on excavated slopes, to drain isolated zones with perched water tables, and to drain impervious surfaces at final excavation elevation.
- D. After they have served their purpose, remove all temporary protective work at a satisfactory time and in a satisfactory manner. All diversion channels and other temporary excavations in areas where the compacted fill or other structures will be constructed shall be cleaned out, backfilled, and processed under the same Specifications as those governing the compacted fill.
- E. When the temporary works will not adversely affect any item of permanent work or the planned usage of the Project, the **Contractor** shall receive approval from the **County** to leave such temporary works in place. In such instances, breaching of

dikes, levees, and cofferdams may be required.

3.02 DEWATERING

- A. By the use of well points, pumps, tile drains, or other approved methods, the **Contractor** shall prevent the accumulation of water in excavated areas. Should water accumulate, it shall be promptly removed.
- B. As directed by the **County**, excavations shall be continuously dewatered to maintain a groundwater level no higher than two (2) feet below the lowest point in the excavation.
- C. The **Contractor** shall use piezometric observation wells to monitor the groundwater level and to ensure proper dewatering prior to excavation below the static water table. The number of wells required will vary depending on the size and depth of structures.
- D. No separate payment will be made for dewatering required to accomplish the work.

+++ END OF SECTION 02140 +++

SECTION 02200 - EARTHWORK

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The work covered by this Section includes furnishing all labor, equipment, and materials required to accomplish all clearing, grubbing, excavation, dewatering, sheeting, backfilling, grading, and any other similar earthwork operation which may be necessary to properly complete the work. All work shall be done in conformity with the Specifications and the directions of the Engineer.

- B. This Section includes the following:
 - 1. Preparing and grading subgrades for slabs, walks, pavements and landscaping.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage and moisture-control fill course for slabs-on-grade.
 - 4. Subbase course for walks and pavements.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling trenches within building lines.
 - 7. Excavating and backfilling for underground mechanical and electrical utilities and appurtenances.

1.02 RELATED DOCUMENTS

- A. Division 1: General Requirements.
- B. Division 2: Site Work.

1.03 DEFINITIONS

- A. Excavation: Consists of the removal of material encountered to subgrade elevations and the reuse or disposal of materials removed.

- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Subbase Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.
- E. Base Course: The layer placed between the subbase and surface pavement in a paving system.
- F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.
- G. Unauthorized Excavation: Consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities: On-site underground pipes, conduits, ducts and cables, as well as underground services within building lines.

1.04 SUBMITTALS

- A. General: Submit the following according Section 01340 of the Specifications.
- B. Product data for the following:
 - 1. Each type of plastic warning tape.
 - 2. Filter fabric.
 - 3. Ground stabilization fabric.
- C. Samples of the following:
 - 1. 20-lb samples sealed in airtight containers, of each proposed fill and backfill soil material from on-site or borrow sources.

2. 12-by-12-inch sample of filter fabric.
 3. 12-by-12-inch sample of ground stabilization fabric.
- D. Test Reports: In addition to test reports required under field quality control, submit the following:
1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources.
 2. One optimum moisture-maximum density curve for each soil material.
 3. Report of field density test of each stratum tested.

1.05 SUMMARY

- A. The elevations shown on the Drawings as existing are taken from the best existing data and are intended to give reasonable, accurate information about the existing elevations. They may not be exact, and the Contractor must satisfy himself as to the exact quantities of excavation and fill required.
- B. Earthwork operations shall be performed in a safe and proper manner with appropriate precautions being taken against all hazards.
- C. All excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels shall be maintained by the Contractor in good condition at all times until final acceptance by the Owner. All damage caused by erosion or other construction operations shall be repaired by the Contractor using material of the same type as the damaged material.
- D. Earthwork within the public rights-of-way shall be done in accordance with requirements and provisions of the permits issued by applicable agencies for the construction within their respective rights-of-way. Such requirements and provisions, where applicable, shall take precedence and supersede the provisions of these Specifications.
- E. The Contractor shall control grading in a manner to prevent water running into excavations. Obstruction of surface drainage shall be avoided and means shall be provided whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Free access must be provided to all fire hydrants, valves, and meters.

- F. No classification of excavated materials will be made. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, or condition thereof.
- G. Tests for compaction and density shall be conducted by the Engineer or by an independent testing laboratory selected by him. Costs of compaction tests performed by an independent testing laboratory shall be paid for by the Contractor. The Contractor shall make all necessary excavations and shall supply any samples of materials necessary for conducting compaction and density tests. The cost of all retests made necessary by the failure of materials to conform to the requirements of these Contract Documents shall be paid by the Contractor.
- H. All earthwork operations shall comply with the requirements of OSHA Construction Standards, Part 1926, Subpart P, Excavations, Trenching, and Shoring, and Subpart O, Motor Vehicles, Mechanized Equipment, and Marine Operations, and shall be conducted in a manner acceptable to the Owner and the Engineer.
- I. It is understood and agreed that the Contractor has made a thorough investigation of the surface and subsurface conditions of the site and any special construction problems which might arise as a result of nearby watercourses and floodplains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient to him for completing the work within the time specified in these Contract Documents.

1.06 QUALITY ASSURANCE

- A. The Contractor shall perform earthwork in compliance with the requirements of all authorities having jurisdiction over the construction.
- B. Testing and Inspection Service: The Engineer or a qualified independent geotechnical engineering testing agency, designated by the Engineer, will be employed to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory testing.
- C. Pre-installation Conference: The Contractor will conduct a conference at Project site to comply with requirements of Division 1, Section 01200, Project Meetings.

1. Before commencing earthwork, the Contractor will meet with representatives of the governing authorities, Owner, Engineer, consultants, Geotechnical Engineer, independent testing agency and other concerned entities. The Contractor will review earthwork procedures and responsibilities including testing and inspection procedures and requirements. The Contractor shall notify participants at least 3 working days prior to convening conference. The Contractor shall record discussions and agreements and furnish a copy to each participant.

1.07 PROJECT CONDITIONS

- A. Existing Utilities: The Contractor shall not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided.
 1. The Contractor shall provide a minimum 48-hours written notice to the Engineer and receive written notice to proceed before interrupting any utility.
- B. The Contractor shall demolish and completely remove from site existing underground utilities indicated on the plans to be removed. The Contractor shall coordinate with utility companies to shutoff services if lines are active.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

- A. The Contractor shall provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials are defined as ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, SM, ML and CL; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.
- C. Unsatisfactory Soil Materials are defined as ASTM D 2487 soil classification groups GC, SC, MH, CH, OL, OH and PT.
- D. Backfill and Fill Materials shall be satisfactory soil materials.
- E. Engineered fill is defined as subbase or base materials.

2.02 ACCESSORIES

- A. Detectable Warning Tape shall be acid and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.
1. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.
- B. The Contractor shall install a continuous run of plastic metallic tape above the top of the pipe at 18 to 24 inches below finished grade. Tape shall be suitable for detection with metal pipe location equipment, labeled to identify contents of pipe, and brightly colored to contrast with the soil. In addition to the tape, the contractor shall install a continuous run of tracer wire attached to pipe runs greater than 500'. This tracer wire shall be attached to a 2" galvanized pipe with a 180 degree bend at top extending 36" above grade for connection to locator equipment.
- C. Fabric:
1. Filter Fabric (for underdrains and other drainage use) shall be a non-woven pervious geotextile fabric that meets the following requirements:
 - a. Weight (ASTM D-3776): 4.5 ounces per square yard.
 - b. Thickness (ASTM D-1777): 60 mils.
 - c. Grab Tensile Strength (ASTM D-1682): 120 pounds.
 - d. Grab Elongation (ASTM D-1682): 55%.
 - e. Flow Rate (CFMC-GET-2): 285 gallons per minute per square foot.

PART 3 – EXECUTION

3.01 PREPARATION

- A. The Contractor shall protect structures, utilities, sidewalks, pavements and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.
- B. The Contractor shall protect subgrades and foundation soils against freezing temperatures or frost and provide protective insulating materials as necessary.
- C. The Contractor shall provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.02 DRAINAGE

- A. The Contractor shall provide positive drainage on site at all times and prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades and from flooding Project site and surrounding area.
- B. The Contractor shall protect subgrades and foundation soils from softening and damage by rain or water accumulation.

3.03 EXCAVATION

- A. The Contractor shall perform all excavation of every description, and of whatever substances encountered, to the dimensions and levels shown on the Drawings and/or specified.
- B. Over excavation of the organic sand layer (i.e. small to large roots) shall be performed. The preliminary soils investigation report shall be made available at the contractors. The over excavation operations shall be monitored by a licensed geotechnical engineer to evaluate the horizontal and vertical extent of the organic zone. The geotechnical engineer shall certify that (1) all organics are removed; and (2) excavation of acceptable soils has been minimized. The over excavation shall be performed within and to a distance of at least five feet beyond each individual structure footprint.

After the organics are removed, compacted of the resulting subgrade should not be attempted. Dry structural fill, as approved by the engineer, shall be placed over the subgrade with relatively light tracked equipment.

No rubber tired equipment should be allowed to traverse the areas until at least two and a half feet of compacted structural fill is in place. The structural fill, after placement and compaction, should have densities equivalent to 95 percent of the Modified Proctor maximum dry density (ASTM D 1557) design grade elevations.

- C. **Unclassified Excavation:** Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.
1. Rock excavating equipment for footings, trenches and pits shall be equivalent to Caterpillar Model No. 215D LC track-mounted hydraulic excavator, equipped with a 42-inch-wide short-tip radius rock bucket, rated at not less than 120-hp flywheel power with bucket-curling force of not less than 25,000 lbs. and stick-crowd force of not less than 18,700 lbs., measured according to SAE Standard J1179.
 2. Rock-excavating equipment for open excavations shall be equivalent to Caterpillar Model No. 973, heavy-duty, track-mounted loader, rated at not less than 210-hp flywheel power and developing minimum of 45,000-lb breakout force, measured according to SAE Standard J732c-69. Excavations more than 10 feet in width and pits more than 30 feet in either length or width are defined as open excavations.
- D. Rock will not be classified as such for additional payment. The Bidder shall satisfy himself as to rock and other materials which may be encountered in excavation, and make proper allowances for all contingencies in his lump sum or unit price bid. Neither the Owner nor the Engineer will be responsible for subsurface conditions found.
- E. Excavation for pipelines shall be made in open cut unless shown otherwise on the Drawings. Trenches shall be cut true to the lines and grades shown on the Drawings or established by the Engineer on the ground. The banks of trenches shall be cut in vertical parallel planes equidistant from the pipe centerline. From an elevation 12 inches above the top of the pipe to the bottom of the trench, the horizontal distance between vertical planes for different sizes of pipe shall not exceed those specified and/or shown on the Drawings. When sheeting is used, the width of the trench shall be considered as the distance between the inside faces of the sheeting. The bottom of the trench shall be cut carefully to the required grade of the pipe except where bedding materials or cradles are required, in which case the excavation shall extend to the bottom of the bedding or cradles as shown on the Drawings. Minimum pipe cover shall be as specified or shown on the Drawings.

1. Bell holes for bell and spigot pipe and mechanical joint pipe shall be excavated at proper intervals so the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of all joints in the pipe. Bell holes shall not be excavated more than 10 joints ahead of pipe laying. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
 2. Pipe trenches shall not be excavated more than 100 feet in advance of pipe laying and all work shall be performed to cause the least possible inconvenience to the public. Adequate temporary bridges or crossings shall be constructed and maintained where required to permit uninterrupted vehicular and pedestrian traffic.
 3. Unless otherwise specified herein or shown on the Drawings, wherever pipe trenches are excavated below the elevation shown on the Drawings, the Contractor, at his own expense, shall fill the void thus made to the proper grade with Class "C" concrete or with compacted layers of crushed rock or gravel conforming to the requirements for bedding materials.
 4. Rock, boulders and large stones encountered in trenches shall be removed to provide a clearance of not less than 6 inches in every direction from all parts of pipe, fittings, and other appurtenances.
 5. In all cases where materials are deposited along open trenches they shall be placed so that no damage will result to the work or adjacent property in case of rain or other surface wash.
- F. If additional material, other than that to be obtained from excavation, is required for backfilling and grading, the Contractor shall obtain that additional material from borrow as directed by the Engineer.
- G. All excess excavated earth, and all excavated rock, shall be hauled off to a designated spoil area. Surfaces and slopes of spoil areas shall be left smooth and free to drain.
- H. All ditches are to be closed at the end of each work day.

3.04 STABILITY OF EXCAVATIONS

- A. Contractor must comply with all local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

- B. The sides of all excavations shall be sufficiently sheeted, shored, and braced whenever necessary to prevent slides, cave-ins, settlement, or movement of the banks and to maintain the excavation clear of all obstructions. Wood or steel sheeting of approved design and type shall be used in wet, saturated, or flowing ground. All sheeting, shoring, and bracing shall have sufficient strength and rigidity to withstand the pressures exerted.
- C. The responsibility for correctly assessing the need for sheeting and analyzing the stresses induced shall be the total responsibility of the Contractor. Since the Engineer does not dictate or determine the Contractor's sequence or limits of excavation, the Engineer assumes no responsibility for sheeting and shoring. The Contractor must employ or otherwise provide for adequate professional structural and geotechnical engineering supervision to assess the need for sheeting and shoring and design same. Results of sheeting and shoring analysis and design shall be submitted to the Engineer upon request.
- D. Excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys shall be sheeted, shored, and braced adequately to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpinning of adjacent structures shall be done when necessary to maintain structures in safe condition. Any damage to structures or pavements occurring through settlements, water or earth pressures, slides, caves, or other causes; due to failure or lack of sheeting or bracing, or due to improper bracing; or occurring through negligence or fault of the Contractor in any other manner shall be repaired by the Contractor at his own expense.
- E. Sheeting, shoring, or bracing materials shall not be left in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Such materials shall be removed in such manner that no danger or damage will occur to new or existing structures or property, public or private, and so that cave-ins or slides will not take place. Steel sheeting may be removed without cutting, provided the rate of removal is in pace with tamping and backfilling operations to assure complete filling of the void created by the withdrawal of the sheeting. Complete withdrawal of the sheeting in advance of tamping and backfilling will not be permitted.
- F. All holes and voids left in the work by the removal of sheeting, shoring, or bracing shall be filled and thoroughly compacted.

3.05 UNAUTHORIZED EXCAVATION

- A. The Contractor shall not commence or continue any excavation until authorized by the Engineer.
- B. The Contractor shall fill any unauthorized excavation as directed by the Engineer.

3.06 STORAGE OF SOIL MATERIALS

- A. The Contractor shall stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials.
- B. The Contractor shall stockpile soil materials without intermixing.
- C. The Contractor shall place, grade and shape stockpiles to drain surface water.
- D. The Contractor shall cover to prevent wind-blown dust.
- E. The Contractor shall stockpile soil materials away from edge of excavations.
- F. The Contractor shall not store soil materials within drip line of remaining trees.

3.07 BACKFILLING

- A. The backfilling of sewer and pipe line trenches shall be started immediately after the construction of same has been inspected by the Engineer. Selected backfill material shall consist of finely divided earth, stone, dust, sand, crushed stone, or other approved material free from all wood, vegetable matter, debris, and other objectionable material and having scattered clods, stone or broken concrete less than 2 inches in maximum dimension.
 - 1. Material that is too dry to be adequately compacted shall receive a prior admix of sufficient water to obtain optimum moisture content. Material having excessive water content shall not be placed at any time.
 - 2. Selected backfill material shall be carefully placed in the trench on each side of the pipe in 6-inch layers for the full width of the trench and thoroughly and uniformly compacted by tamping or

ramming. Sufficient select backfill material shall be placed around the pipe and compacted to provide not less than 12 inches cover over the top of the pipe.

3. Backfilling shall be carried on simultaneously on both sides of the pipe and in a manner which will prevent injurious side pressures. If suitable select materials are not available from the trench excavation, the Contractor will be required to obtain the select materials elsewhere.
- B. Across sidewalks and driveways and at any other places subject to vehicular traffic or other superimposed loads, trench backfill shall be compacted in 6 inch layers to the density of the original adjacent material for the full depth of the trench. The top 6 inches of backfill shall consist of uniformly graded crushed stone.
 - C. Roadway subgrade shall be accomplished in layers not exceeding 6 inches in depth and each layer shall be thoroughly compacted to minimum 98 percent of the Modified Proctor maximum dry density as determined by ASTM D-698. This operation shall include any reshaping and wetting required to obtain proper compaction. All soft or otherwise unsuitable material shall be removed and replaced with suitable material.
 - D. In all other areas not affected by superimposed loads, trench backfill may be placed from the level 12 inches above the top of pipe upward without compaction. At these places backfill shall be neatly rounded over the trench to sufficient height to allow for settlement to grade after consolidation.
 - E. Wherever the subgrade is by nature too soft or mucky, in the opinion of the Engineer, for the proper installation of the pipe, he may order the Contractor to undercut the trench and backfill with stone or gravel bedding material. The stone shall be brought to the subgrade required by the class of bedding for the particular location and compacted.
 - F. Where slabs are to be constructed on earth fill, the fill shall be of select material. Selected backfill material shall consist of finely divided earth, stone, dust, sand, crushed stone, or other approved material free from all wood, vegetable matter, debris, and other objectionable material and having scattered clods, stone or broken concrete less than 2 inches in maximum dimension. The fill shall be placed in layers of not more than six inches compacted thickness and compacted by the use of heavy rolling or power tamping equipment to secure at least 95% of the Modified Proctor Dry Density.

- G. Backfills around structures shall be properly placed and compacted. The fills shall be brought up in layers. The layers shall be thoroughly compacted to at least 95% of the Modified Proctor Dry Density, each layer to be not deeper than six inches compacted thickness. Compaction around structures shall be by use of heavy power tamping equipment.

3.08 STORM DRAIN TRENCH BACKFILL

- A. The Contractor shall shape bedding course to provide continuous support for bells, joints and barrels of storm drain pipe.
- B. After the trench bottom has been exposed and before placement of any backfill, the trench bottom shall be inspected by the Engineer.
- C. A minimum 12-inch depth course of No. 57 stone wrapped in filter fabric shall be placed in the bottom of the trench. None of the aggregate in this 12-inch course shall be in contact with soil. The filter fabric shall be lapped a minimum of two (2) feet at the joints.
- D. Aggregate backfill shall be placed in 8-inch layers on top of the filter fabric wrapped 12-inch course. The first 8-inch layer shall be consolidated to a uniform density. Each subsequent 8-inch layer of aggregate backfill shall be placed and consolidated to a uniform density. Care shall be exercised in the placement of each layer to see that each section is continuously supported throughout its length. Aggregate shall be so placed up to one-half (½) the outside diameter of the pipes.
- E. The trench above one-half (½) the outside diameter of the pipes shall be backfilled with material meeting the requirements of Section 207 of the above-cited standard specification for normal backfill. The material shall be placed in 6-inch layers and compacted to 95 percent of the laboratory dry density except that the 12 inches immediately underneath the stone base shall be compacted to 100 percent of the laboratory dry density.
- F. Compaction tests shall be performed on each 6-inch layer of normal backfill between and alongside each 60-inch pipe at intervals not exceeding 200 feet. The next layer shall not be placed until the specified compaction has been achieved in each underlying layer.

3.09 MOISTURE CONTROL

- A. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches and dikes and shall perform all pumping and other work necessary to divert or remove rainfall and other accumulations of surface water from the excavations. The diversion and removal of

surface water shall be performed in a manner that will prevent the accumulation of water within the construction area where it may be detrimental.

- B. Where groundwater is encountered, the Contractor shall make the effort necessary to secure a dry excavation. In sandy and in other suitable type soils, dewatering shall be done by well pointing. If, in the opinion of the Engineer, the Contractor has failed to obtain an absolutely dry excavation by insufficient use of all known methods of dewatering, the Engineer may order the Contractor to excavate below grade and place not less than 6 inches of graded crushed stone fill material over the bottom to form french drains to suitably located sumps and to remove the water by bailing or pumping. The graded crushed stone fill material shall be placed at the Contractor's own expense and shall be of such depth that there shall be no water in the excavation at the time of pouring concrete. All costs of equipment, labor, and materials required for dewatering shall be included in the bid price.

3.10 FIELD QUALITY CONTROL

- A. The Contractor shall inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
 - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered and at intervals as directed by the Engineer.
 2. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-

place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.

3. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.
 4. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
- B. When the tests indicate that subgrades, fills or backfills are below specified density, the Contractor shall scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained.

3.11 PROTECTION AND MAINTENANCE

- A. The Contractor shall protect newly graded areas from traffic, freezing, erosion, trash and debris.
- B. The Contractor shall repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.

The Contractor shall scarify or remove and replace material to depth directed by the Engineer. The Contractor shall reshape and recompact at optimum moisture content to the required density.

- C. Where settling occurs during the Project correction period, the Contractor shall remove finished surfacing, backfill with additional approved material, compact and reconstruct surfacing.

The Contractor shall restore appearance, quality and condition of finished surfacing to match adjacent work and eliminate evidence of restoration to the greatest extent possible.

3.12 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. All materials removed by excavation, which are suitable for the purpose, shall be used to the extent possible for backfilling pipe trenches, foundations, and footings and for making embankment fills or for such other purposes as may be shown on the Drawings. All materials not used

for such purposes shall be considered as waste materials and the disposal thereof shall be made by the Contractor in a manner and at locations approved by the Engineer.

- B. Waste materials shall be spread in uniform layers and neatly leveled and shaped. Spoil banks shall be provided with sufficient and adequate openings to permit surface drainage of adjacent lands.
- C. Unsuitable materials, consisting of wood, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material so designated by the Engineer shall be removed from the work site and disposed of by the Contractor in a manner and at a location approved by the Engineer.
- D. No unsuitable or waste material shall be dumped on private property unless written permission is furnished by the owner of the property and unless a dumping permit is issued from the local jurisdiction.

3.13 FINAL GRADING

- A. After other earthwork operations have been completed, the sites of all structures, roads, and embankments shall be graded within the limits and to the elevations shown on the Drawings. Grading operations shall be so conducted that materials shall not be removed or loosened beyond the required limits. The finished surfaces shall be left in smooth and uniform planes such as are normally obtainable from the use of hand tools. If the Contractor is able to obtain the required degree of evenness by means of mechanical equipment he will not be required to use hand labor methods. Slopes and ditches shall be neatly trimmed and finished to slopes shown on the Drawings unless otherwise approved by the Engineer.
- B. Unless otherwise specified or shown on the Drawings, all finished ground surfaces shall be graded and dressed to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions and shall be acceptable to the Engineer.

3.14 TOPSOIL

- A. All areas to be sprigged or planted with trees, shrubs, or grass as shown on the plans shall be prepared by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. It shall then be brought to a neat and finished grade by the addition of 4 inches of approved topsoil.
- B. Topsoil removed from the construction area may be stockpiled and reused or topsoil may be obtained from approved borrow areas. If obtained from

borrow areas, the Contractor shall make suitable arrangements with the property owner and shall pay all costs incident to the borrowed material including royalties.

3.15 SETTLEMENT

- A. Tanks shall be filled to their maximum level and allowed to sit for 7 days prior to the final piping connections are made.
- B. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within one (1) year after final acceptance of the work by the Owner.
- C. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or Owner.

END OF SECTION

SECTION 02224 PIPE BORING AND JACKING

PART 1 – GENERAL

1.01 SCOPE

- A. The work covered by this Section includes furnishing all labor, materials, and equipment required to bore and jack casings or construct tunneled crossings and to properly complete pipeline construction as described herein and/or shown on the Drawings.
- B. General: Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), or other recognized standards. Latest revisions of all standards are applicable. If requested by the **County**, submit evidence that the manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two (2) years.

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 - Submittals. In addition, the following specific information shall be provided:
- B. Method Submittals: As directed by the **County**, the **Contractor** shall provide for the County's approval, a detailed plan for the methods proposed for the construction of the casing or tunnel. These plans shall address the following:
 - 1. Tunneling Method:
 - a. Groundwater Control: The **Contractor** shall control the groundwater throughout the construction of the casing. The groundwater shall be controlled by dewatering (well points, sumps, or deep wells), grouting, freezing, or other method approved by the **County**. The **Contractor** shall prepare a written, detailed plan for controlling groundwater, citing similar installation conditions and results. This plan shall be submitted to the **County** prior to any construction of the casing.
 - b. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing or tunnel.
 - c. Casing Design: Design of the bore pit and required bearing to resist jacking forces is the responsibility of the **Contractor**. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the **Contractor**, with the approval of the **County**, at no additional cost. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal length may be necessary.

2. Bore and Jack Method:
 - a. With **County** approval, the **Contractor** has the option to select the bore and jack method, including groundwater control, except as restricted herein.
 - b. The **Contractor** shall submit working drawings, written procedures, and calculations describing in detail the proposed bore and jack method and entire operation. This shall include, but not be limited to, groundwater control, ground stabilization if proposed, excavation procedures, control of casing alignment and grade, support of face, detection of surface movement, procedure for installing pipes and anchors and placement of an approved fill material between pipe and casing. If, in opinion of the **Contractor**, modifications to the methods are required during construction, working drawings shall be submitted for **County** approval delineating such modifications, including reasons for the modifications. Preparation of these drawings will be at no cost to the **County**.

- C. Material Submittals: The **Contractor** shall provide for the **County's** approval, shop drawings, proposed construction drawings and other pertinent specifications and product data as follows:
 1. Shop drawings for casing pipe and tunnel liner plate showing sizes and connection details
 2. Design mixes for concrete and grout
 3. Casing spacers

- D. Experience Submittals:

Boring and jacking casings and tunnel construction is deemed to be specialty contractor work. If the **Contractor** elects to perform the work, the **Contractor** shall provide evidence of experience as required by the General Requirements of the Contract Documents. The **Contractor** proposed to do the work shall have a minimum of five (5) continuous years of experience in steel casing and tunnel construction. Evidence of this experience shall be provided with the shop drawings for approval by the **County**.

1.03 STORAGE AND PROTECTION

All materials shall be stored and protected in accordance with the Manufacturer's recommendations and as approved by the **County**.

PART 2 – PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

- A. Casing:
 1. The casing shall be new unused pipe made from steel plate having minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A36.

2. As directed by the **County**, the outside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of sixteen (16) mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of sixty-five (65) percent by volume and shall be air or airless spray applied, minimum drying time shall be seven (7) days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Kop-Coat, Valspar, or approved equal and submitted for approval by the **County**.
3. Minimum casing thicknesses are shown on the Drawings. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking and all calculations shall be submitted for approval by the **County**. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the **County**.
4. Minimum diameters of casing are shown on the Drawings. Larger casings, with the **County's** approval, may be provided at no additional cost to the **County**, for whatever reasons the **Contractor** may decide, whether due to casing size availability, line and grade tolerances, soil conditions, etc.

B. Liner Plate:

1. Liner plates shall be of the thickness shown on the Drawings. The liner plates shall be either the four (4) flange-type or the two (2) flange lap-joint-type. Bolts and nuts used with the two- (2)-flange plates shall be a minimum of five-eighths (5/8) inch in diameter and shall conform to the latest revision of ASTM A307 for plate thickness less than 0.209 inch, and ASTM A449 for plate thickness equal to or greater than 0.209 inch. Bolts and nuts used with four- (4-) flange plates shall be not less than one-half (1/2) inch in diameter for plate thicknesses to and including 0.179 inch and not less than five-eighths (5/8) inch in diameter for plates of greater thickness. The bolts and nuts shall be quick acting coarse thread and shall conform to ASTM A307, Grade A. Each ring shall have two- (2-) inch-diameter half-couplings and plugs for grouting, located as shown on the Detail Drawings. Liner plates, bolts, and calculations shall be submitted to the **County** for approval.

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch-thick also having a hardness of eighty-five to ninety (85 - 90) durometer. Runners shall be attached to stainless steel risers that shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company, Advanced Products & Systems, Inc., or approved equal.
2. Casing spacers shall be a two-section, flanged, bolt-on style constructed of heat-fused PVC coated steel, minimum fourteen- (14-)gauge band and ten- (10-)gauge risers, with two- (2-) inch-wide fiberglass reinforced

- polyester insula duty PVC inner liner, minimum 0.09-inch-thick, having a hardness of eighty-five to ninety (85-90) durometer, and all stainless steel hardware shall be Pipeline Seal and Insulator, Ltd., or approved equal.
3. Casing spacers shall be designed for the general configuration shown in the Plans, including provisions for other conduits to be installed with the carrier pipe.
- D. Carrier Pipe: Carrier pipes shall be as specified in Section 02665, Water Mains, and Accessories, or Section 02665 - Transmission Water Mains. All joints of pipe in casing shall be restrained.
- E. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs. The **Contractor** may submit alternate methods to the **County** for approval.

2.02 EQUIPMENT

- A. Casings
1. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.
 2. On casing pipe for water lines over sixty (60) feet in length, the installation equipment shall include a steering head and a grade indicator.
 3. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing, which would indicate the elevation of the front end of the casing or some other means for grade indication approved by the **County**.
- B. Tunnels
1. Tunnel Boring Machine (TBM)
 - a. The TBM's design shall be submitted for approval by the **County**. The TBM shall be minimally equipped with disc cutters of diameter nineteen (19) inches or greater designed for operation at thrusts of up to seventy (70) kips per cutter.
 - b. The TBM shall afford adequate protection against loss of ground and permit ground support adjacent to the tunnel face, as required by ground conditions.
 - c. The TBM shall be equipped with a dust control system that includes a water spray system, dust shield, and dust scrubber system.
 - d. The method used to advance the TBM shall ensure its correct alignment at all times, without binding or imposing excessive loads on the primary tunnel supports or upon the surrounding ground.
 - e. The TBM shall be equipped with a roll indicator and laser target system, which allows the operator to observe the machine's alignment and orientation (predictor system) from the control station.
 - f. The TBM shall be grounded in accordance with the latest requirements of the National Electrical Code and equipped with ground fault protection.

2. Other tunneling Equipment
 - a. Power machinery and tools within the tunnel shall be operated by electricity, compressed air, diesel with approved scrubber, or other approved power. Electrical tools and equipment shall be grounded in accordance with the latest equipments of the National Electrical Code.
 - b. All electrical equipment and power receptacles shall have appropriate ground fault protection.
 - c. Provide temporary electrical lights to properly and safely illuminate all part of the shafts and tunnel including special illumination at the working face. Lighting circuits shall be thoroughly insulated and separated from power circuits, and lights shall be enclosed in wire cages. Secure electrical permits required for successful completion of this work.

PART 3 – EXECUTION

3.01 GENERAL

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the **Contractor**. Rock and/or water, if encountered, shall not entitle the **Contractor** to additional compensation. The **Contractor** shall examine the geotechnical report and borings and obtain all additional information as required to assure that the system provided will be capable of operating successfully given groundwater conditions, soil type, rock profile, potential for obstructions and all geotechnical parameters pertinent to this type of microtunneling. With approval from the **County**, the **Contractor** may perform additional soil investigation at no cost to the **County**.
- B. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a twenty-four (24-) hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be carried out in such a manner that removal of soil particles is held to a minimum. Dewatering shall comply with the approved Temporary and Permanent Erosion and Sediment Control Plan.
- C. Methods of dewatering shall be at the option and responsibility of the **Contractor**. Maintain close observation to detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the **County** immediately and take such action as necessary to maintain safe conditions and prevent damage.
- D. Casing and tunnel construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the work. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The **Contractor** shall be responsible for all settlement resulting from operations and shall repair and restore all damaged property to its original or better condition and is responsible for all associated damages at no cost to the **County**.

3.02 SAFETY

- A. Provide all necessary bulkheads and shields to ensure complete safety to all traffic, persons, and property at all times during the work. Perform the work in such a manner as to not permanently damage the roadbed or interfere with normal traffic over it in those areas immediately adjacent and outside the active project work area.
- B. Perform all activities in accordance with the Occupational Safety and Health Act of 1970, OSHA, PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons."

3.03 SURFACE SETTLEMENT MONITORING

- A. Provide surface settlement markers, placed as specified and as directed by the **County**. The **Contractor** shall place settlement markers outside the pavement area, along the centerline of the casing or tunnel at twenty- (20-)foot intervals. Markers shall also be placed at each shoulder of the roadway, at each edge of pavement, at the centerline of the pavement, and at ten and twenty-five (10 and 25) feet offset in each direction from the centerline of the casing. Tie settlement markers to benchmarks and indices sufficiently removed as not to be affected by the **Contractor's** operations.
- B. Make observations of surface settlement markers, placed as required herein, at intervals acceptable to the **County**. In the event settlement or heave on any marker exceeds one (1) inch, the **Contractor** shall immediately cease work and, using a method submitted to and approved by the **County**, take immediate action to restore surface elevations to those existing prior to start of the **Contractor's** operations.
- C. Take readings and permanently record surface elevations prior to the start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within fifty (50) feet of the casing or tunnel heading, at the beginning of each day; more frequently at the **County's** direction if settlement is identified. Make all elevation measurements to the nearest one-hundredth (0.01) of a foot.
- D. The **Contractor** shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by and at the expense of the **Contractor**.
- E. Promptly report any settlement and horizontal movement immediately to the **County** and take immediate remedial action at no cost to the **County**.

3.04 BORING AND JACKING

- A. Shaft
 - 1. Conduct boring and jacking operations from a shaft excavated at one (1) end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the lower elevation end of the bore.
 - 2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all

operations. Perform shaft dewatering operations as necessary to maintain the integrity of the shaft and foundation.

3. The bottom of the shaft shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base to create the support necessary to perform the required boring and jacking operation at no extra cost to the **County**.

B. Jacking Rails and Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads. The **Contractor** shall submit calculations detailing the wall pressures exerted by the jacking operations for the full length of the jack distance.
3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

- C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing, or wet boring.
- D. Auger the hole and jack the casing through the soil simultaneously.
- E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.
- F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield.
- G. Alignment and grade shall be monitored with a state-of-the-art laser system. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.
- H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the **County**, or removed and replaced at the **Contractor's** own expense.
- I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between sections shall be completely welded in accordance with AWS recommended procedures. Prior to welding the joints, the **Contractor** shall ensure that both ends of the casing sections being welded are square.
- J. The **Contractor** shall submit for approval to the **County** a contingency plan **County** that will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.
- K. Once the jacking procedure has begun, it shall be continued without stopping until completed, subject to weather and conditions beyond the control of the **Contractor**.
- L. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

- M. The **Contractor** shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.
- N. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, sheeting, shoring, and bracing shall be left in place, cut off, or removed, as directed by the **County**.
- O. Refer to Section 02200 - Earthwork, and Section 02324 - Trenching and Trench Backfilling, for additional information related to trench excavation, all classes and types of excavation, the removal of rock, muck and debris, and the excavation of all working pits and backfill.

3.05 TUNNELS

A. Shaft Excavation

- 1. Excavate in such a manner that overbreak is held to a minimum. In soil and mixed-face conditions, install primary support in continuous and close contact with the excavated surface to control water inflow and prevent ground loss, so that adjacent structures are not affected by ground movements. Excavation in soil shall not be advanced ahead of the previously installed primary support any more than is necessary for the installation of the succeeding section of primary support.
- 2. Whenever shaft sinking is suspended, the **Contractor** shall complete prairie support to the excavated surfaces and keep all dewatering system(s) operating. The **Contractor** shall have qualified personnel periodically check conditions that might threaten the excavation stability.
- 3. Remove excavated soil and rock from the site and dispose of properly complying with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials. All required inspections, permits, and fees are the **Contractor's** responsibility and at no cost to the **County**.
- 4. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring, and bracing shall be done in such a manner as not to endanger or damage new or existing structures, private or public properties and to avoid cave-ins or sliding in the banks.

B. Tunnel Excavation

- 1. Excavate in such a manner that overbreak is held to a minimum.
- 2. Where water inflows in the tunnel face are large and increasing, the **County** shall be notified of the conditions requiring the supplemental actions. The **Contractor** shall take all necessary actions to mitigate the water flows, including, but not limited to, drilling probe holes, relief holes, and ground treatment holes in the tunnel face, and to carry out consolidation grouting before proceeding.
- 3. Whenever tunneling is suspended, the **Contractor** shall complete installation of the primary support for that excavation cycle, and have qualified personnel periodically check conditions that might threaten tunnel stability.

4. Remove excavated rock from the excavation of the TBM erection as well as from transit and reception chambers, and dispose of properly at a location secured by the **Contractor**.
- C. The **Contractor** shall submit to the **County** for approval, a grouting schedule based on liner plate completion in time intervals and distances. The liner plates shall be installed progressively as excavation proceeds. Excavation shall not continue more than twenty-four (24) inches past the end of the liner plate already in place. At this time, an additional section of liner shall be installed before excavation shall continue. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout shall be continuously placed as close to the heading as possible, using grout stops if necessary. Grout shall be injected in the lower holes first, moving upward as the back space is filled. Threaded plugs shall be installed after filling each grout hole.

3.06 VENTILATION AND AIR QUALITY

Provide, operate, and maintain for the duration of the casing project, a ventilation system to meet safety and OSHA requirements.

3.07 ROCK EXCAVATION IN CASING

- A. In the event that rock is encountered during the installation of the casing pipe that, in the opinion of the **County**, cannot be removed through the casing, the **County** may authorize the **Contractor** to complete the crossing with a tunnel.
- B. With the **County's** approval, the **Contractor** may continue to install the casing and remove the rock through the casing at no additional cost to the **County**.

3.08 INSTALLATION OF PIPE

- A. After construction of the casing or tunnel is complete, and has been accepted by the **County**, install the pipeline in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and submit a plan to the **County** for approval to set the pipe at proper alignment, grade, and elevation, without any sags or high spots.
- C. The carrier pipe shall be held in the casing pipe by the use of casing spacers. The casing spacers shall be designed by the **Contractor** such that the carrier pipe can be installed in the casing. For tunnels, the carrier pipe will be held in place with a steel strap per the details.
- D. With **County** approval and as directed by the **County**, close the ends of the casing or tunnel with four- (4-) inch brick walls, plastered with Portland cement mortar and waterproofed with asphaltic roofing cement.

3.09 SHEETING REMOVAL

Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring, and bracing shall be done in such a manner so as not to endanger or damage either new or existing structures or private or public properties, and to avoid cave-ins, subsidence, or sliding in the banks.

+++ END OF SECTION 02224 +++

SECTION 02231 TREE PROTECTION AND TRIMMING

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes the protection and trimming of trees that interfere with, or are affected by, execution of the Work, whether temporary or new construction.
- B. Related Work specified elsewhere:
 - 1. Section 02324 - Trenching and Trench Backfilling
 - 2. Section 02920 - Site Restoration

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:
 - 1. Product Data: For each type of product indicated.
 - 2. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. The **Contractor** shall include lists of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.
 - 3. Certification: From a qualified forester that trees indicated to remain have been protected during construction according to recognized standards and that the trees were promptly and properly treated and repaired when damaged.
 - 4. Maintenance Recommendations: From a certified arborist for care and protection of trees affected by construction during and after completing the Work.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
 - 1. Hortus Third: Concise Dictionary of Plants Cultivated in the U.S. and County, 1976.
 - 2. Standardized Plant Names (American Joint Committee on Horticulture Nomenclature).
 - 3. National Arborist Association "Pruning Standards for Shade Trees", latest revision.

4. ANSI A 300 – Trees, Shrubs, and Other Woody Plant Maintenance – Standard Practices.
 5. ASTM D 448 – Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 6. ASTM D 5268 – Standard Specification for Topsoil Used for Landscaping Purposes.
- B. Forester Qualifications: A forester licensed in the State of Georgia.
- C. Tree Pruning Standards: The **Contractor** shall comply with the requirements of ANSI A300 unless more stringent requirements are indicated.
- D. Pre-installation Conference: The **Contractor** shall conduct a pre-installation conference at the site of the Work.

