



GWINNETT COUNTY
DEPARTMENT OF WATER RESOURCES

CONTRACT DOCUMENTS

For

48-Inch PCCP Replacement
(I-85 Interchange at SR 324)

VOLUME 2

TECHNICAL SPECIFICATIONS

GCDWR Project No. M0735-78
Bid No. BL070-17

JULY 2017

Prepared By:



400 Pike Boulevard
Lawrenceville, Georgia 30046
Phone: 770-338-8000



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TECHNICAL SPECIFICATIONS**

FOR

THE CONSTRUCTION OF WATER MAINS

FOR

**48-INCH PCCP REPLACEMENT
(I-85 INTERCHANGE AT SR 324)**

**GCDWR PROJECT NO. M0735-78
BL070-17**

GWINNETT COUNTY, GEORGIA

JULY 2017

TABLE OF CONTENTS

Section Number Title

DIVISION 01 – GENERAL REQUIREMENTS

01 00 00	GENERAL REQUIREMENTS
01 11 00	SUMMARY OF WORK
01 22 15.11	MEASUREMENT AND PAYMENT
01 31 19	PROJECT MEETINGS
01 32 33	PHOTOGRAPHIC DOCUMENTATION
01 33 00	SUBMITTAL PROCEDURES
01 41 00	REGULATORY REQUIREMENTS
01 42 19	REFERENCE STANDARDS
01 43 00	QUALITY ASSURANCE
01 45 29	TESTING LABORATORY SERVICES
01 50 00	TEMPORARY FACILITIES AND CONTROLS
01 60 00	PRODUCT REQUIREMENTS
01 65 00	PRODUCT DELIVERY REQUIREMENTS
01 66 00	PRODUCT STORAGE AND HANDLING REQUIREMENTS
01 71 23.16	CONSTRUCTION SURVEYING
01 73 29	CUTTING AND PATCHING
01 74 19	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
01 74 23	FINAL CLEANING
01 78 36	WARRANTIES
01 78 39	PROJECT RECORD DOCUMENTS

DIVISION 02 – EXISTING CONDITIONS

02 32 19	EXPLORATORY EXCAVATIONS
02 41 13.13	PAVING REMOVAL

<u>Section Number</u>	<u>Title</u>
02 41 13.23	UTILITY LINE REMOVAL
02 42 11	REMOVAL OF CONSTRUCTION MATERIAL
 <u>DIVISION 03 - CONCRETE</u>	
03 30 00	CAST-IN-PLACE CONCRETE
 <u>DIVISION 04 - MASONRY</u>	
04 21 13	BRICK MASONRY
 <u>DIVISION 31 - EARTHWORK</u>	
31 11 00	CLEARING AND GRUBBING
31 13 11	TEMPORARY FENCING
31 23 00	EXCAVATION AND FILL
31 25 00	EROSION AND SEDIMENTATION CONTROLS
31 37 00	RIPRAP
 <u>DIVISION 32 – EXTERIOR IMPROVEMENTS</u>	
32 12 16	ASPHALT PAVING
32 16 13	SIDEWALKS, CURBS, AND GUTTERS
32 92 00	TURF AND GRASSES
32 93 43	TREES
 <u>DIVISION 33 - UTILITIES</u>	
33 05 16.13	PRECAST CONCRETE UTILITY STRUCTURES
33 05 23.16	UTILITY PIPE JACKING
33 05 23.71	TUNNEL LINING
33 11 13.05	DUCTILE IRON PIPE (WATER)
33 12 13	WATER SERVICE CONNECTIONS
33 12 16	WATER UTILITY DISTRIBUTION VALVES
33 12 16.10	AIR RELEASE AND VACUUM VALVES-WATER
33 12 19	WATER UTILITY DISTRIBUTION FIRE HYDRANTS
33 12 19.81	RELOCATE AND RECONNECT HYDRANTS, VALVES, AND METERS
 <u>DIVISION 34 - TRANSPORTATION</u>	
34 41 16.10	TRAFFIC CONTROL
34 71 00	ROADWAY CONSTRUCTION
 <u>APPENDIX ‘A’ – SUPPLEMENTAL SPECIFICATIONS</u>	
A-01 22 15	SUPPLEMENTAL MEASUREMENT AND PAYMENT BID PROJECTS
 <u>APPENDIX ‘B’ – GEOTECHNICAL REPORTS</u>	
S&ME -	REPORT OF GEOTECHNICAL EXPLORATION 48-INCH PCCP REPLACEMENT – OLD CAMP BRANCH ROAD
S&ME -	REVISED REPORT OF GEOTECHNICAL EXPLORATION 48-INCH PCCP REPLACEMENT – CAMP BRANCH ROAD

SECTION 01 00 00
GENERAL REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	System Description
1.5	Contract Drawings
1.6	Schedules
1.7	Or Equals
1.8	Submittals
3.1	Access
3.2	Aid to the Injured
3.3	Buildings and Shanties
3.4	Cleaning
3.5	Cleaning and Crowning of Streets
3.6	Cleaning Surfaces
3.7	Contractor's Office
3.8	Dimensions and Elevations
3.9	Emergency Response
3.10	Environmental Contamination
3.11	Existing Irrigation and Sprinkler Systems
3.12	Existing Utilities
3.13	Inspections
3.14	Insufficiency of Safety Precautions
3.15	Intoxicating Liquors
3.16	Landscape Protection
3.17	Lighting
3.18	Means and Methods
3.19	Measures and Weights
3.20	Mill and Shop Tests and Inspection
3.21	Monuments and Landmarks
3.22	Obstructions Encountered
3.23	Overtime Work
3.24	Ownership of Materials
3.25	Painting and Coatings
3.26	Power
3.27	Protecting Existing Buildings and Structures
3.28	Protection
3.29	Record Drawings
3.30	Roadway Right-of-Way, Working Facilities, and Easements

- 3.31 Safety
- 3.32 Sales Tax
- 3.33 Sanitary Measures.
- 3.34 Schedules
- 3.35 Shoring, Formwork, and Temporary Structures
- 3.36 Site Video
- 3.37 Sound Attenuation
- 3.38 Storage
- 3.39 Temporary Heat
- 3.40 Use of Facilities
- 3.41 Use of Streets
- 3.42 Utility Relocations or Modifications
- 3.43 Water Supply
- 3.44 Work in Inclement Weather

1.2 REFERENCES

- A. Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the documents before it was discontinued shall apply.
- B. This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1.3 DEFINITIONS

- A. Whenever the following abbreviations are used, they shall refer to and designate:
 - “ACI” - American Concrete Institute
 - “AISC” - American Institute of Steel Construction
 - “ANSI” - American National Standards Institute
 - “ASME” - American Society of Mechanical Engineers
 - “ASTM” - American Society for Testing and Materials
 - “AWWA” - American Water Works Association
 - “GCDOT” – Gwinnett County Department of Transportation
 - “GCDWR” – Gwinnett County Department of Water Resources
 - “GDOT” – Georgia Department of Transportation

1.4 SYSTEM DESCRIPTION

- A. Performance Requirements

The Work shall be comprised of and for the construction of GCDWR infrastructure as identified in the Bid Schedule, including but not limited to, safety, installation, connections, sterilizing, testing, and fabrication with any and all appurtenances in accordance with the Contract Documents, complete and fully operational in compliance with federal, state, county, and local codes and regulations, standards, and specifications as applicable at the time of bid unless otherwise directed in writing by GCDWR.

1.5 CONTRACT DRAWINGS

- A. Existing conditions shown on the Contract Drawings were derived from the best available information at the time and preparation of the Contract Documents and do not purport to be completely correct. The Contractor is therefore directed to perform any and all field surveys that are deemed necessary to satisfy the Contractor to the actual surface and sub-surface conditions prior to submitting his/her bid, upon which his/her bid shall be based.
- B. The Work proposed, its connections, routing, and design intent was based on the available information of the existing conditions. The Contractor shall field verify the nature and extent of the Work proposed prior to ordering any materials. No payment shall be authorized for materials not retained as part of GCDWR facilities and its appurtenances.
- C. Additionally, GCDWR reserves the right to require deviations from the Contract during construction where such deviations are deemed necessary to provide for future connections or to provide flexibility in the maintenance and operation of the system and increase the efficiency and reliability of service to its customers. Deviations will be addressed using contract unit prices. If this cannot be accomplished see Article 10 of the General Conditions.
- D. The Contractor shall maintain, on site, one (1) complete set of Contract Documents throughout the course of the Work and make available upon request by GCDWR.

1.6 SCHEDULES

- A. Contractor shall prepare, furnish, distribute, and periodically update the Project Progress Schedule and Schedule of Submittals, as specified herein. Contractor shall also prepare and furnish a Schedule of Values, as specified herein.
- B. Acceptance of the Contractor's Project Progress Schedule, Schedule of Submittals, and Schedule of Values, and revisions thereto, shall in no way relieve Contractor of any duties and obligations under the Agreement. Such approval is limited to the format of the schedule, and does not in any way indicate approval of, or concurrence with, the Contractor's means, methods, and ability to carry out the Work.
- C. Submit a monthly update of the Project Progress Schedule and Schedule of Submittals with each request for payment.
- D. Failure of the Contractor to meet the schedule submission milestones will result in withholding of monthly payments, until deliverables associated with the milestones are received. Payments will be withheld should the Contractor fail to deliver acceptable schedules within thirty (30) days after date of Notice to Proceed.

1.7 OR EQUALS

- A. For the purposes of these Contract Documents, "or equal" item(s) shall be defined as:
 - 1. A product or manufacturer offered as a replacement to a specified product or manufacturer where the term "or equal" is included after the list of acceptable manufacturers in the Specification.
- B. An item which is offered where no specific product, manufacturer, means, methods, technique, sequence, or procedure of construction is specified or shown on the Drawings, shall not be considered a replacement, and shall be at the option of the Contractor, subject to the provisions in the Contract Documents for that item.

- C. For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless indicated otherwise in the Contract Documents.
 - D. If the manufacturer is named on the Drawings, or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the Specifications and Drawings are acceptable.
 - E. Whenever the design is based on a specific product of a particular manufacturer, that manufacturer will be shown on the Drawings and/or listed in the list of approved manufacturers in the Specifications. Any Contractor intending to furnish products other than the listed acceptable manufacturer(s) shall:
 - 1. Verify that the item being furnished will fit in the space allowed, perform the same function(s), and have the same capabilities as the item specified,
 - 2. Include in the item price the cost of all accessory items, which may be required by the “or equal” product,
 - 3. Include the cost of any architectural, structural, mechanical, piping, electrical, instrumentation, or other modifications required, and
 - 4. Include the cost of required additional work by the Engineer, if any to accommodate the item.
 - F. Approval of the Engineer and Owner of an “or equal” item as an acceptable manufacturer, is dependent on determination that the product offered:
 - 1. Is essentially equal in function, performance, quality of manufacture, ease of maintenance, reliability, service life, availability of local technical support, and other criteria to that on which the design is based, and
 - 2. Will require no major modifications to structures, electrical systems, control systems, or piping systems.
 - G. “Or equal” items will be considered only if the term “or equal” is included after the list of acceptable manufacturers in the Specification.
 - H. The Contractor shall submit shop drawings on the “or equal” item for the Engineer’s review in accordance with Specification Section 01 33 23 Submittal Procedures.
 - I. The cost of Engineer’s and Owner’s factory inspection, reference project tour, or mill inspection, required to evaluate the acceptance of the “or equal” product shall be borne by the Contractor.
- 1.8 SUBMITTALS
- A. Specified submittals shall be to the Engineer, and submitted by the Contractor only, (i.e. NOT subcontractors, vendors, suppliers, etc.).
 - B. Each submittal, with variations from the requirements of the Contract Documents, shall make specific mention of such variations. Those declared variations found acceptable by the

Engineer or GCDWR shall require the Contractor to take suitable action for the proper installation in accordance with the Contract Documents. Variation not declared or suitable action not taken by the Contractor shall not relieve Contractor of error or the responsibility for executing the Work, and cost for remedial actions deemed necessary by the Engineer or GCDWR.

PART 2 – PRODUCTS – (NOT USED)

PART 3 – EXECUTION

3.1 ACCESS

- A. The Contractor shall enable and facilitate access to all parts of the Work to GCDWR and third parties to inspect, certify, or observe when required by law; or to those who require reasonable access to the Work by reason of specific contractual relationship to the Work.

3.2 AID TO THE INJURED

- A. The Contractor shall furnish, maintain, and make ready and available for immediate use, first aid to the injured with standing arrangements for the immediate removal, transport, and hospital treatment of any personnel who may be injured on the Work, as required by federal, state, county and local laws, codes and regulations.

3.3 BUILDINGS AND SHANTIES

- A. No provision shall be allowed for the housing of men/women employed for the Work on land owned or leased by the County, unless in writing a permit is secured from GCDWR. Should permission be asked and granted, the Contractor shall comply with all regulations regarding the construction and maintenance of such buildings.

3.4 CLEANING

- A. With completion of the Work, the Contractor shall return the surface conditions of the work area to pre-work status, unless where otherwise specified in the Contract Documents. The finished surface Work shall leave the grounds in a neat and approved condition, including but not limited to, the removal of material, debris, equipment, structures, and the Contractor's office.
- B. Contractor shall terminate all temporary utilities as applicable or as required by the Contract Documents. Contractor shall also clean out all drains, pipes, inlets, and miscellaneous and appurtenant structures of debris from his/her operations.

3.5 CLEANING AND CROWNING OF STREETS

- A. As Work progresses and before the Work herein specified is accepted, the Contractor shall, upon notice from GCDWR, thoroughly clean all streets, roads, sidewalks, and lawns free from all debris and dirt accumulating from the construction, shall open all gutters so that free drainage may be had, and on unpaved streets and roads, shall completely crown the roadway within the limits of the herein specified Work.

3.6 CLEANING SURFACES

- A. Contact surfaces between existing and new Work shall be free from debris, dirt, grease, or foreign matter to the extent of wire brushing and washing, and such surface preparation as recommended by the manufacturer or directed by GCDWR. The cost for cleaning shall be included in the Prices Bid and stipulated for the various items of the bid.

3.7 CONTRACTOR'S OFFICE

- A. Facilities are not required to be on the project site. The Contractor may provide adequate indoor facilities for conducting project meetings; and at a minimum shall be equipped with power, water, lighting, heating ventilation and air conditioning, and a meeting area with table and chairs. If in the opinion of GCDWR, the location of the facility is not convenient to project personnel, GCDWR may provide suitable facilities for project meetings.

3.8 DIMENSIONS AND ELEVATIONS

- A. In the Contract Documents, figured dimensions shall take precedence over scaled dimensions, detailed drawings shall take precedence over general drawings, and elevations and slopes shall be as indicated on the Drawings, or as directed by the Engineer.

3.9 EMERGENCY RESPONSE

- A. The Contractor shall respond within four (4) hours to any emergency that may arise in connection with the Work on a twenty-four (24) hour per day, seven (7) days per week basis. Should County maintenance forces be called upon by the County to rectify a problem created by the Contractor, the Contractor shall be responsible for all costs incurred by the County, plus twenty-five (25) percent, with a minimum charge of one hundred (100) dollars per occurrence. This charge is subject to change depending upon the severity of the emergency and will be determined by Gwinnett County.

3.10 ENVIRONMENTAL CONTAMINATION

- A. Precautions against property endangerment and/or damages from water, sewage, seepage, storm, stormwater, and flood flows shall be active during the course of Work. Cost for precautions shall be included in the Prices Bid and stipulated for the items of Work.

3.11 EXISTING IRRIGATION AND SPRINKLER SYSTEMS

- A. The Contractor shall be responsible for restoring the soundness to any portion of an existing irrigation or sprinkler system disturbed and/or damaged by the Work. No compensation shall be made for this Work.

3.12 EXISTING UTILITIES

- A. Existing utilities shall be maintained, except when a utility or a utility feature requires moving. In such circumstances, the Contractor shall notify the utility before any such Work is started for approval. In the event that the utility grants approval for such movement that results in damage, it shall be repaired by the authorities having control of the same, and the expense of said repairs shall be paid by the Contractor or deducted from the monies which are due or to become due to said Contractor. No underground or overhead facilities encountered shall be disturbed without proper authority and then only in such manner as said owner may prescribe and approve.

- B. Should it become necessary to change the position, or permanently or temporarily remove part of a utility in order to clear the structure being built or to permit the Contractor to use a particular method of construction, the Contractor shall notify GCDWR of the location and circumstances and shall cease work if necessary, until satisfactory arrangements have been made by the Owners of the said utility to properly care for or relocate the same as necessary to permit the Work to proceed as specified. No claims for damages shall be allowed the Contractor on account of any delay occasioned thereby. The entire cost of the changes or temporary or permanent removal of such utilities shall be borne by the Contractor and the cost thereof shall be included in the Prices Bid and stipulated for the various Items of the Bid.
- C. Nothing contained herein shall relieve the Contractor of doing such Work at his cost and expense as is specifically included in the Contract Documents.
- D. Anything contained herein shall not relieve the Contractor of his obligation to support and protect all pipes, conduits, and other structures which may be encountered during the construction of Work, and to make good all damages done to such pipes, conduits, and other structures, as provided in this specifications. Any such damages must be repaired without delay and the cost of such repairs must be borne by the Contractor.

3.13 INSPECTIONS

- A. GCDWR shall schedule a pre-construction meeting with the Contractor a minimum of 24-hours prior to construction. During construction the GCDWR Inspector shall be the lead person for witnessing construction including, but not limited to, taps, cores, bores, wet cut-ins, flow diversions, shutdowns, testing, chlorination, sampling and work that may be required or determined necessary by the Engineer. Should existing conditions necessitate a change or cost to the Contract Documents, the GCDWR Project Manager shall be notified for approval prior to proceeding.
- B. The GCDWR Inspector shall review and approve quantities of unit items installed and/or materials stored in the Work by the Contractor prior to Contractor's submittal for payment to GCDWR Project Manager. Failure to do so may result in delays in processing payments.
- C. Upon notification by the Contractor, GCDWR shall perform an inspection of the finished surface features and conditions for acceptance of the Work. Should discrepancies exist, the Contractor shall make restorations as directed, until acceptance is granted by GCDWR, upon which final payment shall be made for the Work.
- D. Contractor shall pay for second inspections, if so required by the County.

3.14 INSUFFICIENCY OF SAFETY PRECAUTIONS

- A. If at any time, in the opinion of the County, the Work is not properly instituted or maintained and is not in accordance with federal, state, county and local laws, codes and regulations, the Contractor shall execute immediate measures to bring into compliance unsatisfactory surroundings. In the event that the Contractor is not readily available at the Work to be notified of the insufficiency of safety precautions, then the County may elect to institute or restore such Work to a state deemed safe. Such actions by the County shall in no way release the Contractor from judiciary duty specified. Costs to correct safety precautions shall be at the Contractor's expense.

3.15 INTOXICATING LIQUORS

- A. The Contractor shall neither permit nor suffer the introduction or use of intoxicating substances, such as but not limited to, alcohol or illegal drugs upon or about the Work jobsite.

3.16 LANDSCAPE PROTECTION

- A. Landscaping, such as but not limited to, ornamental trees, shrubbery, hedges, flower beds, decorative berms, decorative rocks, ponds, timbers, and their appurtenances shall not be removed or disturbed without approval from GCDWR. However, should it be required to remove or disturb such items, the Contractor shall seek approval no later than 72 hours in advance of conflict. If and when approval is granted by GCDWR, the Contractor shall take the proper precautions to preserve, protect, and reestablish such items along the line of or contiguous to the Work. All landscaping shall be restored to the same or better general conditions as existed prior to commencement of the Work. If deemed by GCDWR to be damaged, each item damaged shall be replaced with the same type and like size. Cost for removal and relocation shall be considered as having been included in the Prices Bid and stipulated for the various items of Work. Cost for restitution shall be borne by the Contractor.

3.17 LIGHTING

- A. Except for acts of nature, the Work shall be secured by such means to prevent loss to health, limb, and property. Adequate lighting shall be provided and maintained during periods of Overtime Work, from one-half (½) hour before sunset to one-half (½) hour after sunrise. Contractor shall provide adequate lighting for safety and performance of construction operations and provide the necessary safety and other facilities required for work during normal working hours and for work at night.

3.18 MEANS AND METHODS

- A. Unless otherwise expressly provided in the Contract Documents, the means and methods of construction shall be such as the Contractor may choose. However, GCDWR maintains the right to reject or alter the Contractor's proposed means and methods, which shall not produce finished Work in accordance with the terms of the Contract, or to GCDWR right as administrator of the construction to direct the Contractor to more stringent means or methods.
- B. If determined by GCDWR that the Contractor's work methods, features, and/or equipment appears to be unsafe, insufficient, or improper, GCDWR may order the Contractor to improve their safety, sufficiency, and/or character, whereby the Contractor shall conform to such orders; but should GCDWR not demand any increase of such safety precautions, insufficiency, inadequacy or any improvement shall not release the Contractor from his obligation to secure the work methods, safety precautions, work features, and/or equipment for the safe conduct and quality of work specified, and shall not constitute a cause of action for damages.
- C. The Contractor shall have the right to deny access to the Work during construction, except to GCDWR and third parties to inspect, certify, or observe when required by law; or to those who require reasonable access to the Work by reason of specific contractual relationship to the Work.

3.19 MEASURES AND WEIGHTS

- A. Whenever so requested as deemed necessary by GCDWR, the Contractor shall provide accurate scales, adequate equipment, and the necessary assistance for weighing and/or measuring materials for the installed Work as specified. It is understood and agreed that a "ton" shall mean the short ton of two thousand (2,000) pounds.

3.20 MILL AND SHOP TESTS AND INSPECTION

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish triplicate copies of attested certificates signed by a duly authorized representative of the manufacturer, showing details of quality or performance sufficient to demonstrate compliance with the Contract Documents. Inspection of materials shall be made as required by these specifications.

3.21 MONUMENTS AND LANDMARKS

- A. Monuments or landmarks shall not be damaged or removed by the Contractor or any of his/her employees without the written consent of GCDWR. Any monument or landmark so removed shall be replaced by GCDWR at the expense of the Contractor. The cost thereof shall be retained from the monies due or to become due the Contractor under this agreement.

3.22 OBSTRUCTION ENCOUNTERED

- A. The giving of this information upon the Work Assignment Contract Drawings shall not relieve the Contractor of his obligation to support and protect all pipes, conduits, and other structures which may be encountered during the construction of Work, and to make good all damages done to such pipes, conduits, and other structures, as provided in this Specification. The Contractor shall locate obstructions ahead of the Work. Should the Contractor determine that the existing information is not correct and an obstruction shall be encountered, he/she shall immediately contact GCDWR.

3.23 OVERTIME WORK

- A. It is the intent of the contract that the Contractor provide sufficient work force at all times during normal working hours and days of each week to complete the Work without resort to overtime work. The definition of normal working hours and days is an eight (8) hour day, Monday through Friday, Gwinnett County-recognized legal holidays excepted, during a consecutive period as agreed upon in the area of the Work, not counting the lunch period; and the definition of normal work week is the aggregate of the five (5) consecutive eight (8) hour days, Monday through Friday inclusive, maximum, the same holidays excepted.
- B. Night work or work on Saturdays, Sundays, or Gwinnett County-recognized legal holidays, requiring the presence of GCDWR personnel or an inspector, shall not be permitted except in case of emergency, and then only to such extent as is absolutely necessary, and with the written permission of GCDWR.
- C. Should the Contractor, for his convenience, request permission to work overtime or to work on Saturdays, Sundays, or trade recognized legal holidays in the area of the Work, the County shall have the right to deduct sufficient sums from the monies due the Contractor to cover payment of additional salaries for the GCDWR personnel as are normally employed on the Work.
- D. Should it become necessary for Work to be accomplished at the direction of GCDWR for the convenience and/or requirement of the GCDWR outside of normal working hours, then full inspection and engineering shall be provided at no additional cost to the Contractor during those hours.
- E. During periods of overtime work, the Contractor shall provide the necessary facilities required for work during normal working hours and for work at night. The Contractor shall be in readiness in time of emergency even nights, Saturdays, Sundays, and holidays at no cost to the County.

3.24 OWNERSHIP OF MATERIALS

- A. Existing material removed that shall not be relocated or reused in the Work shall be moved off site within 48 hours, becoming the property of the Contractor. The cost for such Work shall be as stipulated by the Prices Bid, for the various items of the Work.
- B. Existing material recovered that shall be relocated or reused in the Work shall be refurbished or renovated as required, unless otherwise directed by GCDWR.
- C. Existing material removed shall be disposed of in a manner approved by GCDWR at the Contractor's expense.
- D. New material not installed in the Work shall be moved offsite and remain the property of the Contractor. Only material that is installed by the Contractor will be paid for. However, the Contractor may submit pay applications for stored material in accordance with Section 14.02 of the General Conditions.
- E. All manhole covers, salvaged fire hydrants and any other material bearing the name of Gwinnett County shall be returned to GCDWR.

3.25 PAINTING AND COATINGS

- A. It is the intention of these specifications that metal permanently installed in the Work shall be protected by a durable coating of paint, or other approved material, and that all such metal surfaces not buried in the earth or masonry shall be left clean and well painted at the completion of the Contract, and in accordance with detailed requirements as may hereinafter be set forth.

3.26 POWER

- A. The Contractor shall make his own arrangements for power. No payment shall be made for cost of obtaining power. The cost for power shall be as stipulated by the Prices Bid, for the various items of the Work.

3.27 PROTECTING EXISTING BUILDINGS AND STRUCTURES

The Contractor shall take the necessary precautions to protect, including but not limited to, buildings, bridges, structures, and substantial walls or fences which may be encountered or endangered in the execution of the Work, not otherwise provided for, shall repair and make good any damages caused by reason of his operations and restore such property to its state before the damages. Existing walls and fences that are removed due to the execution of the Work shall be replaced by the Contractor and, where required or directed by GCDWR, temporary fencing shall be installed by the Contractor. No payment shall be made for said Work or material.

3.28 PROTECTION

- A. The Contractor shall furnish and maintain satisfactory protection to the Work against injury by weather, flooding, or breakage thereby permitting all Work to be left in a perfect condition at the completion of the Work.

3.29 RECORD DRAWINGS

- A. The Contractor shall be furnished one set of Contract Drawings for the purpose of recording information on the as installed Work, as specified in Section 01 78 39 Project Record

Documents. The information shall be correct and presented on the Drawings and returned to GCDWR for acceptance.

- B. The Contractor shall provide Georgia State Plane GPS coordinates for all appurtenances (fire hydrants, manholes, junction boxes, valves (new or existing), etc.) associated with the work.

3.30 ROADWAY RIGHT-OF-WAY, WORKING FACILITIES, AND EASEMENTS

- A. Work within the limits of private property and rights-of-way, shall be done in conformity with all applicable permits and agreements with the County and the owners of such private property, easements, or rights-of-way. Whether or not such a condition be part of the agreement, care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said private property to the same or better general conditions as at the time of entry for Work to be performed under this contract. The Contractor shall not enter any easement without first confirming with GCDWR that such easement is fully executed.
- B. The Contractor shall not (except after consent from the proper parties), enter or occupy with labor, tools, or equipment on any land outside the rights-of-way or property of the County.
- C. The Contractor shall be allowed use of the site designated for construction as necessary for the Work. However, existing access to properties shall be maintained or adequate access provided during the course of the Work. Cost for access shall be included in the Prices Bid and stipulated for the various items of the Work to be done under this contract.
- D. Work that shall be performed on private property or easements that requires granted access beyond the established road right-of-ways shall be done in conformity with all permits and agreements between Gwinnett County and property owners. Should the Contractor desire or require additional space outside the limits of Work, he/she must arrange for such space with property and easement owners at his/her own expense. Legal binding agreements for such additional space must be in writing and a copy filed with GCDWR, prior to accessing such lands. In such agreements, care shall be taken to avoid injury to the premises entered and shall be left in a neat and orderly condition as existed at the time of entry for Work.
- E. When working on easements, the Contractor shall install Tree Save Barriers along all boundaries of the work area, unless otherwise specifically directed by GCDWR, prior to any Work. Work premises shall be left in a neat and orderly condition by the removal of rubbish, debris, and the grading of surplus materials and the restoration of said private property to the same general conditions as existed at the time of entry for Wor

3.31 SAFETY

- A. Unless otherwise specified, all federal, state and county regulations shall be maintained during the course of the Work.

3.32 SALES TAX

- A. The Contractor shall furnish GCDWR with certified copies of paid invoices or their equivalent proof covering sales tax paid on items which GCDWR is eligible for tax refund; none of which shall be refunded or credited to the Contractor.

3.33 SANITARY MEASURES

- A. Sanitary conveniences shall be employed prior to beginning the Work in sufficient number, in such manner and in such places as shall satisfy GCDWR. Such sanitary conveniences shall

be operated and maintained in such a manner as to remove harmful effects to personnel or environment. All persons connected with the Work are obliged to use the conveniences provided and shall in no way violate these provisions. Violations shall result in an immediate dismissal of the employee and removal from the Work. Only upon written consent by GCDWR shall the violator regain access to the Work. Sanitary conveniences shall be maintained during the Work and in compliance with the local Health Department and GCDWR. When possible, sanitary conveniences shall be placed in locations that least impact public view. Upon completion of the Work, the Contractor shall remove sanitary conveniences without deleterious effect.

3.34 SCHEDULES

- A. The Project Progress Schedule shall be plotted on a minimum eleven-inch by seventeen-inch (11" x 17") size sheets with the flow of activities from left to right. Printing shall be in color and suitable for half-size reproduction. No lettering or numbering shall be less than one-eighth-inch (1/8") in height for capital letters and numbers. The critical path shall be clearly marked and readily identifiable.
- B. The Project Progress Schedule shall be a Critical Path Method (CPM) Network Diagram, and include the following:
 1. Furnish an updated diagram with all activities and restraints. This includes providing an "As-Built" Schedule with completion dates for all key monthly completion and delivery dates,
 2. Provide updated Project Progress Schedule graphics in color showing progress-to-date and completion schedule. The critical path shall be clearly identified,
 3. A legend clearly identifying each symbol used,
 4. Be prepared in the form of a time-scaled CPM network,
 5. Group activities by facility and major area of work. The identification number of the individual activities shall be coded such to provide the grouping,
 6. Be prepared in chronological order of the beginning of each item of work,
 7. Have a horizontal time scale based on calendar days and identify the Monday of each week,
 8. Show the order and interdependencies of the activities and the sequence in which the work is to be accomplished as planned by the Contractor. The diagram shall show how the start of a given activity is dependent upon the completion of the preceding activities, and how its completion restricts the start of following activities. Float need not be shown on the network diagram,
 9. Show all activities relating to the construction of the work, and include the following information related to the activities:
 - a. Activity number
 - b. Activity description
 - c. Percent complete
 - d. Estimated duration, in working days, of each activity
 - e. Start date
 - f. Finish date

10. Show all planned facility shutdowns, including temporary relocations, temporary bypasses, and transitions from existing to temporary, temporary to new, and the like.
 - a. For each anticipated shutdown included in the schedule, submit within thirty (30) days prior to the planned shutdown, a description of the shutdown, duration, anticipated start and completion dates, related preparation work, and related temporary facilities to be provided.
 11. Show adverse weather days on the critical path.
 - a. The number of adverse weather days per month shown on the critical path of the schedule shall not be less than the mean number of days for that particular month, in which precipitation meets or exceeds 1/10-inch, liquid measure.
 - b. The mean number of days in which the precipitation meets or exceeds 1/10-inch, liquid measure, will be based upon a thirty (30) year average of precipitation recorded and described by the National Oceanic and Atmospheric Administration (NOAA).
 - c. The total number of adverse weather days shall be monitored and agreed to monthly by Contractor, Engineer, and Owner. The Project Progress Schedule shall be updated to reflect the accrual of adverse weather days agreed to and enacted by a Contract Time extension.
 12. Show the following for specified submittals of Shop Drawings, product data, samples, and materials:
 - a. Submittal date,
 - b. Review period, based on fourteen (14) calendar day review period,
 - c. Fabrication duration,
 - d. Delivery dates.
 13. Show the following events and milestones in addition to construction activities:
 - a. Notice to Proceed,
 - b. Milestones,
 - c. Schedule of Submittals
 - d. Operational Testing (including air testing, chlorination, CCTV, etc.)
 - e. Owner coordination
 - f. Notification Periods
 - g. Coordination with separate contracts/contractors
 - h. Owner activities impacting the Work.
- C. The Project Progress Schedule update shall coincide with the end of the pay period. The update shall be used to create the monthly payment application request. No monthly payment request will be processed unless the Project Progress Schedule is updated and submitted to the Engineer.
- D. The Schedule of Values shall be of the following form:
1. Type schedule on eight and one-half –inch by eleven-inch (8½” x 11”) white paper,

2. Contractor's standard forms and automated printouts may be used,
3. Identify Schedule of Values information with:
 - a. Title of Project
 - b. Project Location
 - c. Purchase Order Number
 - d. Name of Engineer Firm
 - e. Name and Address of Contractor
 - f. Bid Number (BL)
 - g. Date of Submission
- E. The Schedule of Values shall list the installed value of the component parts of the Work in sufficient detail to serve as a basis for computing values for progress payments during construction. Breakdown shall be by utility, then by CSI Format, for ease of field verification of quantities completed.
- F. For Schedule of Values, follow the Bid Form as the format for listing component items. Identify each item with number and title of the respective major section of the Specifications.
- G. For each major line item, list sub values of major products or operations under the item.
- H. For the various portions of the Work:
 1. Each item shall include a directly proportional amount of the Contractor's overhead and profit.
 2. For items on which progress payments will be requested for stored materials, breakdown the value into:
 - a. The delivered and unloaded cost of the materials, with taxes paid. Owner shall require invoices for proof of purchase.
 - b. The total installed value, including Contractor's overhead and profit, less the value of stored material item a. above.

3.35 SHORING, FORMWORK, AND TEMPORARY STRUCTURES

- A. The Contractor shall take full responsibility including the hiring of a practicing licensed professional engineer that may be needed for the adequacy and safety throughout erection, use and removal of all temporary Work such as shoring and supports during all phases of the Work, formwork, and supports for concrete, temporary protection, and structures of all kinds.

3.36 SITE VIDEO

- A. Prior to the Work, the Contractor shall perform and supply GCDWR a thoroughly detailed video of the worksite and its contiguous area. The video shall be of such quality as to view and establish existing conditions in detail and used to render a decision where no other documentation is available. Site videos made from a moving vehicle will not be accepted.

3.37 SOUND ATTENUATION

- A. The Contractor shall, during the course of the Work, comply with Gwinnett County Noise Ordinance unless GCDWR enforces a stricter standard.

- B. Work operations, machinery, equipment, and material handling shall be performed in such a manner as to avoid and eliminate unnecessary noise. Noise deemed unacceptable by the County shall be immediately terminated.

3.38 STORAGE

- A. Materials, equipment, tools, and machinery required for the Work shall be neatly and compactly piled in such a manner as to cause the least inconvenience to property owners and traffic. Storage shall be in areas approved by GCDWR. Fire hydrants, water and gas shut-off boxes, underground power and telephone line manholes shall, at all times, be kept free and unobstructed, and shall be left uncovered by such materials.

3.39 TEMPORARY HEAT

- A. The Contractor shall supply temporary heat for such period of time and at such temperature as needed for the proper protection and execution of the Work. No cost shall be paid for temporary heat.

3.40 USE OF FACILITIES

- A. The County shall have the right or grant permits to connect any conduit, pipe line, or structure with the Work and its appurtenances at any time before the Work is accepted. The Contractor shall not interfere or be granted compensation for such Work.

3.41 USE OF STREETS

- A. Access: During the progress of the Work, the Contractor shall make ample provisions for both vehicular and foot traffic on public roadways except during periods of road closures approved by Gwinnett County, and shall indemnify and save harmless Gwinnett County from any expense whatsoever due to the Work. The Contractor shall provide, but not limited to, free access to all driveways, fire hydrants, water, and gas valves located along the line of Work. Gutters and waterways must be kept open or other provisions made for the removal of stormwater.

Street intersections may not be blocked, except for one-half (½) the roadway at any given time, and the Contractor shall lay and maintain temporary driveways, bridges, and crossings, such as in the opinion of GCDWR are necessary to reasonably accommodate the public.

- B. Traffic Control: Adequate signs, barricades, and lights, in accordance with the standards of GDOT, necessary to protect the public shall be provided.

Flagmen to direct traffic shall be employed continuously during periods when only one-way traffic can be maintained or when equipment is operated back and forth across the pavement areas.

Roadway disturbances shall not be left unfilled overnight, except in emergencies, and in such cases adequate precautions shall be exercised to protect traffic.

- C. Procedural Rules: Work in roads shall be in accordance with the rules and regulations of the controlling agency.

In the event of the Contractor's failure to comply with these provisions, GCDWR may cause the same to be done, and shall deduct the cost of such Work from any monies due or to become due the Contractor under this agreement, but the performance of such Work by GCDWR or at its instance, shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or of the Work.

3.42 UTILITY RELOCATIONS OR MODIFICATIONS

- A. Should, in the course of the Work, a need arise to relocate or modify a portion of GCDWR existing piping system, the Contractor shall immediately notify GCDWR for approval to proceed with such Work in accordance with the Contract Documents, or as directed by GCDWR. Removal of the existing piping system shall include, but not be limited to, the removal of its bulkheads, thrust restraints, piping appurtenances, concrete, and/or masonry that was exposed by excavation in part or whole, except for tie-rods beyond the limits of trenching. Without exception, any part of an existing restraint system relevant to the remaining existing piping system shall remain and be supplemented with additional restraint to maintain an unimpaired piping system. The cost for such Work shall be as stipulated by the Prices Bid, for the various items of the Work.

3.43 WATER SUPPLY

- A. In the vicinity of the Work, GCDWR shall make available water required to execute the Work. The Contractor shall be responsible for the retrieval, transport, and delivery of all water with all means to protect and maintain the integrity of GCDWR water system at his/her cost in accordance with all applicable rules and regulations. When water is required for the Work, the Contractor shall obtain a hydrant water meter from GCDWR Customer Service, at no up-front cost to the Contractor. The Contractor shall notify GCDWR of all project water usage by providing meter reads to the Project Inspector by the first business day of the month for project tracking purposes. If the hydrant meter is kept for 6 months, the Contractor will be contacted via email to bring the meter on a specified date, to GCDWR warehouse for recalibration testing.

3.44 WORK IN INCLEMENT WEATHER

- A. The Contractor shall take into account historical weather conditions and potential difficulties that may be encountered for completing the Work demonstrated in the work schedule. Contractor shall provide adequate protection against unfavorable weather to the satisfaction of GCDWR. Weather shall not be grounds for contract extension of available work days unless, such should be most adverse, and reasonable effort to perform the Work is exercised, and affected construction activities lie on the critical path of the current, approved Project Progress Schedule.
- B. The attachment listed below, following “End of Section 01 00 00” is a part of this Specification.
 - 1. Weather Delay Monthly Report

END OF SECTION 01 00 00

WEATHER DELAY MONTHLY REPORT

Month and Year Reported Below	Project Number and Name

Day of Month	Mark "X" if Work delayed by this cause				Specific Description of Delay Condition and Construction Activity Affected
	Precip	Temp	Wind	Dryout	
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					

	(a) Total Weather Delay Days this Month
	(b) Standard Baseline Days for Average Climatic Range this Month

	Claimable Days this Month = (a) - (b)
--	---------------------------------------

SECTION 01 11 00

SUMMARY OF WORK

PART 1 – GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- A. Water main work to be performed under this Contract is as described in the Notice of Bid Advertisement and shall consist of furnishing all labor, materials, tools, equipment, and incidentals and performing all work required to make, install, test, and place the proposed water main(s) in service in a complete and functioning manner including the following work:
1. Install water mains as indicated on the Drawings. Provided and install all necessary fittings and appurtenances to maintain the proposed alignment, or as directed by the Engineer.
 2. Install thrust restrain systems for piping and fittings, as required or directed by the Engineer.
 3. Make connections to existing water mains using either tapping sleeves and valves or wet cut-ins, as directed.
 4. Install fire hydrant assemblies and isolation valves as shown on the Drawings or as directed by the Engineer.
 5. Install service connections and reconnect existing service meters.
 6. Pressure test and disinfect the new water main until testing and disinfection requirements of the specifications are met.
 7. Backfill, compact, and repave all pipe trench cuts within paved areas; and backfill, compact, and landscape all pipe trench cuts within unpaved areas, in compliance with the Contract Documents.
 8. Provide and install all necessary manholes, vaults, and appurtenances as required or directed by the Engineer.
 9. Remove existing fire hydrants for salvage and deliver to the location directed by GCDWR.
 10. Remove existing valve boxes and refill the holes with compacted material. Cover surface with materials matching the surrounding area.
 11. Abandon existing water mains by plugging pipe ends and closing valves.
 12. Restore all disturbed areas including driveways, parking areas, curbs, curb and gutter, sidewalks, yards, ornamental plantings, etc.
 13. Maintain traffic control throughout the duration of construction.
 14. Clean-up the project work area and return the area to its pre-construction conditions.

- B. Sanitary sewer main work to be performed under this Contract is as described in the Notice of Bid Advertisement and shall consist of furnishing all labor, materials, tools, equipment, and incidentals and performing all work required to make, install, test, and place the proposed sanitary sewer mains in service in a complete and functioning manner including the following work:
1. Install sanitary sewer mains as indicated on the Drawings. Provided and install all necessary fittings and appurtenances to maintain the proposed alignment, or as directed by the Engineer.
 2. Install thrust restrain systems for piping and fittings, as required or directed by the Engineer.
 3. Install service connections and reconnect existing sewer service.
 4. Pressure and leak test the force main and/or gravity sewer and manholes until testing requirements of the specifications are met.
 5. Backfill, compact, and repave all pipe trench cuts within paved areas; and backfill, compact, and landscape all pipe trench cuts within unpaved areas, in compliance with the Contract Documents.
 6. Remove existing vaults and refill the holes with compacted material. Cover surface with materials matching the surrounding area.
 7. Restore all disturbed areas including driveways, parking areas, curbs, curb and gutter, sidewalks, yards, ornamental plantings, etc.
 8. Maintain traffic control throughout the duration of construction.
 9. Clean-up the project work area and return the area to its pre-construction conditions.
 10. Provide and install all necessary manholes, vaults, and appurtenances as required or directed by the Engineer.
 11. Make connections to existing manholes and rehabilitate manhole inverts as required or directed by the Engineer.
 12. Provide the necessary bypass pumping for execution of the Work, while allowing flow to continue through the sewer and around the work area.
 13. Abandon portions of existing sewer and manholes in place in accordance with the Contract Documents.
 14. Clear easements as necessary for installation of the proposed sewer and maintain erosion control measures throughout the duration of the project.

1.2 SCHEDULING AND SEQUENCE OF WORK

- A. The existing water mains must remain in service throughout the duration of construction. Once the Contractor has completed the installation of the proposed water main, successfully tested and disinfected the water main, and received approval from the Engineer and GCDWR, the service connection may be relocated from the existing water mains to the new water main. Upon completion of relocating the service connections, the Contractor shall abandon the existing water mains in place.

- B. All water system shut-offs for making wet cut-ins shall be coordinated with the GCDWR Project Inspector a minimum of one (1) week in advance of planned shut-off. A minimum of twenty four (24) hours' notice shall be provided to the affected residents prior to shutting off water service.
- C. All sanitary sewer flow shall be pumped around segments of existing sanitary sewer under construction, as necessary, for the repair, replacement, or rehabilitation of the existing sanitary sewer, during the installation and testing of the new sanitary sewer, sewer connections/reconnections, and the replacement of manholes.
- D. The Contractor shall prepare and submit a detailed plan for setup, operation, monitoring, and shutdown of the bypass system, as outlined in Section 33 01 30.74 Bypass Pumping.
- E. The Contractor shall schedule any gravity sewer downtime with GCDWR and the Engineer prior to removing any of the existing facilities from service.