Before starting tree protection and trimming, the **Contractor** shall meet with representatives of authorities having jurisdiction, including, the **County**, consultants, and other concerned entities. The **Contractor** shall review tree protection and trimming procedures and responsibilities. The **Contractor** shall notify participants at least three (3) working days before convening the conference. The **Contractor** shall record discussions and agreements and furnish a copy to each participant.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Drainage Fill: Selected crushed stone, or crushed or uncrushed gravel, washed, ASTM D448, Size 24, with ninety (90) to one hundred (100) percent passing a two and one-half- ($2\frac{1}{2}$ -) inch sieve and not more than ten (10) percent passing a three-quarter- ($\frac{3}{4}$ -) inch sieve.
- B. Topsoil: Fertile, friable, surface soil, containing natural loam and complying with the requirements of ASTM D5268. The **Contractor** shall provide topsoil that is free of stones larger than one (1) inch in any dimension and free of other extraneous or toxic matter harmful to plant growth. The **Contractor** shall obtain topsoil only from well-drained sites where soil occurs in depth of four (4) inches or more; the **Contractor** shall not obtain topsoil from bogs or marshes.
- C. Filter Fabric: Manufacturer's standard, non-woven, pervious, geotextile fabric of polypropylene, nylon, or polyester fibers.
- D. Webbed Fabric Fence (temporary fencing): Orange polyethylene webbed fabric, forty-six (46) inches high supported by six (6) feet steel channel posts, five (5) feet on center. The **Contractor** shall set posts two (2) feet below grade.
- E. Chain Link Fence: Shall meet the requirements set by Owner and or Engineer.

PART 3 - EXECUTION

3.01 IDENTIFICATION

- A. Prior to any construction, the **Contractor** shall flag all trees on the site of the Work scheduled to be protected. All flagging shall be approved by the **County** prior to startup of the Work and construction activities. The **County** shall be notified immediately of any conflicts with proposed Work, structures, or utilities.

3.02 PREPARATION

- A. Temporary Fencing: The **Contractor** shall install temporary fencing as indicated on the Plans or outside the drip line of trees to protect remaining vegetation from construction damage.

The **Contractor** shall install chain link fence according to the requirements of set by Owner and or Engineer.

- B. The **Contractor** shall protect tree root systems from damage due to noxious materials caused by runoff or spillage while mixing, placing, or storing construction materials. The **Contractor** shall protect root systems from flooding, eroding, or excessive wetting caused by dewatering operations.
- C. The **Contractor** shall not store construction materials, debris, or excavated material within the drip line of remaining trees. The **Contractor** shall not permit vehicles or foot traffic within the drip line. The **Contractor** shall prevent soil compaction over root systems.
- D. The **Contractor** shall not allow fires under or adjacent to remaining trees or other plants.

3.03 EXCAVATION

- A. The **Contractor** shall install shoring or other protective support systems to minimize sloping or benching of excavations that could endanger trees.
- B. The **Contractor** shall not excavate within drip line of trees, unless otherwise indicated or approved by the **County**
- C. Where excavation for new construction is required within drip line of trees, the **Contractor** shall hand-clear and excavate to minimize damage to root systems. The **Contractor** shall use narrow-tine spading forks and comb soil to expose roots.
 - 1. The **Contractor** shall relocate roots in backfill areas where possible. If encountering large, main lateral roots, the **Contractor** shall expose roots beyond excavation limits as required to bend and relocate them without breaking. If encountered immediately adjacent to the location of new construction and relocation is not practical, the **Contractor** shall cut roots approximately three (3) inches back from new construction.

2. The **Contractor** shall not allow exposed roots to dry out before placing permanent backfill. The **Contractor** shall provide temporary earth cover or pack with peat moss and wrap with burlap. The **Contractor** shall water and maintain earth in a moist condition. The **Contractor** shall temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
- D. Where utility trenches are required within drip line of trees, the **Contractor** shall tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.

Root Pruning: The **Contractor** shall not cut main lateral roots or taproots. The **Contractor** shall cut only smaller roots that interfere with installation of utilities. The **Contractor** shall cut roots with sharp pruning instruments. The **Contractor** shall not break or chop roots.

3.04 REGRADING

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, the **Contractor** shall slope grade away from trees as recommended by the forester, unless otherwise directed by the **County**.
- B. Root Pruning: The **Contractor** shall prune tree roots exposed during grade lowering. The **Contractor** shall not cut main lateral roots or taproots. The **Contractor** shall cut only smaller roots. The **Contractor** shall cut roots with sharp pruning instruments. The **Contractor** shall not break or chop roots.
- C. Minor Fill: Where existing grade is six (6) inches or less below elevation of finish grade, the **Contractor** shall fill with topsoil. The **Contractor** shall place topsoil in a single un-compacted layer and hand grade to required finish elevations.
- D. Moderate Fill: Where existing grade is more than six (6) inches, but less than twelve (12) inches below elevation of finish grade, the **Contractor** shall place drainage fill, filter fabric, and topsoil on existing grade as follows:
 1. Carefully place drainage fill against tree trunk approximately two (2) inches above elevation of finish grade and extend not less than eighteen (18) inches from the tree trunk on all sides. For balance of area within drip line perimeter, the **Contractor** shall place drainage fill up to six (6) inches below elevation of grade.
 2. The **Contractor** shall place filter fabric with edges overlapping six (6) inches minimum.
 3. The **Contractor** shall place fill layer of topsoil to finish grade. The **Contractor** shall not compact drainage fill or topsoil. The **Contractor** shall hand-grade to required finish elevations.

3.05 TREE PRUNING

- A. The **Contractor** shall prune remaining trees affected by temporary and new construction.

- B. The **Contractor** shall prune remaining trees to compensate for root loss caused by damaging or cutting root system. The **Contractor** shall provide subsequent maintenance during Contract period as recommended by the forester.
- C. Pruning Standards: The **Contractor** shall prune trees according to the most current revision of ANSI A300 following the following types of pruning:
 - 1. Crown cleaning
 - 2. Crown thinning
 - 3. Crown raising
 - 4. Crown reduction
 - 5. Vista pruning
 - 6. Crown restoration
- D. The **Contractor** shall cut branches with sharp pruning instruments. The **Contractor** shall not break or chop branches.
- E. The **Contractor** shall chip branches removed from trees. The **Contractor** shall spread chips where indicated or as directed by the **County**.

3.06 TREE REPAIR AND REPLACEMENT

- A. The **Contractor** shall promptly repair trees damaged by construction operations within twenty-four (24) hours. The **Contractor** shall treat damaged trunks, limbs, and roots according to written instructions of the certified arborist.
- B. The **Contractor** shall remove and replace dead and damaged trees that the certified arborist determines to be incapable of restoring to a normal growth pattern.
- C. The **Contractor** shall aerate surface soil compacted during construction ten (10) feet beyond drip line and no closer than thirty six (36) inches to tree trunk. The **Contractor** shall drill two- (2-) inch-diameter holes a minimum of twelve (12) inches deep at twenty-four (24) inches on center. The **Contractor** shall backfill holes with an equal mix of augered soil and sand.

3.07 DISPOSAL OF WASTE MATERIALS

- A. Burning at the site of the Work is not permitted.
- B. Disposal: The **Contractor** shall remove excess excavated material, displaced trees, and excess chips from the site and dispose of them at an approved location.

3.08 MAINTENANCE

- A. All protected trees that have been root pruned shall be watered deeply twice a week during periods of hot, dry, windy weather (defined as when daily temperatures rise over eighty-five (85) degrees with no rain in the last 72 hours).

3.09 REPLACEMENT

- A. The **Contractor** shall be responsible for replacement of all protected trees that are damaged or destroyed during the construction period. Replacement shall be in equal caliper inches (D.B.H.) to those trees damaged or destroyed and shall be in like species unless otherwise determined by the **County**.

3.10 ADJUSTING AND CLEANING

- A. At the end of the construction period, the **Contractor** shall remove all protection fencing, trash, and debris within the protection area and finish grade and cover in accordance with the requirements of these Specifications.

+++ END OF SECTION 02231 +++

SECTION 02316 ROCK REMOVAL

PART 1 – GENERAL

1.01 RELATED SECTIONS

- A. Section 01300 Submittals.
- B. Section 02324 Trench and Trenching Backfilling.

1.02 DEFINITION

- A. Rock: any solid material in excess of 1.0 cy and which cannot be removed by means of mechanical excavating equipment having 1.25 to 2.0 cy bucket. Frozen material not classified as rock.
- B. PPV: peal particle velocity.

1.03 MEASUREMENT PROCEDURES

- A. Mass rock:
 - 1. Rock quantities will be taken from cross section showing original rock surface and actual grade line set by Engineer/Architect, except that minimum depth or rock required to excavated to be considered as 1 ft.
 - 2. Volume of individual boulders and rock fragments will be determined by measuring three maximum mutually perpendicular dimensions.
- B. Trench rock: rock quantities measured will be actual volume removed within following limits:
 - 1. Width for trench excavation as indicated.
 - 2. Width for excavation for structures to be bounded by vertical planes up to 1.5 ft outside and parallel to neat lines for footings as indicated.
 - 3. Depth from rock surface elevations immediately prior to excavation, to elevation as indicated.
 - 4. Where design elevation is less than 1 ft below original rock surface depth will be considered to be 1 ft blow original rock surface.
- C. Replacement imported fill: Imported fill quantities will be measured in cubic yards, compacted in place.
- D. Quantities for measurement purposes are indicated in Tender Form. If no quantities are provided, rock removal and fill replacement considered inclusive to the work and will not be measured.

- E. **Contractors** shall provide all survey equipment needed and provide assistance to Engineer/Architect in taking cross sections. Sections shall be taken at 15 ft intervals for mass and trench rock excavation. Sections will be submitted to **contractor's** site representative for verification. Additional sections shall be taken at points or significant change in elevation or at any other locations as determined by Engineer/Architect. **Contractor** to schedule work to allow sufficient time for Engineer/Architect to take necessary sections

1.04 SUBMITTALS

A. Blasting Operation

1. Submit to Engineer/Architect and local authorities having jurisdiction for approval, written proposal of operations for removal of rock by blasting, in accordance with Section 01300 Submittals.
2. Indicate proposed method of carrying out work types and quantities of explosives to be used, loading charts and drill hole patterns, type of caps, blasting techniques, blast protection measures for items such as flying rock, vibration, dust and noise control. Include details on protective measures, time of blasting and other pertinent details.
3. Submit records to Engineer/Architect at end of each shift. Maintain complete and accurate records for drilling and blasting operations.
4. Prior to any blasting operations, the **contractor** shall carry out a preblast survey. This survey will be conducted by an independent agency. The survey report will be submitted to the Engineer/Architect for review.
5. No blasting shall take place without a minimum of 48 hours notice to the Engineer/Architect.

1.05 QUALIFICATIONS

- A. Retain licensed explosives expert to program and supervise blasting work, to interpret recommendations of preblasting report, and to determine precautions, preparation and operations techniques.

1.06 BLASTING AND VIBRATION CONTROL

- A. Reduce ground vibrations to avoid damage to structures or remaining rock mass.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION

- A. Prevent damage to surroundings and injury to persons in accordance with GDOT Requirements. Sound warnings and display signs when blasting to take place.

3.02 ROCK REMOVAL

- A. Coordinate this Dekalb Health and Safety requirements.
- B. Remove rock to alignments, profiles, and cross sections as indicated.
- C. Explosive blasting is not permitted at locations indicated.
- D. Do blasting operations in accordance with local and provincial codes, requirements of authority having jurisdiction.
- E. Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.
- F. Excavate rock to horizontal surfaces.
- G. Scale, pressure wash and broom clean rock surfaces which are to bond to concrete.
- H. Excavate trenches to lines and grades to minimum of 300 mm below pipe invert indicated. Provide recesses for bell and spigot pipe to ensure bearing will occur uniformly along barrel of pipe.
- I. Cut trenches to widths as indicated.
- J. Use preshearing, cushion blasting or other smooth wall drilling and blasting techniques directed by Engineer/Architect.
- K. Remove boulders and fragments which may slide or roll into excavated areas.
- L. Correct unauthorized rock removal at no extra cost, in accordance with Section 02315 Excavating, Trenching and Backfilling.

3.03 ROCK DISPOSAL

- A. Dispose of surplus removed rock off site. Dispose in locations acceptable to authorities having jurisdiction and Engineer/Architect.

END OF SECTION 02316

SECTION 02324 TRENCHING AND TRENCH BACKFILLING

PART 1 - GENERAL

1.01 SCOPE

- A. The Work covered under this section consists of furnishing all labor, equipment, and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines shown on the Plans and as specified in these Specifications.
- B. Excavation shall include the removal of all trees, stumps, brush, debris, or other obstacles that remain after the site preparation operations and that may obstruct the Work. Excavation shall also include the excavation and removal of all earth, rock, or other materials to the extent necessary to install the pipe and appurtenances in conformance with the lines and grades shown on the Plans and as specified in these Specifications.
- C. Backfill shall include the refilling and compaction of the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.
- D. Trenches are divided into five areas:
 - 1. Foundation: The area beneath the bedding, sometimes also referred to as trench stabilization.
 - 2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel of the pipe.
 - 3. Haunch: The area above the bottom of the barrel of the pipe up to a specified height above the bottom of the barrel of the pipe.
 - 4. Initial Backfill: The area above the haunching material and below a plane 12 inches above the top of the barrel of the pipe.
 - 5. Final Backfill: The area above a plane 12 inches above the top of the barrel of the pipe.
- E. The choice of method, means, techniques, and equipment rests with the **Contractor**. The **Contractor** shall select the method and equipment for trench excavation and backfill depending upon the type of material to be excavated and backfilled, the depth of excavation, the amount of space available for operation of equipment, storage of excavated material, proximity of man-made improvements to be protected, available easement or right-of-way, and prevailing practice in the area.
- F. When hazardous or contaminated materials are encountered while performing trench excavation, the **Contractor** shall stop work and report the hazardous or

contaminated materials to the **County** immediately. The **County** will instruct the **Contractor** on the required procedures.

G. Related Work Specified Elsewhere:

1. Section 01210 - Measurement and Payment
2. Section 02200 - Earthwork
3. Section 02140 - Dewatering

1.02 SUBMITTALS

A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:

1. The **Contractor** shall submit a work plan for trenching and trench backfilling with complete written description that identifies details of the proposed method of construction and the sequence of operations for construction relative to trenching and trench backfilling. The descriptions, with supporting illustrations, shall be sufficiently detailed to demonstrate to the **County** that the procedures meet the requirements of the Plans and these Specifications.
2. The **Contractor** shall submit a dewatering plan in accordance with the requirements of Section 02140 - Dewatering.
3. The **Contractor** shall submit backfill material sources and product quality information.
4. The **Contractor** shall submit record documents in accordance with the requirements of the General Conditions. The **Contractor** shall record locations of sewers, as installed, referenced to survey benchmarks. The **Contractor** shall include locations of utilities encountered or rerouted. The **Contractor** shall give horizontal dimensions, elevations, inverts, and gradients. The **Contractor** shall use either GPS technology or a conventional survey to locate utilities.
5. The laboratory shall submit the following reports directly to the Engineer/**County** from the testing services, with a copy to the **Contractor**.
 - a. Test reports on borrow material
 - b. Verification of each footing subgrade
 - c. Field density test reports
 - d. One (1) optimum moisture-maximum density curve for each type of soil encountered
 - e. Report of actual unconfined compressive strength and/or results of bearing tests of each of the strata tested

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
1. ASTM C33 - Concrete Aggregates
 2. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 3. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ or 600 kN-m/m³)
 4. ASTM D2922 - Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
 5. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method
 6. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ or 2,700 kN-m/m³)
 7. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
- B. Density: All references to "maximum dry density" shall mean the maximum dry density defined by ASTM D1557, except that for cohesionless, free-draining soils, "maximum dry density" shall mean the maximum index density as determined by ASTM D4253. Determination of the density of foundation, bedding, haunching, or backfill materials in place shall meet the requirements of ASTM D1556 and ASTM D2922.
- C. Sources and Evaluation Testing: Testing of materials to certify conformance with these Specifications shall be performed by an independent testing laboratory approved by the **County**.

1.04 SAFETY

The **Contractor** shall perform all trench excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended. The **Contractor** shall pay particular attention to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226.

1.05 TESTING

- A. Tests and analysis of fill and borrow material shall be performed in accordance with the requirements of ASTM D1557.
- B. Testing shall be performed by an approved independent commercial testing laboratory. The **Contractor** shall coordinate testing.
- C. Compaction testing shall be performed in accordance with the requirements of ASTM D1556 or ASTM D2292.

- D. If tests indicate Work does not meet specified requirements, the **Contractor** shall remove Work, replace, and retest at no cost to the **County**.

1.06 JOB CONDITIONS

- A. All operations shall be performed by the **Contractor** in strict conformance with OSHA and any applicable local safety requirements. The **Contractor** shall pay particular attention to safety regulations for excavations and entering confined spaces.
- B. Test borings and other exploratory operations may be made by the **Contractor** with **County** approval at no cost to the **County**.
- C. The **Contractor** shall verify that survey benchmarks and intended elevations for the Work are as indicated on the Plans.
- D. It is intended that the Plans show the locations of all known existing surface and subsurface structures. However, the locations of many gas mains, water mains, conduits, sewers, is unknown and the **County** assumes no responsibility for failure to show any or all of these structures on the Plans or to show them in their exact locations. It is mutually agreed that such failure will not be considered sufficient basis for claims for Extra Work or for increasing the pay quantities, unless an obstruction encountered is such as to necessitate substantial changes in the lines or grades or requires the building of special structures, provisions for which are not made in the Plans. Any substantial change shall be determined and approved by the **County**.
- E. The **Contractor** shall locate existing underground utilities in the site of the Work. If utilities are to remain in service and in place, the **Contractor** shall provide adequate means of support and protection during trenching and trench backfilling.
- F. Utilities Notification Prior to Construction:
 - 1. Georgia law mandates that, before beginning all mechanical digging or excavation work, the **Contractor** shall contact Georgia 811 by using eRequest on www.Georgia811.com or by calling 811 or 1-800-282-7411.
 - 2. The **Contractor** may utilize EDEN (Excavation Digging Event Notification) web application that enables Members and Professional Excavators to create, manage, respond to, and edit Georgia 811 Locate Request Tickets.
 - 3. The **Contractor** shall retain all records of notification and responses during the course of the project until final Payment.
- G.. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, the **Contractor** shall consult the utility owner immediately for directions. The **Contractor** shall cooperate with utility companies in keeping respective services and facilities in operation. The **Contractor** shall repair damaged utilities to the satisfaction of the utility owner and shall be responsible for all costs associated with the repair or replacement of the damaged utility facilities.

- H. Unless specified otherwise in other Specifications Sections, the **Contractor** shall not interrupt existing utilities serving any facilities, during occupied hours, except when permitted in writing by the **County** and then only after acceptable temporary, utility services have been provided.
- I. The **Contractor** shall provide a minimum of forty-eight- (48-) hour notice to the **County** and utility owner, and shall receive written notice to proceed before interrupting any utility.
- J. The **Contractor** shall demolish and completely remove from the site of the Work existing underground utilities indicated on the Plans to be removed. The **Contractor** shall coordinate with utility companies for shut-off of services if lines are active. No separate payment will be made by the **County**.
- K. The **Contractor** shall protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavations. Where indicated in the Plans or directed by the **County**, the **Contractor** shall use augured piles and lagging. Augured piles shall be used instead of vibratory driven piles when near structures or existing sewers.
- L. The **Contractor** shall notify the **County** of unexpected subsurface conditions and discontinue work in affected area until the **Contractor** receives notification to resume work.
- M. The **Contractor** shall protect the bottom of the trench and soil adjacent to and beneath trench from frost.
- N. The **Contractor** shall prevent surface water run-off into a trench.

PART 2 - PRODUCTS

2.01 TRENCH FOUNDATION MATERIALS

Crushed stone shall be utilized for trench foundation (trench stabilization) and shall meet the requirements of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.02 BEDDING AND HAUNCHING MATERIALS

- A. Unless specified otherwise, bedding and haunching materials shall be crushed stone as specified below.
- B. Crushed stone utilized for bedding and haunching shall meet the requirements of Section 02060 - Crushed Stone Aggregate and of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be No. 57.
- C. Filter Fabric - Non-Woven Type:

1. Filter fabric associated with bedding shall be a UV stabilized, spun-bonded, continuous filament, needle-punched, polypropylene, nonwoven geotextile.
2. The fabric shall have an equivalent open size (EOS or AOS) of 120 to 70. The fabric shall also conform to the minimum property values listed in the following table:

Fabric Property	Unit	Test Procedure	Average Value	
			Typical	Minimum
Weight	oz/yd ²	ASTM D 3776	8.3	
Thickness	mils	ASTM D 1777	105	
Grab Strength	lbs	ASTM D 4632	240	210
Grab Elongation	%	ASTM D 4632	>50	50
Tear Strength	lbs	ASTM D 4533	100	85
Mullen Burst	psi	ASTM D 3786	350	320
Puncture Resistance	lbs	ASTM D 4833	115	100
Permittivity	sec ⁻¹	ASTM D 4491	1.7	
Water Permeability	cm/sec	ASTM D 4491	0.4	
Water Flow Rate	gpm/ft ²	ASTM D 4491	120	
UV Resistance (500 hrs)	%	ASTM D 4355	>85	
pH			2 - 13	

3. If directed by the **County**, the filter fabric manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of 10 days during initial pipe installation.
4. Filter fabric shall be equal to TenCate Polyfelt TS 700, Trevira Fiber Company 1125, or Supac 7-MP.

2.03 INITIAL BACKFILL

- A. Initial backfill material shall be crushed stone as specified for bedding and haunching materials or earth material meeting the requirements of this section.

2.04 FINAL BACKFILL

- A. Final backfill material for unpaved areas shall be general excavated earth materials, shall not contain rock larger than two (2) inches at its greatest diameter, cinders, stumps, limbs, man-made wastes, and other unsuitable materials. If materials excavated from the trench are not suitable for use as final backfill material, the **Contractor** shall provide select material conforming to the requirements of this section, including compaction requirements.
- B. Final backfill material for paved areas shall be crusher run. The **Contractor** shall install crusher run to the sub-base elevation in paved areas.

2.05 SELECT BACKFILL

Select backfill shall be imported materials that meet the requirements as specified for bedding, haunching, initial backfill or final backfill materials, including compaction requirements.

2.06 CONCRETE

Concrete for bedding, haunching, initial backfill, or encasement shall have a compressive strength of not less than three-thousand (3,000) psi, with not less than five and one-half (5½) bags of cement per cubic yard and a slump between three and five (3 and 5) inches. Ready-mixed concrete shall be mixed and transported in accordance with the requirements of ASTM C94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.07 FLOWABLE FILL

Flowable fill, where required for trench backfill, shall be submitted for approval and meet the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Section 600 for Excavatable or Non-Excavatable type.

<http://www.dot.ga.gov/PartnerSmart/Business/Source/specs/ss600.pdf#search=section%20600> The **Contractor** shall receive direction from the **County** on which type of flowable fill shall be used on a case-by-case basis.

1. Flowable fill is a mixture of Portland cement, fly ash, fine aggregate, air entraining admixture, and water. Flowable fill contains low cementitious content for reduced strength development.
2. Ensure flowable fill is manufactured at plants that qualify at approved sources according to the Standard Operating Procedure for Quality Assurance for Ready-Mix Concrete Plants in Georgia.

2.08 GRANULAR MATERIAL

Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet gradation requirements for Size No. 57 or finer.

2.09 COMPACTION EQUIPMENT

Compaction equipment shall be of suitable type and adequate to obtain the amount of compaction specified. Compaction equipment shall be operated in strict accordance with the manufacturer's instructions and recommendations and shall be maintained in such condition that it will deliver the manufacturer's rated compaction effort.

PART 3 - EXECUTION

3.01 PREPARATION OF PIPELINE EASEMENT

- A. Preparation of pipeline easement shall be performed in accordance with the requirements of Section 02200 - Earthwork. Where clearing or partial clearing of the easement is necessary, the **Contractor** shall clean the easement prior to the start of trenching. The **Contractor** shall cut trees and brush as near to the surface of the ground as practicable, remove all stumps, and pile for disposal. The **Contractor** shall not permit excavated materials to cover brush or trees prior to disposal.

The **Contractor** shall not remove any trees without approval from the **County**.

- B. Trees and shrubs farther than ten (10) feet from pipe centerline shall not be removed unless designated for removal by the **County** and within the easement. The **Contractor** shall protect all other trees and shrubs.

3.02 DISPOSAL OF CLEARED MATERIAL

The **Contractor** shall bear all costs of disposing of trees, stumps, brush, roots, limbs, and other waste materials from the clearing operation. Material shall be disposed of in such a manner as to meet all the requirements of Federal, State, and local regulations regarding health, safety, and public welfare. All cleared material shall be disposed of offsite in an approved location and at the **Contractor's** expense.

3.03 OBSTRUCTIONS

This item refers to obstructions that may be removed and do not require replacement. The **Contractor** shall remove obstructions within the trench area or adjacent thereto such as tree roots, stumps, abandoned piling, concrete structures, logs, and debris of all types without additional compensation. The **County** may make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the intended function of the facility. The **Contractor** shall dispose of obstructions removed from the excavation in accordance with the requirements of this section.

3.04 TRENCH EXCAVATION

- A. Topsoil and grass shall be stripped a minimum of six (6) inches over the trench excavation site and stockpiled separately for replacement over the finished grading areas.
- B. Trenches shall be excavated to the lines and grades shown on the Plans with the centerlines of the trenches on the centerlines of the pipes and to the dimensions

that provide the proper support and protection of the pipe and other structures and accessories.

C. Trench Width for Pipelines:

1. The sides of all trenches shall be vertical, as much as possible, to a minimum of one (1) foot above the top of the pipe. Unless otherwise indicated on the Plans, the maximum trench width shall be equal to the sum of the outside diameter of the pipe plus two (2) feet. The minimum trench width shall be that which allows the proper consolidation of the haunching and initial backfill material.
2. The **Contractor** may, with the County's approval, excavate the top portion of the trench to the maximum width within the construction easement or right-of-way that will not cause unnecessary damage to adjoining structures, roadways, pavement, utilities, trees, or private property. Where necessary to protect adjoining structures, roadways, pavement, utilities, trees, or private property, the **Contractor** shall provide sheeting and shoring. The **Contractor** shall use trench boxes to stabilize the trench meeting minimum structural loading. The **Contractor** shall ensure that all shop drawings from the supplier of the trench boxes have been stamped by a Professional Engineer registered in Georgia. The **Contractor** shall also submit to the **County** for approval the sheeting and shoring.
3. Where rock is encountered in trenches, the **Contractor** shall excavate to remove boulders and stones to provide a minimum of six- (6-) inch clearance between the rock and any part of the pipe or manhole. The maximum allowable width of rock excavation for payment shall be the outer diameter of the pipe bell to be installed plus twenty-four (24) inches.
4. Wherever the prescribed maximum trench width is exceeded, the **Contractor** shall use the next higher Class or Type of bedding and haunching as shown on the Plans for the full trench width as actually cut. The excessive trench width may be due to unstable trench walls, inadequate or improperly placed bracing and sheeting which causes sloughing, accidental over-excavation, intentional over-excavation necessitated by the size of the **Contractor's** tamping and compaction equipment, intentional over-excavation due to the size of the **Contractor's** excavation equipment, or other reasons beyond the control of the **County** and the cost is borne by the **Contractor**.

D. Depth:

1. The trenches shall be excavated to the required depth or elevation that allows for the placement of the pipe and bedding to the dimensions shown on the Plans.
2. Where rock is encountered in trenches for pipelines, the **Contractor** shall excavate to the minimum depth that will provide clearance below the pipe barrel of eight (8) inches for pipe twenty-one (21) inches in diameter and smaller and 12 inches for larger pipe and manholes. The **Contractor** shall

remove boulders and stones to provide a minimum of six (6) inches clearance between the rock and any part of the pipe, manhole, or accessory.

E. Excavated Materials:

1. Excavated materials shall be placed a minimum of two (2) feet from the top edge of the open trench and may be used for backfilling as required. Topsoil shall be carefully separated and lastly placed in its original location.
2. Excavated materials shall not be placed in public roadways. Excavated materials not used or useful as backfill shall be immediately disposed of away from the site of the Work in accordance with the requirements of Section 02200 - Earthwork.
3. Excavated material shall be placed sufficiently back from the edge of the excavation to prevent caving of the trench wall, to permit safe access along the trench and not cause any drainage problems. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.05 SHORING, SHEETING, AND BRACING OF TRENCHES

- A. The **Contractor** shall sheet and brace the trench as required by Federal, State, and local laws and regulations. Shoring, sheeting, and bracing shall be designed by a Professional Engineer registered in the State of Georgia. OSHA standards shall be used to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public. The **Contractor** shall increase trench widths accordingly by the thickness of the sheeting. The **Contractor** shall maintain sheeting in place until the pipe has been placed and backfilled at the pipe zone. Shoring and sheeting shall be removed, as the backfilling is done, in a manner that will not damage the pipe or permit voids in the backfill. All sheeting, shoring, and bracing of trenches shall conform to the safety requirements of the Federal, State, or local public agencies having jurisdiction. The most stringent of these requirements shall apply.
- B. Sheeting, bracing, and shoring shall be performed in the following instances:
1. Where sloping of the trench walls does not adequately protect persons within the trench from slides or cave-ins.
 2. In caving ground.
 3. In wet, saturated, flowing, or otherwise unstable materials, the sides of all trenches and excavations shall be adequately sheeted, braced, and shored.
 4. Where trenches and other excavations are within ten (10) feet from existing buildings and structures or where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees, or private properties, which are required to remain, whichever is more stringent.
 5. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

- C. In all cases, excavation protection shall strictly conform to the requirements of the Occupational Safety and Health Act of 1970, as amended.
- D. Timber: Timber for shoring, sheeting, or bracing shall be sound, free of large or loose knots, and in good, serviceable condition. Size and spacing shall be in accordance with OSHA regulations.
- E. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads. Procedures for installation and bracing shall be so scheduled and coordinated with the removal of the earth that the ground under existing structures shall be protected against lateral movement at all times. The **Contractor** shall provide closure and sealing between sheet piling and existing facilities.
- F. Trench Shield: A trench shield or box may be used to support the trench walls. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting the haunching of the pipe as the shield is moved. When the bottom of the trench shield extends below the top of the pipe, the trench shield shall be raised in 6-inch increments with specified backfilling occurring simultaneously. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe.
- G. The **Contractor** shall remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property. The **Contractor** shall leave sheeting in place when in the opinion of the **County** it cannot be safely removed or is within three (3) feet of an existing structure, utility, or pipeline. The **Contractor** shall cut off any sheeting left in place at least three (3) feet below the surface.
- H. Sheet piling within three (3) feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the **County**.
- I. If, in the opinion of the **County**, the material furnished for supporting excavation is not of the proper quality or sufficient size, or not properly placed to insure the safety of the Work or of adjacent structures or property, the **Contractor** shall, upon notice by the **County**, forthwith procure and place satisfactory supports, or place said supports in a satisfactory manner and upon his failure so to do, the **County** may order the **Contractor** to stop work until said notice has been complied with and without entitling the **Contractor** to any claim for extra compensation, damage, or delay.
- J. When required by the **County**, a shoring plan shall be submitted by the **Contractor** for approval prior to construction of the particular portion of the Work.
- K. All supports in excavations shall be withdrawn in stages on both sides of trenches (to prevent lateral movement of the pipe) as the backfilling is being done, except where, and to such extent as the **County** shall order, or where the **County** shall permit the same to be left in place, at the **Contractor's** expense and upon the **Contractor's** request. The **Contractor** shall cut off any sheeting

left in place, at least three (3) feet below finished grade whenever ordered by the **County**.

3.06 TRENCH ROCK EXCAVATION

- A. Rock excavation shall be performed in accordance with the requirements of Section 02316 - Rock Removal.
- B. Definition of Trench Rock: Any material that requires drilling and blasting, and occupies an original volume of at least one (1) cubic yard. Rock shall be considered as material that cannot be removed with a crawler tractor equal to a D-8 Caterpillar, equipped with a single-tooth ripper or by an excavator trackhoe equal to a Caterpillar 225 rated with a $\frac{3}{4}$ -cubic-yard capacity with a bucket curling pullout capacity of 25,000 pounds.
- C. Blasting: The **Contractor** shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. The **Contractor** shall provide licensed, experienced workmen to perform blasting. The **Contractor** shall conduct blasting operations in accordance with all existing ordinances and regulations and gain all required permits at their cost. The **Contractor** shall protect all buildings and structures from the effects of the blast. The **Contractor** shall repair any resulting damage. If the **Contractor** repeatedly uses excessive blasting charges or blasts in an unsafe or improper manner, the **County** may direct the **Contractor** to employ an independent blasting consultant to supervise the preparation for each blast and approve the quantity of each charge at the **Contractor's** expense.
- D. Disposal of Rock: The **Contractor** shall dispose of rock, off site, that is surplus or not suitable for use as riprap or backfill in a lawful manner.
- E. The **Contractor** shall notify the **County** prior to any blasting. Additionally, the **Contractor** shall notify the **County** and local fire department before any charge is set.
- F. The **Contractor** shall employ an independent, qualified specialty subcontractor, approved by the **County**, to: monitor the blasting by use of a seismograph; identify the areas where light charges must be used; conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log.

3.07 DEWATERING EXCAVATIONS

- A. Dewatering shall be performed in accordance with the requirements of Section 02140 - Dewatering.
- B. The **Contractor** shall dewater excavations continuously to maintain a water level at least two (2) feet below the bottom of the trench.
- A. The **Contractor** shall control drainage in the vicinity of excavations so the ground surface is properly pitched to prevent water running into the excavation.

- D. The **Contractor** shall maintain sufficient pumping equipment, in good working order, available at all times, to remove any water that accumulates in excavations. Where pipes cross natural drainage channels, the Work shall be conducted in such a manner that unnecessary damage or delays in the Work shall be prevented. The **Contractor** shall make provisions for the satisfactory disposal of surface water to prevent damage to public or private property.
- E. In all cases, accumulated water in the trench shall be removed before placing bedding or haunching, laying pipe, placing concrete, or backfilling.
- F. Where dewatering is performed by pumping the water from a sump, crushed stone shall be used as the medium for conducting the water to the sump. Sump depth shall be at least two (2) feet below the bottom of the trench. Pumping equipment shall be of sufficient quantity and/or capacity to maintain the water level in the sump at least two (2) feet below the bottom of the trench. Pumps shall be a type such that intermittent flows can be discharged. A standby pump shall be required in the event the operating pump or pumps clog or otherwise stop operating.
- G. The **Contractor** shall dewater trenches by use of a well point system when pumping from sumps does not lower the water level at least 2 feet below the trench bottom. Where soil conditions dictate, the **Contractor** shall construct well points cased in sand wicks. A casing of six (6) to ten (10) inches in diameter shall be jetted into the ground, followed by the installation of the well point, filling the casing with sand, and withdrawing the casing.

3.08 TRENCH FOUNDATION AND STABILIZATION

- A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.
- B. If, after dewatering as specified above, the trench bottom is spongy, or if the trench bottom does not provide firm, stable footing, and the material at the bottom of the trench will still not adequately support the pipe, the trench will be determined to be unsuitable and the **Contractor** shall then stabilize the trench by over-excavating the trench bottom and filling it with crushed stone.
- C. Where the replacement of unsuitable material with crushed stone does not provide an adequate trench foundation, the trench bottom shall be excavated to a depth of at least 2 feet below the specified trench bottom. The **Contractor** shall place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, haunching, and pipe have been placed at the proper grade. The ends of the filter fabric shall be overlapped above the pipe.
- D. Where trench stabilization is provided, the trench stabilization material shall be compacted to a minimum ninety (90) percent of the maximum dry density, unless shown on the Plans or specified otherwise in these Specifications.

3.09 BEDDING AND HAUNCHING

- A. Prior to placement of bedding material, the trench bottom shall be free of any water, loose rocks, boulders, or large dirt clods.
- B. Bedding material shall be placed to provide uniform support along the bottom of the pipe and to place and maintain the pipe at the proper elevation. The initial layer of bedding placed to receive the pipe shall be brought to the grade and dimensions indicated on the Plans. All bedding shall extend the full width of the trench bottom. The pipe shall be placed and brought to grade by tamping the bedding material or by removal of the excess amount of the bedding material under the pipe. Adjustment to grade and line shall be made by scraping away or filling with bedding material. Wedging or blocking up of pipe shall not be permitted. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint.
- C. At each joint, the **Contractor** shall excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
- D. After the pipe section is properly placed, the **Contractor** shall add the haunching material to the specified depth. The haunching material shall be shovel sliced, tamped, vigorously chinked, or otherwise consolidated to provide uniform support for the pipe barrel and to fill completely the voids under the pipe, including the bell hole. Prior to placement of the haunching material, the bedding shall be clean and free of any water, loose rocks, boulders, or dirt clods.
- E. Gravity Sewers and Accessories: The **Contractor** shall lay pipe with Class "B" bedding, unless otherwise shown on the Plans, specified in these Specifications, specified by the manufacturer, or directed by the **County**.
 - 1. Class "A": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall lay pipe to line and grade on concrete block. The **Contractor** shall place concrete to the full width of the trench and to a height of one-quarter of the outside diameter of the pipe above the invert.
 - 2. Class "B": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to the centerline of the pipe.
 - 3. Class "C": The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall place and compact bedding material to the proper grade. Haunching material shall then be carefully placed by hand and compacted to provide full support under and up to a height of one-quarter the outside diameter of the pipe above the bottom of the pipe barrel.
 - 4. Type 5: The **Contractor** shall excavate the bottom of the trench flat at a minimum depth as shown on the Plans, below the bottom of the pipe barrel. The **Contractor** shall place and compact bedding material to the proper

grade before installing pipe. After the pipe has been brought to the proper grade, haunching material shall be carefully placed by hand and compacted to the top of the pipe.

- F. Manholes: The **Contractor** shall excavate to a minimum of twelve (12) inches below the planned elevation of the base of the manhole. The **Contractor** shall place and compact crushed stone bedding material to the required grade before constructing the manhole.
- G. Excessive Width and Depth:
 - 1. Gravity Sewers: If the trench is excavated to excess width, the **Contractor** shall provide the bedding class with the next higher bedding factor. Type 5 Bedding may be used in lieu of Class "A" bedding, where Class "A" bedding is necessitated by excessive trench width.
 - 2. If the trench is excavated to excessive depth, the **Contractor** shall provide crushed stone to place the bedding at the proper elevation or grade.
- H. Compaction: Bedding and haunching materials under the pipe, manholes, and accessories shall be compacted to a minimum of ninety (90) percent of the maximum dry density, unless shown or specified otherwise in these Specifications.

3.10 INITIAL BACKFILL

- A. Initial backfill shall be placed to anchor the pipe, protect the pipe from damage by subsequent backfill, and ensure the uniform distribution of the loads over the top of the pipe.
- B. The **Contractor** shall place initial backfill material carefully around the pipe in uniform layers to a depth of at least twelve (12) inches above the pipe barrel. Layer depths shall be a maximum of six (6) inches.
- C. The **Contractor** shall backfill on both sides of the pipe simultaneously to prevent side pressures.
- D. The **Contractor** shall compact each layer thoroughly with suitable hand tools or tamping equipment.
- E. Initial backfill shall be compacted to a minimum ninety (90) percent of the maximum dry density, unless shown or specified otherwise in these Specifications.

3.11 CONCRETE ENCASEMENT FOR PIPELINES

- A. Where concrete encasement is shown on the Plans for pipelines, the **Contractor** shall excavate the trench to provide a minimum of twelve (12) inches clearance from the barrel of the pipe. The **Contractor** shall lay the pipe to line and grade on solid concrete blocks or solid bricks. In lieu of bedding, haunching, and initial backfill, the **Contractor** shall place concrete to the full width of the trench and to a height of not less than twelve (12) inches above the pipe barrel. The **Contractor** shall properly brace the pipeline in order to prevent floating of piping during

concrete encasement placement. The **Contractor** shall not backfill the trench for a period of at least twenty-four (24) hours after concrete is placed.