1.3 USE OF PREMISES

- A. Confine operations at the site to areas permitted by law, ordinances, permits, and Contract Documents.
- B. Do not unreasonably encumber premises with materials and equipment.
- C. Maintain the premises in clean and safe conditions at all times.
- D. Maintain access for emergency service personnel and school bus traffic at all times during construction.
- E. If construction is going to block driveway access for residents, the Contractor shall notify the residents in advance to allow for removal of vehicles. The Contractor shall also maintain, on site, suitable steel plates for use in allowing vehicle access across open trenches and place plates as required allowing vehicular traffic to pass.
- F. Provide access to GCDWR's authorized persons and the police, fire, or other departments having legal jurisdiction to the site at all times and provide cooperation in their work.

1.4 COMMUNICATION

- A. All formal communications shall be in writing. Use prescribed forms as required by GCDWR.
- B. Designate in writing the individual who will be the Contractor's authorized representative.

END OF SECTION 01 11 00

SECTION 01 22 15.11

MEASUREMENT AND PAYMENT

BID WATER AND SEWER PROJECTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section defines the bid items of Work listed on the Bid Form and defines how payment shall be determined. Payment shall be made for each bid item based on the description in this section.
- B. Bid Prices included on the Bid Form shall be full compensation for all materials, labor, equipment, tools, construction equipment and machinery, heat, utilities, transportation, taxes, overhead, markup, incidentals and services necessary for the execution and completion of the Work in the Contract Documents to be performed under this Contract. For the Work described, the allowance and unit price, actual used and installed quantities of each bid item shall be measured in the field and certified by the Engineer and/or GCDWR upon completion of construction in the manner set forth for each item in this and other sections of the Specifications. Payment for all items listed on the Bid Form will constitute full compensation for all Work shown and specified to be performed.
- C. The Contractor shall assist and fully cooperate with GCDWR to determine proper measurement and payment for each item providing complete and reasonable backup documentation as requested by GCDWR to substantiate payment due.

1.2 BID ITEMS

The following items 1 through 38 comprise the Base Bid Total as listed on the Bid Form.

- 1. SPECIFICATION SECTION NO. 321216, UNIT PRICE FOR ASPHALT PAVING RESURFACING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of roadway or parking area pavement installed as shown on the Drawings or as directed by GCDWR. Pavement required as trench backfill as shown on the Drawings and Specifications for the minimum width trench for utility pipe construction is not included in this section, up to, but not including the final asphalt surface coarse (1½" maximum depth), but shall be included in the applicable bid item for utility pipe construction. This includes trench backfill and compaction, graded aggregate base, and paving to the bottom of the surface coarse of the utility pipe trench as shown on the Drawings. The final asphalt surface coarse is included in Asphalt Pavement Resurfacing. If asphalt pavement resurfacing is not specified or shown on the Drawings, then the final asphalt surface coarse will also be included in the applicable section for utility pipe construction.

PAYMENT: The Unit Prices Bid per square yard (SY) for roadway pavements and parking areas shall include permit fees, maintenance charges and inspection fees required by all road departments and the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

- a) **Partial Depth Repair – Patching:** Payment shall be the actual square yards of pavement repair, preparation, and resurfacing utilizing Partial Depth Repair – Patching.
 - b) **Asphalt Pavement Resurfacing:** Payment shall be the actual square yards of pavement resurfacing as specified, shown on the Drawings, or directed by the Engineer. Pavement resurfacing shall include milling, tack coat, asphalt pavement surface, and roadway striping to the depth indicated in the Drawings and Specifications.
 - c) **Full Depth Pavement:** Payment shall be the actual square yards of pavement utilizing Full Depth Pavement as shown on the Drawings, specified, or as directed by the Engineer. Included shall be the costs of graded aggregate base, asphalt base, binder, asphalt surface, roadway striping, tack coat, milling, and all associated costs of work necessary for furnishing Full Depth Pavement. Pavement depth and materials shall be as specified on the Drawings and Specifications.
2. SPECIFICATION SECTION NO. 347100, UNIT PRICE FOR DRIVEWAY CUT RESTORATION:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of driveway pavement restored within the construction of trench crossing said driveways. The width of pavement measured for payment shall be the allowable payment width of excavation as indicated on the Drawings; except in the instance where entire sections or slabs have been removed under direction of the Engineer or GCDWR. Optional free bores used to cross driveways in lieu of open cutting driveway shall be paid by the square yard, as measured in feet by the width of the driveway at the centerline of the pipe times a length of ten (10) feet.
- PAYMENT:** The Unit Prices Bid per square yard (SY) of driveway pavement restored shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
3. SPECIFICATION SECTION NO. 321613, UNIT PRICE FOR CURB/ COMBINATION CURB & GUTTER RESTORATION:
MEASUREMENT: The quantity to be paid under these items shall be the actual number of linear feet of curb and combination curb and gutter restored as specified, indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per linear foot (LF) length for curbs/curbs and gutter shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

4. SPECIFICATION SECTION NO. 321613, UNIT PRICE FOR SIDEWALK RESTORATION:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of sidewalk restored in accordance with the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per square yard (SY) of sidewalks shall include the furnishing of all materials, labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

5. SPECIFICATION NO. 330523.16, UNIT PRICE FOR UTILITY PIPE JACKING:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet placed under the respective items uncased boring, jacked steel casing, or steel casing/open cut, as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per linear foot (LF) of uncased boring, jacked steel casing, or steel casing/open cut shall be in full compensation for all excavation, rock excavation, dewatering, sheeting, shoring, jacking/auguring operations, receiving pits, concrete, grout, sand and screenings, brick masonry, steel casing pipe, welding, backfill and all other materials, labor, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR. The unit price for each shall further include full compensation for furnishing barricades, warning signals, and lights. The carrier pipe shall be paid separately under the item titled for the specific pipe material type.

6. SPECIFICATION NO. 330523.71, UNIT PRICE FOR STEEL TUNNEL LINER:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet placed as shown on the Drawings or as directed by GCDWR. The length shall be measured along the axis of the tunnel between the existing faces of the masonry bulkheads.

PAYMENT: The Unit Prices Bid per linear foot (LF) of tunnel liner shall include earth excavation, rock excavation, tunneling operations, sheeting and shoring, lumber left in place, concrete, grout or sand fill, brick masonry, liner plates, bolts and other fasteners; furnishing the services of qualified representative of liner plate manufacturer; and the furnishing of all necessary tools, equipment, labor and materials to complete the Work.

7. SPECIFICATION NO. 329200, UNIT PRICE FOR PERMANENT SEEDING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards of planted seed, complete; to include ground preparation, lime, fertilizer, seed, and mulch as specified, as indicated on the Drawings, or as directed by GCDWR.
- PAYMENT: The Unit Prices Bid per square yard (SY) shall include all labor, materials, tools, and equipment necessary to complete the Work as specified.
8. SPECIFICATION NO. 329200, UNIT PRICE FOR SODDING:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of square yards installed, complete; to include ground preparation, lime, fertilizer, and sod as specified, as indicated on the Drawings, or as directed by GCDWR.
- PAYMENT: The Unit Prices Bid per square yard (SY) shall include all labor, materials, tools, and equipment necessary to complete the Work as specified.
9. SPECIFICATION NO. 329343, UNIT PRICE FOR TREE REPLACEMENT:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of trees planted by type as shown on the Drawings or as directed by GCDWR.
- PAYMENT: The Unit Prices Bid for each tree (EA) planted shall include all necessary tools, equipment, labor and materials to complete the Work.
10. SPECIFICATION NO. 023219, UNIT PRICE FOR EXPLORATORY EXCAVATIONS:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of exploratory excavations as verified by GCDWR. This item is to only be used when directed by GCDWR and is not to be used by the Contractor as a method of payment for locating utilities or valves required for the completion of the Work.
- PAYMENT: The Unit Prices Bid for each (EA) exploratory excavation shall include all necessary labor, equipment, and materials required to perform exploratory excavations. The unit price shall further include full compensation for maintaining traffic, furnishing barricades, warning signals, lights, and flagmen. Any and all site restoration and clean-up work shall be included in the unit price. Topsoil removed from the immediate site and reused will not be considered for payment.

11. SPECIFICATION NO. 344116.10, UNIT PRICE FOR TRAFFIC CONTROL:
MEASUREMENT:

- a) Devices: The quantity to be paid under this item shall be lump sum for the construction, maintenance, and removal of temporary traffic control devices required for maintenance of traffic during construction.
- b) Police Officer: The quantity to be paid under this item shall be the actual number of hours (HR) worked by Police Officer(s) to direct traffic outside the immediate construction area.

PAYMENT:

- a) Devices: The Unit Prices Bid lump sum (LS) shall include the furnishing of all materials, tools, equipment, and labor, necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- b) Police Officer: The Unit Prices Bid per hour (HR) shall include the use of Police Officer(s) to direct traffic to be paid at the rate of \$50.00 per hour for the actual number of hours worked by Police Officer(s) (*with a two (2)-hour minimum*), necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. The \$50.00 per hour cost shall be a fully loaded cost. This cost shall also include all tools and equipment necessary to complete the Work.

12. SPECIFICATION NO. 312500, UNIT PRICE FOR EROSION AND SEDIMENTATION CONTROLS:

MEASUREMENT: The quantity to be paid under this item shall be as indicated for each Best Management Practice (BMP) actually installed as specified, as indicated on the Drawings, as directed by the Engineer, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid shall include all labor, materials, tools, and equipment necessary for furnishing, placing, maintaining, and removing each BMP, as applicable; all costs for inspection, monitoring, and reporting on the erosion and sedimentation controls. There will be no separate payment for installation or maintenance of construction exit(s), interceptor, diversion, or perimeter dikes or ditches.

- a. Anionic Polyacrylamide – PAM (Pm): Payment shall be the actual number of gallons (GAL) of undiluted chemical utilized; or if (PAM) “logs” are utilized, payment shall be the actual number of (PAM) “logs” installed.
- b. Hay Bales (Sd1): Payment shall be for each (EA) hay bale actually installed.
- c. Temporary Silt Fence Type ‘A’ (Sd1): Payment shall be the actual number of linear feet (LF) installed. No payment will be made for silt fence required to be reinstalled for any reason.

- d. Temporary Silt Fence Type 'C' (Sd1): Payment shall be the actual number of linear feet (LF) installed. No payment will be made for silt fence required to be reinstalled for any reason.
 - e. Inlet Sediment Trap (Sd2): Payment shall be for each (EA) number of inlet sediment traps actually installed.
 - f. Slope Stabilization (Ss): Payment shall be for the square yards (SY) of matting or netting actually installed. No payment shall be made for maintenance of matting or netting.
 - g. Stone Check Dam (Cd-S): Payment for shall be for each (EA) stone check dam actually installed.
 - h. Riprap (St): Payment shall be for square yards (SY) actually installed.
 - i. Straw or Hay Mulch (Ds1): Payment shall be per ton (TN) actually installed at the coverage rates specified.
 - j. Temporary Seeding (Ds2): Payment shall be per square yard (SY) of actually planted seed at the coverage rates specified. No payment shall be made for reseeded or maintenance.
13. SPECIFICATION NO. 024211, UNIT PRICE FOR SITE RESTORATION AND REMOVAL OF CONSTRUCTION MATERIAL:
MEASUREMENT: The quantity to be paid under this item shall be lump sum for cleanup and removal of all junk, rubbish, trash, and construction debris.
PAYMENT: The Unit Prices Bid lump sum (LS) shall include all labor, tools, and equipment necessary to complete the Work as specified.
14. SPECIFICATION NO. 017839, UNIT PRICE FOR PROJECT RECORD DRAWINGS:
MEASUREMENT: The quantity to be paid under this item shall be all project record drawings of actual Work installed, complete as specified, submitted, and approved by GCDWR.
PAYMENT: The Unit Prices Bid lump sum (LS) shall include all labor, materials, tools, and equipment necessary to prepare and submit project record drawings of actual Work installed; complete as specified.
15. SPECIFICATION SECTION NO. 331113.05, UNIT PRICE FOR DUCTILE IRON PIPE (WATER):
MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed or lowered in place.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include ductile iron pipe and fittings, clearing and grubbing, excavation, borrow, rock excavation, furnishing and placing of pipe and fittings complete, including all thrust restraints, all concrete work, poly wrap; making all required connections to either active or inactive lines, including wet cut-ins and installation of new service lines where required, service connections; backfilling, testing, and sterilization, including and the furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

16. SPECIFICATION NO. 331216, UNIT PRICE FOR WATER UTILITY DISTRIBUTION VALVES:

MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves installed or relocated as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) valve under this item shall be full compensation for the furnishings, testing, installing and painting of all valves, furnishing and installing valve markers, valve boxes with concrete collars, including pilot valves, sleeves, anchors, gauges, gearing, wrenches, lubricant, brackets, valve operating nut extensions, valve keys, the cutting and plugging of existing mains as required, and other accessories and appurtenances, and the furnishing of all detailed drawings, manuals, labor, superintendents, materials, tools and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. All necessary earth excavation required for the installation of valves shall be included in this Unit Prices Bid item. The valves specifically included under other items of the contract will be included in the payments made under those items. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

17. SPECIFICATION SECTION NO. 331216.10, UNIT PRICE FOR AIR RELEASE AND VACUUM VALVES – WATER (NEW INSTALLATION):

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number, size, and type of valves installed as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) air and vacuum valve under this item shall include the furnishing of all materials for properly constructing the installation complete; including: manhole base or vault, riser and slab top, frames and covers or hatch, concrete, excavation, foundation cushion, air and vacuum valve, isolation valve, galvanized steel piping, brass blow-off valve, double strap service saddle, rubber hose with quick disconnect, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

18. SPECIFICATION SECTION NO. 331216.10, UNIT PRICE FOR AIR RELEASE AND VACUUM VALVES – WATER (RELOCATED):

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number, size, and type of valves relocated as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) air and vacuum valve under this item shall be the furnishing of all materials for the proper relocation of an existing air release and vacuum valve utilizing all reusable components, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. No additional payment will be made for a valve installation on an existing live main requiring a Wet Cut-In.

19. SPECIFICATION NO. 330516.13, UNIT PRICE FOR PRECAST CONCRETE VAULTS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of precast concrete vaults installed as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each (EA) precast concrete vault shall include all necessary tools, equipment, labor and materials to complete the Work.

20. SPECIFICATION SECTION NO. 330516.13, UNIT PRICE FOR ADJUSTING/MODIFYING VAULT TOPS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of vault tops adjusted, modified, or replaced as specified, as indicated on the Drawings, or as directed by GCDWR. Adjustments utilizing riser sections shall be paid per vertical foot of riser installed. All salvaged manhole frame and covers are to be returned to GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) vault top adjustment, modification, or replacement shall include all necessary tools, equipment, labor and materials to complete the Work.

21. SPECIFICATION NO. 331219, UNIT PRICE FOR WATER UTILITY DISTRIBUTION FIRE HYDRANTS:

MEASUREMENT: The quantity to be paid per each fire hydrant shall be the number actually installed as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) fire hydrants shall include excavation, furnishing hydrants, placing to correct horizontal alignment and vertical elevation, connecting to existing main, backfill, testing, and shop and field painting of all fire hydrants; complete with all accessories, appurtenances, restraint, gravel, concrete, and hydrant wrenches; and the furnishing of all labor, superintendents, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

Connecting pipe and fittings will be paid for under the bid item titled Ductile Iron Pipe: (Water). Gate valves will be paid under bid item titled Water Utility Distribution Valves.

22. SPECIFICATION NO. 331219.81, UNIT PRICE TO RELOCATE OR RECONNECT FIRE HYDRANTS

MEASUREMENT: The quantity to be paid under this item shall be based on the actual number of existing hydrants that have been relocated or reconnected as shown on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for relocating or reconnecting each (EA) fire hydrant shall include excavation, disconnecting from, plugging and blocking, or connecting openings in existing mains, cleaning and reworking hydrants and valves removed from the existing water system, and relocating, setting, connecting all hydrants and gate valves to the new mains, complete with all accessories, appurtenances, restraint, gravel, concrete, and hydrant wrenches, and furnishing all labor, superintendents, equipment, materials, and tools necessary to complete the Work as specified, indicated on the Drawings, or as directed by GCDWR.

Gate valves will be paid under the bid item titled Water Utility Distribution Valves.

Additional ductile iron pipe and fittings will be provided and paid under the item titled Ductile Iron Pipe: (Water).

23. SPECIFICATION NO. 331219.81, UNIT PRICE TO ADJUST EXISTING FIRE HYDRANTS:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of vertical feet of adjusted fire hydrants as specified, as indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per vertical foot (VF) for each fire hydrant shall include excavation, backfill, adjusting gate valve, complete with all accessories, appurtenances, restraint, gravel, concrete, and hydrant wrenches, and furnishing all labor, superintendents, equipment, materials, tools, and equipment necessary to complete the Work specified.

Additional ductile iron pipe and fittings will be provided and paid under the item titled Ductile Iron Pipe: (Water).

24. SPECIFICATION SECTION 331219.81, UNIT PRICE FOR SALVAGE EXISTING FIRE HYDRANT:

MEASUREMENT: The quantities to be paid under this item shall be the actual number of existing fire hydrant(s) removed, transported, and delivered to a location specified by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) salvaging fire hydrant(s) shall include the furnishing of all materials, labor and equipment for excavation, disconnecting from, plugging and blocking, or connecting openings in existing mains, backfilling, landscape repairs, transporting and delivery of the complete

fire hydrant(s) to a location specified by GCDWR. Removal of hydrant valves shall not be measured for payment under any other Bid Item.

25. SPECIFICATION NO. 331213, UNIT PRICE TO SALVAGE EXISTING METERS:

MEASUREMENT: The quantities to be paid under this item shall be the actual number of existing meters salvaged as indicated on the Drawings or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each (EA) salvage existing meter(s) under this item shall include the excavation, backfilling, landscape repairs, the furnishing of all labor, materials, tools, and equipment to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Payment shall include transporting and delivery of meter(s) to a location specified by GCDWR. Salvaging existing meter(s) shall not be measured for payment under any other Bid Item.

26. SPECIFICATION NO. 312300, UNIT PRICE FOR UTILITY PIPE BEDDING:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of cubic yards of bedding material placed as specified, indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per cubic yard (CY) of bedding material include the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Payment will not be made when bedding material is used by the Contractor due to over excavation or for the Contractor's convenience.

27. SPECIFICATION SECTION NO. 333100, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (GRAVITY PVC):

MEASUREMENT:

- a. The quantity to be paid for under this item shall be the number of linear feet of each size of PVC pipe actually furnished and laid in accordance with the specifications, measured along a horizontal line after the pipe has been connected in place. Measurements shall be from center of manhole to center of manhole. No deductions or additions will be made for PVC Tee or Wye fittings, elbow bends or specials. No deductions will be made for manholes.
- b. House connections shall be measured from the centerline of the main to the end of the house connection. Stubs placed in manholes shall be measured from the center of the manhole to the end of the stub, as indicated on the Drawings. Sewer connecting to existing stubs at manholes shall be measured from the end of the existing stub.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for the various sizes of PVC, pipe and specials under this item shall include clearing and grubbing, excavating, rock excavation, furnishing and placing of pipe complete with Tee or Wye

fittings, elbow bends, jointing materials, mastic fillers, stoppers, concrete work, and other appurtenances; making connections to either active or inactive lines, all service connections, manhole repair for any damaged manholes in the course of the work, backfilling, graded aggregate base backfill when under paved roads, testing and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or directed by GCDWR.

- b. The Unit Prices Bid per linear foot (LF) for house connections under this item shall include excavating, Tee or Wye fitting, plugs, mastic fillers and other appurtenances for making connections to sewers, backfilling, electronic markers, testing and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

28. **SPECIFICATION SECTION NO. 333100, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (GRAVITY DIP):**

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed or lowered in place.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include ductile iron pipe and fittings, clearing and grubbing, as well as, the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work; excavation, borrow, rock excavation, furnishing and placing of pipe and fittings complete, including all thrust restraints, or with jointing materials mastic fillers; all concrete work, poly wrap; making all required connections to either active or inactive lines, including service connections; backfilling as shown on the Drawings, testing, including furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

29. **PUMP STATION SPECIFICATION SECTION NO. 331113.05, UNIT PRICE FOR SANITARY UTILITY SEWERAGE PIPING (FORCE MAINS DIP):**

MEASUREMENT:

- a. The quantity to be paid under this item shall be the number of linear feet of each size, actually furnished and laid in accordance with these specifications, measured along a horizontal line after the pipe has been connected in place. Measurements shall be from outside edge of manhole to outside edge of manhole. Stubs placed in manholes will be measured from the center of the manhole to the end of the stub as indicated on the Drawings. Force mains connecting to existing stubs at manholes will be measured from the end of the existing stub.
- b. The number and size of wet cut-ins paid shall be the actual number installed.

- c. The number and size of plug valves shall be the actual number installed.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for the various sizes of pipe and fittings under this item shall include: clearing and grubbing, excavation, borrow, rock excavation, furnishing and placing of pipe and fittings complete, including all thrust restraints, all concrete work, poly wrap, painting of non-potable pipe lines, installation of Carsonite markers for non-potable pipe lines, and other appurtenances making all required connections, backfilling, graded aggregate base backfill when under paved roads, testing, and inspections and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.
- b. The Unit Prices Bid for each (EA) wet cut-in shall be full compensation for all necessary tools, equipment, labor, pumping, disposal, material and fittings to complete the Work.
- c. The Unit Prices Bid for each (EA) plug valve shall be full compensation for all necessary tools, equipment, labor, material and fittings, valve boxes and valve markers, and related appurtenances to complete the Work. Installation of plug valves on existing force mains containing sewage shall also include payment for one (1) wet cut-in.

30. SPECIFICATION NO. 331113.07, UNIT PRICE FOR STEEL PIPE:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of pipe, by size, furnished and installed.