3.12 FINAL BACKFILL

- A. The **Contractor** shall backfill carefully to restore the ground surface to its original condition.
- B. Except as specified otherwise in this section, the top six (6) inches shall be topsoil obtained as specified in this section.
- C. Excavated material that is unsuitable for backfilling shall be disposed of in accordance with the requirements of Section 02200 - Earthwork.
- D. If materials excavated from the trench are not suitable for use as backfill materials, the **Contractor** shall provide select backfill material conforming to the requirements of this section.
- E. After initial backfill material has been placed and compacted, the **Contractor** shall backfill the trench with final backfill material. The **Contractor** shall place backfill material in uniform layers, compacting each layer thoroughly as follows:
 - 1. In six- (6-) inch inch layers, if using light power tamping equipment, such as a "jumping jack"
 - 2. In twelve- (12) -inch layers, if using heavy tamping equipment, such as hammer with tamping feet
 - 3. In twenty-four- (24-) inch layers, if using a Hydraram HARDOX-400 compactor.
- F. Settlement: If the trench settles, the **Contractor** shall excavate, re-fill, compact, and grade the surface to conform to the adjacent surfaces.
- G. Final backfill shall be compacted to a minimum ninety (90) percent of the maximum dry density, unless specified otherwise.

3.13 ADDITIONAL MATERIAL

- A. Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material shall be as shown on the Plans. The **Contractor** shall utilize excess material excavated from the trench, if the material is suitable. If excess excavated materials are not suitable, or if the quantity available is not sufficient, the **Contractor** shall provide additional suitable fill material.

3.14 BACKFILL WITHIN RIGHTS-OF-WAY

- A. The **Contractor** shall compact backfill underlying pavements and sidewalks, and backfill under dirt and gravel roads to a minimum ninety-five (95) percent of the maximum dry density.

3.15 BACKFILL WITHIN GEORGIA DOT RIGHTS-OF-WAY

Backfill within the GDOT rights-of-way shall meet the requirements stipulated in the "Utility Accommodation Policy and Standards," published by GDOT.

3.16 FLOWABLE FILL

- A. Where flowable fill is required, and approved by the **County**, the **Contractor** shall excavate the trench to provide a minimum of six (6) inches clearance on either side of the pipe barrel. The **Contractor** shall lay the pipe to line and grade on solid concrete blocks or bricks. In lieu of bedding, haunching, and initial backfill, the **Contractor** shall place flowable fill to the full width and depth of the trench.
- B. Flowable fill shall be protected from freezing for a period of thirty-six (36) hours after placement. Minimum temperature of flowable fill at point of delivery shall be fifty (50) degrees F.
- C. The **Contractor** shall provide steel plates over flowable fill in road locations.

3.17 COMPACTED GRANULAR MATERIAL

Where compacted granular material is required as initial and final backfill material, it shall be placed after bedding and haunching material specified elsewhere has been placed. Compacted granular material shall be compacted to a minimum ninety-five (95) percent of the maximum dry density.

3.18 TESTING AND INSPECTION

- A. The soils testing laboratory is responsible for the following:
 - 1. Compaction tests in accordance with the requirements of this section.
 - 2. Field density tests for each two (2) feet of lift, with at least one test site between each pair of manholes, every one-hundred (100) feet within road rights-of-way, or more frequently if ordered by the **County**. The **County** will direct where the **Contractor** shall perform density tests along the site of the Work.
 - 3. Inspecting and testing stripped areas, subgrades, and proposed fill materials.
- B. The **Contractor's** duties relative to testing shall include the following:
 - 1. Notifying laboratory of conditions requiring testing.
 - 2. Coordinating with laboratory for field-testing.
 - 3. Paying costs for additional testing performed beyond the scope of that required and for re-testing where initial tests reveal non-conformance with specified requirements.

4. Providing excavation as necessary for laboratory personnel to conduct tests at no cost to the **County**
- C. Inspection:
1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill are subject to inspection by the **County**.
 2. Foundations and shallow spread footing foundations shall be inspected by **County** geotechnical personnel, who shall verify suitable bearing and construction.
- D. The **Contractor** shall comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state, or federal authorities having jurisdiction.

3.19 DISPOSAL OF EXCESS EXCAVATED MATERIAL

The **Contractor** shall dispose of excess excavated material, in accordance with the requirements of Section 02200 - Earthwork. The **Contractor** shall arrange for the disposal of excess materials, and shall bear all costs and expense of disposal.

+++ END OF SECTION 02324 +++

SECTION 02433 REINFORCED CONCRETE PIPE FOR STORM DRAINS

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals necessary to install reinforced concrete pipe and fittings as shown on the drawings and required by the Specifications.

1.2 SHOP DRAWINGS

- A. Submit shop drawings showing piping and drainage structure layout and details of reinforcement, joint and method of construction and installation of reinforced concrete pipe, specials, and fittings required.

1.3 RELATED WORK

- A. Division 3: Concrete
- B. Division 4: Mortar

PART 2 - PRODUCTS

2.1 REINFORCED CONCRETE PIPE

- A. Except as otherwise specified within, pipe shall conform to ASTM Standard Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe, Designation C76, Class III, Wall B. The tabulated reinforcement given in the tables in ASTM Standard C76 shall be the minimum required.
- B. The pipe shall be capable of withstanding construction equipment loading which may be encountered during the progress of work. Any pipe damage during construction operations shall be promptly and satisfactorily repaired.
- C. Non-air-entraining Portland cement conforming to ASTM Specification C150, Type I shall be used, except as otherwise approved in writing. The use of a non-bleeding, water-reducing, dispersing agent may be permitted subject to the specific approval. The use of any other admixture will not be permitted.

- D. Fine aggregate shall consist of washed inert natural sand conforming to the requirements of ASTM Specification C33, except for gradation, with a maximum loss of 5% when subjected to 5 cycles of the soundness test using magnesium sulfate.
- E. Coarse aggregate shall consist of well-graded crushed stone or washed gravel conforming to the requirements of ASTM Specification C33, with a maximum loss of 5% when subjected to 5 cycles of the soundness test using magnesium sulfate.
- F. The 28-day compressive strength of the concrete, as indicated by cores cut from the pipe shall be not less than 4,000 psi. The pipe interior shall comprise a continuous integral cement skin and shall be smooth and even, free from roughness, projections, indentations, offsets or irregularities. The concrete mass shall be dense and uniform. The average absorption shall not exceed 5.3%. Reinforcement shall be circular for all concrete pipe. Reinforcement in the bell and spigot shall be adequate to prevent damage to concrete during shipping, handling and installation. Cores indicating reinforcing steel having less than 85% bond shall be cause for rejection of the lot of pipes.
- G. The pipe shall be clearly marked as required by ASTM C76. The markings may be at either end of the pipe for the convenience of the manufacturer, but for any one size shall always be at the same end of each pipe length. Pipe shall not be shipped until compressive strength of the concrete has attained 3,000 psi and not before 5 days after manufacture and/or repaired, whichever is the longer.
- H. Pipes shall have a minimum laying length of approximately 8', except for closure and other special pieces. The length of the incoming and outgoing concrete pipe at each structure shall not exceed 4', except where the joint is cast flush with the exterior wall of the structure. Maximum laying length shall not exceed 16', but the installation of 16' lengths will depend upon the ability of the Contractor to handle such lengths of pipe. In deep sheeted trenches comply with trench width requirements, maintain the integrity of the sheeting and avoid disturbance to adjacent ground. If in the opinion of the Owner's Representative the use of 16' lengths is impracticable, shorter lengths shall be used.
- I. The quality of all materials and the finished pipe shall be subject to inspection and approval of a representative of the Owner. Such inspection may be made at both places, and the pipe shall be subject to rejection at any time because of failure to meet any of the specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery

shall be marked for identification and shall be removed from the job at once.

- J. At the time of inspection, the pipe will be carefully examined for compliance with the appropriate ASTM and project specification, and inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, and other features. All pipes will be checked for soundness by being tapped and scratched over a reasonable portion of the area, at least once on every 20 sq. inches of pipe surface. The surface shall be dense and close-textured. Cores shall also serve as a basis for rejection of pipe, particularly if lamination or poor bond of reinforcement is apparent.
- K. The manufacturer shall inspect all pipe joints for out-of-roundness and pipe ends for squareness. The manufacturer shall furnish a notarized affidavit stating all pipes meet the requirements of ASTM C76, these specifications, and the joint design with respect to square ends and out-of-round joint surfaces.
- L. Unsatisfactory or damaged pipe will be either permanently rejected or returned for minor repairs. Only that pipe actually conforming to the specifications and accepted will be listed for approval, shipment and payment. Approved pipe will be so stamped or stenciled on the inside before it is shipped. All pipe which has been damaged after delivery will be rejected, and if such pipe already has been laid in the trench, it shall be acceptably repaired, if permitted, or removed and replaced.
- M. Pits, blisters, rough spots breakage and other imperfections may be repaired, subject to the approval of the Owner's Representative, after demonstration by the manufacturer that strong permanent repairs result. Repairs shall be carefully inspected before final approval. Non-shrink cement mortar used for repairs shall have a minimum compressive strength of 6,000 psi at the end of 7 days and 7,000 psi at the end of 28 days, when tested in 3" cylinders store in the standard manner. Epoxy mortar may be utilized for repairs.

2.2 JOINTS FOR CONCRETE PIPE

- A. Joints for concrete pipe shall be the tongue and groove or bell and spigot type of joint with provisions for using a round rubber "O-Ring" gasket in recess in the spigot end of the pipe. The bevel on the bell of the pipe shall be between 1-1/2 degree and 2-1/2 degree and the annular open spaced at the gasket when the joint is made up and pipes are centered in line shall not exceed 1/8". The faces of pipe in contact with the gasket shall be true, and free of irregularities. Joints for drain pipe may be made with mortar.

- B. The round rubber "O-Ring" gaskets for either joint shall conform to ASTM C443 Specifications for joints for Circular Concrete Sewer and Culvert Pipe using rubber gaskets.

PART 3 - EXECUTION

3.1 LAYING REINFORCED CONCRETE PIPE FOR DRAINS

- A. Bell and spigot pipe joints shall be made by caulking all around with twisted jute of proper size to give proper alignment of the pipe. Inner surfaces of abutting sections shall be flush and on a smooth grade. Brush and wet the jointing surfaces and fill the annular opening with mortar to a minimum depth of 2", sufficient to form a bead around the outside face of the bell.
- B. Mortar for jointing shall consist of one part Portland cement and two parts sand, using a minimum amount of water-sufficient to make a workable mortar.
- C. Joints shall be immediately protected from freezing or excessive drying by covering with earth, burlap or other approved material.

3.2 CLEANING

- A. At the conclusion of the work, thoroughly clean all of the new pipe lines by flushing with water or other means to remove all dirt, stones, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest outlet. If, after this outlet cleaning, obstructions remain, they shall be removed.

END OF SECTION

SECTION 02485 - SEEDING

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. The work covered by this section consists of furnishing all labor, equipment, and material required to place topsoil, seed, commercial fertilizer, agricultural limestone, and mulch material, including seedbed preparation, harrowing, compacting, and other placement operations on graded earthen areas as described herein and/or shown on the Drawings. In general, seeding operations shall be conducted on all newly graded earthen areas not covered by structures, pavement, or sidewalks; all cleared or grubbed areas that are to remain as finish grade surfaces; and on all existing turf areas that are disturbed by construction operations and which are to remain as finish grade surfaces. Areas disturbed by borrow activities shall also be seeded according to these specifications.
- B. The work shall include temporary seeding operations to stabilize earthen surfaces during construction or inclement weather and to minimize stream siltation and erosion. Temporary seeding shall be performed on any disturbed area left exposed for a period greater than seven (7) days.
- C. Areas disturbed by construction activities, shall be restored to their original conditions with regard to surface grading, drainage, grass type (predominate), or other landscape features.

1.02 RELATED WORK

- A. Section 02125 – Temporary and Permanent Erosion and Sediment Control
- B. Section 02486 - Sodding

1.03 QUALITY ASSURANCE

- A. Prior to seeding operations, the **Contractor** shall furnish to the **County** all labels or certified laboratory reports from an accredited commercial seed laboratory or a state seed laboratory showing the analysis and germination of the seed to be furnished. Acceptance of the seed test reports shall not relieve the **Contractor** of any responsibility or liability for furnishing seed meeting the requirements of this section.
- B. Prior to topsoil operations, the **Contractor** shall obtain representative samples and furnish soil test certificates including textural, pH, and organic ignition analysis from the State University Agricultural Extension Services or other certified testing laboratory.

1.04 ALTERNATE METHODS

- A. The **Contractor** may propose alternate means and methods to establish a satisfactory coverage of healthy grass of the type required. The **Contractor** shall submit sufficient information to enable the **County** to assess the acceptability of the alternate approach.

PART 2 – PRODUCTS

2.01 TOPSOIL

- A. The **Contractor** shall place a minimum of 4 inches of topsoil over all graded earthen areas and over any other areas to be seeded. The quality of topsoil shall be acceptable to the **County**.
- B. Topsoil shall be a friable loam containing a large amount of humus and shall be original surface soil of good, rich, uniform quality, free from any material such as hard clods, stiff clay, hardpan, partially disintegrated stone, pebbles larger than ½ inch in diameter, lime, cement, bricks, ashes, cinders, slag, concrete, bitumen or its residue, boards, sticks, chips, or other undesirable material harmful or unnecessary to plant growth. Topsoil shall be reasonably free from perennial weeds and perennial weed seeds, and shall not contain objectionable plant material, toxic amounts of either acid or alkaline elements or vegetable debris undesirable or harmful to plant life.
- C. Topsoil shall be natural topsoil without admixture of subsoil material, and shall be classifiable as loam, silt loam, clay loam, sandy loam, or a combination thereof. The pH shall range from five and five tenths to seven (5.5 to 7.0). Topsoil shall contain not less than five (5) percent or more than twenty (20) percent, by weight, of organic matter as determined by loss on ignition of oven-dried samples to sixty-five (65°C) degrees centigrade.

2.02 SEED

- A. Seed shall be delivered in new bags or bags that are sound and labeled in accordance with the U. S. Department of Agriculture Federal Seed Act.
- B. All seed shall be from the last crop available at time of purchase and shall not be moldy, wet, or otherwise damaged in transit or storage.
- C. Seed shall bear the growers analysis testing to ninety-eight (98) percent for purity and ninety (90) percent for germination. At the discretion of the Owner, samples of seed may be taken for check against the grower's analysis.
- D. Species, rate of seeding, fertilization, and other requirements shall be as necessary to successfully establish the required stand of grass.

2.03 FERTILIZER AND LIMING MATERIALS

- A. Fertilizer and liming materials shall comply with applicable state, local, and federal laws concerned with their production and use.
- B. Commercial fertilizer shall be a ready mixed material of grade 18-46-0. Container bags shall have the name and address of the manufacturer, the brand name, net weight, and chemical composition.
- C. Agricultural limestone shall be a pulverized limestone having a calcium carbonate content of not less than 85 percent by weight. Agricultural limestone shall be crushed so that at least 85 percent of the material will pass a No. 10 mesh screen and 50 percent will pass a No. 40 mesh screen.

2.04 MULCH MATERIAL

- A. All mulch materials shall be air dried and reasonably free of noxious weeds and weed seeds or other materials detrimental to plant growth.
- B. Mulch shall be composed of wood cellulose fiber, straw, or stalks, as specified herein. Mulch shall be suitable for spreading with standard mulch blowing equipment.
- C. Wood-cellulose fiber mulch shall be as manufactured by Weyerhaeuser Company, Conway Corporation, or equal.
- D. Straw mulch shall be partially decomposed stalks of wheat, rye, oats, or other approved grain crops.
- E. Stalks shall be the partially decomposed, shredded residue of corn, cane, sorghum, or other approved standing field crops.

2.05 MULCH BINDER

- A. Mulch on slopes exceeding three to one (3 to 1) ratio shall be held in place by the use of an approved mulch binder. The mulch binder shall be non-toxic to plant life.
- B. Emulsified asphalt binder shall be Grade SS-1, ASTM D 977. Cutback asphalt binder shall be Grade RC 70 or RC 250.

2.06 INOCULANTS FOR LEGUMES

- A. All leguminous seed shall be inoculated prior to seeding with a standard culture of nitrogen-fixing bacteria that is adapted to the particular seed involved.

2.07 WATER

- A. Water shall be clean, clear water free from any objectionable or harmful chemical qualities or organisms and shall be furnished by the **Contractor**.

PART 3 - EXECUTION

3.01 PLACING TOPSOIL

- A. Before placing or depositing topsoil upon any areas, all improvement within the area shall be completed.
- B. The areas in which topsoil is to be placed or incorporated shall be prepared before securing topsoil for use.

3.02 SEEDBED PREPARATION

- A. Before fertilizing and seeding, all topsoil surfaces shall be trimmed and worked to true line free from unsightly variation, bumps, ridges and depressions, and all detrimental material, and roots. All stones larger than two (2) inches in any dimension shall be removed from the soil. All non-residential and residential areas shall be hand raked to remove all detrimental material, roots, and stones
- B. No earlier than twenty-four (24) hours before the seed is to be sown, the soil surface to be seeded shall be thoroughly cultivated to a depth of not less than two (2) inches with a weighted disc, tiller, pulvimixer, or other equipment, until the surface is smooth.
- C. If the prepared surface becomes eroded because of rain or for any other reason, or becomes crusted before the seed is sown, the surface shall again be placed in a condition suitable for seeding.
- D. Ground preparation operations shall be performed only when the ground is in a tillable and workable condition.

3.03 FERTILIZATION AND LIMING

- A. Following seedbed preparation, fertilizer shall be applied to all areas to be seeded so as to achieve an application rate 80 pounds per acre.
- B. Fertilizer shall be spread evenly over the seedbed and shall be lightly harrowed, raked, or otherwise incorporated into the soil for a depth of ½ inch.
- C. Fertilizer need not be incorporated in the soil as specified above when mixed with seed in water and applied with power sprayer equipment. The seed shall not

remain in water containing fertilizer for more than thirty (30) minutes when a hydraulic seeder is used.

- D. Agricultural limestone shall be thoroughly mixed into the soil at a rate of one to two (1 to 2) tons per acre. The specified rate of application of limestone may be reduced by the Owner if pH tests indicate this to be desirable. It is the responsibility of the **Contractor** to obtain such tests and submit the results to the Owner for adjustment in rates.
- E. It is the responsibility of the **Contractor** to make one application of maintenance fertilizer at one-half the original rates applied in early spring following initial establishment of cover.

3.04 SEEDING

- A. Seed of the specified group shall be sown as soon as preparation of the seedbed has been completed. No seed shall be sown during high winds, nor until the surface is suitable for working and is in a proper condition. Seeding shall be performed during the periods shown below. Seed mixtures may be sown together provided they are kept in a thoroughly mixed condition during the seeding operation.
- B. Seeds shall be uniformly sown by any approved mechanical method to suit the slope and size of the areas to be seeded, preferably with a broadcast type seeder, windmill hand seeder, or approved mechanical power drawn seed drills. Hydroseeding and hydromulching may be used on steep embankments, provided full coverage is obtained. Care shall be taken to adjust the seeder so that the seeding's are at the proper rate before seeding operations are started, and to maintain their adjustment during seeding. Seed in hoppers shall be agitated to prevent segregation of the various seeds in a seeding mixture.
- C. Immediately after sowing, the seeds shall be covered and compacted to a depth of one-eighth to three-eighths (1/8 to 3/8) inch by a cultipacker or suitable roller.
- D. Leguminous seeds shall be inoculated prior to seeding with an approved and compatible nitrogen-fixing inoculant in accordance with the manufacturer's mixing instructions.

Seeding Requirements Table

The seed shall be a mixture as shown in the Table below, and shall be applied at the following rates shown:

Seeding Requirements		
Season	Type of Seed	Pounds Per Acre
Jan 1 – May 15	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	300
	Rebel II Supreme	150
May 16 – Sept 1	Hulled Common Bermuda	75
Sept 2 – Dec 31	Unhulled Common Bermuda	45
	Kentucky 31 Fescue	300
	Rebel II Supreme	150

3.05 MULCHING

- A. All areas to be seeded shall be uniformly mulched in a continuous blanket immediately after seeding when using Wheat straw at a minimum of two and one-half (2 ½) tons per acre or equivalent to two to four (2" to 4") inches thickness. The rate of application will correspond to a depth of at least one inch and not more than one and one half inches, according to the texture and moisture content of the mulch material. It is intended that mulch shall allow some sunlight to penetrate and air to circulate, at the same time shading the ground, reducing erosion and conserving soil moisture. The **Contractor** shall take steps necessary to prevent loss of mulch or bunching of mulch as caused by the wind.
- B. Mulch on slopes greater than three to one (3 to 1) ratio shall be held in place by the use of an approved mulch binder. Binder shall be thoroughly mixed and applied with the mulch. Emulsified asphalt or cutback asphalt shall be applied at the approximate rate of five (5) gallons per one thousand (1,000) square feet as required to hold the mulch in place.
- C. The **Contractor** shall cover structures, poles, fence, and appurtenances if the mulch binder is applied in such a way that it would come in contact with or discolor the structures.

- D. Mulch and binder shall be applied by suitable blowing equipment at closely controlled application rates.

3.06 WATERING

- A. **Contractor** shall be responsible for maintaining the proper moisture content of the soil to ensure adequate plant growth until a satisfactory stand is obtained. If necessary, watering shall be performed to maintain adequate water content in the soil. Water shall not be applied when there is danger of freezing. In the event that official watering bans or water restrictions are in effect, the Contract shall comply with applicable guidelines on watering for new grassing.
- B. Watering shall be accomplished by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.07 MAINTENANCE

- A. Upon completion of seeding operations, the **Contractor** shall clear the area of all equipment, debris, and excess material and the premises shall be left in a neat and orderly condition.
- B. The **Contractor** shall maintain all seeded area without additional payment until final acceptance of the work by the **County**, including all regrading, refertilizing, reliming, reseeding, remulching, and watering required. Seeding work shall be repeated on defective areas until the **County** is satisfied that a satisfactory uniform stand is accomplished. Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired at the **Contractor's** expense by filling with topsoil, compacting, and repeating the seeding work.

3.08 VEGETATIVE STABILIZATION SCHEDULE

- A. The **Contractor** shall stabilize disturbed areas as construction progresses. The time duration limitations for stabilization of disturbed areas by either temporary mulching (for 7 days or less), temporary grassing, permanent grassing, or permanent sodding shall be as specified in Section 02125 – Temporary and Permanent Erosion and Sediment Control; however, unstabilized areas of the construction corridor shall not exceed one thousand (1,000) linear feet on sanitary sewer sewers or water mains installed with easements and three hundred (300) linear feet for all other projects. Stabilization with permanent vegetation is preferred unless seasonal limitations exist.

+++ END OF SECTION 02485 +++

SECTION 02486 - SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Sodding shall consist of establishing certain critical areas with sod as designated on the drawings.
- B. Areas disturbed by construction activities shall be restored to their original conditions with regard to surface grading, drainage, grass type (predominate), or other landscape features.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02000 - Site Work
- B. Section 02125 - Temporary and Permanent Erosion and Sediment Control
- C. Section 02845 - Seeding
- D. Erosion and Sediment Control Plan

1.03 ALTERNATE METHODS

- A. The **Contractor** may propose alternate means and methods to establish a satisfactory coverage of healthy grass of the type required. The **Contractor** shall submit sufficient information to enable the **County** to assess the acceptability of the alternate approach.

PART 2 - PRODUCTS

2.01 SOD

- A. Sod shall consist of a live, dense, well-rooted growth of turf grass species as noted on the Drawings. The sod shall be free from Johnson grass, nut grass and other obnoxious grasses, of suitable character for the purpose intended and for the soil in which it is to be planted. It shall be uninjured at the time of planting.
- B. Sod shall be uniform in thickness, having not over two (2) inches or less than one (1) inch of soil.
- C. Sod strips shall have a consistent width of twelve or eighteen (12 or 18) inches.

2.02 FERTILIZER

- A. Fertilizer (10-10-10) used in connection with sodding, shall contain ten (10) percent nitrogen, ten (10) percent phosphoric acid and ten (10) percent potash. The fertilizer shall be furnished in standard containers with the name, weight, and guaranteed analysis of the contents clearly marked. The containers shall

ensure proper protection in handling and transporting the fertilizer. All commercial fertilizer shall comply with local, state, and federal fertilizer laws.

- B. Ammonium nitrate shall be a standard commercial product, shall conform to the requirements for other commercial fertilizers as specified above, and shall have a minimum of thirty-three and one-half (33½) percent nitrogen.

2.03 LIME

- A. Agricultural limestone shall contain not less than eighty-five (85) percent of calcium carbonate and magnesium carbonate combined, and shall be crushed so that at least eighty-five (85) percent will pass the No. 10 mesh sieve and fifty (50) percent will pass a No. 40 mesh screen.

2.04 WEATHER LIMITATIONS

- A. Sod shall be placed only when the soil is moist and favorable to growth. No placement shall occur unless weather and soil conditions are considered favorable for the successful establishment of the particular sod type being placed.

PART 3 - EXECUTION

3.01 SODDING

- A. The area to be sodded shall be constructed to the lines and grades indicated on the Drawings and the surface loosened to a depth of not less than three (3) inches with a rake or other device. As applicable clean, uniform topsoil shall be placed to provide a rich bed for root growth. If necessary, the area shall be sprinkled until saturated at least one (1) inch in depth and kept moist until the sod is placed thereon. Immediately before placing the sod, the fertilizer shall be uniformly applied at the rate of twenty-five (25) pounds of Grade 10-10-10, or equivalent, per one thousand (1,000) square feet. Agricultural limestone shall be applied at the rate of one hundred (100) pounds per one thousand (1,000) square feet.
- B. The entire area shall be thoroughly covered with sod. Sod shall be placed on the prepared surface with edges in close contact and, as far as possible, in a position to break joints.
- C. Sod shall be maintained moist from time of removal until reset but shall be placed as soon as practicable after removal from place where growing. Immediately after placing it shall be rolled with a roller or hand tamped to the satisfaction of the **County**.
- D. Sod on slopes steeper than three to one (3 to 1) shall be held in place by wooden pins about one (1) inch square and six (6) inches long, driven through the sod into the soil until they are flush with the top of the sod.

3.02 WATERING AND MAINTENANCE

- A. Sod shall be watered for a period of two (2) weeks after which ammonium nitrate shall be applied at the rate of three (3) pounds per one thousand (1,000) square feet and the sod given a final watering. Water shall not be applied when there is danger of freezing. In the event that official watering bans or water restrictions are in effect, the **Contractor** shall comply with applicable guidelines on watering for new grassing.
- B. The **Contractor** shall not allow any equipment or material to be placed on any planted area and shall erect suitable barricades and guards to prevent his equipment, workers, or the general public from traveling over any area planted with sod.
- C. It shall be the obligation of the **Contractor** to secure a satisfactory growth of grass before final acceptance of the project by the **County**

3.03 VEGETATIVE STABILIZATION SCHEDULE

- A. The **Contractor** shall stabilize disturbed areas as construction progresses. The time duration limitations for stabilization of disturbed areas by either temporary mulching for seven (7) days or less, temporary grassing, permanent grassing or permanent sodding shall be as specified in Section 02125 – Temporary and Permanent Erosion and Sediment Control; however, unstabilized areas of the construction corridor shall not exceed one thousand (1,000) linear feet on sanitary sewer sewers or water mains installed within easements and three hundred (300) linear feet for all other projects. The permanent vegetative stabilization method is preferred unless seasonal limitations exist.

+++ END OF SECTION 02486 +++

SECTION 02490 TREES, SHRUBS, AND GROUND COVERS

PART I - GENERAL

1.01 SCOPE

- A. This Section includes furnishing all equipment, materials, and labor necessary for soil preparation; planting of trees, shrubs, ground cover, or vines as applicable; protection, maintenance, guarantee, and replacement of plants; and all related items necessary to restore the site after the construction work is completed.
- B. Products and procedures specified in this section shall apply to the following job-specific conditions:
 - 1. Replacement of trees, shrubs, and ground covers removed or damaged as the result of construction activities. The nature and extent of replacement work will be as indicated on the Drawings and the cost of such work will be included in the Contract Price. Such replacement work shall include: the relocation and re-installation of existing plant materials; the replacement of removed plants with new materials, matching quantities, species and arrangement; or, a combination of these options as determined by the scope of the Work.
 - 2. Installation of new materials in accordance with prior agreements made with property owners, as described in the Easement Stipulations. The cost of this work shall be included in the Contract Price.
 - 3. Additional installation of new materials at the direction of the **County** will be considered extra work and will be paid for in the Contract.
- C. Related Work Specified Elsewhere
 - 1. Section 02125 – Temporary and Permanent Erosion and Sediment Control

1.03 EXISTING CONDITIONS

- A. Before commencing any work required by this Section, the **Contractor** shall ascertain the location of all utilities, subsurface drainage, irrigation systems, and underground construction so that proper precautions may be taken not to disturb or damage any subsurface improvements. The **Contractor** will be held responsible for making, at its own expense, all repairs to damaged utilities, structures and all associated damages resulting from the work.
- B. It is not contemplated that planting shall occur where the depth of soil over underground construction or obstructions is insufficient to accommodate the roots or where impervious soil will require drainage. Where such conditions are encountered in excavation of planting areas, other locations for the planting may be designated by the **County**.

- C. Removal of underground obstructions, relocation of construction and provision of drainage for planting areas shall be done only as directed by the **County**.
- D. If changes in the location of the work or if removal of obstructions involves additional work, the **Contractor** shall proceed in accordance with the "General Conditions" of the Contract for construction.
- E. The **Contractor** shall take all necessary precautions during planting operations to avoid damage to existing sidewalks, fencing, paving, curbs, lighting, and other site improvements. Any damage that does occur shall be corrected to the County's satisfaction at the **Contractor's** expense.
- F. The **Contractor** shall make a dimensional sketch of existing landscaped areas before such areas are disturbed, and shall use said sketch for layout during restoration of these areas. The Preconstruction Video and any still photographs taken prior to construction activities will also be used to verify the restoration work.

1.04 QUALITY ASSURANCE

- A. All planting shall be performed by a company specializing in landscape development construction, particularly soil preparation, lawns, and live plant materials; with at least five years experience in such work. Evidence of this experience must be provided, citing similar projects, prior to the initiation of the work.
- B. Size, quality, root ball preparation, and grading standards shall conform to the American Association of Nurserymen, Inc., as published in the "American Standard for Nursery Stock: ANSI 260.1, latest approved revision.
- C. The **Contractor** shall be responsible for all certificates of inspection of plant materials that may be required by federal, state, or other authorities to accompany shipments of plants. All plants must be inspected and approved by the **County** before they are planted. Inspection and approval of plants upon delivery shall be for quality, size, and variety only and shall not in any way impair the right of rejection for failure to meet other requirements during progress of the work.
- D. Fertilizer shall conform to the local, state, and federal laws applicable to its manufacture and labeling.

1.05 PLANT GUARANTEE AND REPLACEMENT

- A. Guarantee - Plants shall be alive, healthy, and vigorous at the end of the Guarantee period. The guarantee period shall be at least one year and shall terminate at the end of the first full growing season. The first full growing season begins on April 1 after planting and ends on November 1.
- B. Replacement - Any plant installed under this contract that is dead or not in satisfactory growth, will be removed from the site; these and any plants missing due to the **Contractor's** negligence shall be replaced as soon as conditions

permit. In case of any question regarding the condition and satisfactory establishment of a rejected plant, the **Contractor** shall notify the **County** immediately in writing, and the **County** shall determine acceptability. All replacement plants shall be guaranteed for the duration of one full growing season as described in Paragraph 1.05A above.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Topsoil shall be natural, fertile, agricultural soil, capable of sustaining vigorous plant growth. It shall be of uniform composition without admixture of subsoil. It shall be free of stones ($\frac{1}{2}$ inch in diameter or larger), clods of hard earth, live plants, roots, sticks, or other extraneous matter harmful to plant growth.
 - 1. Topsoil shall have an acidity range of ph. 6.0 to 6.5 and shall contain not less than 6 percent organic matter.
 - 2. Topsoil shall be obtained from naturally well drained areas that have never been stripped before.
 - 3. Topsoil shall not be delivered in a frozen or muddy condition.
- B. The commercial fertilizer shall be a complete formula, 6-12-12, and shall conform to the applicable state fertilizer laws. It shall be uniform in composition, dry and free flowing and shall be delivered to the site in the original, unopened containers, each bearing the manufacturer's guaranteed analysis. Any fertilizer that is caked or otherwise damaged, making it unsuitable for use, will not be accepted.
- C. Pine straw mulch shall be freshly baled straw capable of producing desired results and not contain excessive amounts of pine cones, branches, or forest litter.
- D. All mulch shall be clean, and free of weeds, moss, sticks, insects, and debris, and shall be satisfactory to the **County**.
- E. Pre-emergent used shall be "Ronstar G" or approved equal.
- F. Pine bark shall be good quality commercial stock of one-half to one (1/2" - 1") size pieces (mini-nuggets) or "Nature's Helper".
- G. Lime shall be ground limestone with analysis showing not less than eight-five (85) percent total carbonates. Lime shall be delivered in original unopened containers. Any caked or hardened lime shall not be used.
- H. Water shall be supplied by the **Contractor**, along with all necessary hose or other watering equipment required for installation and maintenance of plant materials.
- I. Herbicide used shall be "Round-up" or Approved Equal.

2.02 PLANT MATERIALS

- A. Plant materials used will depend on job-specific conditions, as follows:
1. Trees, shrubs and ground covers removed or damaged as the result of construction activities shall be replaced with new materials of the same size and type, except; mature trees and shrubs shall be replaced in **County** with the following minimum size requirements: trees – two- (2-) inch caliper; shrubs – two- (2-) gallon container; or,
 2. Plant materials will be of the size, type and quantity listed in the Easement Stipulations; or,
 3. Plant materials will be as directed by the **County**.
- B. Plant materials shall comply with State and Federal Laws relating to inspection for diseases and insect infestation.
- C. Plant materials shall conform to American Standard Nursery Stock (May 2, 1989, ANSI 260.1-1986). Names shall conform to those given in Standardized Plant Names, 1942 Edition prepared by the American Joint Committee on Horticultural Nomenclature.
- D. Plants shall have a habit of growth that is normal for the species and shall be sound, healthy, vigorous, and free from insect pests, plant diseases, and injuries. All plants shall equal or exceed the measurements specified in the plant list before pruning.
- E. Plants shall be nursery grown unless otherwise specified.
- F. Substitutions will be permitted only upon submittal of proof that the specified plant is not obtainable. A substitute of nearest equivalent size or variety will be used with equitable adjustment of Contract Price when approved in writing by the **County**.
- G. Plants designated “B & B” in the plant list shall be adequately balled with firm natural balls of soil sized as set forth in the American Standard for Nursery Stock. Balls should be firmly wrapped with burlap or similar bio-degradable material and bound with twine, or wire mesh. No balled plant shall be planted if the ball is cracked or broken during shipment or during the planting process.
- H. Insofar as is practicable, all plant material shall be planted on the day of delivery. Plants that **County** be planted immediately upon delivery shall be protected from the sun and wind. B & B plants shall be covered with moist soil, mulch, or other acceptable material. B & B plants and container grown plants shall be shaded and well watered. Plants shall not remain unplanted for longer than three days after delivery.
- I. Plants shown as container grown in the plant list shall have sufficient root to hold earth intact after removal from containers but without being root-bound.
- J. Caliper of tree trunks shall be measured at the chest level of a six- (6-) tall person for trees up to and including four- (4-) inch caliper size.

PART 3 - EXECUTION

3.01 TIME OF PLANTING

- A. Planting operations shall be conducted immediately under favorable weather conditions in conformance to the seasonal restrictions as follows:
 - 1. Deciduous Material: September 15 to June 15. Materials must be in dormant condition if planted after November 1 and prior to April 1. Soil, plant material, and environmental conditions must be suitable for planting.
 - 2. Evergreen Materials: Spring: March 15 to June 15; Fall: September 1 to November 1.
 - 3. Perennials: Spring: March 30 to June 30; Fall: September 1 to November
 - 4. Annuals: In season.
 - 5. Planting periods may be extended or reduced according to weather and soil conditions at the time. Preparations for planting may begin earlier than specified seasons, if approved.

- B. At the option and on the full responsibility of the **Contractor**, planting operations may be conducted under unseasonable conditions without additional compensation; however, prior written approval must be obtained from the **County** and the guarantee period shall remain as specified in Paragraph 1.05.A herein.

3.02 PRODUCT HANDLING AND STORAGE

- A. Balled and burlapped plants shall be dug and prepared for shipment in a manner that will not damage roots or branches.

- B. Protection After Delivery - The balls or roots of plants not planted immediately upon delivery shall be covered with moist soil or mulch, or other protection from drying winds and sun. All plants shall be watered as necessary, until planted. Balled plants shall not be lifted by the trunk of the plant.

3.03 TREES AND SHRUBS

- A. Locations for all plants and outlines for planting areas shall be staked on the ground and must be approved by the **County** before plants are set. Orientation of plants, foliage, and branching shall be approved before installation. Any adjustments in locations and/or outline must be approved in writing by the **County**.

- B. Care shall be exercised to have pits dug and soil prepared prior to moving plants to pits for planting. Circular pits with vertical sides shall be excavated for all plants. Diameter of planting pits shall be twice the diameter of the ball or root spread. The depth of the pits shall be sufficient to accommodate the ball or roots when the plant is set to finished grade allowing for six inches of topsoil in the bottom of the pit. The soil at the bottom of the planting pit shall be loosened to a depth of three inches and mixed with topsoil. Any rock, rubble, hard pan, or other underground obstruction shall be removed to permit proper installation and drainage. The

Contractor shall ensure positive drainage away from all planting beds.

- C. Soil used in planting shall be a topsoil mixture. One cubic yard of pine bark "Nature's Helper" and twenty pounds of commercial six percent nitrogen-twelve percent phosphorus – twelve percent potassium (6-12-12) fertilizer or bone meal shall be mixed with every six (6) cubic yards of topsoil.
- D. Unless otherwise specified, all plants shall be planted in pits, centered, and set at a depth so that the finished grade level will be the same as that at which the plant was grown.
- E. For balled and burlap material, all wire and string binding shall be removed from around the root ball. After placing the plant in the planting pit, the burlap shall be cut away or folded back from the top third of the root ball. If balled plants are wrapped with material that is not biodegradable, then this wrapping material must be removed once the plant is set in the planting pit. Care must be taken so not to damage the root system.
- F. The pit shall be backfilled with topsoil placed in layers around the roots or ball. Each layer shall be carefully tamped to avoid air pockets. When the hole is approximately two-thirds full, water should be added. After the water has been absorbed, the hole shall be filled with topsoil and tamped lightly to grade.
- G. A four- (4-) inch mound of soil shall be formed around each plant to produce a saucer. On slopes, an adequate shoulder shall be formed on the downhill side to hold water and avoid erosion.
- H. Guying and Staking
 1. Hose shall be two-ply reinforced hose not less than three-eighths (3/8) inch inside diameter.
 2. Wire shall be galvanized pliable, zinc-coated iron not less than No. 16 gage.
 3. Turnbuckles shall be galvanized and have a three- (3-) inch minimum lengthwise opening fitted with screw eyes. Three turnbuckles are required per tree planting.
 4. Trees shall be supported immediately after planting. All trees shall be guyed or staked.
 5. Guy wires shall consist of two twisted strands of wire encased in hose to prevent direct contact with bark of the tree. Guying shall be spaced equally about each tree. Guy wires shall be placed around the tree trunk or lower branches in a single loop at an angle or about sixty (60) degrees or about two-fifths (2/5s) of the height of the tree. Guy wires shall be fastened to two by two by thirty (2" x 2" x 30") inch wooden stakes driven to approximately six (6) inches above the ground. Guy wires shall be tightened and kept taut by turn-buckles, or other approved methods.
 6. Wood stakes to be used shall be uniform two-by-two (2" x 2") inch pressure treated wood with one end sharpened. Stakes shall be not less than six (6') feet in length.