PAYMENT: The Unit Prices Bid per linear foot (LF) shall include steel pipe, clearing and grubbing, excavation, borrow, rock excavation, poly wrap, welding; making all required connections to either active or inactive lines; backfilling, testing and sterilization, and the furnishing of all labor, materials, tools, and equipment necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

31. SPECIFICATION SECTION NO. 330516.13, UNIT PRICE FOR PRECAST CONCRETE UTILITY STRUCTURES:

MEASUREMENT:

- a. Standard diameter (48") manholes to be paid under this item shall be the total number of vertical feet of manhole base, riser(s), and cone or slab top placed, as measured between the inside invert of the downstream sewer pipe to the top of the ring and cover. All measurements shall be to the nearest one-tenth (0.1) foot.
- b. Large diameter (60", 72", 84" and 96") manholes to be paid under this item shall be the actual number installed of each size base - including the reducer slab. The vertical feet of 48" manhole riser(s) and cone or slab top placed, as measured between the top of the reducer slab to the top of the ring and cover, shall be paid under Standard diameter (48") manholes.

- c. Frames and covers to be paid under this item for "traffic" and "bolt down" type frames and covers shall be the actual number of manhole frames and covers installed, including all necessary tools, labor and equipment required to complete the Work.
- d. Outside drops to be paid under this item shall be the actual number of outside drops installed. Payment for the manhole shall be paid under the items for manholes described above in items a. or b.
- e. Cores to be paid under this item shall be the actual number of manhole cores made, complete with a flexible manhole boot installed, including all necessary tools, labor and equipment required to complete the Work in accordance with these specifications.
- f. Adjustment of frame and cover to be paid under this item shall be the actual number of frames and covers adjusted.

PAYMENT:

- a. The Unit Prices Bid per vertical foot (VF) of Standard Diameter (48") manhole shall be the total number of vertical feet installed of manhole base, riser(s), and cone or slab top placed, as measured between the inside invert of the downstream sewer pipe to the top of the ring and cover. All measurements shall be to the nearest one-tenth (0.1) foot.
 - b. The Unit Prices Bid for each (EA) Large Diameter (60", 72", 84" and 96") manhole shall be the actual number installed of each size base - including the reducer slab. The vertical feet of (48") manhole riser(s) and cone or slab top placed, as measured between the top of the reducer slab to the top of the ring and cover, shall be paid under Standard Diameter (48") manhole item described above in item a.
 - c. The Unit Prices Bid for each (EA) frame and cover for "traffic" and "bolt down" type shall be the actual number of manhole frame and cover installed, including all necessary tools, labor and equipment required to complete the Work.
 - d. The Unit Prices Bid for each (EA) outside drop shall be the actual number of outside drops installed. Payment for the manhole shall be paid under the items for manholes described above in items a. or b.
 - e. The Unit Prices Bid for each (EA) core shall be the actual number of manhole cores made, complete, with a flexible manhole boot installed; including all necessary tools, labor and equipment required to complete the Work in accordance with these specifications.
 - f. The Unit Prices Bid for each (EA) adjustment of frame and cover shall be the actual number of frame and cover adjusted.
32. SPECIFICATION SECTION NO. 330130.71, UNIT PRICE FOR MANHOLE INVERT REHABILITATION:
MEASUREMENT: The quantity to be paid under this item shall be the actual number of manhole inverts rebuilt.

PAYMENT: The Unit Prices Bid for each (EA) manhole invert rehabilitation shall include all necessary tools, equipment, labor and materials to complete the Work.

33. SPECIFICATION SECTION NO. 330130.72, UNIT PRICE FOR RELINING SEWERS:

MEASUREMENT: The quantity to be paid under this item shall be the number of linear feet of each size actually furnished, and measured along the horizontal line, after the liner has been sealed in the connecting manholes. Measurement shall be from center of manhole to center of manhole.

PAYMENT: The Unit Prices Bid per linear foot (LF) for each size liner installation shall include the access to the site, clearing of the site of the Work, as well as the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work, excavation, furnishing and installing of pipe lining complete with jointing materials, mastic fillers, and other appurtenances; making connections to manhole and other sewers, reopening of service connections, testing, and inspections; and the furnishing of all labor, materials, tools, and equipment necessary to complete the work. The unit price shall further include full compensation for furnishing barricades, warning signals, and lights.

34. SPECIFICATION SECTION NO. 330130.73, UNIT PRICE FOR PIPE BURSTING:

MEASUREMENT:

- a. The quantity to be paid under this item shall be the number of linear feet of each size actually furnished and installed, as measured along the horizontal line between connecting manholes. Measurement shall be from center of manhole to center of manhole.
- b. The number of service connections to be paid shall be the actual number installed.

PAYMENT:

- a. The Unit Prices Bid per linear foot (LF) for each size of pipe bursting under this item shall include the access to the site, clearing of the site of the Work, as well as the clearing and preparation of any areas used for storage or for fabrication of materials; television inspection of the existing sewer lines, cleaning of the existing sewer lines, manhole repair for any damaged manholes in the course of the work, excavation, furnishing and installing of pipe complete with jointing materials mastic fillers, and other appurtenances, backfilling, testing, and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work.
- b. The Unit Prices Bid per linear foot (LF) for connections to manhole and other sewers, locating and reconnecting house service connections, backfilling, testing, and inspections, and the furnishing of all labor, materials, tools, and equipment necessary to complete the Work.

35. SPECIFICATION SECTION NO. 331216.12, UNIT PRICE FOR AIR AND VACUUM VALVES – SEWER (NEW INSTALLATION):

MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves installed as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per each air and vacuum valve under this item shall include the furnishing of all materials for properly constructing the installation complete; including: manhole base or vault, riser and slab top, frames and covers or hatch, concrete, excavation, foundation cushion, air and vacuum valve, isolation valve, galvanized steel piping, brass blow-off valve, double strap service saddle, rubber hose with quick disconnect, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

36. SPECIFICATION SECTION NO. 331216.12, UNIT PRICE FOR AIR AND VACUUM VALVES – SEWER (RELOCATED):

MEASUREMENT: The quantity to be paid under this item shall be the actual number, size, and type of valves relocated as shown on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid for each air and vacuum valve under this item shall be the furnishing of all materials for the proper relocation of an existing air release and vacuum valve utilizing all reusable components, and the furnishing of all labor, tools, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

37. SPECIFICATION NO. 330130.74, UNIT PRICE FOR BYPASS PUMPING:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of hours of bypass pump run time during pumping operations.

PAYMENT: The Unit Prices Bid shall include all labor, materials, tools, equipment and monitoring personnel required to complete the Work as specified.

38. SPECIFICATION SECTION NO. 024119.81, UNIT PRICE FOR SEPTIC TANK DEMOLITION:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of septic tanks authorized by GCDWR to be demolished. There will be no additional payment for backfilling, pumping, and disposal of septic tank contents.

PAYMENT: The Unit Prices Bid for each septic tank demolition shall include all necessary tools, equipment, labor and materials to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

39. SPECIFICATION SECTION NO. 329343, UNIT PRICE FOR TREE SAVE BARRIER FENCE:

MEASUREMENT: The quantity to be paid under this item shall be the actual number of linear feet of tree save barrier fence installed as required by the Drawings, Specifications, or as directed by GCDWR.

PAYMENT: The Unit Prices Bid per linear feet (LF) of tree save barrier fence installed shall be the actual number of linear feet installed. No payment shall be made for tree save barrier fence required to be reinstalled for any reason.

END OF SECTION 01 22 15.11

SECTION 01 31 19

PROJECT MEETINGS

PART 1 – GENERAL

1.1 SCOPE:

- A. Work under this Section includes all scheduling and administering of pre-construction and progress meetings as herein specified and necessary for the proper and complete performance of this Work.
- B. Scheduling and Administration by Owner:
 - 1. Prepare Agenda, with assistance from Engineer
 - 2. Make physical arrangements for the meetings.
 - 3. Preside at meetings.
- C. Scheduling and Administration by Engineer:
 - 1. Assist Owner with Agenda
 - 2. Record minutes and include significant proceedings and decisions.
 - 3. Distribute “Draft” meeting minutes for review/revision
 - 4. Incorporate revisions and distribute Final copies of the minutes to participants.

1.2 PRE-CONSTRUCTION MEETING:

- A. The Owner shall schedule the pre-construction conference prior to the issuance of the Notice to Proceed.
- B. Representatives of the following parties are to be in attendance at the meeting:
 - 1. Owner; including project manager, project inspector, Operations stakeholder(s)
 - 2. Engineer
 - 3. Designer (if different than Engineer)
 - 4. Contractor’s project staff including at a minimum: the project manager, site superintendent, quality/safety control coordinator, and subcontractor coordinator
 - 5. Major subcontractors
 - 6. Representative(s) of governmental or regulatory agencies, when appropriate.
 - 7. Materials Testing Firm representative
- C. The agenda for the preconstruction conference shall consist of the following as a minimum:
 - 1. List of attendees, and introduction of each attendee and their respective project role.
 - 2. Project Data to include Bid date, total Bid amount, Notice to Proceed Date, Substantial Completion date, and Final Completion Date.

3. List of project stakeholders and their contact information including email address and cell phone number.
4. Communication procedures and chain of communication for specified project components.
5. Distribute and discuss a list of major subcontractors and a tentative construction schedule, including County Holidays, and adverse weather days.
6. Critical work sequencing.
7. Pay request procedure including format, submittal, pay date, and retainage.
8. Procedures for maintaining record documents.
9. Discuss submittals to include, project schedules, requests for information, shop drawings, product data, samples, and project record drawings.
10. Processing of field decisions and Change Orders.
11. Work Times and Schedule.
12. Inspection of Work, testing, and laboratory work.
13. Safety and first aid procedures.
14. Permits, easements, and their acquisition status.
15. Blasting protocol.
16. Traffic control.
17. Housekeeping notes and procedures.

1.3 PROJECT PROGRESS MEETINGS:

- A. Owner to schedule progress meetings monthly, or more frequently as directed by the Engineer.
- B. Hold called meetings as the progress of the Work dictates.
- C. The meetings shall be held at the location indicated by the Owner.
- D. Representatives of the following parties are to be in attendance at the meetings:
 1. Owner, to include project manager, project inspector, and as conditions dictate, Operations stakeholder(s)
 2. Engineer.
 3. Designer's representative as appropriate
 4. Contractor's project staff including at a minimum the project manager, site superintendent, quality control coordinator, and subcontractor coordinator
 5. Major subcontractors as pertinent to the agenda.
 6. Representatives of governmental or other regulatory agencies, as appropriate.
 7. Materials testing firm representative as pertinent to the agenda
- E. The minimum agenda for progress meetings shall consist of the following:
 1. List of attendees
 2. Review and approve minutes of previous meeting.
 3. Contractor to supply updated Project Progress Schedule.
 4. Review work progress since last meeting.
 5. Review work progress planned for the next period.
 6. Status of Overall Project Schedule, identify problems which impede planned progress.
 7. Review Contractor's corrective measures and procedures to regain plan schedule.

8. Review submittal schedule .
9. Review budget status.
9. Review Request for Information process
10. Review Change Management items and status of individual Change documents.
11. Review Notices, Punch lists, and project coordination issues.
12. Note field observations, problems and decisions.
13. Review testing and quality control measures and associated issues.
14. Complete other current business.

1.4 SHUTDOWN COORDINATION MEETINGS:

- A. One week minimum prior to significant planned shutdowns, Contractor shall arrange with Owner, and Owner shall convene a coordination meeting.
- B. Meeting participants shall include Owner, Engineer, Designer, and Contractor, including involved subcontractors.
- C. Meeting agenda shall include Contractor's review/presentation of detailed work plan and schedule, Owner input regarding facility operations, and all other pertinent coordination topics.

1.5 QUALITY CONTROL AND COORDINATION MEETINGS:

- A. Scheduled by Engineer and coordinated with Owner, on regular basis and as necessary to review test and inspection reports, and other matters relating to quality control of Work and work of other contractors.
- B. Attendees will include:
 1. Owner, including project manager, project inspector, chief inspector, and as it pertains to the Work, Operations stakeholder(s)
 2. Engineer
 3. Designer (if different than Engineer)
 4. Contractor's project staff including at a minimum: the project manager, site superintendent, quality/safety control coordinator, and subcontractor coordinator
 5. Major subcontractors, as it pertains to the Work
 6. Materials Testing Firm representative, as it pertains to the Work.

1.6 PRE-INSTALLATION MEETINGS:

- A. When required in individual Specification Sections, convene at site prior to commencing Work of that section.
- B. Require attendance of entities directly affecting, or affected by, Work of that Section.
- C. Notify Engineer and Owner five (5) days in advance of meeting date.
- D. Provide suggested agenda to Engineer to include reviewing conditions of installation,

preparation and installation or application procedures, and coordination with related Work and work of others.

1.7 FACILITY STARTUP MEETINGS:

- A. Schedule and attend facility startup meetings for each system, facility, or group of facilities, as applicable.
- B. Attendees will include:
 - 1. Contractor's project staff including at a minimum the site superintendent.
 - 2. Subcontractors and equipment manufacturer's representatives whom Contractor deems to be directly involved in facility startup.
 - 3. Engineer's representatives.
 - 4. Owner's inspection personnel.
 - 5. Others as required by Contract Documents.

1.8 OTHER MEETINGS:

- A. In accordance with Contract Documents and as may be required by Owner and Engineer.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 31 19

SECTION 01 32 33

PHOTOGRAPHIC DOCUMENTATION

PART 1 – GENERAL

1.1 SCOPE

- A. The Contractor shall furnish all equipment and labor materials required to provide the Owner with digital construction audio/video recordings of the Project.
- B. Photos, electronic files, and audio/video recordings shall become the property of the Owner, and none of which shall be published without express permission of the Owner.

1.2 MEASUREMENT AND PAYMENT

- A. No separate measurement and payment will be made for work under this section. All costs in connection with this work specified herein, is considered to be incidental to the Work.

1.3 PRE AND POST-CONSTRUCTION AUDIO/VIDEO RECORDINGS:

- A. Prior to the beginning of any work, the Contractor shall make audio/video recordings of the work area to record existing conditions.
- B. Following completion of the work, another recording shall be made showing the same areas and features as in the pre-construction recording.
- C. All conditions which might later be subject to a disagreement shall be shown in sufficient detail to provide a basis for decisions.
- D. The recordings shall include the date and time markings on the video. All videos shall be provided with an audio narration, stating a description of what is shown, structure, area, approximate station of the area shown, and street address and property owner where appropriate.
- E. Audio/video recordings shall be made in standard definition DVD format and stored on a DVD optical disc. The quality and content shall be subject to the approval of the Engineer.
- F. The DVD disc shall bear a typed label containing the following information: Project title, date of recording, and project stations shown on the recording.

1.4 DISPUTES AND POTENTIAL CLAIMS

- A. In the event a problem arises or dispute occurs, which may result in a potential Claim, under General Conditions Article 10.05, and the problem or dispute can be illustrated by photographs and video recordings, the Contractor shall provide such photographs and video files.

1.5 SUBMITTALS:

- A. Formats
 - 1. Photo files shall be provided in jpeg format.
 - 2. Audio/Video Recordings shall be provided in DVD format.
- B. Audio/Video Recordings
 - 1. The pre-construction recording shall be submitted prior to the first progress payment request.
 - 2. The post-construction recording shall be submitted with the final payment request.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 32 33

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Contractor's Responsibilities
1.4	Engineer's Responsibilities
1.5	Request for Information (RFI)
1.6	Letter of Transmittal
2.1	General
2.2	Schedules
2.3	Request for Information
2.4	Shop Drawings
2.5	Operation and Maintenance Manuals
2.6	Record Drawing
3.1	General
3.2	Review Procedures
3.3	Schedules
3.4	Request for Information
3.5	Shop Drawings
3.6	Effect of Review of Contractor's Submittals
3.7	Cost for Review of Submittals

- B. All materials and/or equipment provided to GCDWR shall require submittal to, and approval of, Engineer prior to releasing Contractor for ordering. Any items ordered and/or delivered without approved submittals may be rejected by GCDWR.
- C. This section includes information and requirements for the submittal of documents during the course of work for, including but not limited to, schedules, shop drawings, product data, operation and maintenance manuals, requests for information, and record drawings as specified.
- D. Submittals shall include, but not be limited to, manufacturers' information, catalog data, shop drawings, test procedures, test results, samples, calculations of equipment performance, equipment weight, fabrication, erection, mechanical accessories, materials installed, reinforcing steel, piping, details, and Work-related information. The Contractor shall furnish scaled drawings, or drawings of equivalent dimensions to ascertain information deemed necessary by the Engineer, including descriptive data, certificates, samples, tests, and any other instructions specifically required in the Contract Documents

or recommended by the manufacturer to demonstrate that the materials and equipment to be furnished, and the methods of Work, comply with the provisions and intent of the Contract Documents.

1.2 REFERENCES

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

1.3 CONTRACTOR'S RESPONSIBILITIES

- A. Before starting construction, Contractor shall submit to the Engineer for timely review, a Preliminary Progress Schedule, and a Preliminary Schedule of Submittals; and shall submit to GCDWR for timely review, a Schedule of Values for all of the Work, in a format acceptable to GCDWR, per Specification Section 01 00 00 General Requirements.
- B. After starting and during construction, Contractor shall submit to the Engineer for timely review, an updated Progress Schedule, and an updated Schedule of Submittals, per Specification Section 01 00 00 General Requirements.
- C. The Contractor shall be responsible for the accuracy and completeness of information contained in each submittal assuring that the Work shall be done in accordance with the Contract Documents, unless a deviation has been approved. The Contractor shall verify that each feature of every product shall conform to the specified requirements. Submittal documents shall be clearly edited to indicate only those items being submitted in accordance with the Work. All extraneous materials shall be stricken out or removed. The Contractor shall coordinate submittals among his subcontractors and suppliers to meet the specified Work so that the Work shall not be delayed. No extension of time shall be allowed because of failure to properly schedule submittals. The Contractor shall certify on each submittal document that he/she has reviewed the submittal, verified field conditions, and complied with the Contract Documents.
- D. The Contractor may authorize in writing to GCDWR that a material or equipment supplier may deal directly with GCDWR or its authorized representative. These dealings shall be limited to contract interpretations to clarify and expedite the Work.
- E. If the information provided in a submittal indicates any deviation from the Contract requirements, the Contractor shall by written statement accompanying the submittal, advise the Engineer and GCDWR of any deviation and state the reasons for such.
- F. It shall be the Contractor's responsibility to ensure there is no conflict with other submittals and to notify the Engineer and GCDWR in any case where the Contractor's submittal may concern work by another contractor, subcontractor, or GCDWR. The Contractor is solely responsible for the coordination of submittals by his subcontractors and shall verify that his subcontractors' submittals are complete in every way and meet the requirements of the Contract.

1.4 ENGINEER'S RESPONSIBILITIES

- A. Submittal reviews shall be returned to the Contractor and copied to GCDWR, marked with one of the following, “No Exceptions Taken”, “Note Markings”, “Revise and Resubmit”, “Rejected – See Remarks”, or “Engineer’s Review Not Required”. Returned submittals marked with “Revise and Resubmit” or “Rejected – See Remarks” shall be re-submitted until an acceptable mark of “No Exceptions Taken” or “Note Markings” is granted. The contractor shall pay for any submittals requiring Engineer to review beyond the second submittal.
- B. The approval of the Contractor’s submittals shall not relieve the Contractor of responsibility for any error, or any obligation for accuracy of dimensions and details, or for agreement with and conformity to the Contract and Contract Documents, or the responsibility to fulfill the Contract as prescribed. Nor shall approval be considered approval of any deviation or conflict unless Engineer and GCDWR have been expressly advised of the same, or Engineer and GCDWR have expressly approved such deviation or conflict.

1.5 REQUEST FOR INFORMATION (RFI)

- A. The Contractor shall submit in writing, a Request for Information (RFI) to the Engineer concerning all proposed substitutions and deviations to the Contract Documents, with the specified or associated parts. Such written requests shall be clearly marked with a numeric designation and should show a corresponding, concise, and lucid justification substantiating the benefits to GCDWR. RFIs are subject to rejection.

1.6 LETTER OF TRANSMITTAL

- A. Transmittals shall be attached to each submittal with the following minimum requirements:
 - 1. Transmittals written in pencil will be returned along with the submitted documents without review.
 - 2. Transmittals shall be used for each submittal.
 - 3. Transmittals shall be typed or written in ink announcing the project particulars, sender’s and receivers’ information, purpose for the submittal, a listing of items contained in the submittal with a detailed explanation attached to the cover of each submittal package.

PART 2 - SUBMITTALS

2.1 GENERAL

- A. Submittals typically fall into one of five (5) general categories; “Schedules”, “Request For Information (RFI)”, “Shop Drawings”, “Operation and Maintenance Manuals” and “Record Drawings”. Unless otherwise specified, all submittals shall be considered product data.

2.2 SCHEDULES

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. Preliminary and updated Project Progress Schedules shall include construction activities, milestones, and dates for events, including Schedule of Submittals.
- C. The Schedule of Values shall list the installed value of component items of the Work to serve as a basis for computing values for progress payments during construction.

2.3 REQUEST FOR INFORMATION (RFI)

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. Submittals shall include the GCDWR project name and number, and RFI number in numerical order, on the top portion, of the top page of the document(s).

2.4 SHOP DRAWINGS

- A. The Contractor shall submit all requirements sufficiently in advance of construction requirements to allow ample time for the Contractor and Engineer to complete their responsibilities, as specified herein, without claim and or allowance by the Contractor for delays arising from his failure in this respect.
- B. All shop drawings submitted must bear the stamp of approval of and by the Contractor as evidence that the submittal has been thoroughly reviewed and coordinated.
- C. Submittals shall include the GCDWR project name and number, and Shop Drawing Number in numerical order, on the top portion, of the top page of the document(s).

2.5 OPERATION AND MAINTENANCE MANUALS

- A. Operation and Maintenance Manuals submittal documents common to more than one piece of equipment shall be identified with all the appropriate equipment numbers and referenced in the other parts of the manual under that specific equipment or material. Submittals that consist of various items that together constitute a manufacturer's equipment or package, or are so functionally related, must be submitted, reviewed and approved as a whole.