7. Tree species less than three (3) feet tall will require slash staking. Wood stakes used shall be uniform two by two (2" x 2") inch pressure treated wood with one end sharpened. Stakes shall not be less than four (4) feet in length.
 - I. All trees shall be wrapped with standard manufactured tree wrapping paper, brown in color. Tree trunks shall be wrapped spirally overlapping two (2) inches and shall be wound from the ground line to above the lowest main branches. The wrapping shall be securely tied in at least five places, including the top, middle, and bottom, with a jute twine not less than two-ply or other approved bio-degradable material.
 - J. A four- (4-) inch layer of pine straw mulch and a pre-emergent such as "Ronstar" or equal shall be applied to all planting bed areas.
 - K. Plant beds containing ericaceous plants shall be top dressed with ordinary powdered sulfur at the rate of three (3) pints per one hundred (100) square feet of area.

3.04 GROUND COVERS

- A. Except as otherwise specified, the **Contractor's** work shall conform to accepted horticultural practices as used in the trade.
- B. Planting areas shall be dug and soil for planting ready before plants are delivered.
- C. Ground cover beds shall be prepared by thorough loosening of existing subgrade and by placement of a minimum of four (4) inches of approved topsoil to conform to the final grade. Soil used in planting shall be topsoil mixed with one cubic yard of pine bark "Nature's Helper" and twenty pounds of commercial six (6) percent nitrogen-twelve percent phosphorus – twelve percent potassium (6-12-12) fertilizer or bone meal with every six cubic yards of topsoil.
- D. Pre-emergence weed control shall be applied in accordance with manufacturer's instructions.
- E. All planting beds shall be mulched with a two- (2-) inch layer of bark mulch prior to planting. Planting holes shall be dug through the mulch. Ensure that roots are surrounded by soil below the mulch.
- F. Biodegradable pots shall be crushed and non-biodegradable pots shall be removed prior to planting. The root systems of all potted plants shall be split or crumbled.

3.05 PRUNING AND REPAIR

- A. Upon completion of the work under the Contract, all new trees and shrubs shall have been pruned and any injuries repaired. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches and to compensate for the loss of roots as a result of transplanting operations.

Pruning shall be done in such a manner as not to change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs. On all bruises or scars on the bark and cuts over three-quarter (3/4) inch in diameter, the injured cambium shall be traced back to living tissue and removed; wounds shall be smoothed and shaped so as not to retain water; and the treated area shall be coated with shellac or a commercial tree wound dressing.

3.06 REUSE OF EXISTING PLANT MATERIALS

- A. Where shown on the Drawings, or as allowed herein, in-situ plant materials may be removed and re-installed in lieu of replacement with new materials. Such reuse shall conform to the following conditions:
1. In those areas indicated on the Drawings, existing trees and shrubs shall be removed and re-installed. The arrangement or location of the re-installed materials may vary from existing conditions. The **Contractor** shall be responsible for removal, proper handling, temporary storage, re-installation, and maintenance for the existing materials; however, no guarantee of survival is required. The cost of this work shall be included in the Contract Price.
 2. If conditions permit, the **Contractor** may, at its own risk, remove and re-install existing trees and shrubs as an alternate to replacement with new materials. The Guarantee and Maintenance requirements shall apply for re-installed existing materials in the same manner as for new materials. The **Contractor** shall obtain written concurrence from the **County** of its intention to reuse existing plant materials prior to the execution of the work.
 3. In those areas indicated in the Easement Stipulations or shown on the Drawings, certain existing trees and shrubs may be removed and re-installed by the property owner. The **Contractor** shall provide prior written notification to the property owner (with copy to the **County**) advising of the schedule of construction and the required time frame for removal. If the **Contractor** proceeds with construction without providing the required prior notice, any materials that are damaged or destroyed shall be replaced in **County** and quantity at the expense of the **Contractor**.
- B. Trees and shrubs shall be dug with firm natural balls of earth of sufficient size and depth to encompass the fibrous and feeding root system necessary for full recovery of the plant.
- C. All plants shall be protected from drying action of the sun and wind during digging and after being dug, while in storage awaiting planting, and while being transplanted. Heel plants or properly protect them with soil, wet peat moss or in a manner acceptable to the **County**.
- D. All existing trees and shrubs must be replanted promptly, preferably within twenty-four (24) hours after removal, but in no case longer than forty-eight (48) hours.

3.07 INSPECTION FOR ACCEPTANCE

- A. Upon completion of all planting, and after receipt of written notification, inspection of the landscape work will be made by the **County**. Inspection of the work will be conducted again by the **County** during and at the end of the maintenance period.

3.08 MAINTENANCE

- A. Maintenance shall begin immediately after each plant is planted and shall continue until all plants are accepted. Planting shall be protected and maintained by watering, fertilizing, and replanting as necessary, at the **Contractor's** expense, for at least one full growing season following installation beginning April 1 and ending November 1 as specified in Paragraph 1.05.A herein.

+++ END OF SECTION 02490 +++

SECTION 02510 PAVEMENT REPAIRS

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals for installation of all pavement repairs; pavement replacement; surface preparation; asphaltic concrete placement; pavement milling; cleaning and protection and any other similar, incidental, or appurtenant pavement repair operation which may be necessary to properly complete the Work as shown on the drawings and as specified herein.
- B. Related Work specified Elsewhere:
 - 1. Section 01200 - Measurement and Payment
 - 2. Section 02920 - Site Restoration
 - 3. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements within Section 01300 - Submittals of the Contract Documents. In addition, the following specific information shall be provided:
 - 1. The **Contractor** shall submit asphalt mix design to the **County** for approval.
 - 2. Certificates: The **Contractor** shall submit certification of quality control and compliance with the requirements of this section to the **County**. Certificates shall be signed by asphalt and concrete producers and the **Contractor**.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
 - 1. ASTM C94 - Standard Specification for Ready Mix Concrete.
 - 2. ASTM C33 - Standard Specification for Concrete Aggregates.
 - 3. ASTM C150 - Standard Specification for Portland Cement.
 - 4. ACI 301 - Specifications for Structural Concrete.
 - 5. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.

6. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
 7. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 8. ASTM C494 - Chemical Admixtures for Concrete.
 9. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
 10. ASTM D3371 - Standard Specification for Viscosity-Graded Asphalt Cement for use in Pavement Construction.
 11. ASTM D946 - Standard Specification for Penetration Graded Asphalt Cement for use in Pavement Construction.
 12. AI (Asphalt Institute) - MS-2- Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
 13. AI (Asphalt Institute) - MS-3- Asphalt Plant Manual.
 14. AI (Asphalt Institute) - MS-8- Asphalt Paving Manual.
 15. AI (Asphalt Institute) - MS-19 - Basic Asphalt Emulsion Manual.
 16. AASHTO M147-65 - Materials for Aggregate and Soil Aggregates.
 17. ASTM C-136 - Sieve Analysis of Fine and Coarse Aggregates.
 18. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. The **Contractor** shall perform Work in accordance with the requirements of the Georgia Department of Transportation (GDOT) Standard Specifications Construction of Transportation Systems, latest edition.
- C. The **Contractor** shall obtain materials from the same source throughout the duration of the paving Work.
- D. The **Contractor** shall use only materials which are furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete and shall be a GDOT-approved facility.

1.04 PERFORMANCE REQUIREMENTS

- A. The **Contractor** shall comply with the performance standards and requirements established by GDOT.
- B. Paving: Pavement shall be designed for movement of trucks up to sixty-thousand (60,000) pounds.

- C. General: In addition to other specified conditions, the **Contractor** shall comply with the following minimum requirements:
1. Finished asphaltic concrete courses shall be compacted to the following densities:
 - a. Asphaltic Concrete Hot Mix Surface Course; Not less than ninety-two (92) percent of theoretical density.
 - b. Asphaltic Concrete Hot Mix Binder Course: Not less than ninety (90) percent of theoretical density.
 2. On the day following placement of asphaltic materials, samples for the determination of in-place density shall be taken from the finished pavement. The **Contractor** shall core the samples at locations and in the manner directed by the County. The cuts made in taking such samples shall be repaired by the **Contractor** at no expense to the **County**.
 3. The finished surface, when checked with a ten-foot straightedge placed parallel to the centerline, shall show no variation more than one-quarter ($\frac{1}{4}$) inch for base and intermediate courses, and not more than one-eighth ($\frac{1}{8}$) inch for surface courses. All testing will be made in a longitudinal direction at intervals as directed by the County. Surface deviations for intermediate courses may be corrected by skin patching, feather edging, or other methods that would provide the required smoothness and maintain quality material. However, surface deviations for surface courses shall be corrected in such a manner as to maintain a quality pavement having the same uniform texture and appearance as the adjoining surface. All corrective work shall be performed at the expense of the **Contractor**.

1.05 REGULATORY REQUIREMENTS

- A. The **Contractor** shall conform to applicable code for paving work on public and private properties.

1.06 JOB CONDITIONS

- A. Weather Limitations:
1. The **Contractor** shall apply bituminous prime and tack coats only when the ambient temperature in the shade has been at least forty (40) degrees F.
 2. The **Contractor** shall not conduct paving operations when the surface is wet, frozen, or contains excess moisture that would prevent uniform distribution and required penetration.
 3. The **Contractor** shall construct asphaltic courses only when atmospheric temperature in the shade is above thirty-five (35) degrees F, when the underlying base is dry and when weather is not rainy.

4. The **Contractor** shall place base course when air temperature is above thirty-five (35) degrees F and rising. The **Contractor** shall not place base course on a frozen or muddy subgrade.

B. The **Contractor** shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

C. Traffic Control:

1. The **Contractor** shall maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.

2. In addition, the **Contractor** shall provide flagmen, barricades, and warning signs for the safe and expeditious movement of traffic through construction zones within public rights-of-way in accordance with the requirements of Section 01550 - Traffic Regulation.

1.07 TEMPORARY ROADWAY PAVING REPAIRS

A. Temporary cold or permanent hot asphalt patching will be required for both transverse and longitudinal roadway cuts upon completing backfilling requirements at the end of each day's work if the road is to be opened for local traffic while work has stopped.

B. It shall be the **Contractor's** responsibility to maintain the temporary paving in such condition as to prevent hindrance or hazard to traffic. When final paving is undertaken the temporary surfacing materials shall be removed to accommodate final paving of types and thicknesses as specified in this section, the edges of the existing paving shall be neatly and uniformly trimmed, and the permanent pavement shall be placed.

C. Steel Plate Bridging:

1. At the **County's** discretion, steel plate bridging may be used. The **Contractor** must adhere to the following chart with respect to minimum plate size and thickness.

Trench Width	Minimum Plate Thickness
10" (0.25 m)	1/2" (13 mm)
1'-11" (0.58 m)	3/4" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.60 m)	1 1/4" (32 mm)
*For trench widths greater than 5' 3", the County will determine the plate thickness.	

2. Steel plates used for bridging must extend a minimum of twelve (12) inches beyond all edges of the trench.

3. For traffic speeds less than forty-five (45) mph, the surrounding pavement shall be cold planed to a depth equal to that of the steel plate selected.
4. For traffic speeds greater than forty-five (45) mph, approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2) inches into the pavement. Subsequent plates shall be butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope eight and one-half (8½) percent with a minimum twelve (12) inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of either asphalt concrete mix, concrete slurry, or an equivalent slurry that is satisfactory to the **County**.
5. Steel plates shall not be left on the road in any one location for more than fourteen (14) days.

D. Graded Aggregate Base:

1. Temporary patch paving using graded aggregate base shall be placed only as approved and directed by the **County**. All compacted material shall conform closely enough to the existing road surface so as to permit safe travel.
2. Graded aggregate may consist of gravel, air cooled blast furnace slag, crushed stone, or synthetic aggregate having hard, strong, durable pieces free of adherent coatings and shall be approved for use by the **County**.

1.08 SOURCE QUALITY CONTROL

- A. The **Contractor** shall submit proposed mix design of each class of mix to the **County** for review prior to commencement of the Work.
- B. The **County's** independent testing laboratory shall test samples in accordance with TAI MS.

1.09 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed in accordance with the requirements of the General Conditions.
- B. The **County's** independent testing laboratory shall take samples and perform tests in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.10 PROTECTION

- A. Immediately after placement, the **Contractor** shall protect pavement from mechanical injury for seven (7) days.

PART 2 - PRODUCTS

2.01 FLEXIBLE PAVEMENT

- A. Aggregates for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. Asphaltic cement for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- C. Bituminous prime coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- D. Bituminous tack coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- E. Hot Mix asphaltic concrete construction shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

2.02 RIGID PAVEMENT

- A. Concrete and reinforcing bars (where required) for rigid pavement shall conform to the requirements set by Owner and or Engineer
- B. Concrete Reinforcement and Section 03300 - Cast-In-Place Concrete. Concrete for pavement shall be Class A.

2.03 CURB AND GUTTER

- A. Concrete for curb, curb and gutter, or valley gutter shall be Class A. Concrete shall conform to the requirements of Section 03300 - Cast-In-Place Concrete.

2.04 SIDEWALKS

- A. Concrete for sidewalks shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.05 DRIVEWAYS

- A. Concrete for driveways shall be Class A conforming to the requirements of Section 03300 - Cast-In-Place Concrete.

2.06 STANDARD GRANITE CURB, GRADE B

- C. Curbs shall be furnished in standard lengths of eight (8) feet in so far as possible employing shorter lengths where required such that the minimum length employed shall not be less than four (4) feet long. Curb sections shall have a split face and split top. Each joint shall have an unreinforced concrete footing as specified in the Detail Drawings. On wheel chair ramps and driveways, the granite curb shall continue through depressed sections of these elements as shown in the Detail Drawings. On curve section of roadway, the granite curb shall

be split or cut on the curve.

2.07 SPECIALTY BRICK PAVER REPLACEMENT

- A. The **Contractor** shall verify the size, type, color, and pattern of the existing specialty brick pavement surface prior to removal. The **Contractor** shall submit to the **County** for review the proposed replacement brick paver material and installation information. Materials shall conform to the existing installation for pattern, color, and size.

2.08 SPECIAL BRICK SIDEWALK REPLACEMENT

- A. All brick shall be solid pavers conforming to the requirements of the GDOT Standard Specifications Construction of Transportation Systems, Latest Edition. The **Contractor** shall submit to the **County** for review on the brick to be used to replace brick sidewalks within the Project area. Materials shall conform to the existing installation for pattern, color, and size.

2.09 STAMPED HEXAGONAL CONCRETE PAVERS

- A. Where existing hexagonal concrete pavers must be removed to allow pipe installation, the **Contractor** may replace them with poured-in-place concrete sidewalk with stamped paver pattern as shown in the Standard Details.

2.10 PAVEMENT MARKINGS

- A. This work shall consist of furnishing and applying thermoplastic reflectorized pavement marking compound that is extruded or sprayed on the pavement by mechanical means and which, upon cooling to pavement temperature, produces a reflectorized pavement marking.
- B. Pavement markings shall be placed to reconstitute the markings that were existing before the pavement was milled for resurfacing. All final markings shall meet the requirements of the Manual of Uniform Traffic Control Devices (MUTCD). If any existing markings did not meet the MUTCD requirements or were absent, the **Contractor** shall nevertheless upgrade the markings at these locations to meet the MUTCD requirements. Thermoplastic traffic stripe shall consist of solid or broken (skip) lines, words and/or symbols of the type and color as shown in the MUTCD Manual. Short lines such as crosswalks, stop bars, arrows, symbols, and crosshatching shall be extruded. All other lines shall be sprayed.
- C. Materials shall meet the requirements of GDOT Standard Specifications Construction of Transportation Systems, latest edition, Section 653.02.
- D. Pavement markings shall include, but not be limited to, the following:
 - 1. Double solid yellow center line.
 - 2. Solid white pavement edge line where street does not have curb and to mark bike lanes.
 - 3. Skip yellow lines to designate lanes in multi-lane streets.

4. Traffic stripe shall be six- (6-) inch-wide on GDOT streets and County streets designated as arterial. Traffic stripe shall be four- (4-) inch-wide on all other streets.
5. White crosshatched lines for crosswalks at schools and at intersections.
6. White stop bars at stop streets.
7. Symbols such as turn arrows, one-way arrows, etc.
8. Wording such as "STOP," "SCHOOL," etc.
9. All other striping, symbols, and wording required by MUTCD.

PART 3 - EXECUTION

3.01 PAVEMENT REPLACEMENT

- A. The **Contractor** shall obtain prior approval from the **County** for any paving subcontracts.
- B. The **Contractor** shall replace all pavements following the guidelines established by the Georgia Department of Transportation and other authorities having jurisdiction.
- C. Where paved streets, sidewalks, driveways, and gutters are removed within the construction limits as specified, such replacement shall be paid for at the respective unit prices in the Bid Form. Such pavements removed or damaged by the **Contractor** beyond the specified construction limits shall be replaced in accordance with these specifications at the **Contractor's** expense.
- D. Where chert, gravel, slag, or other unpaved street or driveway surfaces are removed or damaged, they shall be replaced with the same type of materials that were removed as an incidental part of the Work and no specific payment therefore shall be allowed. Unpaved drives shall be topped with gravel at no additional cost to the **County**.
- E. In replacing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- F. Where shown on the Plans, service lines and small diameter pipes, eight (8) inches in diameter or less located across paved surfaces shall be installed by boring or other approved methods that will not require cutting or removing the pavement where feasible. This is to be approved by the **County**.
- G. All concrete pavement replaced shall not be less than four (4) inches thick or equal to the original if greater than four (4) inches.

- H. Pavements replaced shall be of the same type of construction as was removed, except that no asphalt surface replaced shall be less than three (3) inches thick consisting of a binder and seal coat. Wearing surfaces shall be slag sealed in accordance with the requirements established by GDOT.

3.02 SURFACE PREPARATION

A. Graded Aggregate Base Course:

1. The **Contractor** shall check subgrade for conformity with elevations and section immediately before placing aggregate base material.
2. The **Contractor** shall place aggregate base material in compacted layers not more than six (6) inches thick, unless continuing tests indicate that the required results are being obtained with thicker layers.
3. In no case shall more than eight (8) inches of compacted base be placed in one lift.
4. The **Contractor** shall spread, shape, and compact all aggregate base material deposited on the subgrade during the same day.
5. The compacted base shall have sufficient stability to support construction traffic without pumping and meet minimum contract compaction specifications.
6. If compacted base becomes unstable as a result of too much moisture, the base material and underlying subgrade, if necessary, shall be dried or removed and reworked to a moisture content that can be recompacted to meet minimum contract compaction specifications at the expense of the **Contractor**.

B. Loose and Foreign Material:

1. The **Contractor** shall remove loose and foreign material from the surface immediately before application of paving.
2. The **Contractor** shall use power brooms or blowers, and hand brooming as required.
3. The **Contractor** shall not displace surface material.

C. Prime Coat:

1. The **Contractor** shall uniformly apply at a rate of 0.20 to 0.50 gallon per square yard over compacted and cleaned subbase surface.
2. The **Contractor** shall apply enough material to penetrate and seal, but not flood the surface.

3. The **Contractor** shall allow material to cure and dry as long as required to attain penetration and evaporation of volatile, and in no case less than twenty-four (24) hours unless otherwise acceptable to the County.

4. The **Contractor** shall blot excess asphalt with just enough sand to prevent pick-up under traffic.

5. The **Contractor** shall remove loose sand before paving.

D. Tack Coat:

1. The **Contractor** shall dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and similar surfaces.

2. The **Contractor** shall apply at a rate of 0.05 to 0.15 gallons per square yard of surface.

3. The **Contractor** shall apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.

4. The **Contractor** shall allow surfaces to dry until material is at a condition of tackiness to receive pavement.

3.03 EQUIPMENT

A. The **Contractor** shall provide size and quantity of equipment to complete the work specified in this section within the Project Schedule.

B. Bituminous pavers shall be self-propelled that spread hot asphalt concrete mixtures without tearing, shoving, or gouging surfaces, and control pavement edges to true lines without use of stationary forms.

C. Rolling equipment shall be self-propelled, steel-wheeled, and pneumatic-tired rollers that can reverse direction without backlash.

D. The **Contractor** shall provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified in this section.

3.04 ASPHALTIC CONCRETE PLACEMENT

A. The **Contractor** shall place asphalt concrete mix on prepared surfaces, spread, and strike-off using paving machine.

B. The **Contractor** shall spread the asphaltic concrete mixture at a minimum temperature of two-hundred and twenty-five (225) degrees F.

C. Inaccessible and small areas may be placed by hand.

D. The **Contractor** shall place each course at a thickness such that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated in the Plans.

E. Pavement Placing:

1. Unless otherwise directed by the **County**, the **Contractor** shall begin placing asphaltic concrete along the centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.

2. After first strip has been placed and rolled, the **Contractor** shall place succeeding strips and extend rolling to overlap previous strips.

3. The **Contractor** shall complete base courses for a section before placing surface courses.

4. The **Contractor** shall place the asphaltic concrete mixture in as continuous an operation as practical.

F. Hand Placing:

1. The **Contractor** shall spread, tamp, and finish the asphaltic concrete mixture using hand tools in areas where machine spreading is not possible, as acceptable to the **County**.

2. The **Contractor** shall place the asphaltic concrete mixture at a rate that will ensure handling and compaction before mixture becomes cooler than acceptable working temperature.

G. Joints:

1. The **Contractor** shall carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining work.

2. The **Contractor** shall construct joints to have the same texture, density, and smoothness as adjacent sections of asphalt concrete course.

3. The **Contractor** shall clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.

4. The **Contractor** shall offset transverse joints in succeeding courses not less than twenty-four (24) inches.

5. The **Contractor** shall cut back edge of previously placed course to expose an even, vertical surface for full course thickness.

6. The **Contractor** shall offset longitudinal joints in succeeding courses not less than six (6) inches.

7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, the **Contractor** shall cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.05 ASPHALTIC CONCRETE COMPACTION

- A. The **Contractor** shall provide sufficient rollers to obtain the required pavement density.
- B. The **Contractor** shall begin rolling operations as soon after placing, as the mixture will bear weight of roller without excessive displacement.
- C. The **Contractor** shall not permit heavy equipment, including rollers to stand on finished surface before it has thoroughly cooled or set.
- D. The **Contractor** shall compact the asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. The **Contractor** shall start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. The **Contractor** shall roll to slightly different lengths on alternate roller runs.
- F. The **Contractor** shall not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:
1. The **Contractor** shall accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and the outside edge.
 2. The **Contractor** shall operate rollers as close as possible to paver without causing pavement displacement.
 3. The **Contractor** shall check crown, grade, and smoothness after breakdown rolling.
 4. The **Contractor** shall repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.
- H. Second Rolling:
1. The **Contractor** shall follow breakdown rolling as soon as possible, while the asphaltic concrete mixture is hot and in condition for compaction.
 2. The **Contractor** shall continue second rolling until the asphaltic concrete mixture has been thoroughly compacted.
- I. Finish Rolling:

1. The **Contractor** shall perform finish rolling while the asphaltic concrete mixture is still warm enough for removal of roller marks.

2. The **Contractor** shall continue rolling until roller marks are eliminated and the course has attained specified density.

J. Patching:

1. The **Contractor** shall remove and replace defective areas.

2. The **Contractor** shall cut-out and fill with fresh, hot asphalt concrete.

3. The **Contractor** shall compact by rolling to specified surface density and smoothness.

4. The **Contractor** shall remove deficient areas for full depth of course.

5. The **Contractor** shall cut sides perpendicular and parallel to direction of traffic with edges vertical.

6. The **Contractor** shall apply tack coat to exposed surfaces before placing new asphaltic concrete mixture.

3.06 PAVEMENT MILLING

A. In street areas where pavement replacement occurs, pavement milling will be performed by the **Contractor** to eliminate excessive buildup of pavement. The depth of milling will be 1-1/2" from curb to curb measured at each edge of pavement or as directed by the **County**.

3.07 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, the **Contractor** shall clean surfaces of excess or spilled asphalt materials to the satisfaction of the **County**.

B. Protection:

1. After final rolling, the **Contractor** shall not permit vehicular traffic on asphaltic concrete pavements until it has cooled and hardened, and in no case no sooner than six (6) hours.

2. The **Contractor** shall provide barricades and warning devices as required to protect pavement and the general public.

C. Maintenance: The **Contractor** shall maintain the surfaces of pavements until the acceptance of the Work. Maintenance shall include replacement, overlaying, milling, and reshaping as necessary to prevent raveling of the road material, the preservation of smooth surfaces, and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the **County**.

3.08 STANDARD GRANITE CURB, GRADE B

- A. This work shall consist of furnishing and installing the standard granite curb where indicated in the Plans or directed by the **County**. In general, granite curb required to be installed shall match existing granite curb that has been removed or damaged in the progress of the Work.
- B. When existing granite curb will conflict with pipe installation, the **Contractor** shall carefully remove, clean, and store the granite curb. The **Contractor** shall remove damaged granite curb from the job site. Granite curb that is acceptable to the **County** may be re-installed.
- C. Installation of standard granite curb, Grade B, shall include saw cutting existing asphalt concrete pavement a minimum of one (1) inch and removing remaining pavement to subgrade, excavation of base and subgrade as necessary to install the granite curbing and backfilling and compacting of the installation.

3.09 SPECIALTY BRICK PAVER REPLACEMENT

- A. This work shall consist of replacing existing brick pavement required to be removed for installation of sanitary sewers or connection of services.
- B. Existing brick pavers removed to accommodate sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the pavement as shown on the Plans. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Replacement construction shall match existing pavement section including concrete base slab.

3.10 SPECIAL BRICK SIDEWALK REPLACEMENT

- A. This work shall consist of replacing existing brick sidewalks required to be removed for connection of services or for installation of sanitary sewers.
- B. Existing brick sidewalk removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the sidewalk or driveway on a line perpendicular to the street. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Brick pavers shall be laid on a four (4)-inch-thick concrete base slab and meet the same requirements as Standard Concrete Sidewalk four (4) inches thick.

3.11 STAMPED HEXAGONAL CONCRETE PAVERS

- A. This work shall consist of replacing existing hexagonal concrete pavers required to be removed for connections of services or for installation of sanitary sewers.

- B. Existing hexagonal pavers removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed the full width of the sidewalk or driveway on a line perpendicular to the street. The stamped hexagonal concrete pavers shall be constructed according to the Standard Detail. Prior to beginning construction of the first section of stamped pavers, the **Contractor** shall construct a four- (4-) foot by a four- (4-) foot test panel for approval by the **County**. A standard concrete sidewalk four (4) inches thick shall be poured. When the concrete has achieved sufficient set, the paver pattern imprint shall be created by pushing the form into the concrete to the specified depth and then carefully removing the form. If the constructed stamped pavers do not conform to the test panel, the unsatisfactory sections shall be removed and reconstructed by the **Contractor** to the satisfaction of the **County** without additional cost to the **County**.

3.12 PAVEMENT MARKINGS

- A. Construction of pavement markings shall be performed according to the requirements of GDOT Standard Specifications Construction of Transportation Systems, latest edition, Section 653.03.

+++ END OF SECTION 02510 +++

SECTION 02521 CONCRETE SIDEWALKS, CURBS AND GUTTERS

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for construction of concrete sidewalks, concrete curb, concrete gutter and concrete combined curb and gutter, which shall consist of monolithic curb and gutter respectively, all constructed of Portland cement concrete, at the locations, and to the lines, grades, cross section, form and dimensions indicated on the Drawings.
- B. Cement concrete sidewalks, concrete curb, gutter and combined curb and gutter shall include all necessary excavation, unless otherwise indicated, and subgrade preparation; backfilling, and final clearing up; and completion of all incidentals thereto, as indicated on the Drawings or as directed by the **County**.
- C. Related Work Specified Elsewhere:
 - 1. Section 02200 - Earthwork
 - 3. Section 02510 - Pavement Repair
 - 5. Section 03300 - Cast-In-Place Concrete

1.02 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect concrete materials before, during and after installation and to protect the installed work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the **County** at no additional cost to the **County**.

1.03 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

PART 2 - PRODUCTS

2.01 CONCRETE REINFORCEMENT

- A. Concrete reinforcement shall conform to Section 03300 – Cast-In-Place Concrete

2.02 CONCRETE AND RELATED MATERIALS

- A. General: Concrete and related materials including, but not necessarily limited to, joint materials, membranes and curing compounds shall conform to Section 03300 - Cast-In-Place Concrete.
- B. Class: All concrete shall be Class B three thousand (3,000) psi and conform to requirements of Section 03300.
- C. Water used in mixing concrete shall be fresh, clean, potable water free from injurious amounts of oil, acid, alkali, vegetable, wastewater and/or organic matter.
- D. Admixtures shall meet the following requirements:
 - 1. Except as herein specified, no curative or hardening admixtures shall be used.
 - 2. An air entrainment agent capable of providing three to six (3 to 6) percent air shall be used. Air entraining admixtures that are added to concrete mixtures shall conform to ASTM C 260 for Air Entraining Admixtures for Concrete.
- F. Sub-base shall be constructed of durable material such as bank-run gravel. Minimum depth of sub-base shall be three (3) inches.
- G. Joint filler shall be a non-extruding joint material conforming to AASHTO M21 3 for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (non-extruding and resilient bituminous types). The filler for each joint shall be furnished in a single piece for the full depth and width required for the joint unless otherwise specified by the **County**.

PART 3 - EXECUTION

3.01 EARTHWORK

- A. General: All earthwork shall be performed in accordance with Section 02200, Earthwork, and as specified in this Section.
- B. Backfilling
 - 1. After the subgrade for sidewalks is compacted and at the proper grade, spread three (3) inches or more of sub-base material. Sprinkle with water and compact by rolling or other approved method. Top of the compacted gravel shall be at the proper level to receive the concrete.
 - 2. After the concrete has set sufficiently, the spaces on both sides of the curb, gutter, and combined curb and gutter shall be backfilled, and the materials compacted and left in a neat and workmanlike condition.
 - 3. Curbs to be used in the construction of asphalt pavements shall be backfilled prior to placement of base material for asphalt pavement.

3.02 SUBGRADE PREPARATION

- A. The subgrade shall be formed by excavating to the required depth below the finished surface of the respective types, in accordance with the dimensions and designs indicated on the Drawings or as directed by the **County**, and shall be of

such width as to permit the proper installation and bracing of forms. The subgrade shall be compacted by hand tamping and all soft, yielding or unsuitable material shall be removed and backfilled with satisfactory material and again compacted thoroughly to ninety-eight (98) percent of dry density per ASTM 698 and finished to a smooth and unyielding surface. The finished grade shall be to the dimensions and design indicated on the Drawings or as directed by the **County** for the bottom of the proposed construction.

3.03 CONCRETE CURB AND GUTTER CONSTRUCTION

- A. Construct curbs to lines and grade shown or established by the **County**. Curbs shall conform to the details shown on the Drawings.
- B. Forming:
 - 1. Forms shall be metal and of an approved section. They shall be straight, free from distortions, and shall show no vertical variation greater than one-eighth (1/8) inch in ten (10) feet, and shall show no lateral variation greater than one-quarter (1/4) inch in ten (10) feet from the true plane surface on the vertical face of the form.
 - 2. Forms shall be of the full depth of the structure and be so constructed as to permit the inside forms to be securely fastened to the outside forms.
 - 3. Securely hold forms in place true to the lines and grades indicated on the Drawings.
 - 4. Wood forms may be used on sharp turns and for special sections as approved by the **County**.
 - 5. Where wooden forms are used, they shall be free from warp and the nominal depth of the structure.
 - 6. All mortar and dirt shall be removed from forms and all forms shall be thoroughly oiled or wetted before any concrete is deposited.
 - 7. The supply of forms shall be sufficient to permit their remaining in place at least twelve (12) hours after the concrete has been placed.
- C. Joints:
 - 1. Joints shall be constructed as indicated on the Drawings and as specified.
 - 2. Construct joints true to line with their faces perpendicular to the surface of the structure and within one-quarter (1/4) inch of their designated position.
 - 3. Thoroughly spade and compact the concrete at the faces of all joints to fill all voids.
 - 4. Install expansion joint materials at the point of curve at all street returns.
 - 5. Install expansion joint material behind the curb at abutment to sidewalks and adjacent structures.
 - 6. Place contraction joints every ten (10) feet along the length of the curbs and gutters.
 - 7. Form contraction joints using steel templates or division plates that conform to the cross section of the structure. Leave the templates in place until the concrete has set sufficiently to hold its shape, but remove them while the forms are still in place.
 - 8. Contraction joint templates or plates shall not extend below the top of the steel reinforcement or shall be notched to permit the reinforcement to be continuous through the joint.

9. Contraction joints shall be a minimum of one and one-half (1-1/2) inches deep.

D. Finishing:

1. Strike off the surface with a template, and finish the surface with a wood float using heavy pressure, after which, contraction joints shall be made and the surface finished with a wood float or steel trowel.
2. Finish the face of the curbs at the top and bottom with an approved finishing tool of the radius indicated on the Drawings.
3. Finish edges with an approved finishing tool having a one-quarter- (1/4-) inch radius.
4. Provide a final broom finish by lightly combing with a stiff broom after troweling is complete.
5. The finished surface shall not vary more than one-eighth (1/8) inch in ten (10) feet from the established grade.

E. Concrete Curing:

1. After finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound specified in Section 03300 - Cast-In-Place Concrete.
2. The compound shall be applied in one or two applications as directed by the **County**. When the compound is applied in two (2) increments, the second application shall follow the first application within thirty (30) minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the **County** at the rate directed by the **County**, but not less than one (1) gallon per two hundred (200) square feet of surface.
4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the **County**.

F. Protection:

1. Provide and use sufficient coverings for the protection of the concrete in case of rain or breakdown of curing equipment.
2. Provide necessary barricades and lights to protect the work and rebuild or repair to the approval of the **County**. All damage caused by people, vehicles, animals, rain, the **Contractor's** operations and the like shall be repaired by the **Contractor** at no additional expense to the **County**.

3.04 SIDEWALK CONSTRUCTION

- A. Sidewalks shall be four (4) inches thick.
- B. At locations where the new sidewalk is to abut existing concrete, saw cut concrete for a depth of two (2) inches and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just

prior to pouring the new sidewalk.

C. Joint:

1. Place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at the curb, and around posts, poles, or other objects protruding through the sidewalk.
2. Provide contraction joints transversely to the walks at locations opposite the construction joints in the curb. These joints shall be straight and at right angles to the surface of the walk.

D. Finishing:

1. Broom the surface with a fine-hair broom at right angles to the length of the walk and tool all edges, joints, and markings. Mark the walks transversely with a jointing tool.

E. Concrete Curing

1. After the finishing operations have been completed and immediately after the free water has left the surface, the surface of the structure shall be completely coated and sealed with a uniform layer of curing compound specified in Section 03300 - Cast-In-Place-Concrete.
2. The compound shall be applied in one or two applications as directed by the **County**. When the compound is applied in two (2) increments, the second application shall follow the first application within thirty (30) minutes.
3. The compound shall be applied continuously by means of an automatic self-propelled, pressure sprayer as approved by the **County** at the rate directed by the **County**, but not less than one (1) gallon per two hundred (200) square feet of surface.
4. The equipment shall provide adequate stirring of the compound during application.
5. Should the method of applying the compound not produce uniform coverage, its use shall be discontinued, and the curing shall be by another method approved by the **County**.

F. Protection:

1. Protect the sidewalks from damage for a period of seven days.
2. All damage caused by people, vehicles, rain, animals, and the **Contractor** shall be repaired by the **Contractor** at no additional expense to the **County**.

3.05 REPLACEMENT CONCRETE CURB AND SIDEWALK

- A. When a section is removed, the existing sidewalk or curb shall be cut to a neat line, perpendicular to both the centerline and the surface of the concrete slab. Existing concrete shall be cut along the nearest existing construction joints; if such joints do not exist, the cut shall be made at minimum distances shown on the Drawings.

- B. Existing concrete sidewalks and curbs that have been cut and removed for construction purposes shall be replaced with the same width and surface as the portion removed. Sidewalks shall have a minimum uniform thickness of four (4) inches. The new work shall be neatly jointed to the existing concrete so that the surfaces of the new work shall form an even, unbroken plane with the existing surfaces.
- C. All work shall conform to the requirements for new sidewalks and curbs as detailed in this Section.

3.06 CLEANING

- A. All excess or unsuitable material shall be disposed of as specified in Section 02050, Demolition.
- B. All surfaces of the Work and adjacent surfaces shall be broom clean. The **Contractor** shall use pressure washing and other means approved by the **County** to remove splashed and spilled concrete from the Work and adjacent surfaces.
- C. Disturbed seeded areas shall be reseeded per requirements of Section 02485 - Seeding.

+++ END OF SECTION 02521 +++

SECTION 02607 MANHOLES, JUNCTION BOXES, CATCH BASINS AND INLETS

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required to install cast-in-place and precast concrete manholes, junction boxes, catch basins, and inlets. The term manholes, as used herein and shown on the Drawings, includes manholes, junction boxes, catch basins, and inlets. All Work shall be installed, adjusted, tested, and placed in operation in accordance with these Specifications, the manufacturer's recommendations, and as shown on the Drawings.
- B. Related Work Specified Elsewhere:
 - 1. Section 03300 - Cast-In-Place Concrete

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Conditions of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:
 - 1. Complete shop drawings and engineering data on frames, covers, steps, and precast manhole sections and flotation calculations shall be submitted to the **County** in accordance with the requirements of the General Conditions of the Contract Documents.

1.03 QUALITY ASSURANCE

- A. Prior to delivery, all basic materials specified herein shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the **County**, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials that fail to conform to these Specifications will be rejected.
- B. After delivery to the site, any materials that have been damaged in transit or are otherwise unsuitable for use in the Work will be rejected and removed from the site.

1.04 QUALITY STANDARDS

- A. Manufacturers offering products that comply with these specifications include:
 - 1. Standard manhole frame and cover
 - a. Vulcan Foundry, VM-26
 - b. Neenah Foundry, Series R-1700
 - c. Or Approved Equal
 - 2. Manhole adjusting rings
 - a. Neenah Foundry, R1979-H

- b. Higgins Foundry
 - c. Or approved equal
3. Manhole rungs
- a. M.A. Industries
 - b. Or Approved Equal

1.05 WARRANTY

- A. Provide a manufacturer's warranty against defective materials and workmanship in accordance with the requirements of the General Conditions of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Drawings or as otherwise directed by the **County**. The height or depth of the manhole will vary with the location, but unless shown otherwise on the Drawings, shall be such that the top of the manhole frame will be at the finished grade of the pavement or ground surface and the invert will be at the designated elevations.

2.02 MATERIALS AND CONSTRUCTION

- A. Concrete and Reinforcement:
- 1. Concrete used in manhole and junction chamber construction shall be Class "A" concrete conforming to the requirements of Section 03300 - Cast-In-Place Concrete.
 - 2. Steel reinforcement shall conform to the requirements set by Owner and or Engineer.
 - 3. Brick: The brick shall conform to the requirements of AASHTO M 91.
 - 4. Mortar: The mortar for brick masonry and similar Work shall be composed of one (1) part of Portland cement and two (2) parts of mortar sand, by volume. The Portland cement shall conform to the requirements of AASHTO M 45. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed fifteen (15) percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acids, alkalis, or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T 26.
- B. Precast Concrete Manholes:
- 1. Precast concrete manholes shall consist of precast reinforced concrete sections, a conical or flat slab top section, and a base section conforming to the typical manhole details as shown on the Drawings.