2.6 RECORD DRAWINGS – Refer to Section 01 78 39 “Project Record Documents”

PART 3 - EXECUTION

3.1 GENERAL

- A. As applicable, submittals shall be marked in accordance to following color schemes:

1. **Manufacturer/vendor** comments shall be in **'black'** ink
2. **Contractor** comments shall be in **'green'** ink
3. **Engineer** comments shall be in **'blue'** ink
4. **GCDWR** comments shall be in **'red'** ink

3.2 REVIEW PROCEDURES

- A. Submittals are specified for those features and characteristics of materials, equipment, and methods of operation which can be selected based on the Contractor's judgment of their conformance to the specified requirements. Review shall not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights or gages, or fabrication processes (except where specifically indicated or required by the specifications) or to safety precautions or programs incident thereto.
- B. When the Contract Documents require a submittal by the Contractor, it shall be to the following minimum requirements:
 1. Shop Drawings: Unless otherwise directed by the Engineer, six (6) copies of submitted information shall be transmitted to Engineer for review and comment. After Engineer's review and comments, Engineer shall return two (2) copies to the Contractor.

3.3 SCHEDULES

- A. Preliminary Project Progress Schedule:
 1. Contractor shall submit to the Engineer, a Preliminary Project Progress Schedule within ten (10) calendar days after the effective date of the Agreement.
 2. The Engineer will review said Preliminary Project Progress Schedule and return reviewed copy to Contractor within fourteen (14) calendar days.
 3. If required, Contractor will resubmit to Engineer, a revised Preliminary Project Progress Schedule incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
- B. Preliminary Schedule of Submittals:
 1. Contractor shall submit to the Engineer, a Preliminary Schedule of Submittals within ten (10) calendar days after the effective date of the Agreement.
 2. The Engineer will review said Preliminary Schedule of Submittals and return reviewed copy to Contractor, within fourteen (14) calendar days.
 3. If required, Contractor will resubmit to Engineer, a revised Preliminary Schedule of Submittals incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
- C. Schedule of Values:
 1. Contractor shall submit to the Owner, a Schedule of Values allocated to the various portions of the Work, within ten (10) calendar days after the effective date of the Agreement. The value of each activity shall be a complete and total value, including all taxes, overhead, and profit. The sum of all the values of the activities shall equal the total Agreement Price. The first progress payment will

not be made until the next pay cycle following the Owner's approval of the Contractor's Schedule of Values.

2. The Owner will review said Schedule of Values and return reviewed copy to Contractor, within fourteen (14) calendar days. Upon request of the Owner, support the values with data, which will substantiate their correctness.
3. If required, Contractor will resubmit to Owner, a revised Schedule of Values incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.
4. The Schedule of Values shall be used only as a basis of the Contractor's Application for Payment.

D. Project Progress Schedule:

1. Contractor shall submit to the Engineer, an updated Project Progress Schedule within thirty (30) calendar days after the effective date of the Agreement.
2. The Engineer will review said Project Progress Schedule and return reviewed copy to Contractor within fourteen (14) calendar days.
3. If required, Contractor will resubmit to Engineer, a revised Project Progress Schedule incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.

E. Schedule of Submittals:

1. Contractor shall submit to the Engineer, an updated Schedule of Submittals within thirty (30) calendar days after the effective date of the Agreement.
2. The Engineer will review said Schedule of Submittals and return reviewed copy to Contractor, within fourteen (14) calendar days.
3. If required, Contractor will resubmit to Engineer, a revised Schedule of Submittals incorporating all revisions, within ten (10) calendar days after receipt of a returned review copy.

3.4 REQUEST FOR INFORMATION (RFI)

- A. If the Contractor proposes to provide material, equipment, or method of Work which deviates from the project manual, he/she shall indicate so on the transmittal letter accompanying that specific submittal. Each RFI must be clearly marked with a numeric designation having a corresponding detailed explanation to indicate the benefit to GCDWR and/or the project. Submittals which do not identify deviations from the contract shall not be acceptable and shall be returned without review.

3.5 SHOP DRAWINGS

- A. The Engineer shall have fourteen (14) calendar days to review and comment on a submittal after its receipt. The returned submittal shall indicate one of the following actions:
 1. If the review indicates that the submittal complies with the Contract Documents, it shall be marked "No Exceptions Taken". In this event, the Contractor may begin to implement the work method or incorporate the material or equipment covered by the submittal; no re-submittal is required.

2. If the review indicates limited corrections are required, copies shall be marked "Note Markings". The Contractor may begin implementing the work method or incorporating the material and equipment covered by the submittal in accordance with the noted corrections. No re-submittal shall be required except where the submittal information shall be incorporated into the Project Operation and Maintenance Manuals, and then a corrected copy shall be incorporated.
3. If the review reveals that the submittal is insufficient and or contains incorrect data, copies shall be marked "Revise and Resubmit". Except at his own risk, the Contractor shall not undertake Work covered by this submittal until it has been revised, resubmitted and returned with a mark of "No Exceptions Taken" or "Note Markings."
4. If the review reveals that the submittal is unacceptable it shall be marked "Rejected – See Remarks". The Contractor shall not undertake Work covered by this submittal until it has been revised, resubmitted and returned with a mark of "No Exceptions Taken" or "Note Markings."

3.6 EFFECT OF REVIEW OF CONTRACTOR'S SUBMITTALS

- A. Review of the Contractor's submittals shall not relieve the Contractor of his responsibility for errors therein and shall not be regarded as an assumption of risks or liability by the County. Also, the Contractor shall have no claim on account of the failure, or partial failure, of the method of Work, material, or equipment so reviewed. A mark of "No Exceptions Taken" or "Note Markings" shall mean that the Owner has no objection to the Contractor, upon his own responsibility, using the plan or method of Work proposed, or providing the materials or equipment proposed, with the exception of incorporating any Notes made by the Engineer.

3.7 COST FOR REVIEW OF SUBMITTALS

- A. GCDWR shall pay for the review of each initial submittal and the first re-submittal required for a project. However, if the Engineer requires that shop drawings or product data be submitted for a third or more review, the Contractor shall then be responsible to pay for the Engineer's time to review the second or more re-submittal, and for each re-submittal of the same thereafter.

END OF SECTION 01 33 00

SECTION 01 41 00

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE:

- A. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, be responsible for obtaining all necessary licenses and permits, excluding those listed in Supplementary Conditions SC-6.08, and for complying with any applicable federal, state, county and municipal laws, codes, ordinances and regulations, in connection with the prosecution of the Work. The Contractor shall be responsible for coordinating and scheduling all necessary inspections required by applicable federal, state, county and municipal codes and regulations in relation to licenses and permits, including building permits issued for the project.
- 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 also be responsible for all materials delivered and work performed until completion and acceptance of the Work.
- D. The Contractor is hereby notified that a road may be under the jurisdiction of the Georgia Department of Transportation and the Gwinnett County Department of Transportation, necessitating permits and notification of both entities by the Contractor.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 41 00

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 DESCRIPTION:

- A. Whenever reference is made to conforming to the standards of any technical society, organization, body, code or standard, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids. This shall include the furnishing of materials, testing of materials, fabrication and installation practices. In those cases where the Contractor's quality standards establish more stringent quality requirements, the more stringent requirement shall prevail. Such standards are made a part hereof to the extent which is indicated or intended.
- B. The inclusion of an organization under one category does not preclude that organization's standards from applying to another category.
- C. In addition, all work shall comply with the applicable requirements of local codes, utilities and other authorities having jurisdiction.
- D. All material and equipment, for which a UL Standard, an AGA or NSF approval or an ASME requirement is established, shall be so approved and labeled or stamped. The label or stamp shall be conspicuous and not covered, painted, or otherwise obscured from visual inspection.
- E. The standards which apply to this Project are not necessarily restricted to those organizations which are listed in Article 1.2.

1.2 STANDARD ORGANIZATIONS:

- A. Piping and Valves:
 - ACPA American Concrete Pipe Association
 - ANSI American National Standards Institute
 - API American Petroleum Institute
 - ASME American Society of Mechanical Engineers
 - AWWA American Water Works Association
 - CISPI Cast Iron Soil Pipe Institute
 - DIPRA Ductile Iron Pipe Research Association
 - FCI Fluid Controls Institute
 - MSS Manufacturers Standardization Society
 - NCPI National Clay Pipe Institute

NSF National Sanitation Foundation
PPI Plastic Pipe Institute
Uni-Bell PVC Pipe Association

B. Materials:

AASHTO American Association of State Highway and Transportation Officials
ALS American Lumber Standards
AMA Acoustical Materials Association
ANSI American National Standards Institute
ASTM American Society for Testing and Materials

C. Painting and Surface Preparation:

NACE National Association of Corrosion Engineers
SSPC Society for Protective Coatings

D. Steel, Concrete, and Asphalt:

ACI American Concrete Institute
AI Asphalt Institute
AISC American Institute of Steel Construction, Inc.
AISI American Iron and Steel Institute
CRSI Concrete Reinforcing Steel Institute
NRMA National Ready-Mix Association
PCA Portland Cement Association
PCI Prestressed Concrete Institute

E. Welding:

ASME American Society of Mechanical Engineers
AWS American Welding Society

F. Government and Technical Organizations:

AIA American Institute of Architects
APHA American Public Health Association
APWA American Public Works Association
ASA American Standards Association
ASAE American Society of Agricultural Engineers
ASCE American Society of Civil Engineers
ASQC American Society of Quality Control
ASSE American Society of Sanitary Engineers
CFR Code of Federal Regulations
CSI Construction Specifications Institute
EDA Economic Development Administration
EPA Environmental Protection Agency
EPD Georgia Environmental Protection Division
FCC Federal Communications Commission
FmHA Farmers Home Administration
FS Federal Specifications

GCDWR	Gwinnett County Department of Water Resources
IAI	International Association of Identification
ISEA	Industrial Safety Equipment Association
ISO	International Organization for Standardization
ITE	Institute of Traffic Engineers
NBFU	National Board of Fire Underwriters
(NFPA)	National Fluid Power Association
NBS	National Bureau of Standards
NISO	National Information Standards Organization
OSHA	Occupational Safety and Health Administration
SI	Salt Institute
SPI	The Society of the Plastics Industry, Inc.
USDC	United States Department of Commerce
WEF	Water Environment Federation

G. Roadways:

AREA	American Railway Engineering Association
GDOT	Georgia Department of Transportation
GCDOT	Gwinnett County Department of Transportation
SSRBC	Standard Specifications for Construction of Transportation Systems, Georgia Department of Transportation

H. Plumbing:

AGA	American Gas Association
NSF	National Sanitation Foundation
PDI	Plumbing Drainage Institute
SPC	SBCC Standard Plumbing Code

1.3 SYMBOLS:

Symbols and material legends shall be as scheduled on the Drawings.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 42 19

SECTION 01 43 00
QUALITY ASSURANCE

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. This section covers Quality Assurance and Quality Control requirements for this contract.
- B. The Contractor is responsible for controlling the quality of work, including work of its subcontractors, and suppliers and for assuring the quality specified in the Technical Specifications is achieved.
- C. Refer to the General Conditions Article 6 - Contractor's Responsibilities, paragraphs 6.01, 6.02, and 6.03.

1.02 SUMMARY:

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and control services required by, including but not limited to, Engineer, Owner, or authorities having jurisdiction, are not limited by provisions of this Section.
- C. Related Requirements:
 - 1. Divisions 01 through 44 Sections for specific test and inspection requirements.

1.03 REFERENCES:

- A. American Society for Testing and Materials (ASTM):

1. E329: Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

1.04 DEFINITIONS:

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer.
- C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are performed by a Nationally Recognized Testing Laboratory (NRTL), an (National Voluntary Laboratory Accreditation Program (NVLAP), or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size,

and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.05 CONFLICTING REQUIREMENTS:

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Engineer for a decision before proceeding.

1.06 SUBMITTALS:

- A. Shop Drawings: Provide plans, sections, dimensions, and elevations, indicating materials and size of proposed construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- C. Qualification Data: For Contractor's quality-control personnel.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.07 CONTRACTOR'S QUALITY-CONTROL PLAN:

- A. Quality Control Plan, General: Submit quality-control plan within thirty (30) days of Notice to Proceed. Submit in format acceptable to Engineer. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
 - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
 - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
 - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
 - 3. Owner-performed tests and inspections indicated in the Contract Documents.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and accepted mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of accepted and rejected results. Include work Engineer has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.08 REPORTS AND DOCUMENTS:

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.

3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector, as applicable.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.09 QUALITY ASSURANCE:

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - d. When testing is complete, remove test specimens, assemblies; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Codes and Standards: Refer to General Conditions Article 3 - Contract Documents: Intent, Amending, Reuse, paragraph 3.02 of the General Conditions.
- L. Copies of applicable referenced standards are not included in the Contract Documents. Where copies of standards are needed by the Contractor for superintendence and quality control of the work, the Contractor shall obtain a copy or copies directly from the publication source and maintain at the jobsite, available to the Contractor's personnel, subcontractors, and Engineer
- M. Quality of Materials: Unless otherwise specified, all materials and equipment furnished for permanent installation in the Work shall conform to applicable standards and specifications and shall be new, unused, and free from defects and imperfections, when installed or otherwise incorporated in the Work. The Contractor shall not use material and equipment for any purpose other than that intended or specified unless the Engineer authorizes such use.
- N. Where so specified, products or workmanship shall also conform to the additional performance requirements included within the Contract Documents to establish a higher or more stringent standard or quality than that required by the referenced standard.
- 1.10 OFFSITE INSPECTION:
- A. When the specifications require inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, such services shall be performed by the Owner's independent testing laboratory, or inspection organization acceptable to Engineer in conjunction with or by the Engineer.
 - B. The Contractor shall give appropriate written notice to the Engineer not less than thirty (30) days before offsite inspection services are required, and shall provide for the

producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

1.11 MATERIALS AND EQUIPMENT:

- A. The Contractor shall maintain control over procurement sources to ensure that materials and equipment conform to specified requirements in the Contract Documents.
- B. The Contractor shall comply with manufacturer's printed instructions regarding all facets of materials and/or equipment movement, storage, installation, testing, startup, and operation. Should circumstances occur where the contract documents are more stringent than the manufacturer's printed instructions, the Contractor shall comply with the specifications. In cases where the manufacturer's printed instructions are more stringent than the contract documents, the Contractor shall advise the Engineer of the disparity and conform to the manufacturer's printed instructions. In either case, the Contractor is to apply the more stringent specification or recommendation, unless accepted otherwise by the Engineer.

1.12 QUALITY CONTROL:

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. The Contractor shall furnish a construction schedule and a minimum of 48 hour notice of readiness for testing and inspection of the work. The Engineer shall determine the exact time and location of field sampling and testing, and may require such additional sampling and testing to determine that materials and equipment conform with data previously furnished by Contractor and with the Contract Documents.
 - 3. The Contractor shall schedule the work to permit adequate time for testing and re-testing should test results not conform to the contract documents. Lack of testing or inspection which is attributable to insufficient notice by the Contractor or failure of the Contractor to cooperate, will be cause for rejection of the work.
 - 4. The Contractor shall deliver materials in sufficient quantities to the Owner's testing agency as may be required. Laboratory testing shall be performed within a reasonable time, consistent with the specified standards.
 - 5. The Contractor shall furnish material samples and cooperate in the field sampling and testing activities, interrupting the work when necessary. The Contractor shall furnish personnel, facilities and access to assist in the sampling and testing activities.

6. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 2. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
 3. Comply with manufacturers' instructions, including each step in sequence.
 4. When manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.
 5. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
 6. Perform Work by persons qualified to produce required and specified quality.
 7. Verify field measurements are as indicated on Shop Drawings or as instructed by manufacturer.
 8. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
 9. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 10. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 11. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 12. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

13. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Tolerances:
1. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
 2. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.
 3. Adjust products to appropriate dimensions; position before securing products in place.
- D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections.
- E. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- F. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- G. Testing Agency Responsibilities: Cooperate with Engineer and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Engineer and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- H. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as

requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

I. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

J. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Engineer, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.13 SPECIAL TESTS AND INSPECTIONS:

A. Special Tests and Inspections: Owner will engage a qualified agency to conduct special tests and inspections required, as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Engineer and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION:

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.02 PREPARATION:

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

3.03 QUALITY CONTROL:

- A. Quality control is the responsibility of the Contractor, and the Contractor shall maintain control over construction and installation processes to assure compliance with specified requirements.
- B. Certifications for personnel, procedures, and equipment associated with special processes (e.g., welding, cable splicing, surveying) shall be maintained by the Contractor, available for inspection by the Engineer. Copies shall be made available to the Engineer upon request.
- C. Means and methods of construction and installation processes are the responsibility of the Contractor, and at no time is it the intent of the Engineer to supersede or void that responsibility.

3.04 TEST AND INSPECTION LOG:

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Engineer.
 - 4. Identification of testing agency or special inspector conducting test or inspection.

- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's reference during normal working hours.

3.05 REPAIR AND PROTECTION:

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 29 Cutting and Patching.
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 43 00

SECTION 01 45 29

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 SCOPE:

- A. This Section includes testing which the Owner may require, beyond that testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This work also includes all testing required by the Owner to verify work performed by the Contractor is in accordance with the requirements of these Specifications, i.e., concrete strength, slump testing, soil compaction, etc.
- C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer.
- D. The testing laboratory or laboratories will be selected by the Owner. The testing laboratory or laboratories will work for the Owner.

1.02 PAYMENT FOR TESTING SERVICES:

- A. Testing services provided by the Owner will be paid by the Owner through GCDWR annual material testing contract. Testing services provided by the Contractor will be from the County's approved list, but paid by the Contractor.
- B. The cost of material testing described in various sections of these Specifications or as required in referenced standards to be provided by a material manufacturer, shall be included in the price bid for that item and shall not be paid for by the Owner.
- C. The cost of retesting any item that fails to meet the requirements of these Specifications shall be paid for by the Contractor. Retesting shall be performed by the testing laboratory working for the Owner.

1.03 LABORATORY DUTIES:

- A. Cooperate with the Owner, Engineer and Contractor.
- B. Provide qualified personnel promptly on notice.
- C. Perform specified inspections, sampling and testing of materials.

1. Comply with specified standards, ASTM, other recognized authorities, and as specified.
 2. Ascertain compliance with requirements of the Contract Documents.
- D. Promptly notify the Engineer and Contractor of irregularity or deficiency of work which are observed during performance of services.
- E. Promptly submit three (3) copies of report of inspections and tests in addition to those additional copies required by the Contractor; one (1) copy to the Owner, one (1) copy to the Engineer, and one (1) copy to the Contractor, with the following information included:
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
 10. Type of inspection or test
 11. Results of test
 12. Observations regarding compliance with the Contract Documents
- F. Perform additional services as required.
- G. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.
- 1.04 CONTRACTOR RESPONSIBILITIES:
- A. Cooperate with laboratory personnel; provide access to Work and/or manufacturer's requirements.
- B. Provide to the laboratory, representative samples, in required quantities, of materials to be tested.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities to:
1. Provide access to Work to be tested;
 2. Obtain and handle samples at the site;
 3. Facilitate inspections and tests;
 4. Provide a clear, level and unobstructed location for placement of concrete curing

box(es) adjacent to the work area as agreed upon with the testing laboratory and the Engineer. Provide power and lighting at the curing box location.

- E. Furnish climatically controlled curing box(es) for field storage of cast concrete cylinders or other samples. Multiple boxes shall be furnished when concrete placement activities are being performed at multiple locations across the project site. Curing box shall be manufactured and marketed for the specific purpose described herein and shall meet standards ASTM C31, C192 and C511. Curing box shall be used to maintain temperature and humidity of the concrete cylinder specimens for 48 hours. Cure box shall feature a digital thermometer, heat/cool indicator lights; temperature set buttons and a capacity of 22 standard 6" x 12" cylinders. Use of field constructed curing boxes will not be acceptable.
- F. Notify the laboratory sufficiently in advance of operation to allow for the assignment of personnel and schedules of tests.
- G. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Engineer, and shipped to the laboratory by the Contractor at Contractor's expense.
- H. Copies of all correspondence between the Contractor and testing agencies shall be provided to the Engineer.

1.05 QUALITY ASSURANCE:

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

1.06 PRODUCT HANDLING:

- A. 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 the progress of the Work.

1.07 FURNISHING MATERIALS:

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

1.08 CODE COMPLIANCE TESTING:

- A. 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.

1.09 CONTRACTOR'S CONVENIENCE TESTING:

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

1.10 SCHEDULES FOR TESTING:

A. Establishing Schedule

1. The Contractor shall, by advance discussion with the testing laboratory selected by the Owner, 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 on site 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.

- C. When the testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner.

1.11 TAKING SPECIMENS:

- A. Unless otherwise provided in the Contract Documents, all specimens and samples for tests will be taken by the testing laboratory or the Engineer.

1.12 TRANSPORTING SAMPLES:

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

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 45 29

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 – GENERAL

1.01 SCOPE:

- A. Temporary facilities required for this work include, but are not necessarily limited to:
1. Temporary utilities such as water and electricity.
 2. First aid facilities.
 3. Sanitary facilities.
 4. Potable water.
 5. Temporary enclosures and construction facilities.

1.02 GENERAL:

- A. First aid facilities, sanitary facilities and potable water shall be available on the Project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the Project warrants.
- B. Maintenance: Use all means necessary to maintain temporary facilities in proper and safe condition throughout progress of the Work. In the event of loss or damage, immediately make all repairs and replacements necessary, at no additional cost to the Owner.
- C. Removal: Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

1.03 TEMPORARY UTILITIES:

A. General

1. Provide and pay all costs for all utilities required for the performance of the Work.
2. Pay all costs for temporary utilities until Project completion.
3. Costs for temporary utilities shall include all utilities necessary for the performance of testing as required by the Contract Documents.

- B. Temporary Water: Provide all necessary temporary piping, and upon completion of the Work, remove all such temporary piping.