2. Precast manhole section shall be manufactured, tested, and marked in accordance with the latest provisions of ASTM C 478.
3. The minimum compressive strength of the concrete for all sections shall be four thousand (4,000) psi.
4. The maximum allowable absorption of the concrete shall not exceed eight (8%) percent of the dry weight.
5. The circumferential reinforcement in the riser sections, conical top sections and base wall sections shall consist of one (1) line of steel and shall be not less than seventeen hundredths (0.17) square inches per lineal foot.
6. The ends of each reinforced concrete manhole riser section and the bottom of the manhole top section shall be so formed that when the manhole risers and the top are assembled, they will make a continuous and uniform manhole.
7. Joints of the manhole sections shall be of the tongue and groove type. Sections shall be joined using O-ring rubber gaskets conforming to the applicable provisions of ASTM C443, latest revision, or filled with an approved preformed plastic gasket meeting the requirements of Federal Specifications 55-5-00210, "Sealing Compound, Preformed Plastic for Pipe Joints", Type 1, Rope Form.
8. Each section of the precast manhole shall have not more than two (2) holes for the purpose of handling and laying. These holes shall be tapered and shall be plugged with rubber stoppers or mortar after installation.
9. Polypropylene plastic manhole steps shall be installed in each section of the manhole in accordance with the **County** standard details.

C. Brick Structures:

1. Foundations: A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Section 03300. The foundation shall be built to the correct elevation and shall be finished to cause the least possible resistance to flowing water.
2. Laying Brick: All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar that is not used within forty-five (45) minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it, which can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set shall be removed, cleaned, and relaid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular

openings or edges; in which case, full bricks shall be placed at ends or corners where possible and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

3. Joints: All joints shall be slushed with mortar at every course, but slushing alone will not be considered adequate for making an acceptable joint. Exterior faces shall be laid up in advance of backing. Exterior faces shall be back plastered or pargeted with a coat of mortar not less than one-half (1/2) inch thick before the backing is laid up. Prior to pargeting, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than one-quarter (1/4) inch or more than one-half (1/2) inch wide and whatever width is adopted shall be maintained uniform throughout the work.
4. Pointing: Face joints shall be neatly struck, using the weather joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.
5. Cleaning: Upon completion of the work, all exterior surfaces shall be thoroughly cleaned by scrubbing and washing down with water and, if necessary to produce satisfactory results, cleaning shall be done with a five (5) percent solution of muriatic acid that shall then be rinsed off with liberal quantities of clean, fresh water.
6. Curing and cold weather protection: In hot or dry weather, the brick masonry shall be protected and kept moist for at least forty-eight (48) hours after laying the brick. Brick masonry Work or pointing shall not be done when there is frost in the brick or when the air temperature is below fifty (50) degrees F unless the **Contractor** has on the project, ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than sixty (60) degrees F for the duration of the curing period.

D. Frames and Covers:

1. Frames and covers shall be cast iron conforming to the minimum requirements of Federal Specifications WWOI-652 or to ASTM A 48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, interchangeable, sound, smooth, clean, and free from blisters and/or other defects. Defective castings that have been plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with a bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
2. Standard manhole frames and covers shall have a minimum of twenty-two (22) inches clear inside diameter and shall be a minimum of five (5) inches high, with guide ring, and shall weigh not less than four hundred, forty-six (446) pounds, total. Manhole covers shall be as detailed on the Drawings.
3. The contact surfaces of all manhole covers and the corresponding supporting rings in the frames shall be machined to provide full perimeter contact.

4. All sanitary sewer manhole covers shall have the word "PROPERTY OF DEKALB COUNTY" cast on the top in letters two (2) inches high.
5. An adjusting ring shall be provided for each manhole in a street.
6. Provide solid manhole and handhole covers and frames for electrical underground systems. Covers shall have letters "HIGH VOLTAGE," "LOW VOLTAGE," "SIGNAL," as applicable, embossed on top.

PART 3 - EXECUTION

3.01 CONSTRUCTION OF CAST-IN-PLACE CONCRETE MANHOLES

- A. Cast-in-place manholes, excluding curved manhole bases, shall be constructed in place with the base, barrel, and conical section all monolithically cast using removable forms of material and design approved by the **County**.
- B. The vertical forms, vertical and horizontal wall spacers, steps, and placing cone must be carefully positioned and firmly clamped in place before any placement is made. The wall spacers must be located ninety (90) degrees from each other. The forms shall be firmly supported with bottom of forms at the proper elevation to permit the base to be deposited through the vertical forms.
- C. No pipe penetration shall be formed within twelve (12) inches of a corner, on square bases, or within twelve (12) inches of another penetration, in any direction, for circular bases.
- D. The manhole base shall be deposited down through the wall forms onto undisturbed earth or shall be rock bearing. It shall be evenly distributed around the walls and vibrated both inside and outside the forms until there is a minimum slope of sixty (60) degrees from the bottom of the forms to the bearing surface both inside and outside of the manhole. When this is complete and before additional concrete is added, the concrete must be carefully vibrated on each side of each sewer pipe.
- E. The base shall be concentric with the manhole, except where eccentric alignment with ladder is required, and have a minimum diameter of four (4) feet or sixteen (16) inches greater than the outside diameter of the manhole whichever is greater, and ten (10) inch minimum thickness under the lowest pipe. Minimum wall thickness shall be six (6) inches.
- F. Additional concrete must be deposited in evenly distributed layers of approximately eighteen (18) inches with each layer vibrated to bond it to the preceding layer. The wall spacers must be raised as the placements are made. The concrete in the area from which the spacer is withdrawn shall be carefully vibrated. Excessive vibration shall be avoided.
- G. Adjustment rings shall be provided between the conical section and the manhole frame. The rings shall be cast-in-place using building felt between pours to create a weakened joint or as directed by the **County**. If adjustment of the lid elevation is called for, concrete adjusting rings shall be used.
- H. All manhole bases, including curved manhole bases and inverts shall be constructed of

Class "A" concrete in accordance with details on the Drawings. Inverts shall be smooth and accurately shaped and have the same cross section as the invert of the sewers that they connect. The manhole base and invert shall be carefully formed to the required size and grade by gradual and even changes in sections, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations. Changing directions of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit. The invert and flow channel shall be formed during or immediately after the placing of the concrete and brush-finished as soon as the concrete has sufficiently set.

- I. Form marks and offsets shall not exceed one (1) inch on the outside surface of the manhole. Form marks and offsets shall not exceed one-half (1/2) inch inside of the manhole. All offsets on the inside surface of the manhole shall be smoothed and rubbed so there is no projection or irregularity capable of scratching a worker or catching and holding water or other materials. Honeycombed areas shall be completely removed immediately upon removal of the forms and replaced with a Class "A" concrete as directed by the **County**, or patched with epoxy grout.
- J. Should circumstances make a joint necessary, a formed groove or reinforcing dowels shall be required in the top of the first placement for shear protection. Immediately before the second placement is made, the surface of the cold joint shall be thoroughly cleaned and wetted with a layer of mortar being deposited on the surface.
- K. Concrete setting time and backfilling shall be in accordance with the applicable requirements of Section 03300 - Masonry Work shall be allowed to set for a period of not less than twenty-four (24) hours. Outside forms, if any, then shall be removed and the manhole backfilled and compacted. All loose or waste material shall be removed from the interior of the manhole. The manhole cover then shall be placed and the surface in the vicinity of the Work cleaned off and left in a neat and orderly condition.

3.02 CONSTRUCTION OF PRECAST CONCRETE MANHOLES

- A. After placing a manhole base, inverts shall be constructed using Class "A" concrete and three to five (3 to 5) inches slump range in accordance with details on the Drawings and inverts shall have the same cross section as the invert of the sewers that they connect. The manhole invert shall be carefully formed to the required size and grade by gradual and even changes in sections. Changes in directions of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- B. After the base section has been set, and inverts formed, the precast manhole sections shall be placed thereon, care being exercised to form the incoming and outgoing sewer pipes into the wall of the manhole at the required elevations.
- C. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the riser section. Where manholes are constructed in paved areas, the top surface of the frame and cover shall be tilted to conform to the exact slope, crown, and grade of the existing adjacent pavement.
- D. After backfilling has been completed, the excavated area, if located in a street, alley, or sidewalk, shall be provided with a temporary surface.

3.03 MANHOLES OVER EXISTING SEWERS

- A. Construct manholes over existing operating sewer lines at locations shown. Perform necessary excavation as specified hereinbefore, support precast concrete MH base over existing pipe on brick or solid concrete block then pour concrete slab base, break into existing line, construct riser sections, and complete Manhole construction.
- B. Maintain flow through existing sewer lines at all times, and protect new concrete and mortar Work for a period of seven (7) days after concrete has been placed. Advise **County** of plans for diverting sewage flow and obtain **County's** approval before starting. **County's** approval will not relieve **Contractor** of responsibility for maintaining adequate capacity for flow at all times and adequately protecting new and existing work.
- C. Construct the new base under the existing sewer and the precast sections as specified herein.
- D. Break out the existing pipe within the new manhole, cover the edges with mortar, and trowel smooth. Gain approval from the **County** prior to breaking out the existing pipe.

3.04 INSPECTION AND TESTING

- A. After completion, all manholes will be inspected. The **Contractor** shall make, at **Contractor's** expense, all necessary changes, modifications, and/or adjustments required to assure satisfactory operation.

+++END OF SECTION 02607+++

SECTION 02665 WATER MAINS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

- A. The work included under this section includes providing all labor, materials, equipment, tools, and incidentals required for a complete installation of water mains and accessories as shown on the Plans and as specified in this section.
- B. The **Contractor** shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), Steel Structures Painting Council (SSPC), and other recognized standards. Latest revisions of all standards are applicable.
- C. Galvanized pipe/fittings shall not be used as any part of the Water Transmission and Distribution System, nor shall it be used to join any appurtenances to the System.
- D. Water mains, valves, hydrants, and appurtenances shall be installed before the installation of the sub-base course or paving or any other utilities except sanitary sewer lines.
- E. All water system products and materials shall be submitted for approval by the **County**. Each shall meet all design and operating requirements of the **County**.
- F. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 01550 - Traffic Regulation
 - 4. Section 02140 - Dewatering
 - 6. Section 02324 - Trenching and Trench Backfilling
 - 7. Section 02510 - Pavement Repairs
 - 8. Section 02521 - Concrete Curbs and Sidewalks
 - 9. Section 02920 - Site Restoration

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:
 - 1. Complete product data and engineering data, including shop drawings.
 - 2. Documentation that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two (2) years.

3. Written certification to the **County** that all products furnished comply with all applicable requirements of these Specifications.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
 1. ANSI A21.4 (AWWA C104) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
 2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
 3. ANSI B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 4. ANSI B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes.
 5. ASTM B32 - Standard Specification for Solder Metal.
 6. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 7. ASTM C150 - Standard Specification for Portland Cement.
 8. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials.
 9. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings.
 10. AWWA C104 (ANSI A21.4) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
 11. AWWA C110 (ANSI A21.10) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids.
 12. AWWA C111 (ANSI A21.11) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
 13. AWWA C115 (ANSI A21.15) - Flanged Ductile Iron Pipe with Threaded Flanges.
 14. AWWA C150 (ANSI A21.50) - Thickness Design of Ductile Iron Pipe.
 15. AWWA C151 (ANSI A21.51) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids.
 16. AWWA C153 (ANSI A21.53) - Ductile Iron Compact Fittings, 3-in. through 24-in. and 54-in. through 64-in., for Water Service.
 17. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
 18. AWWA C606 - Joints, Grooved and Shouldered Type.
 19. AWWA C651 - Disinfecting Water Mains.
 20. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning.
 21. Other ANSI, ASTM, and AWWA specifications referenced herein.

1.04 TRANSPORTATION AND HANDLING

- A. Unloading: The **Contractor** shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves, and accessories. The **Contractor** shall make equipment available at all times for use in unloading. The **Contractor** shall not drop or dump materials. All materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.

- B. Handling: The **Contractor** shall handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. The **Contractor** shall handle pipe by rolling on skids, forklift, or front-end loader. The **Contractor** shall not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.05 STORAGE AND PROTECTION

- A. The **Contractor** shall store all pipes that cannot be distributed along the route. The **Contractor** shall make arrangements for the use of suitable storage areas.
- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell-plain end; plain end-bell. At least two (2) rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipes in adjacent tiers.
- D. Stored mechanical and push on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first in, first out basis.
- E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

- A. Except as otherwise shown on the Plans, the minimum depth of cover shall be four (4) feet and the maximum cover shall be five (5) feet. All deviations must be specifically approved by the **County**.
- B. The installation of a water main parallel to another utility in the same vertical plane is not permitted, i.e., "stacking" of utilities is not permitted.

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Ductile iron pipe shall be manufactured in accordance with the requirements of AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of eighteen (18) to twenty (20) feet. Sizes will be as shown on the Plans. All pipe shall have a minimum pressure rating as indicated in following Table below, and corresponding minimum wall thickness, unless otherwise shown on the Plans, specified in these Specifications, or approved by the **County**.

Pipe Sizes	
Pipe Diameter (inches)	Pressure Class (psi)
4 – 12	350
14 – 18	350
20	300
24	250
30 – 54	200
60 – 64	200

- D. Flanged pipe minimum wall thickness shall be equal to Special Class 53. Flanges shall be furnished by the pipe manufacturer.
- E. Ductile Iron Pipe and fittings shall be cement lined in accordance with the requirements of AWWA C104. A seal coat over the cement lining is not required. Pipe and fittings shall be furnished with a bituminous outside coating.
- F. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110 or AWWA C153 with a minimum rated working pressure of two-hundred and fifty (250) psi.
- G. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47, ASTM A197, or ANSI B16.3
- H. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ANSI B16.11; and fabricated steel fittings and appurtenances shall conform to the requirements of AWWA C208.
- I. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to the requirements of ASTM A536 or malleable iron conforming to the requirements of ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to the requirements of ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.
- J. Joints:
 - 1. Unless shown or specified otherwise, joints for ductile iron pipe shall be push on or restrained joint type for pipe and standard mechanical, push on, or restrained joints for fittings. Push on and mechanical joints shall conform to the requirements of AWWA C111.

2. The only acceptable restrained joint systems for ductile iron pipe are identified in the Table below. unless approved by the **County**. No field welding of restrained joint pipe will be allowed.

Acceptable Restrained Joints				
Diameter (inches)	ACIPCO	U.S. Pipe	McWane	Generic ⁽¹⁾
4 – 12	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 – 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 – 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 – 64	Lok-Ring	TR Flex	N/A	N/A

⁽¹⁾ Fittings and valves only, and only where specifically allowed.

3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least thirty-six (36) feet and as approved by the **County**
 4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
- K. The **Contractor** shall provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of one-eighth ($\frac{1}{8}$) inch thick, cloth reinforced rubber; gaskets may be ring type or full-face type.
- L. Bolts and Nuts:
1. The **Contractor** shall provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with the requirements of ANSI B1.1, Coarse Thread Series, Class 2A external, and 2B internal fit. All bolts and nuts shall be made in the U.S.A.
 2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low alloy steel in accordance with the requirements of ASTM A242 to the dimensions shown in AWWA C111/ANSI A21.11.
 3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to the

requirements of ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.

4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to the requirements of ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to the requirements of ASTM B633, Type II.
 5. Bolts for submerged service shall be stainless steel machine bolts conforming to the requirements of ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to the requirements of ASTM A194, Grade 8.
- M. Mechanical joint glands shall be ductile iron.
- N. Welded Outlet: Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to twenty-four (24) inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. All welding shall be performed by a certified welder and approved by the **County**. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 [Pressure Class 350 for sixty (60) and sixty-four (64) inch sizes]. The welded outlet shall be rated for two hundred and fifty (250) psi working pressure. Each welded outlet shall be hydrostatically tested at five hundred (500) psi or as approved by the **County**. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the following table:

Maximum Outlet Diameters	
Parent Pipe Diameter (inches)	Maximum Outlet Diameter (inches)
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

- O. Ductile iron pipe shall be encased with polyethylene film where shown on the Plans. Polyethylene film shall be in accordance with the requirements of AWWA C105.
- P. Acceptance will be based on the **County's** inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.

2.02 PIPE LINING

- A. Cement Mortar: Unless otherwise specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205. Fittings and specials larger than twenty-four (24) inches not fabricated from centrifugally lined straight sections shall require two (2) inches by four (4) inches by thirteen- (13-) gage self-furring wire mesh reinforcement for hand-applied lining.

2.03 PIPE COATING

- A. Epoxy: Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following requirements:
 - 1. No Coal tar products shall be incorporated in the liquid epoxy.
 - 2. The curing agent may be an amidoamine as well as other curing agents listed in AWWA C210
 - 3. The coating shall be applied to a minimum thickness of sixteen (16) mils in not less than two (2) coats.
- B. Polyethylene tape: Where shown on the Plans or directed by the **County**, pipe and fittings shall be coated and wrapped with prefabricated multi-layer cold applied polyethylene tape coating in accordance with the requirements of AWWA C214. The coating application shall be a continuous step operation in conformity with the requirements of AWWA C214, Section 3. The total coating thickness shall be not less than fifty (50) mils for pipe twenty-four (24) inches and smaller and not less than eighty (80) mils for pipe twenty-six (26) inches and larger.

2.04 FUSION EPOXY COATING AND LINING

- A. Where shown on the Plans or directed by the **County**, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 203, or approved equal, approved by the **County**. Surface preparation shall be in accordance with the requirements of SSPC-SP 10 near white blast cleaning. The application method shall be by the fluidized bed method and shall attain twelve (12) mils minimum dry film thickness.
- B. Field welds, connections, and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306 or approved equal

2.05 COPPER PIPE

- A. Pipe shall be rolled copper tubing, ASTM B 88, Type K.
- B. Where required, sweat to screw adapters shall be cast bronze ANSI B16.18, wrought solder joint ANSI B16.22. Unions shall be cast bronze or bronze with solder connections. Joints shall be made with 95/5 solder for Type K pipe. All fittings less than or equal to 1" shall be flared unless otherwise approved by the **County**.

2.06 PIPING APPURTENANCES

- A. Retainer Glands:
1. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400 or equal, as manufactured by Ford Meter Box Company.
 2. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants and other locations as shown on the Plans.
- B. Hydrant Tees: Hydrant tees shall be ACIPCO A10180 or U.S. Pipe U 592 or approved equal.
- C. Anchor Couplings: Lengths and sizes shall be as shown on the Plans. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U 591.
- D. Hydrant Connector Pipe: The connector pipe shall be ductile iron meeting the requirements of AWWA C153; twenty-four (24) inch offset design so that the hydrant can be adjusted to ensure placement at the proper grade; shall have an anchoring feature at both ends so that when used with M.J. split glands a restrained joint is provided; cement lined in accordance with AWWA C104 and equal to the Gradelok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.
- E. Tapping Saddles: Tapping saddles are not allowed unless approved by the **County**
- F. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, and "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of two (2) inches when buried less than ten (10) inches below the surface. Tape width shall be a minimum of three (3) inches when buried greater than ten (10) inches and less than twenty (20) inches. Detection tape shall be equal to Lineguard Type III Detectable or Allen Systems Detectatape.

2.07 FIRE HYDRANTS

- A. General: Fire hydrant shall be a two (2) piece standpipe and stem, compression shutoff, dry-barrel type. Fire hydrant shall conform to the requirements of AWWA C502 and shall be listed by Underwriters Laboratories, Inc. in accordance with the requirements of UL 246.
- B. Acceptable Products: Fire hydrants shall be American Valve and Hydrant B-62-B, M & H 129T, Mueller Super Centurion 250-AWB, A-423, Kennedy K81A, U.S. Metropolitan 250, or approved equal.

- C. Product Data: The following information shall be provided to the **County**:
1. Affidavit of compliance with the requirements of AWWA C502.
 2. Records of standard tests.
- D. Manufacture
1. Fire hydrant shall be cast iron traffic, three- (3-) way four and one-half- (4½-) inch valve, and left opening type.
 2. Internal main valve diameter shall be a minimum of five and one-quarter (5¼) inches.
 3. Each hydrant shall have the name of the manufacturer, the year of manufacture, and the nominal size in legible, raised letters cast on the barrel or bonnet.
 4. Each hydrant shall be constructed with a moist-proof lubricant chamber that encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. The bonnet shall have "O" ring packing and reservoir capable of utilizing oil or grease so that all operating parts are enclosed in the lubricant.
 5. Operating nut shall be bronze, seven-eighths- (7/8-) inch tapered square nut with tamper-proof device. The direction "opening left" shall be marked on a special tamper-proof device. The tamper-proof device shall be a combination fold-down nut for the op-nut. Hydrant shall have ductile iron combination hold-down nut and operating nut shield to eliminate operation of hydrant with wrenches other than a special socket-type wrench. Arrow shall be cast on the outside of the periphery of the operating nut shield indicating direction of the operation for opening the hydrant.
 6. The hydrant barrel section shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle. The main valve rod section shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.
 7. The hydrant main valve shall be made of synthetic rubber and formed to fit the valve seat accurately. The hydrant valve shall be made from material that will resist damage from rocks or other foreign matter. The valve shall be reversible. The hydrant shall be a true compression type, opening against pressure and closing with pressure.

8. The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze-to-bronze thread engagement. Two (2) "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained to allow without the employment of torque of torque compressed gaskets. The hydrant shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.
 9. The drain mechanism shall be designed to operate with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two (2) internal and two (2) external bronze-lined drain pots shall be required in the main valve assembly to drain the hydrant barrel.
 10. Cast iron inlet elbows shall have a six- (6-) inch mechanical joint connection complete with accessories.
 11. Barrel extension sections shall be available in six - (6-) inch increments complete with rod, extension, coupling and the necessary flanges, gaskets and bolts, so that extending the hydrant can be accomplished without excavating. Hydrants shall have letters "AWB" cast in the barrel for identification purposes. Bury mark of fire hydrant shall be cast on barrel of the hydrant.
 12. Hydrant shall have two (2) two and one-half -(2½-) inch hose nozzles one-hundred and twenty (120) degrees apart and one (1) four and one-half- (4½-) inch pumper nozzle. The threads shall be national standard threads. The nozzle caps shall be secured to fire hydrant with non-kinking chain loop on cap ends to permit free turning of caps.
 13. Bolts and nuts shall be corrosion resistant.
 14. Hydrants shall be designed with safety flange to protect the barrel and stem from damage and to eliminate flooding of area when hydrant is struck or knocked off by vehicular equipment or other objects.
- E. Setting Hydrants: Fire hydrants Traffic design.
1. Hydrants shall be placed at the locations indicated on the Plans in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians will be minimized. The contractor shall install proper "bury" hydrants or shall use, at no cost to the **County**, proper length extensions to ensure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of these Specifications. When placed behind curb, the hydrant barrel shall be set such that no portion of the pumper or hose nozzle caps will be less than six (6) inches, nor more than twelve (12) inches from the gutter face of the curb. The contractor shall place gravel as shown on the Plans. All pipe connecting the fire hydrant to the main

line shall be ductile iron pipe meeting the requirements of these Specifications or approved connecting pieces.

2. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main shall be through either a ductile iron tee or a tapping sleeve and shall include an outlet valve at the point of connection. Using a tapping sleeve where the Plans indicate a tee shall not result in any additional costs to the **County**.
- F. Connection to main: Each fire hydrant shall be connected to the main with a six (6) inch ductile iron branch connection. Gate valves shall be used on fire hydrant branches unless otherwise specified.
- G. Drainage: Stone no larger than four (4) inches in diameter, shall be placed around the base of the fire hydrant for a depth of thirty (30) inches from the bottom of the trench and shall extend for a distance of thirty (30) inches from the back of the hydrant toward the main.
- H. Anchoring and Bracing: The shoe of each fire hydrant shall be braced against unexcavated earth at the end of the trench with stone slabs or poured concrete; or it shall be tied to the pipe with suitable metal tie rods or clamps or both, as directed by the **County**. The straps and rods, nuts and threads, used for anchoring shall be coated with protective materials at the end of installation.
- I. Painting, Coating, and Lubricating:
1. All iron parts of the hydrant inside and outside shall be cleaned and thereafter, unless otherwise stipulated, all surfaces, except the exterior portion above the ground line, shall be coated or painted with, or dipped in an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two (2) coats, the first being allowed to dry thoroughly before the second coat is applied.
 2. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two (2) coats of Koppers primer 621 or approved equal. After installation, each hydrant shall be painted with two (2) field coats of Koppers Glamortex Enamel as manufactured by the Sika Inertol Company or approved equal, color shall be silver. The top cap of each hydrant shall be painted in one of the following colors to indicate the main size: six- (6-) inch or eight- (8-) inch mains shall be silver; ten- (10-) inch or twelve- (12-) inch mains shall be yellow; and sixteen- (16-) inch or greater mains shall be green.
 3. All bronze, threaded contact moving parts shall, during shop assembly, be lubricated, and protected by a coating of rustproof compound to prevent damage in shipment and storage.
- J. Accessories: The **Contractor** shall furnish one (1) standard four- (4-) sided hydrant wrench for each ten (10) hydrants installed or fraction thereof.

- K. Testing: All fire hydrants shall be tested in strict accordance with the requirements of AWWA C502, with no additional cost to the **County**. The Certificate of Compliance shall be furnished to the **County**.

2.08 GATE VALVES (GV)

- A. Twenty (20) Inches in Diameter and Smaller:
1. Gate valves shall be resilient-seated type conforming to the requirements of AWWA C509 or AWWA C515.
 2. Valves through twelve (12) inches in diameter shall have a minimum rated working pressure of two hundred (200) psi. Sixteen- (16-) inch and twenty- (20-) inch valves shall have a minimum rated working pressure of one-hundred and fifty (150) psi.
 3. Valves less than four (4) inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Plans.
 4. Valves shall be non-rising stem type with a two- (2-) inch-square wrench nut, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.
 5. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of four (4) mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to the requirements of AWWA C550.
 6. All seals between valve parts, such as body and bonnet, bonnet and bonnet cover, shall be flat gaskets or O-rings.
 7. Valve disks shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating.
 8. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.
- B. Twenty-four (24) Inches in Diameter and Larger:
1. Valves shall be double disc type conforming to the requirements of AWWA C500.
 2. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator. Valves shall be rated for one-hundred and fifty (150) psi working pressure.
 3. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.

4. Buried valves shall be equipped with valve boxes unless access to the operator is provided by a manhole.
5. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.
6. Gate valves twenty-four (24) inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve, or approved equal.

2.09 BUTTERFLY VALVES (BV)

- A. Unless indicated on the Plans to be two-hundred and fifty- (250-) pound butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504 for Class 150B.
- B. Where butterfly valves are indicated on the Plans to be 250 pound butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504, and as modified below. Valves shall be designed for a rated working pressure of two-hundred and fifty (250) psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:
 1. The leakage test shall be performed at a pressure of two-hundred and fifty (250) psi.
 2. The hydrostatic test shall be performed at a pressure of five-hundred (500) psi.
 3. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the **County**.
- C. 150 Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12, or ASTM A126, Grade B cast iron. Shafts shall be ASTM A76, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. The valve shall have a resilient seat.
- D. 250 Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron shafts, and shaft hardware shall be ASTM A564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
- E. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
- F. Actuators:

1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured, and tested in accordance with the requirements of AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.
 2. Actuators shall be furnished with fully adjustable mechanical stop limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
 3. Valve actuators shall be capable of withstanding a minimum of four-hundred and fifty (450) foot pounds of input torque in either the open or the closed position without damage.
- G. Operators: Valves for buried service shall have a nut-type operator and shall be equipped with a valve box and stem extension, as required.
- H. Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown on the Plans. Flange joints shall meet the requirements of ANSI B16.1, Class 125.
- I. Butterfly valves shall be manufactured by Mueller (Pratt), DeZurik, or equal.
- J. All butterfly valves shall be installed in an approved structure. The structure shall meet the applicable requirements within Section 02607 Manholes, Junction Boxes, and Inlets. The structure design shall be submitted to the **County** for approval.

2.10 VALVE BOXES (VB) AND EXTENSION STEMS

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two- (2-) piece screw type with drop covers. Valve boxes shall have a five and one-quarter (5¼) inch inside diameter. Valve box covers shall weigh a minimum of thirteen (13) pounds. The valve boxes shall be adjustable to six (6) inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the United States.
- B. All valves shall be furnished with extension stems if operating nut is greater than four (4) feet deep, to bring the operating nut to within twenty-four (24) inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801 or approved equal.

2.11 VALVE MARKERS (VM)

- A. The **Contractor** shall provide a concrete valve marker as detailed on the Plans for each valve installed, except on hydrant isolation valves. Valve markers shall be stamped "WATER."

2.12 TAPPING SLEEVES AND VALVES (TS&V)

- A. Tapping sleeves for mains twelve (12) inches in diameter and smaller shall be ductile iron of the split sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.
- B. Tapping sleeves for mains larger than twelve (12) inches shall be of all stainless steel construction.
- C. The **Contractor** shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for two-hundred and fifty (250) psi.
- D. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

2.13 CORPORATION COCKS AND CURB STOPS

- A. Corporation cocks and curb stops shall be ball type, shall be made of bronze conforming to the requirements of ASTM B61 or ASTM B62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube joint. Threaded ends for inlet and outlet of corporation cocks shall conform to the requirements of AWWA C800; coupling nut for connection to flared copper tubing shall conform to the requirements of ANSI B16.26. Corporation cocks and curb stops shall be manufactured by Mueller, Ford FB-600, or equal.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES AND OBSTRUCTIONS

- A. The Plans indicate utilities or obstructions that are known to exist according to the best information available. The **Contractor** shall call the Utilities Protection Center (UPC) (800 282 7411) as required by Georgia Law (O.C.G.A. Sections 25 9 1 through 25 9 13) and shall call all utilities, agencies, or departments that own and/or operate utilities in the vicinity of the construction work site at least seventy-two (72) hours [three (3) business days] prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service:
 - 1. The **Contractor** shall provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility

locations are valid for only ten (10) days after original notice. The **Contractor** shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.

2. The **Contractor** shall expose the facility, for a distance of at least two-hundred (200) feet in advance of pipeline construction, to verify its true location and grade. The **Contractor** shall repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.
3. The **Contractor** shall avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
4. The **Contractor** shall maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The **Contractor** shall provide the **County with** an updated copy of the log biweekly, or more frequently if required by the **County**.

C. Conflict with Existing Utilities:

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying back, supporting, or temporarily suspending service of the parallel or crossing facility. The **Contractor** may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right of way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.
2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The minimum clearance shall be twelve (12) inches. The **Contractor** may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.

- D. Electronic Locator: The **Contractor** shall have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

- E. Water and Sewer Line Separation:
1. Water mains should maintain a minimum ten- (10-) foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the ten- (10-) foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of eighteen (18) inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of eighteen (18) inches.
 2. The water main, when installed below the sewer, shall be encased in concrete with a minimum six- (6-) inch concrete depth, to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.
 3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

- A. The **Contractor** shall install pipe lines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the Georgia Department of Transportation (GDOT) or applicable permitting authority and the **County** with reference to construction operations, safety, traffic control, road maintenance, and repair.
- B. Traffic Control: Shall meet the requirements of Section 01550 and as stipulated below.
1. The **Contractor** shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the Work and the safety of the public. Flagmen shall be certified by a GDOT-approved training program.
 2. Construction traffic control devices and their installation shall be in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways.
 3. Placement and removal of construction traffic control devices shall be coordinated with GDOT and the **County** a minimum of forty-eight (48) hours in advance of the activity.
 4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right of way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used

intermittently, such as “Flagmen Ahead,” shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.
6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.
7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of GDOT and the **County**. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.
8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the Manual on Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

C. Construction Operations:

1. The **Contractor** shall perform all work along highways, streets, and roadways to minimize interference with traffic.
2. Stripping: Where the pipe line is laid along road right of way, the **Contractor** shall strip and stockpile all sod, topsoil, and other material suitable for right of way restoration.
3. Trenching, Laying and Backfilling: The **Contractor** shall not open the trench any further ahead of pipe laying operations than is necessary. The **Contractor** shall backfill and remove excess material immediately behind laying operations. The **Contractor** shall complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: The **Contractor** shall reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. The **Contractor** shall replace topsoil, sod, and any other materials removed from shoulders.

5. Construction operations shall be limited to four-hundred (400) feet along areas, including clean up and utility exploration.
- D. Excavated Materials: The **Contractor** shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. The **Contractor** shall sweep all scattered excavated material off the pavement in a timely manner in accordance with Specification section 02125 – Temporary and Permanent Erosion Control.
- E. Drainage Structures: The **Contractor** shall keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff. E&S measures shall be maintained and the **Contractor** is subject to clean any storm line and MH that has received siltation.
- F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right of way and easement. The **Contractor** shall take extreme care in moving landscape features and promptly reestablish these features.
- G. Maintaining Highways, Streets, Roadways, and Driveways:
 1. The **Contractor** shall maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.
 2. During the time period between pavement removal and completing permanent pavement replacement, the **Contractor** shall maintain highways, streets, and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
 3. The **Contractor** shall furnish a road grader or front end loader for maintaining highways, streets, and roadways. The grader or front end loader shall be available at all times.
 4. The **Contractor** shall immediately repair all driveways that are cut or damaged and the **Contractor** shall maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than one-thousand (1,000) feet beyond the area in which the **Contractor** is actually working without written

permission from the **County**. The **County** reserves the right to reduce this distance to a maximum distance of two-hundred (200) feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The **Contractor** shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets, and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five (5) feet from the roadway pavement, as measured edge to edge.

3.04 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. The **Contractor** shall lay all pipe and fittings to accurately conform to the lines and grades established by the **County**.
- B. Pipe Installation:
 - 1. Pipe shall be installed in accordance with the requirements of AWWA M11, Chapter 16. Welded joints shall be in accordance with the requirements of AWWA C206.
 - 2. Sleeve-type mechanical pipe couplings shall conform to the requirements of AWWA M11.
 - 3. Unless otherwise specified, buried mechanical couplings and valves shall be field coated as shown on the Plans, specified in these Specifications, or as directed by the **County**.
 - 4. Anchorage shall be provided as shown on the Plans, specified in these Specifications, or as directed by the **County**.
 - 5. Proper implements, tools, and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of slings, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
 - 6. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be rejected by the **County** and replaced at the **Contractor** or manufacturer's expense.

7. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
 8. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time.
 9. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
 10. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
 11. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
 12. The **Contractor** shall provide detection tape for all pipe greater than twelve (12) inches in diameter. Detection tape shall be buried four (4) to ten (10) inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide three- (3-) inch-wide tape. In no case shall detection tape be buried greater than twenty (20) inches from the finish grade surface.
- C. Alignment and Gradient:
1. The **Contractor** shall lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. The **Contractor** shall not deflect any joint more than the maximum deflection recommended by the manufacturer.
 2. The **Contractor** shall maintain a transit, level, and accessories on the site of the Work to lay out angles and ensure that deflection allowances are not exceeded.
- D. Expediting of Work: The **Contractor** shall excavate, lay the pipe, and backfill as closely together as possible. The **Contractor** shall not leave un-jointed pipe in the trench overnight. The **Contractor** shall backfill and compact the trench as soon as possible after laying and jointing is completed. The **Contractor** shall backfill the installed pipe each day at the close of work and at all other times when work is not in progress. No excavation is to be left unbackfilled or unsupervised. If necessary to backfill over the end of an uncompleted pipe or accessory, the **Contractor** shall close the end with a suitable plug, either push on, mechanical joint, restrained joint, or as approved by the **County**.
- E. Joint Assembly:

1. Push-on, mechanical, flange, and restrained-type joints shall be assembled in accordance with the manufacturer's recommendations.
 2. The **Contractor** shall inspect each pipe joint within one-thousand (1,000) feet on either side of main line valves to insure one-hundred (100) percent seating of the pipe spigot, except as noted otherwise.
 3. Each restrained joint shall be inspected by the **Contractor** to ensure that it has been "homed" one-hundred (100) percent.
 4. The **Contractor** shall internally inspect each pipe joint to insure proper assembly for pipe twenty-four (24) inches in diameter and larger after the pipe has been brought to final alignment.
- F. Cutting Pipe: The **Contractor** shall cut ductile iron pipe using an abrasive wheel saw. The **Contractor** shall cut PVC pipe using a suitable saw; remove all burrs, and smooth the end before jointing. The **Contractor** shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories, and closure pieces in the correct location. Only push on or mechanical joint pipe shall be cut.
- G. Polyethylene Encasement: Installation shall be in accordance with the requirements of AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the **County**.
- H. Valve and Fitting Installation:
1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage and cracks. Defective valves shall be rejected by the **County** and replaced at the **Contractor's** or manufacturer's expense. Valves shall be closed before being installed.
 2. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified in this section for cleaning, laying and joining pipe, except that twelve- (12-) inch and larger valves shall be provided with special support, such as crushed stone, concrete pads, or a sufficiently tamped trench bottom, so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
 3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the **County**.

4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
 5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Plans or directed by the **County**, valve markers shall be installed six (6) inches inside the right of way or easement, and buried to a depth of thirty (30) inches as per Standard Detail No. W-8
- I. Air Valve Vaults:
1. The **Contractor** shall construct the vault or manhole as detailed on the Plans.
 2. The frame and cover shall be cast into the top slab. The floor drain shall be piped to vault exterior.
 3. Manholes shall be constructed such that their walls are plumb.

3.05 CONNECTIONS TO EXISTING WATER MAINS

- A. The **Contractor** shall make connections to existing pipelines with tapping sleeves and valves, unless specifically shown otherwise on the Plans. Before connecting to any existing water main, the **Contractor** shall receive approval from the **County**.
- B. Location: Before laying pipe, the **Contractor** shall locate the points of connection to existing water mains and uncover as necessary for the **County** to confirm the nature of the connection to be made.
- C. Interruption of Services: The **Contractor** shall make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The **Contractor** shall operate existing valves only with the specific authorization and direct supervision of the **County**.
- D. Tapping Sleeves:
 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 3. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached to induce a test pressure as specified in this section. No leakage shall be permitted for a period of five (5) minutes.

4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one- (1-) percent sodium hypochlorite solution.
- E. Connections Using Solid Sleeves: Where connections are shown on the Plans using solid sleeves, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line.
- F. Connections Using Couplings: Where connections are shown on the Plans using couplings, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging, and backfill.
- G. Transfer of Service: Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. All special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the **Contractor**. To minimize out-of-service time, the **Contractor** shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

3.06 THRUST RESTRAINT

- A. The **Contractor** shall provide restraint at all points where hydraulic thrust may develop.
- B. Retainer Glands: The **Contractor** shall provide retainer glands where shown on the Plans. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The **Contractor** shall furnish a torque wrench to verify the torque on all set screws that do not have inherent torque indicators.
- C. Harnessing:
 1. The **Contractor** shall provide harness rods only where specifically shown on the Plans or directed by the **County**.
 2. Harness rods shall be manufactured in accordance with the requirements of ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
 3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, the **Contractor** shall provide ninety- (90-) degree bend eye bolts.
 4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used

in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.

- D. Thrust Collars: Collars shall be constructed as shown on the Plans. Concrete and reinforcing steel shall meet the requirements set by Owner and or Engineer and Section 03300 - Cast-In-Place Concrete. Welded-on collar shall be designed to meet the minimum allowable load shown on the Plans. The welded-on collar shall be attached to the pipe by the pipe manufacturer.
- E. Concrete Blocking as required and approved by the **County**:
 - 1. The **Contractor** shall provide concrete blocking for all bends, tees, valves, and other points where thrust may develop in addition to thrust restraint as per Standard Detail No. W-36.
 - 2. Concrete shall be as specified in Section 03300 - Cast-In-Place Concrete.
 - 3. The **Contractor** shall form and pour concrete blocking at fittings as shown on the Standard Details and as directed by the **County**. The **Contractor** shall pour blocking against undisturbed earth. The **Contractor** shall increase dimensions when required by overexcavation.

3.07 INSPECTION AND TESTING

- A. All sections of the water main subject to internal pressure shall be pressure-tested in accordance with the requirements of AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion and curing of all thrust restraint and backfilling.
- B. Water used for testing mains and washing streets will be made available to the **Contractor** at the nearest existing DWM facilities. The **Contractor** shall furnish all necessary pipe or hose extensions and transportation to the point of use and exercise care in use of the water. Water used for other purposes will be supplied through a metered connection, which the **Contractor** shall obtain through the DWM Applications Office.
- C. Each segment of water main between main valves shall be tested individually.
- D. Test Preparation:
 - 1. For water mains less than twenty-four (24) inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than two and one-half (2½) feet per second, adequate to remove debris from pipe and valve seats. For water mains twenty-four (24) inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the **County**. The **Contractor** shall partially open valves to allow the water to flush the valve seat.

2. The **Contractor** shall partially operate valves and hydrants to clean out seats.
 3. The **Contractor** shall provide temporary blocking, bulkheads, flanges, and plugs as necessary, to assure all new pipe, valves, and appurtenances will be pressure tested.
 4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. The **Contractor** shall insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as shown on the Standard Details with a meter box.
 5. The **Contractor** shall fill pipeline slowly with water. The **Contractor** shall provide a suitable pump with an accurate water meter to pump the line to the specified pressure.
 6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure of the system. Where necessary, the **Contractor** shall provide temporary backpressure to meet the differential pressure restrictions.
 7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: The **Contractor** shall test the pipeline at two-hundred and fifty (250) psi measured at the lowest point for at least two (2) hours. The **Contractor** shall maintain the test pressure within five (5) psi of the specified test pressure for the test duration. Should the pressure drop more than five (5) psi at any time during the test period, the pressure shall be restored to the specified test pressure. The **Contractor** shall provide an accurate pressure gauge with graduation not greater than five (5) psi.
- F. Leakage:
1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within five (5) psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 2. The **County** assumes no responsibility for leakage occurring through existing valves.
- G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:

$$L = \frac{SD(P)1/2}{133,200}$$

Where: L = Allowable leakage, in gallons per hour
S = Length of pipe tested, in feet
D = Nominal diameter of the pipe, in inches
P = Average pressure during the test (psi, gauge)

As determined under Section 4 of AWWA C600.

- H. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results at the **Contractor's** expense.
- I. Completion: After a pipeline section has been accepted, the **Contractor** shall relieve test pressure. The **Contractor** shall record type, size, and location of all outlets on the Record Drawings.

3.08 DISINFECTING PIPELINE

- A. After successfully pressure testing each pipeline section, the **Contractor** shall disinfect in accordance with the requirements of AWWA C651 for the continuous feed method and these Specifications.
- B. Specialty **Contractor**: Disinfection shall be performed by an approved specialty **Contractor**. Before disinfection is performed, the **Contractor** shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water. The **Contractor** shall receive approval from the **County** where to dispose of chlorinated water.
- C. Chlorination:
 - 1. The **Contractor** shall apply chlorine solution to achieve a concentration of at least twenty-five (25) milligrams per liter free chlorine in new line. The **Contractor** shall retain chlorinated water for twenty-four (24) hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. Backflow preventer must be approved by the **County** prior to connection. Chlorine shall be injected no more than ten (10) feet from the beginning of the new main.
 - 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the twenty-four- (24-) hour period.
 - 3. After twenty-four (24) hours, all samples of water shall contain at least ten (10) milligrams per liter free chlorine. The **Contractor** shall rechlorinate if the required results are not obtained on all samples.
- D. Disposal of Chlorinated Water: The **Contractor** shall reduce chlorine residual of disinfection water to less than one (1) milligram per liter if discharged directly to a body of water or to less than two (2) milligrams per liter if discharged onto the ground prior to disposal. The **Contractor** shall treat water with sulfur dioxide or

other reducing chemicals to neutralize chlorine residual. The **Contractor** shall flush all lines until residual is equal to existing system.

- E. Bacteriological Testing: After final flushing and before the water main is placed in service, the **Contractor** shall collect samples from the line and have them tested for bacteriological quality in accordance with the rules of the Georgia Department of Natural Resources, Environmental Protection Division. The **County** reserves the right to collect and test the samples in the **County's** laboratory. One (1) set of samples shall be collected from every one-thousand and two-hundred (1,200) feet of water main, plus one (1) set from each end of main and one (1) set from each branch. If the test results are not acceptable, the **Contractor** shall re-chlorinate lines at its cost until required results are obtained.

3.09 PROTECTION AND RESTORATION OF WORK AREA

- A. General: The **Contractor** shall return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is completed. Restoration of streets, sidewalks, curb, and driveways shall comply with standards set by Owner and or Engineer. Restoration of off-street areas shall comply with the requirements of Section 02920 and as stipulated below.
1. The **Contractor** shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.
 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 4. The **County** shall be authorized to stop all work by the **Contractor** when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
- B. Man-Made Improvements: The **Contractor** shall protect, or remove and replace with the **County's** approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins, and other improvements that may be encountered in the Work.

- C. Cultivated Growth: The **Contractor** shall not disturb cultivated trees or shrubbery unless approved by the **County**. All such trees or shrubbery that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.
- D. Cutting of Trees: The **Contractor** shall not cut trees for the performance of the Work except as absolutely necessary and with the approval from the **County**. The **Contractor** shall protect trees that remain in the vicinity of the work from damage from equipment. The **Contractor** shall not store spoil from excavation against the trunks. The **Contractor** shall remove excavated material stored over the root system of trees within thirty (30) days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over three (3) inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the site of the Work and disposed of by the **Contractor** in a lawful manner. No stumps, wood piles, or trash piles will be permitted on the site of the Work.
- E. Disposal of Rubbish: The **Contractor** shall dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate Federal, State, and local regulatory agencies.
- F. Wetlands:
 - 1. The **Contractor** shall not construct permanent roadbeds, berms, drainage structures, or any other structures that alter the original topographic features within the easement.
 - 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the **Contractor**.
 - 3. The **Contractor** shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland, or stream that may be temporarily divided by construction.
 - 4. The **Contractor** shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

3.10 ABANDONING EXISTING WATER MAINS

- A. General: The **Contractor** shall abandon in place all existing water main segments indicated on the Plans to be abandoned. The **Contractor** shall perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. The **Contractor** shall

salvage for the **County** existing fire hydrants, valve boxes, valve markers, and other materials located on the abandoned water mains.

- B. Capping and Plugging: The **Contractor** shall disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is directed by the **County**. The **Contractor** shall provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. The **Contractor** shall seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum six- (6-) inch cover of concrete on all sides around the end of the pipe. The **Contractor** shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged. The abandoned pipeline shall be filled with flowable fill if directed by the **County**.
- C. Salvaging Materials: The **Contractor** shall salvage existing fire hydrants, valve boxes, valve markers, and other materials located of water mains abandoned and deliver salvaged items in good condition to the **County's** storage yard. The **Contractor** shall coordinate delivery and placement of salvaged materials in advance with the **County**.
- D. Pavement Removal and Replacement: The **Contractor** shall perform any necessary pavement removal and replacement in accordance with Standard Detail No. W-43 and Section 02510 - Pavement Repairs.

+++ END OF SECTION 02665 +++

SECTION 02665T WATER TRANSMISSION MAINS AND ACCESSORIES

PART 1 - GENERAL

1.01 SCOPE

- A. The work included under this section includes providing all labor, materials, equipment, tools, and incidentals required for a complete installation of water transmission mains and accessories as shown on the Plans and as specified in this section.
- B. The **Contractor** shall supply all products and perform all work in accordance with applicable American Society for Testing and Material (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI), Steel Structures Painting Council (SSPC), and other recognized standards. Latest revisions of all standards are applicable.
- C. Water transmission mains, valves, hydrants, and appurtenances shall be installed before the installation of the sub-base course or paving or any other utilities.
- D. All water system products and materials shall be submitted for approval by the **County**. Each shall meet all design and operating requirements of the **County**.
- E.. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 01550 - Traffic Regulation
 - 3. Section 02140 - Dewatering
 - 4. Section 02324 - Trenching and Trench Backfilling
 - 5. Section 02510 - Pavement Repairs
 - 6. Section 02521 - Concrete Curbs and Sidewalks
 - 7. Section 02920 - Site Restoration

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:
 - 1. Complete product data and engineering data, including shop drawings.
 - 2. Documentation that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least ten (10) years.
 - 3. Written certification to the **County** that all products furnished comply with all applicable requirements of these Specifications

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
1. ANSI A21.4 (AWWA C104) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
 2. ANSI B16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
 3. ASTM C150 - Standard Specification for Portland Cement.
 4. ASTM G62 - Test Methods for Holiday Detection in Pipeline Coatings.
 5. AWWA C104 (ANSI A21.4) - Cement Mortar Lining for Ductile Iron and Gray Iron Pipe and Fittings, for Water and Other Liquids.
 6. AWWA C110 (ANSI A21.10) - Ductile Iron and Gray Iron Fittings, 3-in. through 48-in., for Water and Other Liquids.
 7. AWWA C111 (ANSI A21.11) - Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.
 8. AWWA C150 (ANSI A21.50) - Thickness Design of Ductile Iron Pipe.
 9. AWWA C151 (ANSI A21.51) - Ductile Iron Pipe, Centrifugally Cast for Water and Other Liquids.
 10. AWWA C153 (ANSI A21.53) - Ductile Iron Compact Fittings, 3-in. through 24-in. and 54-in. through 64-in., for Water Service.
 11. AWWA C600 - Installation of Ductile Iron Water Mains and Their Appurtenances.
 12. AWWA C606 - Joints, Grooved and Shouldered Type.
 13. AWWA C651 - Disinfecting Water Mains.
 14. SSPC-SP6 - Steel Structures Painting Council, Commercial Blast Cleaning.
 15. Other ANSI, ASTM and AWWA specifications referenced herein.

1.04 TRANSPORTATION AND HANDLING

- A. Unloading: The **Contractor** shall furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves, and accessories. The **Contractor** shall make equipment available at all times for use in unloading. The **Contractor** shall not drop or dump materials. All materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against the pipe on the ground.
- B. Handling: The **Contractor** shall handle pipe, fittings, valves, and accessories carefully to prevent shock or damage. The **Contractor** shall handle pipe by rolling on skids, forklift, or front-end loader. The **Contractor** shall not use material damaged in handling. Slings, hooks, or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior coatings or internal lining of the pipe.

1.05 STORAGE AND PROTECTION

- A. The **Contractor** shall store all pipe that cannot be distributed along the route. The **Contractor** shall make arrangements for the use of suitable storage areas.

- B. Stored materials shall be kept safe from damage. The interior of all pipe, fittings, and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in a manner that will protect them from damage by freezing.
- C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two (2) rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.
- D. Stored mechanical and push-on joint gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.
- E. Mechanical-joint bolts shall be handled and stored in such a manner that will ensure proper use with respect to types and sizes.

1.06 WATER MAIN LOCATION

- A. The minimum depth of cover shall be four (4) feet and the maximum cover shall be five (5) feet. All deviations must be specifically approved by the **County**.
- B. The installation of a water main parallel to another utility in the same vertical plane is not permitted (i.e., “stacking” of utilities is not permitted).

PART 2 - PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Ductile iron pipe shall be manufactured in accordance with the requirements of AWWA C151. All pipe, except specials, shall be furnished in nominal lengths of eighteen (18) to twenty (20) feet. Sizes will be as shown on the Plans. All pipe shall have a minimum pressure rating as indicated in the following table, and corresponding minimum wall thickness, unless otherwise shown on the Plans, specified in these Specifications, or approved by the **County**

Pipe Sizes (inches)	Pressure Class (psi)
4 – 12	350
14 – 18	350
20	300
24	250
30 – 54	200
60 – 64	200

- B. Ductile Iron Pipe and fittings shall be cement lined in accordance with the requirements of AWWA C104. A seal coat over the cement lining is not required. Pipe and fittings shall be furnished with a bituminous outside coating.

- C. Fittings shall be ductile iron and shall conform to the requirements of AWWA C110 or AWWA C153 with a minimum rated working pressure of two-hundred and fifty (250) psi.
- D. Malleable iron threaded fittings and appurtenances shall conform to the requirements of ASTM A47, ASTM A197, or ANSI B16.3
- E. Unless otherwise specified, steel fittings and appurtenances shall conform to the requirements of ASTM A234, ASTM A105, or ANSI B16.11; and fabricated steel fittings and appurtenances shall conform to the requirements of AWWA C208.
- F. Fittings for grooved end piping systems shall be full flow cast fittings, steel fittings, or segmentally welded fittings with grooves or shoulders designed to accept grooved end couplings. Cast fittings shall be cast of ductile iron conforming to the requirements of ASTM A536 or malleable iron conforming to the requirements of ASTM A47. Standard steel fittings, including large size elbows, shall be forged steel conforming to the requirements of ASTM A106. Standard segmentally welded fittings shall be fabricated of Schedule 40 carbon steel pipe.
- G. Joints:
 - 1. Unless shown or specified otherwise, joints for ductile iron pipe shall be push-on or restrained joint type for pipe and standard mechanical, push-on, or restrained joints for fittings. Push-on and mechanical joints shall conform to the requirements of AWWA C111.
 - 2. The only acceptable restrained joint systems for ductile iron pipe are identified in the Table below. Unless approved by the **County** No field welding of restrained joint pipe will be allowed.

Acceptable Restrained Joints				
Size	ACIPCO	U.S. Pipe	McWane	Generic⁽¹⁾
4 – 12	Fast-Grip Flex-Ring	TR Flex Field Lok, (Mueller)	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 – 24	Fast-Grip Flex-Ring	TR Flex Field Lok, (Mueller)	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 – 36	Flex-Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 – 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 – 64	Lok-Ring	TR Flex	N/A	N/A

- (1) Fittings and valves only, and only where specifically allowed.
 3. Restrained joint pipe (RJP) on supports shall have bolted joints and shall be specifically designed for clear spans of at least thirty-six (36) feet.
 4. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
- H. The **Contractor** shall provide the appropriate gaskets for mechanical and flange joints. Gaskets for flange joints shall be made of one-eighth ($\frac{1}{8}$) inch thick, cloth reinforced rubber; gaskets may be ring type or full-face type.
- I. Bolts and Nuts:
1. The **Contractor** shall provide the necessary bolts for connections. All bolts and nuts shall be threaded in accordance with the requirements of ANSI B1.1, Coarse Thread Series, Class 2A external and 2B internal fit. All bolts and nuts shall be made in the U.S.
 2. Bolts and nuts for mechanical joints shall be Tee Head Bolts and nuts of high strength low-alloy steel in accordance with the requirements of ASTM A242 to the dimensions shown in AWWA C111/ANSI A21.11.
 3. Flanged joints shall be bolted with through stud or tap bolts of required size as directed. Bolt length and diameter shall conform to the requirements of ANSI/AWWA C115 for Class 125 flanges shown in ANSI/ASME B16.1.
 4. Bolts for exposed service shall be zinc plated, cold pressed, steel machine bolts conforming to the requirements of ASTM A307, Grade B. Nuts for exposed service shall be zinc plated, heavy hex conforming to ASTM A 563. Zinc plating shall conform to the requirements of ASTM B633, Type II.
 5. Bolts for submerged service shall be stainless steel machine bolts conforming to the requirements of ASTM A193, Grade B8. Nuts shall be heavy hex, stainless steel conforming to the requirements of ASTM A194, Grade 8.
- J. Mechanical joint glands shall be ductile iron.
- K. Welded Outlet: Welded outlets may be provided in lieu of tees or saddles on mains with a diameter greater than or equal to twenty-four (24) inches. The pipe joint on the outlet pipe shall meet the joint requirements specified above. The minimum pipe wall thickness of the parent pipe and the outlet pipe shall be Special Thickness Class 53 [Pressure Class 350 for sixty (60) and sixty-four (64) inch sizes]. The welded outlet shall be rated for two hundred and fifty (250) psi working pressure. Each welded outlet shall be hydrostatically tested at five hundred (500) psi. The welded outlet shall be fabricated by the manufacturer of the parent pipe. The maximum outlet diameters shall not exceed those listed in the Table below:

Maximum Outlet Diameters	
Parent Pipe Diameter, Inches	Maximum Outlet Diameter, Inches
24	16
30	20
36	24
42	30
48	30
54	30
60	30
64	30

- L. Ductile iron pipe shall be encased with polyethylene film where shown on the Plans. Polyethylene film shall be in accordance with the requirements of AWWA C105.
- M. Thrust collars shall be welded-on ductile iron body type designed to withstand thrust due to two-hundred and fifty (250) psi internal pressure on a dead end.
- N. Acceptance will be on the basis of the **County's** inspection and the manufacturer's written certification that the pipe was manufactured and tested in accordance with the applicable standards.
- O. Pipe Lining
 - 1. Cement Mortar: Unless otherwise specified, pipe and fittings shall be lined with cement mortar as specified in AWWA C205. Fittings and specials larger than twenty-four (24) inches not fabricated from centrifugally lined straight sections, shall require two (2) inches by four (4) inches by thirteen- (13-) gauge self-furring wire mesh reinforcement for hand-applied lining.
- P. Pipe Coating
 - 1. Epoxy: Unless otherwise specified, pipe and fittings shall be coated with a liquid epoxy as specified in AWWA C210 with the following requirements:
 - a. No Coal tar products shall be incorporated in the liquid epoxy.
 - b. The curing agent may be an amidoamine as well as the other curing agents listed in AWWA C210
 - c. The coating shall be applied to a minimum thickness of sixteen (16) mils in not less than two (2) coats.

- d. Polyethylene tape: Where shown on the Plans or directed by the **County**, pipe and fittings shall be coated and wrapped with prefabricated multi-layer cold applied polyethylene tape coating in accordance with the requirements of AWWA C214. The coating application shall be a continuous step operation in conformity with the requirements of AWWA C214, Section 3. The total coating thickness shall be not less than fifty (50) mils for pipe twenty-four (24) inches and smaller and not less than eighty (80) mils for pipe twenty-six (26) inches and larger.

Q. Piping Appurtenances

1. Retainer Glands:

- a. Retainer glands shall be Megalug Series 1100, as manufactured by EBAA Iron, Uni-Flange Series 1400 or equal, as manufactured by Ford Meter Box Company.
- b. Retainer glands shall be provided at all mechanical joints, including fittings, valves, hydrants, and other locations as shown on the Plans.

R. Hydrant Tees: Hydrant tees shall be equal to ACIPCO A10180 or U.S. Pipe U-592.

S. Anchor Couplings: Lengths and sizes shall be as shown on the Plans. Anchor couplings shall be equal to ACIPCO A 10895 or U.S. Pipe U-591.

T. Hydrant Connector Pipe: The connector pipe shall be ductile iron meeting the requirements of AWWA C153; twenty-four- (24-) inch offset design so that the hydrant can be adjusted to ensure placement at the proper grade; shall have an anchoring feature at both ends so that when used with M.J. split glands a restrained joint is provided; cement lined in accordance with AWWA C104 and equal to the GradeLok as manufactured by Assured Flow Sales, Inc., Sarasota, Florida.

U. Tapping Saddles: Tapping saddles shall not be used unless approved by the **County**

V. Detection Tape: Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. Tapes shall be color coded in accordance with APWA color codes with the following legends: Water Systems, Safety Precaution Blue, "Caution Water Line Buried Below". Colors may be solid or striped. Tape shall be permanently printed with no surface printing allowed. Tape width shall be a minimum of two (2) inches when buried less than ten (10) inches below the surface. Tape width shall be a minimum of three (3) inches when buried greater than ten (10) inches and less than twenty (20) inches. Detection tape shall be equal to LineGuard Type III Detectable or Allen Systems Detectatape.

2.02 WELDED STEEL PIPE

- A. Conform to AWWA C200 and AWWA C208, except where modified and supplemented by these Specifications.
- B. COATING
 - 1. Exterior: System No. 8, Buried Metal: General, as specified by Owner and or Engineer. The plain ends of the pipe shall be coated with System No. 1 as specified by Owner and or Engineer. System No. 1 coating shall extend a minimum of 4 inches and a maximum of six (6) inches from the pipe end.
 - 2. Interior: System No. 1, Submerged Metal: Potable Water, as specified by Owner and or Engineer.
- C. Pipe furnished in accordance with AWWA C200, Section 2.1, shall be fabricated from ASTM A570, Grade 40 steel, or equal.
- D. Diameter and Wall Thickness
 - 1. The pipe and fittings shall be furnished to the nominal diameters shown on the Drawings and in accordance with AWWA M11. The pipe and fittings shall have the minimum wall thicknesses shown in the Table below.

Minimum Wall Thickness	
Nominal Diameter (Inches)	Wall Thickness (Inches)
24 and Smaller	1/4
26 through 36	3/8
38 through 60	1/2

- E. Joints
 - 1. Joints shall be in accordance with AWWA C200 and AWWA M11. Joints shall be plain-end, butt-welded, or flanged, as shown on the Drawings.
 - 2. Plain End: Join using flexible couplings and thrust tie rods.
 - 3. Welded Joints:
 - a. All welded joints and materials shall be in conformance with AWWA C206. Submit detailed design of all proposed welded joints to the **County** for review and approval prior to field installation.
 - 4. The coatings of pipe and fittings to be field-welded shall have a holdback of a minimum of four (4) inches and a maximum of six (6) inches on each side of the field welds.

G. Flanges:

1. Flanges, where required, shall be steel hub flanges, conforming to AWWA C207, Class E. All flanges shall be faced and drilled to ANSI B16.1, Class 125. Bolt holes for insulating flanges will require oversizing for insulating sleeves.
2. All nuts, bolts, and gaskets required for joining the flanged pipe, fittings, and appurtenances shall meet the requirements of AWWA C207 and ANSI B16.1. Gaskets shall be cloth-inserted rubber, one-eighth (1/8) inch thick, in one piece, fullcut with holes to pass the bolts. Segmented, straight joint or interlocking gaskets shall not be accepted.

H. Fittings

1. Fittings shall be fabricated in accordance with the details shown on the Drawings and shall be fabricated of a minimum of the same gauge material as that of the adjacent straight pipe section and in accordance with applicable parts of AWWA C200. Reinforcement fittings is required. Some reinforcement is shown on the Drawings. Reinforcement of fittings shall be designed and located in accordance with AWWA M11. Weldolets shall be provided for taps, where required. Where dimensions of specials and fittings are not shown, they shall be in conformance with AWWA C208.
2. Thrust tie lugs shall be welded to pipe by manufacturer prior to the application of the protective coatings.

- I. Hydrostatic Test of Pipe and Fittings: Fabricated pipe and fittings shall be subjected to a 250-psig hydrostatic test pressure by the manufacturer. Testing procedures shall be in accordance with AWWA C200.

J. Feeler Gauge

1. Furnish sufficient feeler gauges for use throughout the complete project.

K. Flexible Couplings

1. Flexible couplings shall be wrought steel capable of withstanding the designated internal pressure without leakage or overstressing. Middle ring shall include center stops where shown.
2. Steel flexible couplings shall be as manufactured by Rockwell International, Inc.; Dresser Manufacturing Division of Dresser Industries, Inc.; or approved equal. All couplings shall have stainless steel bolts and nuts of adequate strength for the service and shall be fully restrained. All couplings shall be coated with System No. 29, Fusion Bonded Coating, as specified by Owner and or Engineer. Flexible coupling shall be Rockwell No. 411 or Dresser No. 38.

3. Middle ring length shall be seven (7) inches for pipes through thirty (30) inches in diameter and ten (10) inches for pipes larger than thirty (30) inches in diameter. Gaskets shall be Buna-N or the equivalent as approved, except special gaskets shall be used in certain buried areas as shown on the Drawings. Special gasket material shall meet the requirements of AWWA C11 and be fluorocarbon elastomer rubber such as Viton or Fluorel.

L. Joint Harness

1. Joint harness shall be used where thrust ties are indicated and at all flexible couplings unless otherwise shown. The joint harness shall be of adequate strength to prevent movement of the joint with 250 psi internal pressure on the pipe. The harness design shall be as shown on the Drawings. Joint harness lugs shall be coated with System No. 8, Buried Metal - General, as specified by Owner and or Engineer. Tie rods and nuts shall be coated with System No. 29, Fusion Bonded Coating, as specified by Owner and or Engineer.

M. Concrete for Thrust Blocking or Pipe Encasement

1. Concrete for thrust blocking shall be in conformance with Section 03300 – Cast-In-Place Concrete.

N. Field Touchup Materials

1. Field touchup materials shall be furnished as necessary to make repairs to the coatings. Materials and methods shall conform to the manufacturer's recommendations.

O. Linings and Coatings

1. Cement-Mortar Lining
 - a. Interior surface of all steel pipe, fittings, and specials shall be lined in the shop with cement-mortar lining applied centrifugally and conforming with AWWA C205.
 - b. Holdbacks shall be left bare and be provided as shown on the approved shop drawings. Holdbacks shall be filled with cement mortar after joint completion per ASSW C205.
 - c. Defective linings as identified in AWWA C205 shall be removed from the pipe wall and shall be replaced to the full thickness required. Defective linings shall be cut back to a square shoulder in order to avoid feather edged joints.
 - d. Fittings shall be cement-mortar lined per AWWA C205. Pipe and fittings too small to cement-mortar line may be lined with AWWA C210 epoxy or AWWA C222 polyurethane.

- e. Cement-mortar lining shall be kept moist during storage and shipping. The **Contractor** shall provide a polyethylene or other suitable bulkhead on the ends of the pipe and on all special openings to prevent drying out the lining. All bulkheads shall be substantial enough to remain intact during shipping and storage until the pipe is installed.
2. Polyethylene Tape Coating
 - a. The prefabricated multi-layer cold applied tape coating system for straight-line pipe shall be in accordance with AWWA C214. The system shall consist of a three-layer system totaling 80 mils.
 - b. An acceptable alternate is a two-layer extruded polyolefin coating system in accordance with AWWA C215.
 3. Coating of Fittings, Specials, and Joints
 - a. Fittings, specials and joints that cannot be machine coated, shall be coated in accordance with AWWA C209. Prefabricated tape shall be Type II and shall be compatible with the tape system used for straight-line pipe. The system shall consist of two (2) layers totaling seventy (70) mils.
 - b. Alternate coating methods for fittings, specials and field joints are shrink sleeves per AWWA C216, liquid epoxy per AWWA C210, or polyurethane per AWWA C222.
 - c. Joint bonds shall be completely encapsulated by the coating system as per manufacturer's recommendations.
 - d. Coating repair for fittings and specials shall be in accordance with the procedure described below for straight-line pipe.
 4. Coating repair shall be made using tape and primer conforming to AWWA C209 Type II and manufacturer's recommendations. The tape and primer shall be compatible with the tape system used for straight-line pipe.
 - a. An alternative repair method shall be to install heat shrink sleeves in accordance with AWWA C216 and manufacturer's recommendations.
- P. Fusion Epoxy Coating and Lining
1. Where shown on the Plans or directed by the **County**, steel pipe and fittings shall be fusion epoxy coated and lined. The fusion epoxy coating shall be 3M Scotchkote 203, or equal, approved by the **County**. Surface preparation shall be in accordance with the requirements of SSPC-SP 10 near white blast cleaning. The application method shall be by the fluidized bed method and shall attain twelve (12) mils minimum dry film thickness.

2. Field welds, connections, and otherwise damaged areas shall be coated and patched according to the manufacturer's instructions with 3M Scotchkote 306.

2.02 Prestressed Concrete Cylinder Pipe and Fittings

- A. Unless otherwise specified, the design materials and workmanship for pipe shall conform to the requirements of AWWA C301. Core and coating thickness for pipe shall be as specified in AWWA C301.
- B. Design Conditions
 1. Pipe shall be designed in accordance with the AWWA C304 Standard, using the following design conditions; these conditions shall also be used in designing fittings that include a Portland cement mortar interior and exterior coating of the steel cylinder.
 2. External Loading

The earth load shall be taken as the greater of the following:
Depth from existing ground level to top of pipe as shown on plans, or
Five feet minimum in all cases.

Earth loads shall be computed assuming the trench width that gives the maximum load on the pipe (transition width) for the following parameters:

Unit Soil Weight = one hundred twenty (120) pounds per cubic foot

TYPE R 5 Bedding

Bedding angle = 150°

Live loads shall be calculated as:

Pipe in streets and other paved areas: AASHTO HS-20 for two (2) tandem dump trucks maximum load passing

Pipe within railroad right-of-way: AREA Cooper E-80

Both HS-20 and E-80 live loads shall be computed in accordance with the *American Concrete Pipe Association* "Concrete Pipe Design Manual" or "Concrete Pipe Handbook".

Internal Pressure

Design working pressure (P_w) shall be one hundred fifty (150) psi

Surge Pressure (P_t) shall be one hundred (100) psi.

Field Test Pressure (P_{ft}) shall be two hundred fifty (250) psi.

3. Fittings
Steel thickness of all fittings shall be designed in accordance with Chapter 8 of the AWWA M9 Manual. Fittings shall be designed for the same conditions as the adjacent pipe.

Fabrication of the fittings shall be as per AWWA M9 Manual and C301.

Interior and exterior concrete/mortar coating shall be as per AWWA C301.

The date of manufacture or a serial number traceable to the date of manufacture and the design strength classification shall be clearly marked by stencil with waterproof paint at the end of the pipe barrel. Unsatisfactory or damaged pipe will be permanently rejected, repaired in the field if permitted by the **County**, or returned for minor repairs. Pits, blisters, rough spots, minor concrete or mortar breakage, and other imperfections may be repaired unless prohibited by the **County**. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of three thousand (3,000) psi at the end of seven (7) days and four thousand five hundred (4,500) psi at the end of twenty-eight (28) days, when tested in cylinders stored in the standard manner.

Major breakage or spalling from interior of pipe may be reason for the rejection of pipe. Pipe may be repaired under unloaded conditions (removal of prestressing wire). Cement mortar used for repair shall have a minimum compressive strength of three thousand (3,000) psi at the end of seven (7) days and four thousand five hundred (4,500) psi at the end of twenty-eight (28) days when tested as standard cylinders. New prestressing wire may be applied when the compressive strength as determined by cylinder testing equals or exceeds the strength required for prestressing as stated in AWWA C301.

Cement shall be Type II and shall be in accordance with ASTM C150.

The pipe core shall be manufactured by the centrifugal method or the vertical casting method.

Wire shall be a minimum of No.6 gauge and shall meet the requirements of ASTM A648, Class III. Wire of a class strength greater than Class III will not be permitted.

Steel cylinders shall be No. 16 gauge minimum and shall be hot rolled.

Mortar coating shall consist of one part cement to a maximum of three parts fine aggregate by weight. Rebound not to exceed one fourth of the total mix weight may be used provided the rebound is treated as fine aggregate.

Bell and spigot joint rings shall be steel, self-centering type, and otherwise specified in AWWA C301. Surfaces of the joint rings that will be exposed after fabrication is complete shall receive a zinc metalized coating of 4 mils thickness (0.004). In areas of the alignment where the pipe will be subject to unbalanced hydrostatic

thrust forces (bends, tees, bulkheads, wyes, and valves), the pipe joints shall be mechanically restrained (harnessed).

The maximum longitudinal stress in the steel cylinder of harnessed pipe sections shall not exceed thirteen-thousand five hundred (13,500) pounds per square inch when subjected to the internal working pressure or seventeen-thousand (17,000) pounds per square inch when subjected to the test pressure and shall be based on the deflection angle as described in the AWWA M9 Manual. The steel cylinder thickness in pipe sections between the location of the maximum thrust force and the end of the harnessed section can be prorated on the basis of zero longitudinal thrust at the end of the harnessed section.

Two acceptable types of harnessed or restrained joints are the harness clamp and Snap Ring® types of flexible restrained joints. The clamp type consists of two semicircular steel clamps that fit over steel lugs that are factory welded or rolled into the steel bell and spigot sections. The semicircular clamps are drawn together by bolts at the springline on both sides of the pipe to form a flexible restrained joint.

The Snap Ring® type of flexible restrained joint consists of a split steel ring that is recessed in the special steel bell section of the pipe until the joint is made. Once the joint is made, the split steel ring is drawn down into position to form a lock between the bell and spigot by tightening a single steel bolt.

Both joint types shall be capable of transmitting the longitudinal thrust forces due to working pressure and test pressure and must be encased in grout after the joint has been completed and before the line is pressurized using special grout bands supplied by the pipe manufacturer.

Field welding of the joints for restraint during initial installation will not be allowed except where connecting to existing pipe or where follower ring closure assemblies are installed into restrained joint areas unless otherwise permitted by the **County**.

The rubber gaskets shall be in accordance with AWWA C301 and shall be designed and manufactured so that the completed joint will withstand an internal water pressure in excess of the highest pressure to which the pipe will be subjected without showing any leakage by the gasket or displacement of it.

Bell and spigot wall fittings shall be manufacturer's standard design. Wall fittings shall be supplied with adequate bracing to keep them round and true during transportation and installation.

Alignment for long-radius, curved sections as specified on the drawings may be produced by joint deflections of standard joints not to exceed that recommended by the manufacturer. Deflections

required which are in excess of those recommendations shall be produced by beveling the spigot ends of the pipe.

No work shall be performed on any PCCP without approval from the **County**.

2.06 FIRE HYDRANTS

- A. General: Fire hydrant shall be a two- (2-) piece standpipe and stem, compression shutoff, dry-barrel type. Fire hydrant shall conform to the requirements of AWWA C502 and shall be listed by Underwriters Laboratories, Inc. in accordance with the requirements of UL 246.
- B. Acceptable Products: Fire hydrants shall be American Valve and Hydrant B-62-B, M & H 129T, Mueller Super Centurion 250-AWB, A-423, Kennedy K81A, U.S. Metropolitan 250, or approved equal .
- C. Product Data: The following information shall be provided to the **County**:
 - 1. Affidavit of compliance with the requirements of AWWA C502.
 - 2. Records of standard tests.
- D. Manufacture:
 - 1. Fire hydrant shall be cast iron traffic, three- (3)-way four and one-half- (4½-) inch valve, and left opening type.
 - 2. Internal main valve diameter shall be a minimum of five and one-quarter (5¼) inches.
 - 3. Each hydrant shall have the name of the manufacturer, the year of manufacture and the nominal size in legible, raised letters cast on the barrel or bonnet.
 - 4. Each hydrant shall be constructed with a moist-proof lubricant chamber that encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. The bonnet shall have "O" ring packing and reservoir capable of utilizing oil or grease so that all operating parts are enclosed in the lubricant.
 - 5. Operating nut shall be bronze, 7/8 inch tapered square nut with tamper-proof device. The direction "opening left" shall be marked on a special tamper-proof device. The tamper-proof device shall be a combination fold-down nut for the op-nut. Hydrant shall have ductile iron combination hold-down nut and operating nut shield to eliminate operation of hydrant with wrenches other than a special socket-type wrench. Arrow shall be cast on the outside of the periphery of the operating nut shield indicating direction of the operation for opening the hydrant.

6. The hydrant barrel section shall be connected at the ground line in a manner that will prevent damage to the hydrant when struck by a vehicle. The main valve rod section shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.
7. The hydrant main valve shall be made of synthetic rubber and formed to fit the valve seat accurately. The hydrant valve shall be made from material that will resist damage from rocks or other foreign matter. The valve shall be reversible. The hydrant shall be a true compression type, opening against pressure and closing with pressure.
8. The hydrant main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze-to-bronze thread engagement. Two (2) "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained to allow without the employment of torque of torque compressed gaskets. The hydrant shall be designed to allow the removal of all operating parts through the hydrant barrel by means of a single, lightweight disassembly wrench without excavating.
9. The drain mechanism shall be designed to operate with the operation of the main valve and shall allow a momentary flushing of the drain ports. A minimum of two (2) internal and two (2) external bronze-lined drain pots shall be required in the main valve assembly to drain the hydrant barrel.
10. Cast iron inlet elbows shall have a six- (6-) inch mechanical joint connection complete with accessories.
11. Barrel extension sections shall be available in six- (6-) inch increments complete with rod, extension, coupling and the necessary flanges, gaskets and bolts, so that extending the hydrant can be accomplished without excavating. Hydrants shall have letters "AWB" cast in the barrel for identification purposes. Bury mark of fire hydrant shall be cast on barrel of the hydrant.
12. Hydrant shall have two (2) two and one-half- (2½-) inch hose nozzles one-hundred and twenty (120) degrees apart and one (1) four and one-half- (4½-) inch pumper nozzle. The threads shall be national standard threads. The nozzle caps shall be secured to fire hydrant with non-kinking type chain loop on cap ends to permit free turning of caps.
13. Bolts and nuts shall be corrosion resistant.
14. Hydrants shall be designed with safety flange to protect the barrel and stem from damage and to eliminate flooding of area when hydrant is struck or knocked off by vehicular equipment or other objects.

E. Setting Hydrants:

1. Hydrants shall be placed at the locations indicated on the Plans in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians will be minimized. The contractor shall install proper "bury" hydrants or shall use, at no cost to the **County**, proper length extensions to ensure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of these Specifications. When placed behind curb, the hydrant barrel shall be set such that no portion of the pumper or hose nozzle caps will be less than six (6) inches, nor more than twelve (12) inches from the gutter face of the curb. The contractor shall place gravel as shown on the Plans. All pipe connecting the fire hydrant to the main line shall be ductile iron pipe meeting the requirements of these Specifications or approved connecting pieces.
2. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main shall be through either a ductile iron tee or a tapping sleeve and shall include an outlet valve at the point of connection. Using a tapping sleeve where the Plans indicate a tee shall not result in any additional costs to the **County**.

F. Connection to main: Each fire hydrant shall be connected to the main with a six (6) inch ductile iron branch connection. Gate valves shall be used on fire hydrant branches unless otherwise specified.

G. Drainage: Stone no larger than four (4) inches in diameter shall be placed around the base of the fire hydrant for a depth of thirty (30) inches from the bottom of the trench and shall extend for a distance of thirty (30) inches from the back of the hydrant toward the main.

H. Anchoring and Bracing: The shoe of each fire hydrant shall be braced against unexcavated earth at the end of the trench with stone slabs or poured concrete; or it shall be tied to the pipe with suitable metal tie rods or clamps or both, as directed by the **County**. The straps and rods, nuts and threads, used for anchoring shall be coated with protective materials at the end of installation.

I. Painting, Coating, and Lubricating:

1. All iron parts of the hydrant inside and outside shall be cleaned and thereafter, unless otherwise stipulated, all surfaces, except the exterior portion above the ground line, shall be coated or painted with, or dipped in an asphalt or bituminous base paint or coating. If these parts are painted, they shall be covered with two (2) coats, the first being allowed to dry thoroughly before the second coat is applied.

2. The outside of the hydrant valve above the finished ground line shall be thoroughly cleaned and thereafter painted in the shop with two (2) coats of Koppers primer 621 or approved equal. After installation, each hydrant shall be painted with two (2) field coats of Koppers Glamortex Enamel as manufactured by the Sika Inertol Company, or approved equal; color shall be silver. The top cap of each hydrant shall be painted in one of the following colors to indicate the main size: six- (6-) inch or eight- (8-) inch mains shall be silver; ten- (10-) inch or twelve- (12-) inch mains shall be yellow; and sixteen- (16-) inch or greater mains shall be green.
 3. All bronze, threaded contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rustproof compound to prevent damage in shipment and storage.
- J. Accessories: The **Contractor** shall furnish one (1) standard four- (4-) sided hydrant wrench for each ten (10) hydrants installed or fraction thereof.
- K. Testing: All fire hydrants shall be tested in strict accordance with the requirements of AWWA C502, with no additional cost to the **County**. Certificate of Compliance shall be furnished to the **County**.