C. Temporary Electricity:

1. Provide all necessary wiring for the Contractor's use.
 2. Furnish, locate and install area distribution boxes such that the individual trades may use, their own construction type extension cords to obtain adequate power, and artificial lighting at all points where required for safety.
 3. Provide all temporary electrical services, wire, generators, etc. required for performance of the Work inclusive of maintaining existing facilities in service during required service shutdowns.
 4. Pay all fuel bills for temporary power required for the performance of the Work where required during shutdowns, bypass pumping etc.
- D. Lighting: Provide temporary lighting to meet all applicable safety requirements to allow application or installation of materials and equipment, and observation or inspection of the Work.
- E. Water:
1. Provide temporary facilities and piping required to bring water to point of use, and remove when no longer needed. Install an acceptable metering device for measuring water used.
 2. Provide a means to prevent water used for construction and testing from flowing back into source pipeline. Device(s) shall be as approved by Owner for backflow prevention.
- 1.04 FIRST AID FACILITIES:
- A. The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Engineer's personnel.
- 1.05 SANITARY FACILITIES:
- A. Prior to starting the Work, the Contractor shall furnish, for use of Contractor's personnel on the job, subcontractors, and all other on-site personnel, all necessary toilet facilities which shall be secluded from public observation, as much as practical. These facilities shall be chemical toilets. All facilities shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the Work is performed. Adequacy of these facilities will be subject to the Engineer's review and maintenance of same must be satisfactory to the Engineer at all times.
- B. Use of Owner's existing sanitary facilities by construction personnel will not be allowed.
- 1.06 POTABLE WATER:

- A. The Contractor shall be responsible for furnishing a supply of potable drinking water for employees, subcontractors, inspectors, engineers and the Owner who are associated with the Work.

1.07 ENCLOSURES AND CONSTRUCTION FACILITIES:

- A. Furnish, install and maintain for the duration of construction, all required scaffolds, tarpaulins, canopies, steps, bridges, platforms and other temporary construction necessary for proper completion of the Work in compliance with all pertinent safety and other regulations.

1.08 PARKING FACILITIES:

- A. Parking facilities for the Contractor's and Contractor's subcontractors' personnel shall be the Contractor's responsibility.

PART 2 – PRODUCT (NOT USED)

PART 3 – EXECUTION

3.01 PROTECTION OF WORK AND PROPERTY:

- A. General:
 1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
 2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours, unless special arrangements have been made.
 3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
 4. Where completion of the Work requires temporary or permanent removal and/or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
 5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
 6. Keep fire hydrants and water control valves free from obstruction and available

for use at all times.

7. In areas where Contractor's operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection thereof have been made by Contractor.
8. Utility Interruptions:
 - a. Notify property owners and utility owner offices that may be affected by construction operation at least two (2) days in advance.
 - b. Before exposing a utility, obtain utility owner's permission. Should service of utility be interrupted due to Contractor's operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer systems. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain original site drainage wherever possible.

B. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on the Drawings to remain undisturbed.
 - a. Where practical, tunnel beneath trees when on or near line of trench.
 - b. Employ hand excavation as necessary to prevent tree injury.
 - c. Do not stockpile materials or permit traffic within drip lines of trees.
 - d. Provide and maintain temporary barricades around trees.
 - e. Water vegetation as necessary to maintain health.
 - f. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.
 - g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
 - h. Dispose of removed trees in a legal manner off the site.
2. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and

tree surgery practices.

3. Replace each plant that dies as a result of construction activities.

C. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

D. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

3.02 TEMPORARY CONTROLS:

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Noise Control:

1. Provide acoustical barriers so noise emanating from tools or equipment will not exceed legal noise levels.
2. Noise Control Ordinance: Gwinnett County Code of Ordinances, Section 42 - 46 through 42 - 48.

C. Water Pollution Control:

1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to existing waterway.

2. Prior to commencing excavation and construction, obtain Engineer's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and lawful disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control:

1. Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.
2. Install erosion and sediment controls as shown on the Drawings, in accordance with applicable local, state, and federal regulations, and as directed by the Engineer.

3.03 STORAGE YARDS AND BUILDINGS:

- A. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.
- B. Temporary Storage Buildings:
 1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
 2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
 3. Store combustible materials (paints, solvents, fuels, etc.) in a well-ventilated and remote building meeting safety standards.

3.04 PARKING AREAS:

- A. Control vehicular parking to preclude interference with public traffic or parking, access

by emergency vehicles, Owner's operations, or construction operations.

- B. Provide parking facilities for personnel working on the Project.

END OF SECTION 01 50 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE:

- A. These general product stipulations apply to all equipment and piping. They supplement the detailed product Specifications, but in case of conflict, the detailed product Specifications shall govern.

1.02 COORDINATION:

- A. The Contractor shall assume full responsibility for the coordination of the installation of all equipment, materials and products furnished under these Contract Documents. The Contractor shall be completely responsible for verification that all structures, piping and equipment components furnished by the Contractor and/or subcontractors and suppliers are compatible. The Contractor shall place in service, each pipeline system and shall make all necessary alterations. All such alterations shall be made at the Contractor's expense.

1.03 ADAPTATION AND LOCATION OF EQUIPMENT:

- A. No responsibility for alteration of a planned structure to accommodate other types of equipment will be assumed by the Owner. Equipment which requires alteration of the structures will be considered only if the Contractor assumes all responsibility for making and coordinating all necessary alterations. All such alterations shall be made at the Contractor's expense.
- B. The Contractor shall install the work in such manner that the equipment, piping, vents, conduit, panels, ductwork and appurtenances be as neatly installed with adequate space for maintenance and passage of personnel.

1.04 PATENT ROYALTIES:

- A. All royalties and fees for patents covering materials, articles, apparatus, devices or equipment shall be included in prices bid by the Contractor.

1.05 WARRANTY:

- A. The Contractor shall warrant all work against faulty or inadequate installation, improper assembly or erection, defective materials, breakage or other failure. The warranty period shall be defined in Section 01 78 36 of these Specifications.

1.06 WORKMANSHIP AND MATERIALS:

- A. All products shall be designed, fabricated and assembled in accordance with the most modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Products shall be new and shall not have been in service at any time prior to delivery, except as required by tests.
- B. Materials shall be suitable for service conditions. Iron castings shall be tough, close grained, gray iron free from blowholes, flaws or excessive shrinkage and shall conform to ASTM A48, Class 30 minimum. Plugging of defective castings shall not be permitted. Castings shall be annealed to remove internal stresses prior to machining and shall have the mark number and heat number cast on them.
- C. Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.
- F. All products delivered to the Project site shall include detailed installation instructions and a parts list.

1.07 EQUIPMENT SPECIFICATIONS:

- A. The use of singular or plural terminology in the Specifications is not intended to define the number of units required to fulfill Contract requirements. Bidders must consult the Drawings and Specifications to determine how many units of a particular product are required. This does not relieve the Contractor of the responsibility to provide all equipment specified when multiple units are specifically required in the Specifications.

1.08 GROUTING:

- A. A special epoxy, non-shrink, or sand-cement grout shall be used in grouting applications as shown on the Drawings.

1.09 WELDING AND BRAZING:

- A. All welds shall be sound and free from embedded scale and slag. All butt welds shall be continuous, and where exposed to view, shall be ground smooth. All continuous welds shall be gas and liquid-tight. Welds in piping shall have full penetration and shall be smooth on the inside of the pipe. Intermittent welds shall have an effective length of at least two (2) inches and shall be spaced not more than six (6) inches apart.

- B. All welding of steel and aluminum, including materials, welding techniques, general safety practices, appearance and quality of welds, and methods of correcting defective work, shall conform to the latest requirements of AWS Specifications. Structural steel welding shall conform to the requirements of the AWS Structural Welding Code. The general recommendations and requirements of the AWS Structural Welding Code shall also apply to welded aluminum structures. The welding process and welding operators shall meet qualification tests and welding performance tests in accordance with the latest provisions of ASME Boiler and Pressure Vessel Code, Section IX, Welding and Brazing Qualifications. Welding process and qualification procedures for welding of pipe shall conform to the latest requirements of ANSI B31.1, Section 327, Welding, and Section 328, Brazing and Soldering. All welding qualification tests shall be witnessed by the Engineer, except as provided herein. All costs associated with the qualification or testing of welders and welding operators shall be borne by the Contractor.
- C. Reports certifying that the welding procedures, welders and welding operators that the Contractor intends to use meet the requirements specified above. These reports shall be submitted to the Engineer prior to beginning the Work. In the case of welder qualifications for shop welding and for carbon steel field welding, welders presenting certified qualification papers validated within the preceding six (6) month period will not be required to take the qualification tests. In the case of field welding of stainless steel or aluminum, all welders shall be required to take the qualification tests regardless of past experience or availability of certified qualification papers.
- D. Field welding practices shall conform to OSHA construction standards, Part 1926, Subpart J, Welding and Cutting. Shop welding practices shall conform to OSHA General Industry Standards, Part 1910, Subpart Q, Welding, Cutting, and Brazing.
- E. Welding electrodes for structural steel shall conform to the standard recommendations of the AISC. Welding electrodes for stainless steel shall conform to applicable AWS Specifications and shall be as recommended by "Welded Austenitic Chromium-Nickel Stainless Steels, Techniques and Properties", published by the International Nickel Company, New York, New York. Welding electrodes for aluminum shall conform to applicable AWS Specifications.
- F. Each welder and welding operator must identify all welds with welder's assigned symbol.
- G. Welders performing unsatisfactory work shall be removed from the welding process.
- H. The Owner may inspect any weld by radiographic or other means. Welds not in accordance with the requirements specified herein shall be repaired or replaced at the Contractor's expense. Excessive porosity, nonmetallic inclusions, lack of fusion, incomplete penetration and cracking shall constitute grounds for rejection of welds.

1.10 SHOP PRIMING AND PAINTING:

- A. All factory and shop priming and painting, including surface preparation, workmanship and materials, shall be as specified by manufacturer.

1.11 FIELD PRIMING:

- A. All iron and carbon steel surfaces not specified to be galvanized or shop primed and all ferrous or nonferrous surfaces specified to be field primed and painted shall be coated in the field with one or more coats of primer in accordance with the manufacturer's specifications.

1.12 FIELD PAINTING:

- A. Except for interior surfaces of vessels and enclosed equipment not specified to be field painted, all ferrous and nonferrous surfaces of equipment which have received one or more coats of shop or field applied primer shall be field painted after installation in accordance with the manufacturer's specifications.

1.13 GALVANIZING:

- A. All galvanizing shall be done by the hot-dip process after fabrication in conformity with requirements of ASTM A 123, Grade 100; ASTM A 153, ASTM A 384 and ASTM A 385. Articles to be galvanized shall be pickled before galvanizing. Articles to be painted shall not be quenched.
- B. Where galvanized bolts are specified or required by the Drawings, zinc plated bolts will be acceptable provided zinc plating conforms to ASTM B 633, Type II.
- C. Areas of galvanizing damaged at the factory by welding or burning or otherwise damaged shall be thoroughly stripped and cleaned and recoated with zinc to the required thickness by the hot dip process. Areas of galvanizing damaged in the field during transportation, handling or installation shall be stripped, cleaned, and recoated with zinc to the required thickness in accordance with ASTM A 780, Annex A3.
- D. Galvanized articles shall be free from uncoated spots, blisters, flux, black spots, dross, projections and other defects not consistent with acceptable galvanizing practice.
- E. Zinc and cadmium plating shall be subject to visual examination to determine uniformity of coating. The Engineer may require that the coating uniformity be tested in accordance with ASTM A 239 or ASTM E 376.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 60 00

SECTION 01 65 00

PRODUCT DELIVERY REQUIREMENTS

PART 1 – GENERAL

1.1 SCOPE:

- A. The Contractor shall provide transportation of all 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 and all other work and incidental items necessary or convenient to the Contractor for the satisfactory prosecution and completion of the Work.
- B. All equipment, materials and products damaged during transportation or handling shall be repaired or replaced by the Contractor at no additional cost to the Owner prior to being incorporated into the Work.

1.2 PREPARATION FOR SHIPMENT:

- A. When practical, factory-assemble products. Match mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted parts that may be damaged by the elements with a strippable protective coating.
- B. Package products to facilitate handling and protect from damage during shipping, handling, and storage. Mark or tag outside of each package or crate to indicate its purchase order number, bill of lading number, contents by name, name of Project, and Contractor, product number, and approximate weight. Include complete packing lists and bills of materials with each shipment.
- C. Deliver materials to project site and place at a location determined by Contractor.
- D. Notify Engineer and Owner's Inspector upon arrival.
- E. Protect equipment from exposure to the elements and keep dry and dust-free as far as practical. Protect painted surfaces against impact, abrasion, discoloration, or other damage.
- F. For major items, request a minimum seven (7) day advance notice of shipment from manufacturers. Upon receipt of manufacturer's advance notice of shipment, promptly notify Engineer of anticipated date of equipment arrival.
- G. Factory Test Results: Reviewed and accepted by Engineer before product shipment as required in individual Specification sections.

1.3 TRANSPORTATION:

- A. All products shall be suitably boxed, crated or otherwise protected during transportation.
- B. Where products will be unloaded using cranes, forklifts, or other hoisting equipment, the Contractor shall ensure that the weights of the assembled sections do not exceed the capacity of the hoisting equipment.
- C. Small items and appurtenances such as gauges and valves, which could be damaged during shipment shall be removed from the equipment prior to shipment, packaged and shipped separately. All openings shall be plugged or sealed to prevent the entrance of water or dirt.

1.4 HANDLING:

- A. Handle products in accordance with the manufacturer's written instructions, and in a manner to prevent damage. Store products, upon delivery, in accordance with manufacturer's instructions, with labels intact and legible, in approved storage yards or sheds. Provide manufacturer's recommended maintenance during storage, installation, and until products are accepted for use by Owner.
- 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. 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 padded as required to prevent damage to protective coatings and finishes.

1.5 OWNER FURNISHED EQUIPMENT:

- A. Owner furnished equipment shall mean any Owner purchased equipment and such being required by these Specifications to be installed by the Contractor.
- B. The Contractor shall off load and store all Owner furnished equipment per this Section of these Specifications.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 65 00

SECTION 01 66 00

PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 – GENERAL

1.01 SCOPE:

- A. The work under this Section includes, but not limited to, the furnishing of all labor, tools and materials necessary to properly store and protect all materials, equipment, products and the like, as necessary for the proper and complete performance of the Work.
- B. The Contractor shall be responsible for selecting and securing a storage site or sites necessary for the construction of this Project.

1.02 STORAGE AND PROTECTION:

A. Storage:

- 1. Maintain ample way for foot traffic at all times, except as otherwise approved by the Engineer. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered but not installed in the Work.
- 2. All property damaged by reason of storing of material shall be properly replaced at no additional cost to the Owner.
- 3. Packaged materials shall be delivered in original unopened containers and so stored until ready for use.
- 4. All materials shall meet the requirements of these Specifications at the time that they are used in the Work.
- 5. Store products in accordance with manufacturer's instructions.

B. Protection:

- 1. Use all means necessary to protect the materials, equipment and products of every section before, during and after installation and to protect the installed work and materials of all other trades.
- 2. All materials shall be delivered, stored and handled to prevent the inclusion of foreign materials and damage by water, breakage, vandalism or other causes.

- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary for the approval of the Engineer and at no additional cost to the Owner.

- D. All equipment shall be boxed, crated or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept clean and dry, as far as practical. All products shall be stored above ground level and adequately supported on wood blocking or other approved support material. Printed storage instructions of the manufacturers shall be strictly adhered to.
- E. Painted, anodized or otherwise coated surfaces shall be protected against impact, abrasion, discoloration and other damage. All coated surfaces which are damaged prior to acceptance of equipment shall be cleaned and coated to the satisfaction of the Engineer with the same or equivalent coating used in the original application.
- F. Individually packaged, unpainted steel parts shall be protected by a wrapping of vapor phase inhibiting or oil-impregnated paper and polyethylene film prior to shipment.
- G. Parts and equipment not requiring periodic inspection or maintenance shall be stored unopened in their original packaging until used.
- H. Flanged openings on equipment shall be covered with suitable solid wooden or metal blanks securely bolted to the flange using a minimum of four bolts and a suitable rubber gasket. Ends of threaded pipe and fittings shall be sealed watertight with metal or plastic caps. Threaded openings shall be sealed watertight with metal or plastic plugs. Other openings shall be sealed with two layers of 6 mil polyethylene securely taped in place with waterproof tape.
- I. Immediately prior to installation, equipment shall be cleaned of any protective coatings used during storage and any rust, dirt, grit or other foreign material shall be removed.
- J. After storage, rubber parts such as valve seats, diaphragms, expansion joints, gaskets, hoses and shaft couplings shall be checked for hardening or cracking. Deteriorated parts shall be replaced prior to placing in service by the Contractor at Contractor's own expense.
- K. Unless otherwise permitted in writing by the Engineer, building products and materials such as cement, grout, plaster, particleboard, finish lumber, wiring, etc., shall be stored indoors in a dry location. Building products such as rough lumber, plywood, concrete block and structural tile may be stored outdoors.
- L. Tarps and other coverings shall be supported above the stored equipment or materials on wooden strips to provide ventilation under the cover and minimize condensation. Tarps and covers shall be arranged to prevent ponding of water.

1.03 OWNER FURNISHED EQUIPMENT:

- A. The Contractor shall provide storage and protection for all Owner furnished equipment and materials, including extended storage as specified above.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 66 00



SECTION 01 71 23.16

CONSTRUCTION SURVEYING

PART 1 – GENERAL

1.1 SCOPE:

- A. Construction surveying shall include all of the surveying work required to layout the Work and control the location of the finished Project. The Contractor shall have the full responsibility for constructing the Project to the correct horizontal and vertical alignment, as shown on the Drawings, as specified, or as directed by the Engineer. The Contractor shall assume all costs associated with rectifying work constructed in the wrong location.
- B. From the information shown on the Drawings and the information to be provided as indicated under Project Conditions below, the Contractor shall:
 - 1. Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking, and all other surveying required for the construction of the Project.
 - 2. Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and shall bear the cost of re-establishing same if disturbed.
 - 3. Stake out the permanent and temporary easements or the limits of construction to ensure that the Work is not deviating from the indicated limits.
 - 4. Be responsible for all damage done to reference points, baselines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, baselines, center lines and temporary bench marks as a result of the operations.
- C. Baselines shall be defined as the line to which the location of the Work is referenced, i.e., edge of pavement, road centerline, property line, right-of-way or survey line.
- D. Record Drawing surveys shall be performed in accordance with Section 01 78 39.

1.2 PROJECT CONDITIONS:

- A. The Drawings provide the location and/or coordinates of principal components of the Project. The alignment of some components of the Project may be indicated in the Specifications. The Engineer may order changes to the location of some of the components of the Project or provide clarification to questions regarding the correct alignment.
- B. The location and elevation of benchmarks are shown on Drawings.

- C. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.

1.3 QUALITY ASSURANCE:

- A. The Contractor shall furnish documentation, prepared by a surveyor currently registered in the State of Georgia, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire, at the Contractor's own expense, a currently registered surveyor, acceptable to the Owner, to provide ongoing construction staking or confirmation of such.
- B. Any deviations from the Drawings shall be confirmed by the Engineer prior to construction of that portion of the Project.
- C. Construction Verification Surveying
 - 1. The Engineer may verify the Contractor's reference points, centerlines and work performed. This verification activity in no way relieves the Contractor of the responsibility of installing reference points, centerlines, temporary benchmarks, verifying that the work has been performed accurately, and all other work covered by this Section.

1.4 SITE WORK:

- A. Staking Precision: The precision of construction staking shall match the precision of a component's location indicated on the Drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.
- B. Written certification, by a licensed surveyor, that structure base grade and structure locations match the locations shown on the Drawings is required prior to beginning construction of the structure.
- C. Paved Surfaces: The Contractor shall establish a reference point for establishing and verifying the paving subgrade and finished grade elevations. Any variance with plan grades shall be identified by the Contractor and confirmed by the Engineer prior to constructing the road base.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 71 23.16

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 – GENERAL

1.1 SCOPE:

- A. The work under this Section includes, but is not necessarily limited to, cutting and patching work as indicated on the Drawings, herein specified and as necessary for proper and complete performance of the Work.
- B. Requirements for cutting and patching may be described in various sections of these Specifications.
- C. Execute cutting, including excavating and filling, or patching of work required to:
 - 1. Make several parts fit properly.
 - 2. Uncover work to provide for installation of ill-timed work.
 - 3. Remove and replace defective work.
 - 4. Remove and replace work not conforming to requirements of the Contract Documents.
 - 5. Remove samples of the installed work as specified for testing.
 - 6. Install specified work in existing construction.
- D. In addition, upon written instruction of the Engineer:
 - 1. Uncover work to provide for the Engineer's observation of covered work.
 - 2. Remove samples of the installed materials for testing.
 - 3. Remove work to provide for alteration of existing work.
- E. Protection of Work:
 - 1. Do not endanger any work by cutting or altering the Work or any part of it.
 - 2. Do not cut or alter the work of another contractor without written consent of the Engineer.

1.2 SUBMITTALS:

- A. Prior to cutting which affects the structural safety of the Project or the work of another contractor, submit a written notice to the Engineer requesting consent to proceed with cutting. The notice shall include:
 - 1. Identification of Project.

2. Description of defective Work.
 3. Necessity for cutting.
 4. Affect on other work or on the structural integrity of the Project.
 5. Description of the proposed work including:
 - a. Scope of cutting and patching
 - b. Subcontractor and trades to execute work
 - c. Products proposed to be used
 - d. Extent of refinishing
 6. Alternatives to cutting and patching.
 7. Designation of party responsible for the cost of cutting and patching.
- B. Cost Estimate: Prior to cutting and patching performed on instruction of the Engineer, submit a cost estimate.
- C. Should conditions of the Work or the schedule necessitate alternative materials or methods, submit a written recommendation to the Engineer that includes:
1. Compelling conditions for alternative materials or methods.
 2. Recommended alternative materials or methods.
 3. Submittals as required for substitutions.
- D. Uncovered Work: Submit written notice to the Engineer designating the time the work will be uncovered for the Engineer's observation.