2.08 GATE VALVES (GV)

- A. Twenty (20) Inches in Diameter and Smaller:
1. Gate valves shall be resilient-seated type conforming to the requirements of AWWA C509 or AWWA C515.
 2. Valves through twelve (12) inches in diameter shall have a minimum rated working pressure of two hundred (200) psi. Sixteen- (16-) inch and twenty- (20-) inch valves shall have a minimum rated working pressure of one-hundred and fifty (150) psi.
 3. Valves less than four (4) inches in diameter shall have threaded ends. Larger valves shall be mechanical joint unless shown otherwise on the Plans.
 4. Valves shall be non-rising stem type with a two- (2-) inch square wrench nut, and shall open left. The manufacturer shall provide an affidavit of compliance with the applicable AWWA standards.
 5. All internal ferrous surfaces shall be coated with epoxy to a minimum thickness of four (4) mils. The epoxy shall be non-toxic, impart no taste to the water and shall conform to the requirements of AWWA C550.
 6. All seals between valve parts, such as body and bonnet, bonnet- and bonnet cover, shall be flat gaskets or O-rings.
 7. Valve disks shall be made of cast or ductile iron having a vulcanized, synthetic rubber coating.

8. Valves shall be manufactured by American Flow Control, Mueller, or M & H Valve.
- B. Twenty-four (24) Inches in Diameter and Larger:
1. Valves shall be double-disc type conforming to the requirements of AWWA C500.
 2. Valves shall be designed for horizontal installation with tracks and rollers, bypass valves, and bevel gear type operator. Valves shall be rated for one-hundred and fifty (150) psi working pressure.
 3. Valve ends shall be mechanical joint type except where restrained joint ends are shown. Flanged joints shall meet the requirements of ANSI B16.1, Class 125.
 4. Buried valves shall be equipped with valve boxes unless access to the operator is provided by a manhole.
 5. Manually operated valves, including geared valves, shall be non-rising stem type having O-ring seals.
 6. Gate valves twenty-four (24) inches in diameter and larger shall be manufactured by American R/D Gate Valve Company, Mueller, M & H Valve or equal.

2.09 BUTTERFLY VALVES (BV)

- A. Unless indicated on the Plans to be two-hundred and fifty 250-pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504 for Class 150B.
- B. Where butterfly valves are indicated on the Plans to be 250 pound valves, butterfly valves shall be resilient seated, short body design, and shall be designed, manufactured, and tested in accordance with the requirements of AWWA C504, and as modified below. Valves shall be designed for a rated working pressure of two-hundred and fifty (250) psi. Class B, AWWA C504 Section 5.2 testing requirements are modified as follows:
1. The leakage test shall be performed at a pressure of two-hundred and fifty (250) psi.
 2. The hydrostatic test shall be performed at a pressure of five-hundred (500) psi.
 3. Proof of design tests shall be performed and certification of such proof of design test shall be provided to the **County**.
- C. 150-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts shall be ASTM A76, Type 304 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. The valve shall have a resilient seat.

- D. 250-Pound Valves: Valve bodies shall be ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12 or ASTM A126, Grade B cast iron. Shafts and shaft hardware shall be ASTM A564, Type 630 stainless steel, machined and polished. Valve discs shall be ductile iron, ASTM A536, Grade 65-45-12. The resilient valve seat shall be located either on the valve disc or in the valve body and shall be fully field adjustable and field replaceable.
- E. Valves shall be installed with the valve shafts horizontal. Valves and actuators shall have seals on all shafts and gaskets on valve actuator covers to prevent the entry of water. Actuator mounting brackets shall be totally enclosed and shall have gasket seals.
- F. Actuators:
 - 1. Valves shall be equipped with traveling nut, self-locking type actuators designed, manufactured, and tested in accordance with the requirements of AWWA C504. Actuators shall be capable of holding the disc in any position between full open and full closed without any movement or fluttering of the disc.
 - 2. Actuators shall be furnished with fully adjustable mechanical stop-limiting devices. Actuators that utilize the sides of the actuator housing to limit disc travel are unacceptable.
 - 3. Valve actuators shall be capable of withstanding a minimum of four-hundred and fifty (450) foot pounds of input torque in either the open or the closed position without damage.
- G. Operators: Valves for buried service shall have a nut type operator and shall be equipped with a valve box and stem extension, as required.
- H. Valve Ends: Valve ends shall be mechanical joint type, except where flanged or restrained joint ends are shown on the Plans. Flange joints shall meet the requirements of ANSI B16.1, Class 125.
- I. Butterfly Valves: Butterfly valves shall be manufactured by Mueller (Pratt), DeZurik, or equal.

2.10 VALVE BOXES (VB) AND EXTENSION STEMS

- A. All valves shall be equipped with valve boxes. The valve boxes shall be cast iron two- (2-) piece screw type with drop covers. Valve boxes shall have a five and one-quarter- ($5\frac{1}{4}$ -) inch inside diameter. Valve box covers shall weigh a minimum of thirteen (13) pounds. The valve boxes shall be adjustable to six (6) inches up or down from the nominal required cover over the pipe. Valve boxes shall be of sufficient length that bottom flange of the lower belled portion of the box is below the valve operating nut. Ductile or cast iron extensions shall be provided as necessary. Covers shall have "WATER VALVE" or "WATER" cast into them. Valve boxes shall be manufactured in the U.S.

- B. All valves shall be furnished with extension stems if operating nut is greater than four (4) feet deep, to bring the operating nut to within twenty-four (24) inches of the top of the valve box. Connection to the valve shall be with a wrench nut coupling and a set screw to secure the coupling to the valve's operating nut. The coupling and square wrench nut shall be welded to the extension stem. Extension stems shall be equal to Mueller A-26441 or M & H Valve Style 3801 or equal.

2.11 VALVE MARKERS (VM)

- A. The **Contractor** shall provide a concrete valve marker as detailed on the Plans for each valve installed, except on hydrant isolation valves. Valve markers shall be stamped "WATER".

2.12 TAPPING SLEEVES AND VALVES (TS&V)

- A. Tapping sleeves for mains twelve (12) inches in diameter and smaller shall be ductile iron of the split-sleeve, mechanical joint type. Tapping sleeves shall be equal to Mueller H-615.
- B. Tapping sleeves for mains larger than twelve (12) inches shall be of all stainless steel construction.
- C. The **Contractor** shall be responsible for determining the outside diameter of the pipe to be connected to prior to ordering the sleeve. The tapping sleeve shall be rated for two-hundred and fifty (250) psi.
- D. Valves shall be gate valves furnished in accordance with the specifications shown above, with flanged connection to the tapping sleeve and mechanical joint connection to the branch pipe. The tapping sleeve shall be supplied by the valve manufacturer.

2.13 CORPORATION COCKS AND CURB STOPS

- A. Corporation cocks and curb stops shall be ball type, shall be made of bronze conforming to the requirements of ASTM B61 or ASTM B62, and shall be suitable for the working pressure of the system. Ends shall be suitable for flared tube joint. Threaded ends for inlet and outlet of corporation cocks shall conform to the requirements of AWWA C800; coupling nut for connection to flared copper tubing shall conform to the requirements of ANSI B16.26. Corporation cocks and curb stops shall be manufactured by Mueller, Ford FB-600, or equal.

PART 3 - EXECUTION

3.01 EXISTING UTILITIES AND OBSTRUCTIONS

- A. The Plans indicate utilities or obstructions that are known to exist according to the best information available. The **Contractor** shall call the Utilities Protection Center (UPC) (800-282-7411) as required by Georgia Law (O.C.G.A. Sections 25-9-1 through 25-9-13) and shall call all utilities, agencies, or departments that own and/or operate utilities in the vicinity of the construction work site at least seventy-two (72) hours [three (3) business days] prior to construction to verify the location of the existing utilities.
- B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service:
1. The **Contractor** shall provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only ten (10) days after original notice. The **Contractor** shall ensure at the time of any excavation that a valid utility location exists at the point of excavation.
 2. The **Contractor** shall expose the facility, for a distance of at least two-hundred (200) feet in advance of pipeline construction, to verify its true location and grade. The **Contractor** shall repair, or have repaired, all damage to utilities resulting from locating or exposing their true location.
 3. The **Contractor** shall avoid utility damage and interruption by protection with means or methods recommended by the utility owner.
 4. The **Contractor** shall maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested and work order number issued, if any. The **Contractor** shall provide the **County** an updated copy of the log biweekly, or more frequently if required.
- C. Conflict with Existing Utilities:
1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the water main by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The **Contractor** may change the proposed alignment of the water main to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement, complies with regulatory agency requirements and after a written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed water main does not permit the crossing without immediate or potential future damage to the utility, main, service, or the water main. The minimum clearance shall be twelve (12) inches. The **Contractor** may change the proposed grade of the water main to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the **County**. Where such relocation of the water main is denied by the **County**, the **Contractor** shall arrange to have the utility, main, or service relocated. The **Contractor** shall receive approval from the **County** for any utility relocation.
- D. Electronic Locator: The **Contractor** shall have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.
- E. Water and Sewer Separation:
1. Water mains should maintain a minimum ten- (10-) foot edge-to-edge separation from sewer lines, whether gravity or pressure. If the main cannot be installed in the prescribed easement or right-of-way and provide the ten- (10-) foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of eighteen (18) inches above the top of the sewer. Should neither of these two separation criteria be possible, the water main shall be installed below the sewer with a minimum vertical separation of eighteen (18) inches.
 2. The water main, when installed below the sewer, shall be encased in concrete with a minimum six- (6-) inch concrete depth to the first joint in each direction. Where water mains cross the sewer, the pipe joint adjacent to the pipe crossing the sewer shall be cut to provide maximum separation of the pipe joints from the sewer.
 3. No water main shall pass through, or come in contact with, any part of a sanitary sewer manhole.

3.02 CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

- A. The **Contractor** shall install pipelines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of, and permits issued by, the Department of Transportation or applicable permitting authority and the **County** with reference to construction operations, safety, traffic control, road maintenance and repair.
- B. Traffic Control: Shall meet the requirements of Section 01550 and as stipulated below.

1. The **Contractor** shall provide, erect, and maintain all necessary barricades, suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct traffic; take all necessary precautions for the protection of the Work and the safety of the public. Flagmen shall be certified by a GDOT-approved training program.
2. Construction traffic control devices and their installation shall be in accordance with the current Manual on Uniform Traffic Control Devices for Streets and Highways.
3. Placement and removal of construction traffic control devices shall be coordinated with GDOT and the **County** a minimum of forty-eight (48) hours in advance of the activity.
4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead," shall be removed and replaced when needed.
5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary locations shall provide the same visibility to affected traffic as the original location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.
6. Construction traffic control devices shall be maintained in good repair and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.
7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of GDOT and the **County**. Sign panels shall be of durable materials capable of maintaining their color, reflective character, and legibility during the period of construction.
8. Channelization devices shall be positioned preceding an obstruction at a taper length as required by the Manual on Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to ensure that they are maintained in the proper position throughout their period of use.

C. Construction Operations:

1. The **Contractor** shall perform all work along highways, streets, and roadways to minimize interference with traffic.
2. Stripping: Where the pipeline is laid along road right-of-way, the **Contractor** shall strip and stockpile all sod, topsoil, and other material suitable for right-of-way restoration.
3. Trenching, Laying and Backfilling: The **Contractor** shall not open the trench any further ahead of pipe laying operations than is necessary. The **Contractor** shall backfill and remove excess material immediately behind laying operations. The **Contractor** shall complete excavation and backfill for any portion of the trench in the same day.
4. Shaping: The **Contractor** shall reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. The **Contractor** shall replace topsoil, sod, and any other materials removed from shoulders.
5. Construction operations shall be limited to four-hundred (400) feet along areas, including cleanup and utility exploration.

D. Excavated Materials: The **Contractor** shall not place excavated material along highways, streets, and roadways in a manner that obstructs traffic. The **Contractor** shall sweep all scattered excavated material off of the pavement in a timely manner meeting all E&S codes

E. Drainage Structures: The **Contractor** shall keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff. E&S measures shall be maintained and the contractor is subject to clean any storm line and MH that has received siltation.

F. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The **Contractor** shall take extreme care in moving landscape features and promptly re-establish these features.

G. Maintaining Highways, Streets, Roadways, and Driveways:

1. The **Contractor** shall maintain streets, highways, roadways, and driveways in suitable condition for movement of traffic until completion and final acceptance of the Work.

2. During the time period between pavement removal and completing permanent pavement replacement, the **Contractor** shall maintain highways, streets, and roadways by the use of steel running plates. Running plate edges shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.
3. The **Contractor** shall furnish a road grader or front-end loader for maintaining highways, streets, and roadways. The grader or front-end loader shall be available at all times.
4. The **Contractor** shall immediately repair all driveways that are cut or damaged and the **Contractor** shall maintain them in a suitable condition for use until completion and final acceptance of the Work.

3.03 PIPE DISTRIBUTION

- A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.
- B. No pipe shall be strung further along the route than one-thousand (1,000) feet beyond the area in which the **Contractor** is actually working without written permission from the **County**. The **County** reserves the right to reduce this distance to a maximum distance of two-hundred (200) feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.
- C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The **Contractor** shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets, and roadways upon which pipe is distributed.
- D. No distributed pipe shall be placed inside drainage ditches.
- E. Distributed pipe shall be placed as far as possible from the roadway pavement, but no closer than five (5) feet from the roadway pavement, as measured edge-to-edge.

3.04 LAYING AND JOINTING PIPE AND ACCESSORIES

- A. The **Contractor** shall lay all pipe and fittings to accurately conform to the lines and grades established by the **County**.
- B. Pipe Installation:
 1. Pipe shall be installed in accordance with the requirements of AWWA M11, Chapter 16. Welded joints shall be in accordance with the requirements of AWWA C206.
 2. Sleeve-type mechanical pipe couplings shall conform to the requirements of AWWA M11.

3. Unless otherwise specified, buried mechanical couplings and valves shall be field coated as shown on the Plans, specified in these Specifications, or as directed by the **County**.
4. Anchorage shall be provided as shown on the Plans, specified in these Specifications, or as directed by the **County**.
5. Proper implements, tools and facilities shall be provided for the safe performance of the Work. All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench by means of slings, ropes, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.
6. All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials will be rejected by the **County** and replaced at the **Contractor's** or manufacturer's expense
7. All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe containing dirt shall be laid.
8. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time.
9. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.
10. It is not mandatory to lay pipe with the bells facing the direction in which work is progressing.
11. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade, shall not be permitted.
12. The **Contractor** shall provide detection tape for all pipe greater than twelve (12) inches in diameter. Detection tape shall be buried four (4) to ten (10) inches deep. Should detection tape need to be installed deeper, the **Contractor** shall provide three- (3-) inch-wide tape. In no case shall detection tape be buried greater than twenty (20) inches from the finish grade surface.

C. Alignment and Gradient:

1. The **Contractor** shall lay pipe straight in alignment and gradient or follow true curves as nearly as practicable. The **Contractor** shall not deflect any joint more than the maximum deflection recommended by the manufacturer.
2. The **Contractor** shall maintain a transit, level, and accessories on the site of the Work to lay out angles and ensure that deflection allowances are not exceeded.

D. Expediting of Work: The **Contractor** shall excavate, lay the pipe, and backfill as closely together as possible. The **Contractor** shall not leave un-jointed pipe in the trench overnight. The **Contractor** shall backfill and compact the trench as soon as possible after laying and jointing is completed. The **Contractor** shall backfill the installed pipe each day at the close of work and at all other times when work is not in progress. No excavation is to be left unbackfilled or unsupervised. If necessary to backfill over the end of an uncompleted pipe or accessory, the **Contractor** shall close the end with a suitable plug, either push-on, mechanical joint, restrained joint, or as approved by the **County**.

E. Joint Assembly:

1. Push-on, mechanical, flange, and restrained type joints shall be assembled in accordance with the manufacturer's recommendations.
2. The **Contractor** shall inspect each pipe joint within one-thousand (1,000) feet on either side of main line valves to ensure one-hundred (100) percent seating of the pipe spigot, except as noted otherwise.
3. Each restrained joint shall be inspected by the **Contractor** to ensure that it has been "homed" one-hundred (100) percent.
4. The **Contractor** shall internally inspect each pipe joint to ensure proper assembly for pipe twenty-four (24) inches in diameter and larger after the pipe has been brought to final alignment.

F. Cutting Pipe: The **Contractor** shall cut ductile iron pipe using an abrasive wheel saw. The **Contractor** shall cut PVC pipe using a suitable saw; remove all burrs, and smooth the end before jointing. The **Contractor** shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories, and closure pieces in the correct location. Only push-on or mechanical joint pipe shall be cut.

G. Polyethylene Encasement: Installation shall be in accordance with the requirements of AWWA C105 and the manufacturer's instructions. All ends shall be securely closed with tape and all damaged areas shall be completely repaired to the satisfaction of the **County**.

H. Valve and Fitting Installation:

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces, handling damage, and cracks. Defective valves will be rejected by the **County** and replaced at the **Contractor's** or manufacturer's expense. Valves shall be closed before being installed.
2. Valves, fittings, plugs, and caps shall be set and joined to the pipe in the manner specified in this section for cleaning, laying and joining pipe, except that twelve- (12-) inch and larger valves shall be provided with special support, such as crushed stone, concrete pads, or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve. Valves shall be installed in the closed position.
3. A valve box shall be provided on each underground valve. They shall be carefully set, centered exactly over the operating nut, and truly plumbed. The valve box shall not transmit shock or stress to the valve. The bottom flange of the lower belled portion of the box shall be placed below the valve operating nut. This flange shall be set on brick, so arranged that the weight of the valve box and superimposed loads will bear on the base and not on the valve or pipe. The valve box cover shall be flush with the surface of the finished area or such other level as directed by the **County**.
4. In no case shall valves be used to bring misaligned pipe into alignment during installation. Pipe shall be supported in such a manner as to prevent stress on the valve.
5. A valve marker shall be provided for each underground valve. Unless otherwise detailed on the Plans or directed by the **County**, valve markers shall be installed six (6) inches inside the right-of-way or easement, and buried to a depth of thirty (30) inches as per Standard Detail No. W-8.

I. Air Valve Vaults:

1. The **Contractor** shall construct the vault or manhole as detailed on the Plans.
2. The frame and cover shall be cast into the top slab. The floor drain shall be piped to vault exterior.
3. Manholes shall be constructed such that their walls are plumb.

3.05 CONNECTIONS TO WATER MAINS

- A. Existing Pipelines: The **Contractor** shall make connections to existing pipelines with tapping sleeves and valves, unless specifically shown otherwise on the Plans. Before connecting to any existing water main, the **Contractor** shall receive approval from the **County**.
- B. Location: Before laying pipe, the **Contractor** shall locate the points of connection to existing water mains and uncover as necessary for the **County** to confirm the nature of the connection to be made.
- C. Interruption of Services: The **Contractor** shall make connections to existing water mains only when system operations permit and only when notices are issued to the customer. The **Contractor** shall operate existing valves only with the specific authorization and direct supervision of the **County**.
- D. Tapping Sleeves:
 - 1. Holes in the new pipe shall be machine cut, either in the field or at the factory. No torch cutting of holes shall be permitted.
 - 2. Prior to attaching sleeve, the pipe shall be thoroughly cleaned, utilizing a brush and rag, as required.
 - 3. Before performing field machine cut, the water tightness of the sleeve assembly shall be pressure tested. The interior of the assembly shall be filled with water. An air compressor shall be attached to induce a test pressure as specified in this Section. No leakage shall be permitted for a period of five (5) minutes.
 - 4. After attaching the sleeve to an existing main, but prior to making the tap, the interior of the assembly shall be disinfected. All surfaces to be exposed to potable water shall be swabbed or sprayed with a one- (1-) percent sodium hypochlorite solution.
- E. Connections Using Solid Sleeves: Where connections are shown on the Plans using solid sleeves, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line.
- F. Connections Using Couplings: Where connections are shown on the Plans using couplings, the **Contractor** shall furnish materials and labor necessary to make the connection to the existing pipe line, including all necessary cutting, plugging, and backfill.

- G. **Transfer of Service:** Immediately before connecting to the relocated or existing meter, all service lines shall be flushed to remove any foreign matter. Any special fittings required to reconnect the existing meter to the new copper service line, or the existing private service line, shall be provided by the **Contractor**. To minimize out-of-service time, the **Contractor** shall determine the connections to be made and have all the required pipe and fittings on hand before shutting off the existing service. After completing the connection, the new corporation stop shall be opened and all visible leaks shall be repaired.

3.06 THRUST RESTRAINT

- A. The **Contractor** shall provide restraint at all points where hydraulic thrust may develop.
- B. **Retainer Glands:** The **Contractor** shall provide retainer glands where shown on the Plans. Retainer glands shall be installed in accordance with the manufacturer's recommendations, particularly, the required torque of the set screws. The **Contractor** shall furnish a torque wrench to verify the torque on all set screws that do not have inherent torque indicators.
- C. **Harnessing:**
1. **Contractor** shall provide harness rods only where specifically shown on the Plans or directed by the **County**.
 2. Harness rods shall be manufactured in accordance with the requirements of ASTM A36 and shall have an allowable tensile stress of no less than 22,000 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.
 3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, the **Contractor** shall provide ninety- (90-) degree bend eye bolts.
 4. Eye bolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eye bolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rod. Eye bolts shall be of the same material and coating as the harness rods.
- D. **Thrust Collars:** Collars shall be constructed as shown on the Plans. Concrete and reinforcing steel shall meet standards set by Owner and or Engineer, and Section 03300 - Cast-In-Place Concrete. Welded-on collars shall be designed to meet the minimum allowable load shown on the Plans. The welded-on collar shall be attached to the pipe by the pipe manufacturer.
- E. **Concrete Blocking as required and approved by the County:**
1. The **Contractor** shall provide concrete blocking for all bends, tees, valves, and other points where thrust may develop in addition to thrust restraint as per Standard Detail No. W-36.
 2. Concrete shall be as specified in Section 03300 - Cast-In-Place Concrete.

3. The **Contractor** shall form and pour concrete blocking at fittings as shown on the Standard Details and as directed by the **County**. The **Contractor** shall pour blocking against undisturbed earth. The **Contractor** shall increase dimensions when required by over-excavation.

3.07 INSPECTION AND TESTING

- A. All sections of the water main subject to internal pressure shall be pressure-tested in accordance with the requirements of AWWA C600 and these Specifications. A section of main will be considered ready for testing after completion and curing of all thrust restraint and backfilling.
- B. Water used for testing mains and washing streets will be made available to the **Contractor** at the nearest existing DWM facilities. The **Contractor** shall furnish all necessary pipe or hose extensions and transportation to the point of use and exercise care in use of the water. Water used for other purposes will be supplied through a metered connection, which the **Contractor** shall obtain through the DWM Applications Office.
- C. Each segment of water main between main valves shall be tested individually.
- D. Test Preparation:
 1. For water mains less than twenty-four (24) inches in diameter, the **Contractor** shall flush sections thoroughly at flow velocities, greater than two and one-half (2½) feet per second, adequate to remove debris from pipe and valve seats. For water mains twenty-four (24) inches in diameter and larger, the main shall be carefully swept clean, and mopped if directed by the **County**. The **Contractor** shall partially open valves to allow the water to flush the valve seat.
 2. The **Contractor** shall partially operate valves and hydrants to clean out seats.
 3. The **Contractor** shall provide temporary blocking, bulkheads, flanges, and plugs as necessary, to ensure all new pipe, valves, and appurtenances will be pressure-tested.
 4. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. The **Contractor** shall insert corporation cocks at highpoints to expel air as main is filled with water as necessary to supplement automatic air valves. Corporation stops shall be constructed as shown on the Standard Details with a meter box.
 5. The **Contractor** shall fill pipeline slowly with water. The **Contractor** shall provide a suitable pump with an accurate water meter to pump the line to the specified pressure.

6. The differential pressure across a valve or hydrant shall equal the maximum possible, but not exceed the rated working pressure of the system. Where necessary, the **Contractor** shall provide temporary backpressure to meet the differential pressure restrictions.
 7. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure.
- E. Test Pressure: The **Contractor** shall test the pipeline at two-hundred and fifty (250) psi measured at the lowest point for at least two (2) hours. The **Contractor** shall maintain the test pressure within five (5) psi of the specified test pressure for the test duration. Should the pressure drop more than five (5) psi at any time during the test period, the pressure shall be restored to the specified test pressure. The **Contractor** shall provide an accurate pressure gage with graduation not greater than five (5) psi.
- F. Leakage:
1. Leakage shall be defined as the sum of the quantity of water that must be pumped into the test section, to maintain pressure within five (5) psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.
 2. The **County** assumes no responsibility for leakage occurring through existing valves.
- G. Test Results: No test section shall be accepted if the leakage exceeds the limits determined by the following formula:
- $$L = \frac{SD(P)^{1/2}}{133,200}$$
- Where:
- | | | |
|---|---|--|
| L | = | Allowable leakage, in gallons per hour. |
| S | = | Length of pipe tested, in feet |
| D | = | Nominal diameter of the pipe, in inches. |
| P | = | Average pressure during the test, psi (gauge). |
- As determined under Section 4 of AWWA C600.
- H. If the water main section being tested contains lengths of various pipe diameters, the allowable leakage shall be the sum of the computed leakage for each diameter. The leakage test shall be repeated until the test section is accepted. All visible leaks shall be repaired regardless of leakage test results at the **Contractor's** expense.
- I. Completion: After a pipeline section has been accepted, the **Contractor** shall relieve test pressure. The **Contractor** shall record type, size, and location of all outlets on the Record Drawings.

3.08 DISINFECTING PIPELINE

- A. After successfully pressure-testing each pipeline section, the **Contractor** shall disinfect in accordance with the requirements of AWWA C651 for the continuous-feed method and these Specifications.
- B. Specialty **Contractor**: Disinfection shall be performed by an approved specialty **Contractor**. Before disinfection is performed, the **Contractor** shall submit a written procedure for approval before being permitted to proceed with the disinfection. This plan shall also include the steps to be taken for the neutralization of the chlorinated water. The **Contractor** shall receive approval from the **County** where to dispose of chlorinated water.
- C. Chlorination:
 - 1. The **Contractor** shall apply chlorine solution to achieve a concentration of at least twenty-five (25) milligrams per liter free chlorine in the new line. The **Contractor** shall retain chlorinated water for twenty-four (24) hours. Water shall be supplied from a temporary source protected by appropriate backflow prevention devices. The backflow preventer must be approved by the **County** prior to connection. Chlorine shall be injected no more than ten (10) feet from the beginning of the new main.
 - 2. Chlorine concentration shall be recorded at every outlet along the line at the beginning and end of the twenty-four- (24-) hour period.
 - 3. After twenty-four (24) hours, all samples of water shall contain at least ten (10) milligrams per liter free chlorine. The **Contractor** shall re-chlorinate if required results are not obtained on all samples.
- D. Disposal of Chlorinated Water: -The **Contractor** shall reduce chlorine residual of disinfection water to less than one (1) milligram per liter if discharged directly to a body of water or to less than two (2) milligrams per liter if discharged onto the ground prior to disposal. The **Contractor** shall treat water with sulfur dioxide or other reducing chemicals to neutralize chlorine residual. The **Contractor** shall flush all lines until residual is equal to existing system.
- E. Bacteriological Testing: After final flushing and before the water main is placed in service, the **Contractor** shall collect samples from the line and have them tested for bacteriological quality in accordance with Georgia EPD rules. The **County** reserves the right to collect and test the samples in the **County's** laboratory. One (1) set of samples shall be collected from every one-thousand two-hundred (1,200) feet of water main, plus one (1) set from each end of main and one (1) set from each branch. If the test results are not acceptable, the **Contractor** shall re-chlorinate lines at its cost until required results are obtained.

3.09 PROTECTION AND RESTORATION OF WORK AREA

- A. General: The **Contractor** shall return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is completed. Restoration of streets, sidewalks, curb, and driveways shall comply with Section 02521. Restoration of off-street areas shall comply with the requirements of Section 02920 and as stipulated below.
1. The **Contractor** shall plan, coordinate, and prosecute the Work such that disruption to personal property and business is held to a practical minimum.
 2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed areas shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.
 3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.
 4. The **County** shall be authorized to stop all work by the **Contractor** when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.
- B. Man-Made Improvements: The **Contractor** shall protect, or remove and replace with the **County's** approval, all fences, walkways, mail boxes, pipe lines, drain culverts, power and telephone lines and cables, property pins, and other improvements that may be encountered in the Work.
- C. Cultivated Growth: The **Contractor** shall not disturb cultivated trees or shrubbery unless approved by the **County**. All such trees or shrubbery that must be removed shall be heeled in and replanted under the direction of an experienced nurseryman.

- D. Cutting of Trees: The **Contractor** shall not cut trees for the performance of the Work except as absolutely necessary and with the approval from the **County**. The **Contractor** shall protect trees that remain in the vicinity of the work from damage from equipment. The **Contractor** shall not store spoil from excavation against the trunks. The **Contractor** shall remove excavated material stored over the root system of trees within thirty (30) days to allow proper natural watering of the root system. The **Contractor** shall repair any damaged tree over three (3) inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the site of the Work and disposed of by the **Contractor** in a lawful manner. No stumps, wood piles, or trash piles will be permitted on the site of the Work.
- E. Disposal of Rubbish: The **Contractor** shall dispose of all materials cleared and grubbed during the construction of the Project in accordance with the applicable codes and rules of the appropriate Federal, State, and local regulatory agencies.
- F. Wetlands:
1. The **Contractor** shall not construct permanent roadbeds, berms, drainage structures, or any other structures that alter the original topographic features within the easement.
 2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed by the **Contractor**.
 3. The **Contractor** shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland, or stream that may be temporarily divided by construction.
 4. The **Contractor** shall not spread, discharge, or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent waterways or wetlands.

3.10 ABANDONING EXISTING WATER MAINS

- A. General: The **Contractor** shall abandon in place all existing water main segments indicated on the Plans to be abandoned. The **Contractor** shall perform abandonment after the new water main has been placed in service and all water main services have been changed over to the new main. The **Contractor** shall salvage for the **County** existing fire hydrants, valve boxes, valve markers, and other materials located on water mains abandoned.

- B. Capping and Plugging: The **Contractor** shall disconnect by sawing or cutting and removing a segment of existing pipe where cutting and capping or plugging is directed by the **County**. The **Contractor** shall provide a watertight pipe cap or plug and concrete blocking for restraint to seal off existing mains indicated to remain in service. The **Contractor** shall seal ends of existing mains to be abandoned with a pipe cap or plug or with a masonry plug and minimum six- (6-) inch cover of concrete on all sides around the end of the pipe. The **Contractor** shall be responsible for uncovering and verifying the size and material of the existing main to be capped or plugged. The abandoned pipeline shall be filled with flowable fill if directed by the **County**.
- C. Salvaging Materials: The **Contractor** shall salvage existing fire hydrants, valve boxes, valve markers, and other materials located of water mains abandoned and deliver salvaged items in good condition to the **County's** storage yard. The **Contractor** shall coordinate delivery and placement of salvaged materials in advance with the **County**.
- D. Pavement Removal and Replacement: The **Contractor** shall perform any necessary pavement removal and replacement in accordance with Standard Detail No. W-43 and Section 02510 - Pavement Repairs.

+++ END OF SECTION 02665T +++

SECTION 02711 FENCING AND GATES

PART 1 - GENERAL

1.01 SCOPE

- A. Work described in this Section includes furnishing all labor, materials, equipment, tools, and incidentals required for a complete installation of chain link fence and gates. All materials shall be installed and adjusted, in accordance with these Specifications, the manufacturer's recommendations and as shown on the Drawings.
- B. Contract drawings show only functional features and some of the required external connections. They do not show all components required for a complete installation nor exact dimensions particular to any manufacturer's products. **Contractor** shall supply all parts, devices, and equipment necessary to meet the requirements of the Contract Documents and shall make all dimensional adjustments particular to the materials being furnished. All costs associated with such changes and adjustments shall be considered as being included in the price bid for the Work shown and specified.
- C. Related Work specified elsewhere:

Section 03300 – Cast-in-Place Concrete

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300.

1.03 QUALITY ASSURANCE

- A. Reference Standards: Comply with all Federal and State laws or ordinances, as well as all applicable codes, standards, regulations and/or regulatory agency requirements including the partial listing below:
 - 1. Department of Transportation Standard Specifications for Construction of Roads and Bridges, Sections 643 and 894.
- B. Experience: Products furnished under this Section shall be of a design and manufacture that has been successfully used in similar applications. The manufacturer shall have furnished product for a minimum of five similar applications. Provide a list of such installations complete with installation description contact names, addresses, telephone numbers. This reference list shall be submitted with the shop drawings.

1.04 QUALITY STANDARDS

- A. The chain link fence and gates shall be furnished by a single manufacturer who shall assume sole responsibility for providing a complete system designed for

long life with a minimum of required maintenance meeting the requirements specified herein and as shown on the Drawings.

- B. Manufacturer shall provide written certification that the material provided under this Specification has been amply designed and is a suitable application for these service conditions.
- C. Manufacturer's offering products that comply with these specifications include:
Anchor Fence, Inc. or Approved equal.

1.05 WARRANTY

- A. Provide a warranty against defective materials and workmanship in accordance with the requirements of the General Requirements of the Contract Documents.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Zinc and aluminum coated steel and aluminum alloy fabric, posts, fittings and accessories, shall conform to AASHTO M 181.

2.02 FENCE FABRIC

- A. All chain link fence shall consist of woven wire in the form of reasonably uniform two- (2-) inch-square mesh, having parallel sides and horizontal and vertical diagonals of approximately uniform dimensions. The wire size shall be as specified on the Drawings.
- B. TYPES
 - 1. Zinc-Coated Steel Fabric: The base metal of the fabric shall be a good commercial quality of steel wire coated with prime western spelter or better (AASHTO: M120) applied at the rate of not less than 1.2 oz. of zinc per square foot of uncoated wire surface after weaving.
- OR -
- 2. Aluminum-Coated Steel Fabric: The base metal of the fabric shall be a good commercial quality steel wire, coated with aluminum alloy applied at the rate of not less than 0.40 oz. per square foot of uncoated wire surface.
- C. Workmanship: Chain Link fence fabric shall be produced by methods recognized as good commercial practices. The zinc or aluminum coating shall be applied to the fabric in a continuous process and shall not be applied to the fabric in roll form. Both coated before weaving and coated after weaving fabric shall be given careful visual inspection to determine the quality of the coating. Excessive roughness, blisters, sal ammoniac spots, bruises, flaking bare spots, or other obvious defects, to any considerable extent, shall be cause for rejection.

1. Tolerances: All dimensions, weights, and test methods shall conform to the applicable portions of AASHTO: M 181 or Federal Specification RR-F-191.

2.03 POSTS

- A. Line Posts shall be:
 1. One and seven-eighths (1 7/8) inch nominal galvanized steel "H" column minimum weight of two and seven-tenths (2.70) pounds per linear foot, or
 2. Nominal two and three-eighths (2 3/8) inches outside diameter galvanized steel pipe minimum weight three and sixty-five hundredths (3.65) pounds per linear foot, or
 3. "C" section channels measuring two and twenty-five hundredths by one and seventy hundredths (2.25" x 1.70") inches, minimum weight of two and seventy-three hundredths (2.73) pounds per linear foot.
- B. End, Corner, and Pull Posts:
 1. Zinc and aluminum-coated posts shall be:
 - a. Nominal two and seven eighths (2-7/8) inches outside diameter galvanized steel pipe weighing a minimum of five and seventy-nine hundredths (5.79) pounds per linear foot, or
 - b. Two and one-hal- (2-1/2-) inch-square posts with a minimum weight of five and seventy hundredths (5.70) pounds per linear foot, or
 - c. Three and one-half by three and one-half (3-1/2 x 3-1/2) inches rolled form sections with integral fabric loops, weighing a minimum of five and fourteen hundredths (5.14) pounds per linear foot.

2.04 TOP RAILS AND HORIZONTAL BRACES FOR END, CORNER AND PULL POSTS

- A. Truss Bracing shall be three-eighths (3/8) inch round rod with suitable turnbuckle or takeup arrangement. Rods shall be of the approximate metal and coating according to the type of fence installation. All braces shall be furnished with suitable metal connections so that they can be securely fastened to the posts.
- B. Top rail shall be furnished in lengths of not less than fifteen (15) feet. Each section shall be provided with a suitable expansion sleeve or coupling not less than seven (7) inches long. Every fifth coupling as installed shall have a heavy spring to take up expansion and contraction of the top rail.
- C. Zinc and aluminum coated rails and braces shall be nominal:
 1. One and five-eighths (1-5/8) inch outside diameter steel pipe, minimum weight of two and twenty-seven hundredths (2.27) pounds per linear foot, or
 2. One and five-eighths by one and one-quarter (1-5/8 x 1-1/4) inches roll formed sections weighing a minimum of one and thirty-five hundredths (1.35) pounds per linear foot.

2.05 POST TOPS AND FITTINGS

- A. All posts shall be fitted with tops designed to fit securely over the posts and carry the top rail. The tops and fittings shall be of dimensions shown on the Drawings.

2.06 FABRIC FASTENERS

- A. Wire for fabric fasteners may be zinc coated or aluminum coated of the gauges specified.

2.07 GATES

- A. Frames, Posts, hinges, and fitting shall be in accordance with dimensions shown in Federal Specification RR-F-191, unless otherwise specified.
 - 1. Gates: Shall be provided with combination spring latch and plunger rod of approved design for padlocking.
 - 2. Hinges: Heavy-duty malleable iron or steel, industrial service type, two hundred and seventy- (270-) degree swing. Provide at least three (3) hinges on each gate leaf at vehicular gate openings.
 - 3. Hold-Open Device: Equip designated gate openings with galvanized steel or malleable iron stop/hold open devices with catch or plunger rod of standard manufacture and approved design.

2.08 BARBED WIRE

- A. Galvanized steel barb wire shall be composed of two strands of No. 12 1/2 gauge wire with round barbs, four-point pattern, spaced five plus and minus one-half ($5\pm 1/2$) inch apart conforming to ASTM: A 121, Class 2, or at the **Contractor's** option may be high tensile strength barbed wire. If the **Contractor** elects to furnish high tensile strength barbed wire, it shall meet the requirements of ASTM: A 121 with the following exceptions:
 - 1. The coated line wires shall have a nominal diameter of 0.067 inch. The coated barbwires shall have a nominal diameter of 0.057 inch.
 - 2. The minimum weight of zinc coating shall be seventy-five hundredths (0.75) ounces per square foot for the line wire and seventy hundredths (0.70) ounces per square foot for the barbed wire.
 - 3. The line wire shall have a minimum tensile strength of four hundred seventy-five (475) pounds per individual strand.

2.09 GROUND RODS

- A. Ground Rods shall be five-eighths (5/8) inch in diameter but no less than nine-sixteenths (9/16) inch and shall be minimum eight (8) feet in length unless otherwise shown on the Plans. Ground rods shall be galvanized steel. Galvanizing shall have a minimum coating of two (2) ounces per square foot in accordance with the requirements of ASTM: A 153.

PART 3 - EXECUTION:

3.01 GENERAL

- A. Fence shall normally be constructed within the right-of-way line with no portion of the permanent installation encroaching on adjacent property. When it is necessary for the **Contractor** to trespass on private property outside of the right-of-way or easements provided on the Drawings, the **Contractor** shall obtain permission from the property owner for such intrusion.
- B. Fence shall generally follow the contour of the ground, with the bottom of fence fabric no less than one inch or more than six inches from the ground surface. The fence line shall be cleared a maximum of eight (8) feet wide and minor grading shall be performed where necessary to provide a neat appearance. Where abrupt changes in the ground profile in low areas make it impractical to maintain the specified ground clearance, longer posts may be used and multiple strands of barbed wire stretched thereon with vertical clearances between strands of barbed wire six (6) inches or less.
- C. Any of the various types of fencing materials shown in Part 2, may be used, except that posts, fabric, barbed wire, and appurtenances, including gates when required, shall be of the same or matching type for each Project, unless otherwise directed.