1.3 PAYMENT FOR COST:

- A. Contractor's Costs: Costs caused by ill-timed or defective work or work not conforming to the Contract Documents, including costs for additional services of the Engineer, shall be paid by the Contractor.
- B. Owner's Costs: Cost of work done as the result of the Engineer's/Owner's instructions, which is not shown on the Drawings or specified, other than defective or non-conforming work, will be paid for by the Owner.

PART 2 – PRODUCTS

2.1 MATERIALS:

- A. All products and materials shall conform to the requirements of the Specifications for the type of work being performed, except where no products are specified in these Specifications for the item being replaced; then the products and materials shall be of an equivalent type, quality, thickness and width of the item removed.

PART 3 – EXECUTION

3.1 INSPECTION:

- A. Inspect existing conditions of the Work including elements subject to movement or damage during cutting and patching, or excavating and backfilling.
- B. After uncovering work, inspect conditions affecting the installation of new products.

3.2 PREPARATION:

- A. Provide shoring, bracing and support as required to maintain structural integrity of the Project.
- B. Provide protection for other portions of the Project and provide protection from the elements.

3.3 PERFORMANCE:

- A. Execute fitting and adjustments of products to provide finished installation that complies with specified tolerances and finishes.
- B. Execute cutting and demolition by means that will prevent damage to other work and will provide proper surfaces to receive installation of repairs and new work.
- C. Execute excavating and backfilling as specified in Section 31 23 00 Excavation and Fill.
- D. Restore work which has been cut or removed and install new products to provide completed work in accordance with the requirements of the Contract Documents.
- E. Refinish entire surfaces as necessary to provide an even finish. Continuous surfaces shall be refinished to the nearest intersection and assemblies shall be entirely refinished.

END OF SECTION 01 73 29

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.01 SUMMARY:

- A. Section includes administrative and procedural requirements for:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 01 50 00 Temporary Facilities and Controls for environmental-protection measures during construction, and location of waste containers at Project site.
 - 2. Section 31 11 00 Clearing and Grubbing for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.02 DEFINITIONS:

- A. Construction Waste: Structure and site improvement materials and other solid waste resulting from construction, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Structure and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycle, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.03 PERFORMANCE REQUIREMENTS:

- A. General: Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials, including the following:

1. Demolition Waste:

- a. Asphalt paving.
- b. Concrete.
- c. Concrete reinforcing steel.
- d. Brick.
- e. Concrete masonry units.
- f. Structural and miscellaneous steel.
- g. Piping.
- h. Supports and hangers.
- i. Valves.
- j. Sprinklers.

2. Construction Waste:

- a. Masonry and CMU.
- b. Lumber.
- c. Wood sheet materials.
- d. Wood trim.
- e. Metals.
- f. Piping.
- g. Electrical conduit.
- h. Packaging: Salvage or recycle 100 percent of the following uncontaminated packaging materials:
 - 1) Paper.
 - 2) Cardboard.
 - 3) Boxes.
 - 4) Plastic sheet and film.
 - 5) Polystyrene packaging.
 - 6) Wood crates.
 - 7) Plastic pails.

1.04 INFORMATIONAL SUBMITTALS:

- A. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.05 QUALITY ASSURANCE:

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Conference: Conduct conference at Project site. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
 - 3. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.

1.06 WASTE MANAGEMENT PLAN:

- A. Waste Identification: Indicate anticipated types and quantities of demolition site-clearing and construction waste generated by the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLAN IMPLEMENTATION:

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with operation, termination, and removal requirements in Section 01 50 00 Temporary Facilities and Controls.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within three (3) days of submittal return.
 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Designate specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 2. Comply with Section 01 50 00 Temporary Facilities and Controls for controlling dust and dirt, environmental protection, and noise control.
- 3.02 SALVAGING DEMOLITION WASTE:
- A. Salvaged Items for Reuse in the Work: Salvage items for reuse and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until installation.
 4. Protect items from damage during transport and storage.
 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use: Salvage items for Owner's use and handle as follows:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- 3.03 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL:
- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:

1. Recycling Bank of Gwinnett.
 2. Blaze Recycling.
 3. Snellville Recycling Center.
- C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste and transport to recycling receiver or processor.
- 3.04 RECYCLING DEMOLITION WASTE:
- A. Asphalt Paving: Grind asphalt to maximum 1-1/2-inch (38-mm) size.
1. Crush asphaltic concrete paving.
 2. Break up and transport paving to asphalt-recycling facility.
- B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
1. Pulverize concrete to maximum 1-1/2-inch (38-mm) size.
- C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.
1. Pulverize masonry to maximum 1-1/2-inch (38-mm) size.
 2. Clean and stack undamaged, whole masonry units on wood pallets.

3.05 RECYCLING CONSTRUCTION WASTE:

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
 - a. Comply with requirements in Section 32 92 00 Turf and Grasses for use of clean sawdust as organic mulch.

3.06 DISPOSAL OF WASTE:

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from site and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 74 23

FINAL CLEANING

PART 1 – GENERAL

1.1 SCOPE:

- A. This Section covers the general cleaning which the Contractor shall be required to perform both during construction and before final acceptance of the Project unless otherwise shown on the Drawings or specified elsewhere in these Specifications.

1.2 QUALITY ASSURANCE:

- A. Daily, and more often if necessary, conduct inspections verifying that requirements of cleanliness are being met.
- B. In addition to the standards described in this Section, comply with all pertinent requirements of governmental agencies having jurisdiction.

1.3 HAZARDOUS MATERIAL AND WASTE:

- A. The Contractor shall handle hazardous waste and materials in accordance with applicable local, state, and federal regulations. Waste shall also be disposed of in approved landfills as applicable.
- B. The Contractor shall prevent accumulation of wastes which create hazardous conditions.
- C. Burning or burying rubbish and waste materials on the site shall not be allowed.
- D. Disposal of hazardous wastes or materials into sanitary or storm sewers shall not be allowed.

1.4 DISPOSAL OF WASTE:

- A. The definitions contained in Georgia Environmental Protection Division Rules 391-3-4-.01 shall be applicable to this Project. The term waste shall include excess and surplus materials, and shall include liquid and solid wastes.
- B. Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

- C. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on-site.
- D. Remove and transport waste in a manner that will prevent spillage on adjacent surfaces and areas.
- E. Burning: Do not burn waste materials on site.
- F. Waste removed from the Project site shall be disposed of in sites permitted by the Georgia Environmental Protection Division for the acceptance of type of waste being disposed. The acceptable types of permitted disposal facilities are as follows:
 - 1. Inert Waste Landfills
 - 2. Municipal Solid Waste Landfills
 - 3. Municipal Solid Waste Landfills permitted to receive only construction and demolition wastes.
- G. Exceptions to Paragraph F are as follows:
 - 1. Hazardous waste shall be disposed of in accordance with Georgia Environmental Protection Division Rules 391-3-11.
 - 2. Asbestos-containing waste shall also be handled and disposed in accordance with Georgia Environmental Protection Division Rules 391-3-14.
 - 3. Excess earth material and excess excavated rock material may be placed on sites for which the Contractor provides to the Owner a signed affidavit from the property owner that the placement of such material is acceptable to the property owner. The Contractor and property owner shall be responsible for all permitting of such disposal.
- H. No waste shall be placed at a transfer station facility.
- I. The Contractor shall maintain records related to all waste removed from the Project site so as to allow the Owner or the Engineer to readily determine the following:
 - 1. Date waste removed from Project site.
 - 2. Name of hauler (company and driver) transporting such waste.
 - 3. General description of waste transported.
 - 4. "Truck tickets" indicating the waste disposal site and amount of waste disposed therein.
- J. For all wastes hauled to any landfill, the handler of such wastes must be licensed in accordance with Georgia Environmental Protection Division rules.

PART 2 – PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT:

- A. Provide all required personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY:

- A. Use only the methods and equipment which are compatible with the type of waste being removed, as recommended by the manufacturer of the material or as approved by the Engineer.

PART 3 – EXECUTION

3.1 PROGRESS CLEANING:

A. General

1. Do not allow the accumulation of scrap, debris, waste material and other items not required for construction of this Work.
2. At least each week, and more often if necessary, completely remove all scrap, debris and waste material from the job site.
3. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the environment.

B. Site

1. Daily, and more often if necessary, inspect the site and pick up all scrap, debris and waste material. Remove all such items to the place designated for their storage.
2. Restack materials stored on site weekly.
3. At all times maintain the site in a neat and orderly condition which meets the approval of the Engineer.

3.2 FINAL CLEANING:

- A. Definitions: Unless otherwise specifically specified, “clean” for the purpose of this Article shall be interpreted as removal of all tools, equipment, surplus materials, scrap, debris, trash, or other waste materials from the site; restoring the site to its pre-construction condition.
- B. General: Prior to completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in 3.1 above.
- C. Site: Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all public sidewalks directly adjacent to the site; rake clean other surfaces of the grounds. Completely remove all resultant debris.

D. Structures

1. Remove all traces of soil, waste material, splashed material, and other foreign matter to provide a uniform degree of exterior cleanliness. Visually inspect all exterior surfaces and remove all traces of soil, waste material, and other foreign matter. Remove all traces of splashed materials from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. In the event of stubborn stains not removable with water, the Engineer may require light sandblasting or other cleaning at no additional cost to the Owner.
- E. Post-Construction Cleanup: All evidence of temporary construction facilities, haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other evidence of construction, shall be removed as directed by the Engineer.
- F. Restoration of Landscape Damage: Any landscape feature damaged by the Contractor shall be restored as nearly as possible to its original condition at the Contractor's expense. Restoration shall be performed to the satisfaction of the Engineer.
- G. Timing: Schedule final cleaning as approved by the Engineer to enable the Owner to accept the Project.

END OF SECTION 01 74 23

SECTION 01 78 36

WARRANTIES

PART 1 – GENERAL

1.1 PROJECT MAINTENANCE AND WARRANTY:

- A. Maintain and keep in good repair the Work covered by these Drawings and Specifications until acceptance by the Owner.
- B. Warranty Period: The Contractor shall warrant for a period of one (1) year from the date of Owner's written Final Acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship, and the Contractor shall promptly make such corrections as may be necessary by reason of such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect throughout the Warranty Period.
- C. The Contractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Contractor or the Owner, or to perform any work which is normally performed by a maintenance crew during operation.
- D. In the event of multiple failures of major consequences prior to the expiration of the one (1) year warranty described above, the affected work shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences. All related components which may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new warranty period equal to the original warranty period shall be provided against defective or deficient design, workmanship, and materials and shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failure shall be interpreted to mean two (2) or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken piping, or vessels, excessive deflections, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over-or under-lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one (1) year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be inspected, modified or replaced as necessary and rewarranted for the original full Warranty Period.

- E. The Contractor shall, at Contractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Contractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.
- F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Contractor's operations, shall be promptly repaired by the Contractor at no cost to the Owner.
- G. The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one (1) year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Contractor shall reimburse the owner of the road for the cost of such repairs.
- H. In the event the Contractor fails to proceed to remedy the defects upon notification within ten (10) days of the date of such notice, the Owner reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Contractor and the sureties on Contractor's bond liable for the cost and expense thereof.
- I. Notice to Contractor for repairs and reconstruction will be made in the form of a registered letter addressed to the Contractor at Contractor's home office.
- J. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Contractor's liability within the law of the place of construction.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION 01 78 36

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Qualified Personnel
3.1	Maintenance of Documents and Samples
3.2	Record Drawings
3.3	GPS Coordinates for Water Projects
3.4	GPS Coordinates for Sanitary Sewer Projects
3.5	GPS Coordinates for Stormwater Projects

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly compile, prepare, maintain, record, and submit Project Record Documents as specified herein.
- B. Project Record Documents to be prepared and submitted by the Contractor include, but are not limited to Record Drawings, Specifications, Change Orders and other modifications to the Contract, Engineer field orders or written instructions, Requests for Information (RFI) and Clarification Memorandums, reviewed shop drawings, product data and samples, and test records. Final payment will not be made until all Project Record Documents are submitted and approved by the Engineer and GCDWR.
- C. The Contractor shall maintain on the project site an updated set of Record Drawings. These Drawings must be the latest revision, and match those of GCDWR.

1.4 SUBMITTALS

- A. Submit for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the following items:
1. Record Drawings.
 2. Specifications.
 3. Change Orders and other Contract modifications.
 4. Engineer/Owner Field Orders.

5. Requests for Information (RFI) and Clarification Memorandums.
 6. Approved shop drawings, product data, and samples.
 7. Test records.
 8. Valve cards providing a 3 point measurement on each valve to a fixed permanent reference point.
 9. GPS Coordinates for all fire hydrants, valves, manholes, and other structures and appurtenances installed.
- B. Contractor shall accompany each submittal with transmittal letter containing date, project title and number, Contractor's name and address, title and number of each record document, and signature of Contractor's authorized representative.

PART 2 – PRODUCTS

2.1 QUALIFIED PERSONNEL

- A. Contractor shall furnish qualified and experienced person, whose duty and responsibility shall be to maintain Project Record Documents.

PART 3 - EXECUTION

3.1 MAINTENANCE OF DOCUMENTS AND SAMPLES

- A. Maintain secure storage for documents and product samples in the Contractor's field office, or an agreed upon location when field offices are not used, apart from documents used for construction. Example acceptable locations may include lockable tool trailer at the lay down area or superintendent's work vehicle. In any case documents shall be kept neat and secure.
- B. File documents and samples in accordance with format of these specifications.
- C. Maintain documents in a neat, clean, dry, legible condition and in good order. Do not use record documents for construction purposes. Maintain at an agreed upon site for GCDWR, one (1) copy of all Project Record Documents.
- D. Make documents and samples available at all times for inspection by the Engineer, or GCDWR.
- E. Failure to maintain up-to-date Project Record Documents, in a satisfactory manner, may be cause for withholding of a certificate for payment.
- F. Purpose of Project Record Documents is to document factual information regarding aspects of Work, both concealed and visible, to enable future modification of Work to proceed without lengthy and expensive site measurement, investigation, and examination.

3.2 RECORD DRAWINGS

- A. The Contractor must maintain an up-to-date Field Record set of drawings by marking changes and other information directly on a clean set of full-size Contract Drawings. The Contractor shall submit for Engineer and GCDWR approval, up-to-date Record Drawings with monthly pay applications. **Approval of monthly pay**

applications will not occur until the updated record drawings are approved.

The Engineer and GCDWR will review the record drawings to confirm that the recorded information is current.

- B. Record information concurrently with construction progress. Do not conceal any Work until required information is recorded. Make entries within twenty-four (24) hours after receipt of information that a change in Work has occurred.
- C. Unless otherwise noted, Record Drawings shall provide dimensions, distances, and coordinates to the nearest one tenth foot (0.1').
- D. Unless otherwise noted, Record Drawings shall provide elevations to the nearest one-hundredth foot (0.01') for all pertinent items constructed by the Contractor.
- E. Record Drawings shall have a title block indicating that the drawings are Record Drawings, the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.
- F. Record Drawings shall include details not on original Drawings to accurately depict actual constructed items.
- G. Legibly mark drawings using erasable colored pencils to record actual construction, including:
 - 1. Color Coding: RED – When showing information added to drawings
GREEN – When showing information deleted from drawings
BLUE – When showing information notes on drawings
 - 2. Date all entries.
 - 3. Call attention to each entry by drawing a “cloud” around area(s) affected.
 - 4. For water mains, legibly mark to record actual changes made during construction, including but not limited to:
 - a. Depth of valve or meter vaults in relation to finished grade data if not shown, or where depth differs from that indicated on the Drawings. Provide the elevation of piping through the vaults.
 - b. Horizontal and vertical locations of existing and new underground facilities and appurtenances, and other underground structures, equipment, or Work. Reference at least two measurements to permanent surface improvements.
 - c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - d. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
 - 4. For Sewer, legibly mark to record actual changes made during construction, including but not limited to:
 - a. Invert elevations of all pipes entering manholes, junction boxes, etc.
 - b. Top elevations (ring and cover) of all manholes, vaults, etc.
 - c. Horizontal and vertical locations of existing and new underground facilities

and appurtenances, and other underground structures, equipment, or Work. Reference at least two measurements to permanent surface improvements.

- d. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
 - e. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.
 - f. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
5. For Stormwater mains, legibly mark to record actual changes made during construction, including but not limited to:
- a. Invert elevations of all pipes entering stormwater structures (Catch Basins, Yard Inlets, Junction Boxes, Headwalls, etc.).
 - b. Top elevations (ring and cover, grate, throat, etc.) of all stormwater structures.
 - c. Locate existing facilities, piping, equipment, and items critical to the construction.
 - d. Changes made by Addenda, Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification, using consistent symbols for each and showing appropriate document tracking number.

3.3 GPS COORDINATES FOR WATER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated fire hydrants, blow-offs, valves, valve vaults, master meter vaults, and dead ends. Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.
- B. As installation of the utility pipeline progresses, the Contractor shall provide offset staking for the centerline of the utility pipe every 100 feet along the pipe. The staking shall identify the distance to the centerline of the pipe and the depth of cover to the top of pipe. At the completion of construction, the Contractor shall provide GPS coordinates for the centerline of the pipe, include depth of bury, based on staked offsets.

3.4 GPS COORDINATES FOR SANITARY SEWER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated manholes, valves, and valve vaults. Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.

3.5 GPS COORDINATES FOR STORMWATER PROJECTS

- A. At the completion of construction, the Contractor shall provide GPS coordinates for all newly installed and relocated Stormwater structures, (Catch Basins, Yard Inlets, Junction Boxes, etc.). Coordinates shall be of survey grade quality (sub foot accuracy minimum) and provided in the Georgia State Plane Coordinates West Zone. Control shall be based on NAD 83 for horizontal and NAVD 88 for vertical. Coordinates shall be submitted in an ESRI shape file format.

- B. For force mains, as installation of the pipeline progresses, the Contractor shall provide offset staking for the centerline of the utility pipe every 100 feet along the pipe. The staking shall identify the distance to the centerline of the pipe and the depth of cover to the top of pipe. At the completion of construction, the Contractor shall provide GPS coordinates for the centerline of the pipe, include depth of bury, based on the staked offsets.

END OF SECTION 01 78 39



SECTION 02 32 19

EXPLORATORY EXCAVATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Exploratory Excavation

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Erosion and Sedimentation Controls (31 25 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly conduct excavation at specified locations or as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 EXPLORATORY EXCAVATION

- A. When directed by GCDWR, the Contractor shall perform field exploratory excavation work to determine the presence of existing underground sanitary sewer, water, and storm drainage, utility piping, and or structures. The information for each said utility

- found shall include, but not limited to, type of utility, material dimension, material type, and both vertical and horizontal measurements of its location.
- B. Where necessary, utilize vacuum excavation equipment to minimize the risk of damage to suspected existing utilities.
 - C. Follow all federal, state, and local regulations related to excavation work.
 - D. For each utility found, provide the following information:
 - 1. Type of utility
 - 2. Material type
 - 3. Material dimension
 - 4. Measurements of the vertical and horizontal location of the utility to permanent reference points
 - 5. Any other information which may help in coordinating work around the utility
 - E. Submit documentation of the findings, including a detailed sketch, to the Engineer and GCDWR.

END OF SECTION 02 32 19

SECTION 02 41 13.13

PAVING REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Equipment
3.1	Trench Paving Removal
3.2	Milling Operation

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove asphalt and/or concrete paving as required for the installation of proposed water mains or sewer mains and related appurtenances under the Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage caused by debris, or construction material removal.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. MILLING EQUIPMENT:

1. Use power-driven, self-propelled milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also use equipment that is:
 - a. Designed to mill and remove specified depth of existing asphalt and/or concrete paving.
 - b. Equipped with grade slope controls operating from a string line or ski, and based on mechanical or sonic operation.
 - c. Capable of removing pavement to an accuracy of 1/8 in. (3 mm).
 - d. Furnished with lighting system for night work, as necessary.
 - e. Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.
- B. DUST CONTROL
1. Provide power brooms, vacuum sweepers, power blowers, or other means to remove loose debris or dust. Do not allow dust control to restrict visibility of passing traffic or to disrupt adjacent property owners.

PART 3 - EXECUTION

3.1 TRENCH PAVING REMOVAL

- A. Where trench excavation within a paved surface is required, the Contractor shall saw cut in a straight line, vertical joints for the entire depth of pavement. The saw cut joints shall extend for the entire length of trench on both sides of the trench. Ragged edges shall be trimmed so as to provide a substantially straight line juncture between the old and new surfaces.
- B. The saw cut joints shall be a minimum of twelve inches (12") outside of the maximum width of excavated trench.
- C. Pavement shall be removed and hauled off site and disposed of in a proper legal manner. Contractor shall be careful not to disturb or damage any pavement that is to remain.

3.2 MILLING OPERATION

- A. Follow the Plans to mill the designated areas and depths, as required. Ensure the following requirements are met:
 1. Schedule the construction operation. Use milling methods that will produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
 2. Provide positive drainage to prevent water accumulation on the milled pavement, as shown on the Plans or directed by the Engineer.
 3. Bevel back the longitudinal vertical edges greater than 2 in (50 mm) that are produced by the removal process and left exposed to traffic. Bevel them back at

- least 3 in for each 2 in (75 mm for each 50 mm) of material removed. Use an attached mold board or other approved method.
4. When removing material at ramp areas and ends of milled sections, taper the transverse edges 10 ft (3 m) to avoid creating a traffic hazard and to produce a smooth surface.
 5. Protect with a temporary asphaltic concrete tie-in (paper joint) vertical edges at other areas such as bridge approach slabs, drainage structures, and utility appurtenances greater than ½-inch that are left open to transversing vehicles. Place the temporary tie-in at taper rate of at least 6 to 1 horizontal to vertical distance.
 6. Remove dust, residue, and loose milled material from the milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.
- B. The reclaimed asphaltic and/or concrete pavement becomes the Contractor's property unless otherwise specified.

END OF SECTION 02 41 13.13

SECTION 02 41 13.23
UTILITY LINE REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Equipment
3.1	Trench Paving Removal
3.2	Milling Operations
3.3	Pipe Removal/Abandonment
3.4	Valve Abandonment
3.5	Fire Hydrant Removal
3.6	Manhole Removal/Abandonment

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove and/or abandon existing utility lines as required for the installation of proposed utility pipelines and related appurtenances under the Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage caused by debris, or construction material removal.
- C. The Contractor shall submit for approval by the Engineer and GCDWR:
1. Details of all caps or plugs to be installed on abandoned piping to remain in the ground.
 2. Details for restraining all existing water mains to remain in services where a portion of the main has been removed or modified.