3.02 INSTALLATION

- A. Posts shall be located and installed as called for on the Drawings. "C" and two and three-eighths (2 3/8) inch tube-type line posts for all types of fences shall be installed using concrete encasement. Posts installed in rock shall be in accordance with Article 643.03.B.3 of the DOT Standard Specifications.
 - 1. All corner, end, and pull posts shall have concrete encasement as shown in the Drawings. Posts damaged by driving shall be replaced by the **Contractor** at its expense. When posts are set in concrete, the entire hole around the post shall be filled with Class A or B concrete. Concrete may be hand mixed for batches of one-half (1/2) cubic yard or less. The posts shall be firmly braced and held in place until the concrete has set. Distance between end, pull, and corner or angle post assemblies, shall not exceed the following:

For Chain Link Fence, Straight Line: five hundred (500) feet
For Chain Link fence, Curved Line: two hundred-fifty (250) feet
 - 2. Posts placed on concrete walls, slabs or solid rock shall be set in round holes twelve (12) inches deep or as indicated on the Drawings. The space around the post shall be filled with a cement filler approved by the **County**.
 - 3. Posts shall be repaired after cutting or drilling. Galvanized steel posts shall be repaired in accordance with the manufacturer's

recommendations.

- B. Fence Erection; Fence fabric or barbed wire, except when posts are set in concrete footings, may be installed when posts are set and braced. When posts are set in concrete footings, the installation of fabric or wire shall be delayed to allow the concrete to cure at least five (5) days. When barbed wire fence is required, three strands shall be installed unless otherwise indicated on the Drawings.
- C. Gates: Gate assemblies shall be of the length, height and type designated on the Drawings, and installed so as to provide for two hundred seventy- (270-) degree swing. Gate frames shall be welded units and shall be properly coated after welding. Fabric matching the fence fabric shall be stretched taut over the gate frame. Gate assemblies shall be provided with a positive type locking device, padlock, and keys.
- D. Electrical Ground: Whenever a power line carrying more than six hundred (600) volts passes over the fence, a ground rod shall be installed. The ground rod shall be installed at the nearest point directly below the point of crossing. Where possible the ground rod shall be driven into the ground for a full eight (8) feet of penetration. In rocky soil, the rod may be driven slanted, so as to provide eighteen (18) inches of cover at the tip. If solid rock is encountered, two (2) ground rods may be installed at the nearest post on each side of the power line crossing where soil conditions will permit. A length of No. 6 bare copper seven (7) stranded wire shall be attached between the fence and the ground rod with suitable clamps.

3.03 STORAGE OF MATERIALS

- A. Barbed wire, wire fence fabric, steel posts, hardware, and other materials, shall not be stored in contact with the ground but shall be placed in floored buildings, on platforms, or on wooden timbers or poles. Floors, platforms, or props shall be high enough to prevent the wire and steel posts from having any contact with the groundwater or surface water. Wire or steel posts that are damaged due to improper storage at any time between fabrication and final erection will be rejected. Except when rusting occurs as a result of ponding water after erection of the fence, all wire or posts that show signs of rusting before final acceptance shall be repaired, as directed by the **County**, or removed and replaced with new material at the **Contractor's** expense.

+++ END OF SECTION 02711 +++

SECTION 02920 SITE RESTORATION

PART 1 - GENERAL

1.01 SCOPE

- A. This section includes disposition of materials and structures encountered in the Work; ground preparation; mulching; seeding; fence reset; cleanup; and any other similar, incidental, or appurtenant operation that may be necessary to properly complete the Work.
- B. The **Contractor** shall provide all services, labor, materials, and equipment required for all site restoration and related operations necessary or convenient to the **Contractor** for furnishing a complete Work as shown on the Plans or specified in these Specifications.
- C. Related Work Specified Elsewhere:
 - 1. Section 01210 - Measurement and Payment
 - 2. Section 02231 - Tree Protection and Trimming
 - 3. Section 02510 - Pavement Repair

1.02 SUBMITTALS

- A. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300. In addition, the following specific information shall be provided:
 - 1. Certificates of inspection as required by government authorities. The **Contractor** shall submit manufacturers' or vendors' certified analysis for soil amendments and fertilizer materials. The **Contractor** shall submit other data substantiating that materials comply with specified requirements.
 - 2. Typewritten instructions recommending procedures to be established by the **County** for maintenance of site restoration work for one (1) full year.
 - 3. Seed vendors certified statements for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and weed for each grass seed species.
 - 4. Proposed planting schedules, indicating dates for each type of planting work during normal seasons for such work in the site of the Work. The **Contractor** shall correlate with specified maintenance periods to provide maintenance from the Date of Substantial Completion. Once accepted, the **Contractor** shall revise dates only as approved in writing, after documentation of reasons for delays.

1.03 QUALITY ASSURANCE

- A. Reference Standards: The **Contractor** shall comply with the applicable provisions and recommendations of the latest editions of the following standards, except as otherwise shown on the Plans or specified in these Specifications.
 - 1. ASTM C602 - Standard Specification for Agricultural Liming Materials.
 - 2. Turfgrass Producers International.
- B. The **Contractor** shall ship site restoration materials with certificates of inspection required by authorities having jurisdiction. The **Contractor** shall comply with regulations applicable to site restoration materials.
- C. If specified site restoration materials are not obtainable, the **Contractor** shall submit proof of non-availability to the **County** together with proposal for use of equivalent material.
- D. The **Contractor** shall package standard products with manufacturers' certified analysis. For other material, the **Contractor** shall provide analysis by recognized laboratory, in accordance with methods established by the Association of Official Agricultural Chemists, as applicable.

1.04 SAFETY REQUIREMENTS

- A. Hazards Control:
 - 1. The **Contractor** shall store volatile wastes in covered metal containers, and remove from the site of the Work daily.
 - 2. The **Contractor** shall prevent accumulation of wastes that create hazardous conditions.
 - 3. The **Contractor** shall provide adequate ventilation during use of volatile or noxious substances.
- B. The **Contractor** shall conduct cleaning and disposal operations in compliance with local ordinances and environmental laws and regulations.
 - 1. The **Contractor** shall not burn or bury rubbish and waste materials on the site of the Work without prior written permission from the **County**.
 - 2. The **Contractor** shall not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.

1.05 DELIVERY

- A. The **Contractor** shall deliver packaged materials in containers showing weight, analysis, and name of manufacturer. The **Contractor** shall protect materials from deterioration during delivery, and while stored at the site of the Work.

1.06 JOB CONDITIONS

- A. All bare earth areas within the limit of work shall be grassed, mulched, or covered with other plant material as shown on the Plans. Final restoration of existing lawn areas (i.e. private residences, schools, and parks) shall be sod.
- B. On a continuous basis, the **Contractor** shall maintain the site of the Work free from accumulations of waste, debris, and rubbish caused by its operations.
- C. At completion of the Work, the **Contractor** shall remove waste materials, rubbish, tools, equipment, machinery, and surplus materials, and clean all sight-exposed surfaces. The **Contractor** shall leave the site of the Work clean and ready for occupancy.
- D. The **Contractor** shall proceed with the complete site restoration work as rapidly as portions of the site of the Work become available, working within seasonal limitations for each kind of site restoration work required. The **Contractor** will not be allowed to postpone cleanup and seeding until the end of the Work.
- E. The **Contractor** shall determine the locations of underground utilities and perform Work in a manner that will avoid possible damage. The **Contractor** shall hand excavate, as required. The **Contractor** shall maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.
- F. When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, the **Contractor** shall notify the **County** before planting.
- G. The **Contractor** shall install materials during normal planting seasons for each type of site restoration work.
- H. The **Contractor** shall plant trees and shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to the **County**. If planting of trees and shrubs occurs after lawn work, the **Contractor** shall protect lawn areas and promptly repair damage to lawns resulting from planting operations.
- I. The **Contractor** may, at its option, employ additional measures (other than those specified) to prevent loss of, or damage to the Work resulting from the effects of wind and/or water. No additional compensation will be made for the employment of such additional measures.

PART 2 - PRODUCTS

2.01 TOPSOIL

- A. Topsoil for site restoration may not be available at the site of the Work in sufficient quantities and shall be furnished as specified.

- B. New topsoil shall be fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay, lumps, brush, weeds, and other litter, and free of roots, stumps, stones, and other extraneous or toxic matter harmful to plant growth.
- C. The **Contractor** shall obtain topsoil from local sources or from areas having similar soil characteristics to that found at the site of the Work. The **Contractor** shall obtain topsoil only from naturally, well-drained sites where topsoil occurs in depths of not less than four (4) inches. The **Contractor** shall not obtain topsoil from bogs or marshes.

2.02 MATERIALS

- A. Grass seed shall meet the requirements of the State of Georgia Seed Laws and Rules and Regulations except that the requirements as to purity, germination, and noxious weeds shall be specified in this section.

- 1. Quality: Grass seed quality shall be as shown in the Table below:

Grass Seed Quality			
Seed	Purity Min. %	Germination Min %	Noxious Weed Max. Per Lb.
Sahara Bermuda Grass	98	90	None
Annual Rye Grass	98	90	None
Rebel II Turf Type Fescue	85	85	None

- 2. Seed shall be approved by the **County** before sowing. Seed shall have been tested by the Georgia Department of Agriculture, and no seed will be acceptable with a date of test more than six (6) months prior to the date of sowing. Such testing, however, shall not relieve the **Contractor** from responsibility for furnishing and sowing seed that meet the requirements of these Specifications at the time of sowing seed. When required by the **County**, samples of seed shall be furnished by the **Contractor** early enough before seeding to permit further testing before the seed is used. When a low percentage of germination causes the quality of the seed to fall below the minimum pure live seed specified, the **Contractor** may choose to increase the rate of seeding to obtain the minimum pure live seed content specified, provided that such an increase in seeding rates does not cause the quantity of noxious weed seed per square yard to exceed the quantity that would be allowable at the regular rate of seeding.
 - 3. Seed that has become wet, moldy, or otherwise damaged will not be acceptable.
- B. All fertilizer shall be of the grades specified and shall meet the requirements of the State Plant Food Act in effect thirty (30) days prior to the taking of bids. It shall be uniform in composition, dry and free flowing and shall be delivered to the site of the Work in the original, unopened containers, each bearing the

manufacturer’s guaranteed analysis. Any fertilizer that is caked or otherwise damaged, making it unsuitable for use, will not be accepted.

C. Mulch shall meet the following requirements:

1. Be acceptable to the **County**.
2. Be of such consistency that, when properly loosened, it can be distributed in a uniform application.
3. Be capable of producing the desired results.
4. Meet State and Federal Quarantine Restrictions pertaining to fire ants, Japanese beetles, and white fringed beetles.
5. Shall have a moisture content of twelve (12) percent or less.
6. Contain no excessive amounts of noxious weed seeds.
7. All materials must carry the following certification: “This material is certified as free for movement under the State and Federal Imported Fire Ant, Japanese Beetle, and White Fringed Beetle Quarantines.”
8. Mulch shall be threshed rye, oat straw, wheat straw, or Bermuda grass hay.

D. Agricultural lime shall be a pulverized limestone having the following properties:

1. Total carbonate, not less than eighty-five (85) percent.
2. Passing ten (10) mesh screen at least one hundred (100) percent.
3. Passing one hundred (100) mesh screen at least twenty-five (25) percent.

E. Hydro mulch: Wood cellulose fiber containing no germination, inhibiting, or growth inhibiting agent. Characteristics shall be as follows:

1. Percent moisture content: Nine (9.0%) percent ± 3.0 percent.
2. Percent organic matter: Nine and two-tenths (9.2%) percent ± 0.8 percent.
3. Percent ash content: One and eight-hundredths (1.08%) percent ± 0.2 percent.
4. pH: four and eight-tenths (4.8) (± 0.5).
5. Water holding capacity: one thousand one hundred fifty (1150) grams water/ one hundred (100) grams fiber minimum.

F. Sod. Sod shall meet the requirements of Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Section 700 and 890, latest edition.

2.03 GRASSING

A. Grass seed shall be as specified on the table below depending on the season or as instructed by the **County**. See the table below for seasonal application rates:

Seasonal Seed Application Rates		
Season	Type of Seed	Application: lbs. per Acre
Jan. 1 – May 15	Rebel II Turf Type Fescue	250

May 16 – Sept. 15	Sahara Hybrid Bermuda Grass	75
Sept. 16 – Dec. 31	Rebel II Turf Type Fescue	250

- B. Disturbed Area Stabilization (Temporary Seeding) shall be planted with seeds listed in Table 2.

PART 3 - EXECUTION

3.01 DISPOSITION OF MATERIALS AND STRUCTURES ENCOUNTERED IN THE WORK

- A. Existing materials or structures that may be encountered (within the lines, grades, or trenching sections established for completion of the Work), if unsuitable or unacceptable to the **County** for use in the Work, and for which the disposition is not otherwise specified, shall either be disposed of by the **Contractor** or shall remain the property of the **County** as further provided in this section.
- B. At the option of the **County**, any existing materials or structures of "value" encountered in the Work shall remain the property of the **County**. The term "value" will be defined by the **County**.
- C. Any existing materials or structures encountered in the Work, and determined not to be of "value" by the **County**, shall be disposed of by the **Contractor**, in an approved manner, except as otherwise specified by Owner and or Engineer.

3.02 GROUND PREPARATION

- A. All ground to be sodded, sprigged, overseeded, or grassed shall be prepared by plowing, disking, and harrowing to a depth or not less than six (6) inches. After plowing, topsoil shall be spread on the prepared area to a depth of four (4) inches, and smoothed to a uniform depth. The finished surfaces shall present a smooth, uniform, loose, well broken soil. All large clods, boulders, stumps, large roots, roots, debris, and other particles two (2) inches in diameter or greater and which will interfere with the Work shall be removed from the site of the Work.
- B. Lime shall be uniformly spread over the area to be planted or sowed at the rate of two thousand (2,000) pounds per acre. Commercial grade five (5) percent nitrogen-ten percent phosphorus – ten percent potassium (5-10-10) fertilizer or approved equal shall also be uniformly spread over the area at the rate of one thousand five hundred (1,500) pounds per acre or as recommended by the manufacturer. The fertilizer and the lime shall then be thoroughly mixed into the top six (6) inches of the soil. All surface areas distorted by mixing of lime and fertilizer into the soil shall be restored to the proper line and grade before any more work is done on the area.

3.03 MULCHING

- A. The quantity of mulch to be applied shall be that required to evenly cover the ground to a depth of at least three (3) quarters of an inch and not more than one and one-half (1½) inches, according to the texture and moisture content of the

mulch material. It is intended that mulch allow some sunlight to penetrate and air to circulate while at the same time shading the ground and conserving soil moisture.

- B. Mulch: Mulch shall be uniformly applied manually or with special blower equipment. When a blower is used, baled material shall be thoroughly loosened before it is fed into the machine so as to obtain a uniform coating of mulch and to prevent placement of unbroken clumps. After initial distribution, thick clumps that are dense enough to prevent new grass from emerging shall be loosened and redistributed. Mulch shall not be applied on windy days when the velocity of the wind is sufficient to prevent uniform distribution of mulch.
- C. Hydro mulch: If Hydro mulch is used, it shall be mixed to provide equivalent quantities of fertilizer and seed as specified in this section.

3.04 SEEDING

- A. Seed shall be uniformly sown at the rates specified, by the use of approved mechanical seed drills, rotary hand seeders, or other type of equipment that will produce a uniform application of the seed. The **Contractor** shall not distribute seed by hand.
- B. In order to obtain an even distribution, seeds shall be sown separately except that seeds of approximately the same size may be mixed and sown together. No sowing shall be done during windy weather that prevents even distribution of the seeds, when the prepared surface is crusted, frozen, wet, or otherwise in non-tillable condition.
- C. Immediately after seeding, all areas shall be rolled.
- D. Watering: After seeding of areas are complete, watering shall be continued daily as long as necessary to promote a rapid growth except that no water shall be applied between the hours of 10 A.M. and 4 P.M. to prevent "crushing over" from the sun.
- E. First Application of Nitrogen (All areas): The first application of nitrogen shall be made on all areas when there is evidence that a satisfactory stand of grass will be obtained. For seeded areas, the young grass must have reached a height of at least one (1) inch. At this time, nitrate of soda, or other approved commercial fertilizer high in nitrogen content shall be applied at a rate sufficient to furnish seventy (70) pounds of nitrogen per acre. No fertilizer shall be applied to unsatisfactory areas that will have to be replanted.
- F. Second Application of Nitrogen (all areas): A second application of nitrogen shall be made thirty (30) days after sufficient moisture has been applied to make the first application available for plant growth. Second application shall also furnish seventy (70) pounds nitrogen per acre.
- G. Maintenance: The **Contractor** shall provide all maintenance necessary to keep all seeded and turf areas in a healthy, satisfactory, and weed-free condition until

the Work is finally accepted. This includes repairing washed-out areas, and correctly applying additional seed, fertilizer, and water if they are needed.

H. Satisfactory Stand Defined:

1. A stand of grass will be considered satisfactory by the **County** only if there is full cover over the seeded area with perennial grass that is alive and growing, leaving no bare spots larger than one (1) square foot or the total of all bare spots within a given area shall constitute no more than one one-hundredth (1/100) of the total area.
2. If it is necessary to repeat any or all of the work necessary to produce a viable stand of perennial grass, including repairing washed-out areas, soil preparation, re-fertilizing, liming, re-seeding, sprigging, watering, or mulching, the **Contractor** shall repeat these operations until satisfactory stand is obtained and approved by the **County**.

- I. The **Contractor** shall remove all stumps, fallen trees, uprooted trees, dead trees, and debris from the edge of the right-of-way.

3.05 SOD

A. Furnish and install sod in all lawn areas or as designated by the **County**.

1. Use only Common Bermudagrass (*Cynodon dactylon*) or one of the following Bermudagrass varieties:
 - a. Tifway 419
 - b. Tifway II Hybrid
 - c. Tift 94
 - d. Tifton 10
 - e. Midlawn
 - f. Midiron
 - g. GN-1 Hybrid
 - h. Vermont
2. No dwarf Bermuda types shall be used. Sod shall be nursery-grown and accompanied with a Georgia Department of Agriculture Live Plant License Certificate or Stamp. Sod shall consist of live, dense, well-rooted material free of weeds and insects as described by the Georgia Live Plant Act.
3. Place sod by hand or by mechanical means so that joints are tightly abutted with no overlaps or gaps. Use soil to fill cracks between sod pieces, but do not smother the grass.
4. Once sod is placed and staked as necessary, tamp, or roll it using adequate equipment to provide good contact with soil.
5. Use caution to prevent tearing or displacement of sod during this process. Leave the finished surface of sodded areas smooth and uniform.

- B. After the sod has been placed and rolled or tamped, water it to promote satisfactory growth. Additional watering will be needed in the absence of rainfall and during the hot, dry summer months. Water may be applied by Hydro Seeder, Water Truck or by other means approved by the **County**.
- C. Sod will be inspected by the **County** at the end of the first spring after installation and at the time of Final Inspection. Replace any sod that is not live and growing. Any cost for replacing any unacceptable sod will be at the **Contractor's** expense.
- D. Apply nitrogen at approximately fifty (50) pounds/acre when specified by the **County** after plants have grown to two (2) inches high. One application is mandatory and must be applied before Final Acceptance. Apply nitrogen with mechanical hand spreaders or other approved spreaders capable of uniformly covering the grassed areas. Do not apply nitrogen on windy days or when foliage is damp. Do not apply nitrogen between October 15 and March 15.

3.06 FENCE RESET

- A. Should the construction of the sewer require or result in removal or damage to an existing fence, the **Contractor** shall replace the fence in kind to the satisfaction of the fence owner.

3.07 CLEANUP

- A. During site restoration work, the **Contractor** shall keep pavements clean and the site of the Work in an orderly condition.
- B. The **Contractor** shall protect site restoration work and materials from damage due to site restoration operations, operations by other contractors, and trades and trespassers. The **Contractor** shall maintain protection during installation and maintenance periods. The **Contractor** shall treat, repair, or replace damaged site restoration work as directed by the **County**.
- C. Throughout the progress of the Work, the **Contractor** shall keep the construction area, including storage areas used by the **Contractor**, free from accumulations of waste material or rubbish, and shall keep its materials and equipment in a neat and orderly manner. Immediately upon completion of any section of the Work and before payment therefore has been made, the **Contractor** shall remove from the site of the Work all construction equipment, temporary structures, and debris, and shall restore the site of the Work to a neat, workmanlike condition; the **Contractor** shall not remove barricades and warning and direction signs until directed by the **County**. The **Contractor** shall not postpone cleanup and seeding until the end of the Work. Waste materials shall be disposed of at locations satisfactory to the **County** or affected regulatory agencies.
- D. After completion of all Work contemplated under the Contract and before final payment has been made, the **Contractor** shall make a final cleanup of each separate part of the Work; shall restore all surfaces to a neat and orderly condition; and shall remove all construction equipment, tools, and supplies.

3.08 INSPECTION AND ACCEPTANCE

- A. When site restoration work is completed, including maintenance, the **County** will, upon request, make an inspection to determine acceptability.
- B. Where inspected site restoration work does not comply with the requirements of the **County**, the **Contractor** shall replace rejected work and continue specified maintenance until reinspected by the **County** and found to be acceptable. The **Contractor** shall remove rejected plants and materials promptly from the site of the Work.

+++ END OF SECTION 02920 +++

SECTION 033000 CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Requirements for mixing and placing concrete.
- B. Requirements for the protection of new work.
- C. Requirements for the curing of concrete.
- D. Procedures and standards for testing and inspections of concrete.
- E. Definitions of defective concrete and procedures for correction.

1.2 RELATED SECTIONS

- A. Section 02510: Pavement Repairs
- B. Section 02710: Concrete Curbs, Gutters, and Sidewalks
- C. Section 03200: Concrete Reinforcement

1.3 REFERENCES

- A. ASTM C33 – “Standard Specification for Concrete Aggregates”
- B. ASTM C150 – “Standard Specification for Portland Cement”
- C. ASTM C494 – “Standard Specification for Chemical Admixtures for Concrete”

1.4 SUBMITTALS

- A. **Mix Designs:** to contain portions of materials and admixtures to be used on Project, signed by mix designer, documentation of average strength for each proposed mix design and Manufacturer’s Certificate of Compliance.
- B. Test Reports for aggregates used in the mix design
- C. Admixtures: manufacturer’s catalog cut sheets and product data sheets for each admixture used in proposed mix design
- D. **Product Data:** Specified ancillary materials.

- E. Detailed plan for curing and protection of concrete placed and cured in cold weather. Details shall include, but not be limited to, the following:
 - 1. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.
 - 2. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - 3. Methods for temperature protection during placement.
 - 4. Types of covering, insulation, housing, or heating to be provided.
 - 5. Curing methods to be used during and following protection period.
 - 6. Use of strength accelerating admixtures.
 - 7. Methods for verification of in-place strength.
 - 8. Procedures for measuring and recording concrete temperatures.
 - 9. Procedures for preventing drying during dry, windy conditions.

- F. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F. Plan shall include, but not be limited to, the following:
 - 1. Procedures for measuring, and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - 2. Use of retarding admixture.
 - 3. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement
 - 4. Types of shading and wind protection to be provided.
 - 5. Curing methods, including use of evaporation retardant.
 - 6. Procedures for measuring and recording concrete temperatures.
 - 7. Procedures for preventing drying during dry, windy conditions

- G. Manufacturer's Certificate of Compliance to specified standards.

- H. Statement of Qualification:
 - 1. Batch Plant: Certification as specified herein.
 - 2. Mix designer.
 - 3. Installer.
 - 4. Testing agency.

- I. Field test reports

PART 2 - PRODUCTS

2.1 MATERIAL

- A. **Portland Cement:** Conform to ASTM C150 "Standard Specifications for Portland Cement", Type I/II. Use one brand of cement. Mix shall contain at least 520 lb. of Portland Cement per cubic yard of concrete.
- B. **Aggregates:** Conform to ASTM C33 "Standard Specifications for Portland Cement". Provide aggregate of natural sand and gravel or prepared from stone or gravel, free from adherent coatings, maximum size of pieces 1". Use pea gravel aggregate for concrete mix used in filling voids in concrete block walls where required.
- C. **Water:** Clean and free from injurious amounts of oils, acids, alkalis, organic materials, and deleterious substances. Non-potable water will not be used in concrete mixing.
- D. **Admixtures:** Conform to ASTM C494 "Standard Specification for Chemical Admixtures for Concrete"

2.2 CONCRETE STRENGTHS

- A. Cast-in-place Concrete: Designed to develop 3,000 psi minimum compressive strength at twenty-eight (28) days and 3,500 IF EXPOSED TO WEATHER unless noted otherwise.
- B. Cast-in-place pavement uses will need to develop 4000 psi minimum compressive strength at twenty-eight (28) days.

PART 3 - EXECUTION

3.1 PREPARATION AND INSTALLATION

- A. Notify Owner at least 1 full working day in advance before starting to place concrete.
- B. Clean equipment for transporting concrete. Remove debris, water, and ice from places to be occupied by concrete. Remove laitance and unsound material from hardened concrete before additional concrete is added.
- B. No concrete shall be placed when mixed longer than ninety (90) minutes, has exceeded three hundred (300) truck drum revolutions, or evidence of curing prior to placement.
- C. Concrete, when deposited, shall have a temperature ranging between a minimum of 50° F and a maximum of 90° F.

- D. Falling concrete shall be closely confined in a drop chute of the proper size when drop is over four (4) feet, and the final drop must be vertical to avoid segregation of aggregates. In no case shall concrete be deposited from a height causing separation of the aggregates.
- E. Concrete shall be mixed in such quantities as required for immediate use and shall be placed while fresh before loss of slump occurs. Retempering by adding water to restore slump lost during excessive mixing or due to too long a lapse of time since initial mixing will not be permitted.
- F. Pumping of Concrete
 - 1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to ensure completion of concrete placement without cold joints in case of primary placing equipment breakdown.
 - 2. Minimum pump hose diameter: 4 inches
 - 3. Replace pumping equipment and hoses that are not functioning properly.
- G. Concrete shall be rodded or vibrated to remove excess voids and air pockets when applicable

3.2 POST INSTALLATION

- A. All freshly placed concrete shall be adequately protected from mechanical injury or by action of the elements until such time as the concrete is thoroughly set.
- B. Curing
 - 1. Curing shall be performed on all concrete surfaces not immediately back-filled when hard.
 - 2. Curing shall be started immediately upon completion of the finishing operation. Curing shall continue uninterrupted for a minimum period of seven (7) days unless a longer period is hereinafter specified. Rapid drying upon completion of the curing period shall be prevented. At no time during the curing period shall the temperature of the concrete be permitted to drop below 40° F.
 - 3. Curing may be by water curing, sheet or liquid membrane. Do not use liquid membrane where a later concrete or masonry joint may occur unless the material has been certified as a non-bond breaker.

3.3 TESTING

- A. Four (4) test cylinders shall be molded each day for each fifty (50) cubic yards or fraction thereof. A slump and air test shall be made for each set of cylinders and whenever the concrete appears to vary in consistency.
- B. Mold and cure test cylinders in accordance with ASTM C-31 or PTM 611.
 - 1. Test one (1) cylinder at seven (7) days. If break does not meet specification, break two (2) cylinders at twenty-eight (28) days for acceptance.
 - 2. The remaining cylinder shall be kept for reference or additional testing if required.
- C. **Slump:** Prior to submitting mix design, consult with concrete producer and select a target slump value at point of delivery, for each application of each design mix. Unless otherwise permitted, target slump value will then be enforced for duration of project.
- D. **Source Quality Control Inspection:** Owner shall have access to and have the right to inspect batch plants, cement mills, and supply facilities of suppliers, manufacturers, and Subcontractors, providing products included in this section.

3.4 ACCEPTANCE

- A. Defective concrete is defined as concrete in place, which does not conform to strength, shapes, alignments and/or elevations as specified or shown on the Drawings.
- B. All defective concrete shall be removed and replaced in a manner meeting specifications at no additional cost to the Owner.

END OF SECTION

SECTION 13110

CATHODIC PROTECTION BY GALVANIC ANODES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section specifies the requirements for furnishing and installing a stray current mitigation and partial cathodic protection system by galvanic anodes for underground polyethylene encased ductile iron water main as specified and/or as shown on the Drawings.
- B. The galvanic cathodic protection system is designed to provide stray current corrosion control for the underground coated water main. The cathodic protection system shall include poly wrap, test stations, galvanic anodes, continuity bond cables and associated devices.
- C. The Contractor will furnish a Cathodic Protection Specialist certified by the NACE International to provide periodic inspections and test the cathodic protection system.

1.2 RELATED DOCUMENTS

- A. The Contractor, Subcontractors, vendors and the like shall meet all the Owner project requirements.

1.3 SCOPE

- A. The Contractor shall furnish all labor, equipment and materials necessary to provide and install a stray current mitigation and partial cathodic protection system for the ductile iron water main installed under this project, as shown on the Drawings and specified herein. This shall include, but not necessarily be limited to, furnishing and installing polyethylene wrap, anodes, anode test stations, and incidental items.
- B. The Contractor shall be responsible for the installation, performance and certification of all the cathodic protection work performed under this Contract.
- C. The Contractor shall record on as-built drawings the GPS coordinates of all test stations, and anodes. GPS equipment shall provide sub-meter accuracy.

1.4 APPLICABLE CODES AND STANDARDS

The work shall be performed in accordance with the latest requirements of laws and codes governing this work, including but not limited to:

- A. National, State and Local Laws, Regulations and Codes.
- B. National Electrical Code (NEC).

- C. U.S. Department of Transportation Regulations for the transportation of liquids by pipeline: Parts 180 and 195, Title 49 of the Code of Federal Regulations (DOT).
- D. NACE International Standard RP-01-69, (2001 Revision) Recommended Practice - Control of External Corrosion on Underground or Submerged Metallic Piping Systems.
- E. National Electric Safety Code.

1.5 **INSTALLER QUALIFICATIONS**

- A. The Contractor shall have on staff, a person with experience having installed cathodic protection systems previously. The name of this person shall be submitted along with a list of projects on which they have worked which involved the installation of cathodic protection.
- B. The Contractor shall retain the services of an NACE certified Cathodic Protection Specialist. The Specialist is required to;
 - Review and sign the cathodic submittal, indicating that it complies with this specification.
 - Visit the project site at the start of construction and review installation requirements for the poly wrap and the cathodic protection system.
 - Visit the project site at the mid-point of construction and ensure proper installation procedures are being followed, inspect any test station already installed.
 - Visit the project site at the end of construction to inspect workmanship and test the cathodic system.
 - Issue a report on the performance of the cathodic system.
- C. The submitted Contractor representative will be required to be involved in all aspects of the cathodic protection system installation, and shall make sure the components are installed correctly. The Contractor's Specialist will meet with the Contractor's representative at the start of construction to review the installation and inspect the materials to be installed.

1.6 **REQUIRED SUBMITTALS**

- A. Installer's Qualifications: Submit resumes of the Contractor's Specialist and cathodic protection installation representative, with a list of applicable projects.
- B. The Contractor shall submit catalog cuts covering the following material:
 - 1. Poly wrap material as specified in mechanical section.
 - 2. Chemical composition of anodes and anode backfill material.

3. Anode weight and total weight of anode package including backfill material.
 4. Anode lead wire
 5. Exothermic weld mold, charge and weld cap
 6. Test station housing
 7. Test lead cable
 8. Test station terminal boards with components
 9. Cable connectors and labels
 10. Test station tags
 11. Cable trench warning tape
 12. Calibrated shunt
- C. The Contractor shall submit a complete list of the materials to be furnished with quantities, units, and descriptions with make, model number and features to match the specification.
- D. The Contractor shall submit a detailed written procedure on how the poly wrap will be installed. Address placing the wrap on the pipe, sealing the wrap, sealing at valves and tees, quality control inspections, and repairs to any damage found.

1.8 **QUALITY ASSURANCE**

- A. After the installation is completed, the cathodic protection system shall be inspected and tested by the Contractor's Specialist. Any deficiencies in the materials and/or workmanship revealed by the testing shall be corrected and retested until the system is performing as required herein. Any repairs and retests shall be at the Contractor's expense.

PART 2 - MATERIALS

2.1 **GENERAL**

All materials shall be the latest design, in new condition and the first quality standard product of manufacturers regularly engaged in the production of such materials. All materials shall be compatible and, where possible, be the product of one manufacturer.

2.2 **ANODES**

- A. Anodes shall be prepackaged magnesium high current output type, each containing 48 pounds of galvanic (sacrificial) anode and having the following chemical composition:

Aluminum	0.003% Maximum
Manganese	0.8% Maximum
Zinc	0.002% Maximum
Silicon	0.002% Maximum
Copper	0.001% Maximum
Nickel	0.001% Maximum
Iron	0.025% Maximum
Other Impurities	0.005% Maximum
Magnesium	Remainder

B. All galvanic anodes shall measure 5.5" X 5.75" X 3.125" (nominal size) and shall be cast with a perforated galvanized steel core. The weight of the core shall not exceed 0.10 pound per foot. One end of the anode shall be recessed so that one end of the strap is accessible for lead wire connections.

C. The anode lead wire shall be thirty (30) feet minimum in length and shall be No. 10 AWG 7 copper wire with Type THWN insulation, red in color. The lead wire shall be connected to the core with silver solder. The connection shall be mechanically secured before soldering, and shall have at least one and one-half turns of wire at the connection. The entire connection shall be insulated to a 600 volt rating by filling the anode recess with an electrical sealing compound.

D. The galvanic anodes shall be packaged in a permeable cloth bag 8 inches diameter by 38 inches long, with inert backfill material, containing not less than a 52-pound mixture of:

Ground Hydrated Gypsum	75%
Powdered Wyoming Bentonite	20%
Anhydrous Sodium Sulphate	5%

E. Backfill shall have a grain size such that 100% is capable of passing through 20 mesh screen and 50% through a 100 mesh screen. The mixture shall be firmly packaged around the magnesium anode within the cloth bag by means of adequate vibration so that the magnesium anode is completely surrounded with a minimum 1/2 inch of backfill material. The combined weight of the anode including backfill and sacrificial galvanic anode material shall be not less than 100 pounds.

2.3 TEST STATIONS

A. Test stations shall have a cast iron head capable of withstanding a minimum average load of 280 P.S.I., 6 inches in diameter, with collar lip extension, cast with "CP-Test", with a 6-inch I.D. by 18 inches long non-metallic conduit, Model 668A with locking lid, as manufactured by C.P. Test Services, Inc or approved equal. All anode test stations shall provide 5 terminals with stainless steel hardware.

B. Shunting bars shall be furnished for each anode test station, but shall not be connected until tests have been made. Shunts are to be 0.01 ohm rated at 8 amperes.

- C. Each test station shall be provided with a 1 inch diameter brass tag. This tag shall have the test station number and associated structure engraved into the metal. Attach tag to the test station terminal boards as shown in the drawings
- D. Cable shall be connected to the test station terminal board using nylon insulated crimp ring terminal.
- E. Lead wire connections from the anode test station terminal block to the pipelines shall be No. 10 AWG, stranded copper wire with RHW-USE insulation, black in color.
- F. All test station cables shall be marked with printed nylon labels.
- G. Test leads shall be connected to pipes using Erico Model CAHAA-1G weld molds and Model CA-15 XF-19 weld charges designed for iron pipe. The welds shall be covered with Royston Model HC-IP caps.

2.4 JOINT BONDS

- A. #4 AWG stranded copper cables with HMWPE insulation shall be used to electronically bond the pipe joint in sections, as identified in the drawing details.
- B. Two #4 AWG/HMWPE cables shall be installed across each joint.
- C. The cables are to be connected using exothermic welds, with Erico Model CAHAA-1C weld molds and Erico Model CA-15-XF-19 charges.
- D. Welds shall be encased in Royston Model HC-IP caps.

2.5 Pipe Encasement

- A. See mechanic specification for poly encasement wrap.

PART 3 - EXECUTION

3.1 ANODES

- A. Anodes shall be installed as and where shown on the Drawings.
- B. The Contractor shall install the anodes in a vertical position as shown on the Drawings. The top of the anode shall, unless otherwise shown on the Drawings, be installed 36 inches below finished grade.
- C. Excavate hole to minimum 2 inches larger than the packaged anode diameter, to the depth indicated.
- D. Anode lead wire shall be installed in a trench; the lead wire shall be installed at a depth of not less than 24 inches below the sub-pavement. The trench bottom shall be smooth. Excavation and backfilling shall be as specified elsewhere in the Specifications, and

coordinated with the related Work of this Section.

- E. The Contractor shall not lift or support the anode by the lead wire. Exercise care to prevent damage to cloth bag or lead wire insulation.
- F. Center the packaged anode in the hole and backfill with clean native soil materials in layers not exceeding 6 inches deep. Carefully tamp each layer to properly compact the backfill. When the backfill is level with the top of the anode, pour not less than five (5) gallons of water into the hole. The backfill material shall be completely saturated. Add additional backfilling material as necessary to compensate for soil shrinkage.
- G. Place a 3 inch layer of select bedding material all around the lead wire in the trench; this select bedding material shall be clean native natural sand soil material obtained from the trench excavation in the immediate area only and shall be 100% passing No. 16 ASTM sieve. Carefully center the lead wire in trench. Backfill over the wire, using the select backfill material, shall be placed in layers not exceeding six inches deep and each layer thoroughly compacted. Scarp metal, wood scrap, organic matter and refuse shall not be allowed in the backfill. Exercise care to avoid damaging the lead wire or its connections. Place a warning tape in the trench at a depth of 6 inches.

3.2 ANODE TEST STATIONS

- A. Anode test stations shall be installed as and where shown on the Drawings, complete with anodes.
- B. The Contractor shall install anode test stations in concrete pads, as shown on the Drawings. The Contractor shall ensure no concrete enters the inside of the test stations.
- C. Lead wire connections to the pipelines shall be by exothermic weld and as specified and as shown on the Drawings.
 - 1. All exothermic welds shall be made after removing enough coating to fit the entire mold on a bare metal surface.
 - 2. Clay or putty may be used to seal the mold to the pipe to prevent leakage of the molten weld metal.
 - 3. Any weld attempts resulting in molten metal leakage shall be abandoned and a new weld shall be made not less than 12" from the site of the original weld.
 - 4. Remove slag from the thermite weld.
- D. Pipeline lead wires and anode wires shall be connected to the test station terminal block as shown on the Drawings.
- E. Lead wire connectors as specified shall be installed using the proper crimping tools and in strict accordance with the manufacturer's instructions.

- F. Cable connections to the gas line must be coordinated with the gas company.

3.3 CONTINUITY BONDS

- A. The Contractor will install bond cables across pipe mechanic and slip fittings within pipeline stations 00+00 to 05+75, and 24+50 to 27+50.
- B. The Contractor will ensure that welds are secure and properly coated.

3.4 QUALITY CONTROL AND TESTING

- A. The Contractor's Specialist will inspect and test the completed cathodic protection system. This will include an inspection of the Contractor's furnished materials and workmanship, as well as compliance testing.
- B. The Contractor's Specialist will ensure that the poly wraps are properly installed and that written procedures are followed.
- C. The Contractor's Specialist will conduct resistance tests on bonded pipe sections, applying a current of at least 20 amperes. The Specialist will submit data and calculations to show that all bond cables are in place. If a section of pipe fails the continuity test, the Contractor will be required to make repairs and retest.
- D. The Contractor's Specialist will be required to record Native potentials on the water main at each test station. This includes the pipe and anode lead wires. Any inoperable or improperly installed components will be replaced by the Contractor.
- E. The Contractor's Specialist will electronically trace and mark the route of each electrically bonded section of water main. The Contractor will then record "Native" potentials on 10-foot centers, with the cell directly over the pipe. The Contractor will drill access holes in pavement where needed. The Contractor will then connect the test leads in the test stations and will record initial current output levels and potential measurements at the test stations. The Contractor will then allow the cathodic system to operate for 2 weeks prior to conducting final tests. After 2 weeks of operation, the Contractor's Specialist will record "Current Applied" potentials on 10-foot centers, along with anode currents.
- F. The Contractor's Specialist will submit a compliance report. The report will include all field data, a photo log showing each test station and at least 5 bonded joints being installed, analysis of the data, calculated anode service life for each test station, and as-built drawings.

END OF SECTION 13110