3. Location of disposal site for all materials removed with documentation from site owner stating acceptance of each type of material to be disposed of.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Milling Equipment

1. Use power-driven, self-propelled milling equipment that is the size and shape that allows traffic to pass safely through areas adjacent to the work. Also use equipment that is:
 - a. Designed to mill and remove specified depth of existing asphalt paving
 - b. Equipped with grade slope controls operating from a stringline or ski and based on mechanical or sonic operation
 - c. Capable of removing pavement to an accuracy of 1/8 in. (3 mm)
 - d. Furnished with lighting system for night work, as necessary
 - e. Provided with conveyors capable of side, rear, or front loading to transfer the milled material from the roadway to a truck.

B. Dust Control Equipment

2. Provide power brooms, vacuum sweepers, power blowers, or other means to remove loose debris or dust. Do not allow dust control to restrict visibility of passing traffic or to disrupt adjacent property owners.

PART 3 - EXECUTION

3.1 TRENCH PAVING REMOVAL

- A. Where trench excavation within a paved surface is required, saw cut vertical joints for the entire depth of pavement. The saw cut joints shall extend for the entire length of trench on both sides of the trench. Ragged edges shall be trimmed so as to provide a substantially straight line juncture between the old and new surfaces.
- B. The saw cut joints shall be a minimum of 12 inches outside of the maximum width of excavated trench.
- C. Pavement shall be removed, hauled off site and disposed of in a proper legal manner. Be careful not to disturb or damage any pavement that is to remain.

3.2 MILLING OPERATION

- A. Follow the Plans to mill the designated areas and depths, as required. Ensure the following requirements are met:
1. Schedule the construction operation. Use milling methods that will produce a uniform finished surface and maintain a constant cross slope between extremities in each lane.
 2. Provide positive drainage to prevent water accumulation on the milled pavement, as shown on the Plans or directed by the Engineer.
 3. Bevel back the longitudinal vertical edges greater than 2 in (50 mm) that are produced by the removal process and left exposed to traffic. Bevel them back at least 3 inches for each 2 inches (75 mm for each 50 mm) of material removed. Use an attached mold board or other approved method.
 4. Remove dust, residue, and loose milled material from the milled surface. Do not allow traffic on the milled surface and do not place asphaltic concrete on the milled surface until removal is complete.
- B. The reclaimed asphaltic pavement becomes the Contractor's property unless otherwise specified.

3.3 PIPE REMOVAL/ABANDONMENT

- A. The Contractor shall be responsible for removal of any existing utility pipeline that is to be abandoned that interferes with the installation of the proposed pipelines. Prior to removing any portion of existing pipelines, the Contractor shall obtain approval from GCDWR.
- B. The Contractor shall isolate the portion of the pipeline to be removed using existing isolation valves. Any service connections on the pipeline to be removed shall be transferred to the new pipeline or an existing pipeline which will remain in service, prior to isolation of the pipeline.
- C. The ends of piping to remain in the ground shall be suitably capped or plugged to prevent water or soil from entering the pipe.
- D. Any existing pipelines that have a portion of pipe removed and are to remain in service shall be properly restrained with thrust blocking to prevent movement of the remaining pipe.
- E. The Contractor shall follow all applicable codes and regulations for removal of hazardous materials, such as asbestos cement pipe, and dispose of in a legal and proper manner.
- F. The Contractor shall load, haul away, and dispose of material in a legally permitted location, any debris, trash, structures, piping, etc. removed from the worksite.

3.4 VALVE ABANDONMENT

- A. Buried valves that are to be abandoned shall be fully closed. The valve box shall be removed and the hole filled with suitable material and compacted. If the valve is within a paved location, the hole shall be capped with matching materials (asphalt, concrete, etc.). If the valve is at the end of a water main that is to remain in service, the valve shall be plugged and restrained to prevent leaks.

3.5 FIRE HYDRANT REMOVAL

- A. Fire hydrants to be removed shall be salvaged in accordance with Section 33 12 19.81 entitled "Relocate and Reconnect Hydrants, Valves, and Meters" of these specifications.

3.6 MANHOLE REMOVAL/ABANDONMENT

- A. The Contractor shall be responsible for removal of any existing manhole that is to be abandoned that interferes with the installation of the proposed sewer or force main. Prior to removing any manholes, the Contractor shall obtain approval from GCDWR.
- B. Where manholes are to be removed, the Contractor shall excavate the manhole; remove the manhole and connecting piping, as required, backfill and compact the void with approved material. If the manhole is located within a road, parking area, driveway or other paved area, the backfill shall be compacted to at least 95% of maximum dry density - Standard Proctor (ASTM D698). If the manhole is located in an unpaved area, the backfill shall be compacted to 85% of maximum dry density - Standard Proctor (ASTM D698), and slightly mounded to allow for settlement.
- C. Where manholes are to be abandoned in place, the Contractor shall grout seal the ends of all pipes entering the manhole, fracture the invert of the manhole to allow for drainage, cut the top of the manhole off to a minimum of three feet (3') below finished grade, fill the manhole with #57 stone, and backfill and compact with suitable fill material. If the manhole is located within a road, parking area, driveway or other paved area, the backfill shall be compacted to at least 95% of maximum dry density - Standard Proctor (ASTM D698). If the manhole is located in an unpaved area, the backfill shall be compacted to 85% of maximum dry density - Standard Proctor (ASTM D698), and slightly mounded to allow for settlement.

END OF SECTION 02 41 13.23

SECTION 02 42 11

REMOVAL OF CONSTRUCTION MATERIAL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Workmanship

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, tools, labor, and equipment, necessary to remove all unwanted construction material and debris, as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall supply identification and license of company hauling/transporting material from the site.
- C. The Contractor shall submit photographs and/or videotape, sufficiently detailed, of existing conditions of project site. These shall be used to evaluate project areas that might be misconstrued as damage, caused by debris, or construction material removal.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. The Contractor shall follow all federal, state, and local regulations related to removal, hauling, and disposal of trash and debris.

- B. The Contractor shall comply with Gwinnett County Ordinance SWO 2012-002 for hauling and disposal of all solid waste removed from the site for the duration of the Work.
- C. The Contractor shall load, haul away, and dispose of debris, trash, structures, automobiles, etc., that may be pre-existing on the Worksite, to a legally permitted location.
- D. The Contractor shall load, haul away, and dispose of construction material that is generated in execution of the Work, to a legally permitted location; including, but not limited to any debris, trash, structures, piping, etc.
- E. The Contractor shall remove and dispose of all unused construction materials prior to Final Acceptance of the Work by GCDWR and the Engineer.
- F. No additional payment shall be made for excavation or disposal of excavated material required for placement or removal of backfill placed above the foundation of the pavement; or for preparation of subgrade. The cost thereof shall be considered included in the pavement unit prices bid.

END OF SECTION 02 42 11

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Assurance
1.6	Delivery, Storage, and Handling
2.1	General
2.2	Concrete Materials
2.3	Forms
2.4	Reinforcement
2.5	Concrete Mix Design
3.1	Measuring Materials
3.2	Mixing and Transporting
3.3	Concrete Appearance
3.4	Placing and Compacting
3.5	Curing and Protection
3.6	Removal of Forms
3.7	Inspection and Field Testing
3.8	Concrete Finishing
3.9	Failure to Meet Requirements
3.10	Patching and Repairs
3.11	Concrete Schedule

B. RELATED SECTIONS

1. Brick Masonry (04 21 13).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Tunnel Lining (33 05 23.71).
4. Ductile Iron Pipe (33 11 13.05).
5. Steel Pipe (33 11 13.07).
6. Water Utility Distribution Valves (33 12 16).
7. Sanitary Utility Sewerage Piping (33 31 00).
8. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. American Society for Testing and Materials (ASTM)
 - 1. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. C33 - Standard Specification for Concrete Aggregates
 - 3. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
 - 4. C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
 - 5. C94 - Standard Specification for Ready-Mixed Concrete
 - 6. C143 - Standard Test Method for Slump of Hydraulic Cement Concrete
 - 7. C150 - Standard Specification for Portland Cement
 - 8. C171 - Standard Specification for Sheet Materials for Curing Concrete
 - 9. C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
 - 10. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
 - 11. C260 - Standard Specification for Air-Entraining Admixtures for Concrete
 - 12. C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
 - 13. C494 - Standard Specification for Chemical Admixtures for Concrete
 - 14. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
 - 15. C1017 - Standard Specification for Chemical Admixtures for use in Producing Flowing Concrete
- C. American Concrete Institute (ACI)
 - 1. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
 - 2. ACI 305R - Hot Weather Concreting
 - 3. ACI 306.1 - Standard Specification for Cold Weather Concreting
 - 4. ACI 318 - Building Code Requirements for Structural Concrete
 - 5. ACI 350R - Environmental Engineering Concrete Structures
- D. Where reference is made to one of the above Standards, the revision in effect at the time of bid opening shall apply.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment to place all cast-in-place concrete, including all reinforcing steel and formwork, in the structures shown on the Contract Drawings, and such other concrete as may be found necessary to fully complete the Work indicated under this Contract, or as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1. Mix Design

- a. Concrete mix for each formulation of concrete proposed for use including constituent quantities per cubic yard, water-cementitious materials ratio, concrete slump, type and manufacturer of cement. Provide either 1) or 2) below for each mix proposed.
 - 1) Standard deviation data for each proposed concrete mix based on statistical records.
 - 2) The curve of water-cementitious materials ratio versus concrete cylinder strength for each formulation of concrete proposed based on laboratory tests. Provide the cylinder strength for the average of the 28 day cylinder strength test results for each mix. Provide results of 7 and 14 day tests.

2. Product Data

- a. Sources of cement, pozzolan and aggregates.
- b. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.
- c. Air-entraining admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM Standards.
- d. Water-reducing admixture. Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations and conformity to ASTM standards.
- e. High-range water-reducing admixture (plasticizer). Product data including catalogue cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range and conformity to ASTM standards. Identify proposed locations of use.
- f. Sheet curing material. Product data including catalogue cut, technical data and conformity to ASTM standard.
- g. Liquid curing compound. Product data including catalogue cut, technical data, storage requirements, product life, application rate and conformity to ASTM Standards. Identify proposed locations of use.

3. Samples
 - a. Fine and coarse aggregates if requested by the Engineer.
4. Certificates
 - a. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.
 - b. Certify admixtures are suitable for use in contact with potable water after 30 days of concrete curing.
 - c. Certify curing compound is suitable for use in contact with potable water after 30 days (non-toxic and free of taste or odor).
5. Test and Evaluation Reports
 - a. Fine aggregates – sieve analysis, physical properties, and deleterious substance.
 - b. Coarse aggregates – sieve analysis, physical properties, and deleterious substances.
 - c. Cements – chemical analysis and physical properties for each type.
 - d. Pozzolans – chemical analysis and physical properties.
 - e. Proposed concrete mixes – compressive strength, slump and air content.
 - f. Shrinkage Test Results – In accordance with ASTM C157 as modified hereinafter.
6. Field Quality Control Submittals
 - a. Field test reports.
 - b. Concrete Delivery/Batch Tickets:
 - 1) For each batch of concrete before unloading at Site.
 - 2) In accordance with ASTM C94/C94M, Section 14 including requirements 14.2.1 through 14.2.10.
 - 3) Indicate the amount of mixing water withheld, and maximum amount that may be permitted to be added at Project Site.
7. Special Procedure Submittals
 - a. Detailed plan for cold weather curing and protection of concrete placed and cured in weather below 40 degrees F.
 - b. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F.
 - c. If Contractor chooses to use self-consolidating concrete: Detailed plan of modified procedures for handling, placing, and finishing.

1.5 QUALITY ASSURANCE

- A. Comply with ACI 318, the recommendations of ACI 350R and other stated requirements, codes and standards. The most stringent requirement of the codes, standards and this Section apply when conflicts exist.
- B. Use only one source of cement and aggregates on any one structure. Provide concrete of uniform color and appearance.
- C. A minimum of 14 days in advance of placing concrete, discuss with the Engineer the sources of individual materials and batched concrete proposed for use. Discuss placement methods, waterstops and curing. Propose methods of hot and cold weather concreting as required. Discuss the properties and techniques of batching and placing plasticized concrete prior to the placement of any concrete containing a high-range water-reducing admixture (plasticizer). Include the plasticizer manufacturer in the discussions.
- D. If, during the progress of the work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. Make all changes ordered at the Contractor's expense.
- E. If, during the progress of the work, the materials from the sources originally accepted change in characteristics, provide all materials, labor, and equipment, at the Contractor's expense, necessary to perform new acceptance tests as were originally required using the new materials prior to their incorporation in the work. If the tests are specified to be conducted by others, the costs of these tests shall be borne solely by the Contractor.
- F. Qualifications
 - 1. Batch Plant: NRMCA Program for Certification of Ready-Mixed Concrete Production Facilities or an approved equivalent program.
 - 2. Mix Designer: Person responsible for developing concrete mixture proportions certified as NRMCA Concrete Technologist Level 2 or DOT certified mix designer in the jurisdiction of the Work. Requirements may be waived if the individual is Contractor's Licensed Design Engineer.
 - 3. Installers: Unless otherwise permitted, at least one person on the finishing crew must be certified as an ACI Flatwork Finisher, or equivalent.
- G. Preconstruction Testing
 - 1. Have the following materials tested to verify conformity with this Specification Section and the stated ASTM Standards.
 - a. Fine aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.
 - b. Coarse aggregates for conformity with ASTM C33 – sieve analysis, physical properties, and deleterious substances.

- c. Cements for conformity with ASTM C150 – chemical analysis and physical properties.
- d. Pozzolans for conformity with ASTM C618 – chemical analysis and physical properties.
- e. Proposed concrete mix designs – compressive strength, slump and air content.

H. Field Samples

1. Field testing and inspection services will be provided by GCDWR. GCDWR will pay the cost of such work, except as specifically stated otherwise. GCDWR will test the following items to verify conformity with this Specification Section.
 - a. Concrete placements – compressive strength (cylinders), compressive strength (cores), slump, and air content.
 - b. Other materials or products that may come under question.
2. Confirm all materials incorporated in the work to accepted samples.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Storage and Handling Requirements

1. Cement: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination and to minimize warehouse set.
2. Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Build stockpiles in successive horizontal layers not exceeding 3-ft in thickness. Complete each layer before the next is started. Do not use frozen or partially frozen aggregate.
3. Sand: Arrange and use stockpiles to avoid contamination. Allow sand to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.
4. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.
5. Pozzolan: Store in weathertight buildings, bins or silos to provide protection from dampness and contamination.
6. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.
7. Liquid Curing Compounds: Store in closed containers.

PART 2 PRODUCTS

2.1 GENERAL

- A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired. Such reference is not intended to indicate a restrictive preference on the part of GCDWR for that particular manufacturer or product, or to prohibit the use of equivalent products or equally qualified manufacturers.
- B. Like items of materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance and manufacturer's service.

2.2 CONCRETE MATERIALS

A. Cementitious Materials

1. Portland Cement

- a. In accordance with requirements of ASTM C150.
- b. Brand: Subject to approval of Engineer. Use one brand throughout the Work.
- c. Alkalies: Maximum 0.60 percent.
- d. Nonhydraulic above grade structures: Type I or Type II.
- e. Hydraulic and below grade structures and sewers: Type II

2. Supplementary Cementitious Materials

- a. Fly Ash (Pozzolan): Class F or Class N fly ash in accordance with ASTM C618, except as modified herein:
 - 1) Produced from process that does not use hazardous or potentially hazardous materials.
 - 2) ASTM C618, Table 1, Loss on Ignition: Maximum 3 percent.
 - 3) ASTM C618, Table 2, Water Requirement: Maximum 100 percent of control.
 - 4) ASTM C618, Table 3, Effectiveness in Controlling Alkali-Silica Reaction: Maximum 100 percent expansion of test mixture as a percentage of low-alkali cement control at 14 days.
 - 5) ASTM C618, Table 3, Expansion of Test Mixture: Evaluate results using either Procedure A or Procedure B as follows:
 - a) Procedure A after 6-month sulfate exposure, maximum 0.10 percent.
 - b) Procedure B, expansion of test mixture as a percentage of sulfate resistance cement control, after at least 6-month exposure, maximum 100 percent.
 - 6) Where fly ash is specified to be used with Type I cement, have fly ash meet one of the following requirements:

- a) CaO: Maximum 15 percent.
- b) Test cementitious materials as follows:
 - (1) In accordance with ASTM C1012.
 - (2) Furnish test data confirming fly ash in combination with cement used meets strength requirements, is compatible with air-entraining agents and other additives, provides increased sulfate resistance equivalent to or better than Type II cement.
 - (3) Conduct tests using proposed fly ash and cement samples together with control samples using Type II cement without fly ash.
- b. Slag Cement: In accordance with ASTM C989, Grades 100 or 120.
- 3. Tricalcium Aluminate
 - a. Content of Cementitious Materials: Maximum 8 percent.
- B. Aggregates: Furnish from one source.
 - 1. Natural Aggregates
 - a. Free from deleterious coatings and substances and conforming to requirements of ASTM C33, except as modified herein.
 - b. Free from materials and aggregate types causing popouts, discoloration, staining, or other defects on surface of concrete.
 - 2. Nonpotentially Reactive: In accordance with ASTM C33, Appendix XI, Paragraph X1.1.
 - 3. Aggregate Soundness: Test for fine and coarse aggregates in accordance with ASTM C33 and ASTM C88 using sodium sulfate solution.
 - 4. Fine Aggregates
 - a. Clean, sharp, and natural sand.
 - b. ASTM C33.
 - c. Material Passing 200 Sieve: 4 percent maximum.
 - d. Limit deleterious substances in accordance with ASTM C33, Table 1 with material finer than 20 sieve limited to 3 percent, coal and lignite limited to 0.5 percent.
 - 5. Coarse Aggregates
 - a. Natural gravels, combination of gravels and crushed gravels, crushed stone, or combination of these materials containing no more than 15 percent flat or elongated particles (long dimension more than five times the short dimension).
 - b. Materials Passing 200 Sieve: 0.5 percent maximum.
 - c. Limit deleterious substances in accordance with ASTM C33, Table 3 for exposed concrete.

- C. Admixtures: Unless otherwise permitted, furnish from one manufacturer.
 - 1. Characteristics
 - a. Compatible with other constituents in mix.
 - b. Free of chlorides and alkalis (except for those attributable to water).
 - c. Do not use admixtures known to be toxic after concrete has cured for 30 days.
 - d. Furnish type of admixtures as recommended by manufacturer for anticipated temperature ranges.
 - e. Proportion and mix in accordance with manufacturer's recommendations.
 - 2. Air-Entraining Admixture: ASTM C260
 - 3. Water-Reducing Admixture: ASTM C494/C494M, Type A or Type D.
 - 4. Retarding Admixture: ASTM C494/C494M, Type B.
 - 5. High Range Water Reducing Admixture (Superplasticizer): ASTM C494/C494M, Type F or G. Use only when approved by Engineer.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II. Use only when approved by Engineer.
 - a. Use of viscosity modifier if intent is to achieve self-consolidating concrete.
 - 7. Do not use calcium chloride as an admixture.
- D. Water and Ice: Use potable water for mixing water for concrete and water used to make ice, unless alternative sources of water are permitted.
 - 1. Water from alternative sources: Comply with requirements of ASTM C1602/C1602M and contain less than:
 - a. 1,000 ppm of chlorides.
 - b. 3,000 ppm sulfate as SO₄.
 - c. 600 ppm alkalis as (Na₂O + 0.658 K₂O).
 - d. 50,000 ppm total solids by mass.

2.3 FORMS

- A. The Contractor shall furnish all labor and materials for all forms required for the construction of the Work.
- B. Either metal or wood forms may be used.
- C. All forms shall be true to the required shape, clean, of sufficient strength, and well braced so that they shall maintain their proper position during the placing and vibrating of the concrete.

2.4 REINFORCEMENT

- A. All steel reinforcement bars, wire, and dowel bars shall be in accordance with GDOT Standard Specifications for Construction of Road and Bridges, latest edition, Section 853.
- B. Steel reinforcement shall be designed, detailed, fabricated and placed in conformance with all applicable requirements of ACI 318, and the CRSI Manual of Standard Practice.
- C. No concrete shall be placed until all steel reinforcement to be covered has been inspected in place and approved by GCDWR or the Engineer.

2.5 CONCRETE MIX DESIGN

- A. Use an independent testing laboratory acceptable to the Engineer for development of mix designs and testing.
- B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and to produce concrete having proper workability, durability, strength, appearance and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work into corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.
- C. Base the design mix on standard deviation data of prior mixes with essentially the same proportions of the same constituents or, if such data is not available, be developed by a testing laboratory, acceptable to the Engineer, engaged by and at the expense of the Contractor. Acceptance of mixes based on standard deviation shall be based on the modification factors for standard deviation tests contained in ACI 318.
- D. The water content of the concrete mix, determined by laboratory testing, shall be based on a curve showing the relation between water cementitious ratio and 7 and 28 day compressive strengths of concrete made using the proposed materials. The curves shall be determined by four or more points, each representing an average value of at least three test specimens at each age. The curves shall have a range of values sufficient to yield the desired data, including the specified design strengths as modified below, without extrapolation. The water content of the concrete mixes to be used, as determined from the curve, shall correspond to strengths 16 percent greater than the specified design strengths. The resulting mix shall not conflict with the limiting values for maximum water cementitious ratio and net minimum cementitious content as specified in Table 1.
- E. Compression Tests: Provide testing of the proposed concrete mix or mixes to demonstrate compliance with the specified design strength requirements in conformity with the above paragraphs.
- F. Entrained air, as measured by ASTM C231, as shown in Table 1.
 1. If the air-entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal.
- G. Slump of the concrete as measured by ASTM C143, as shown in Table 1. If a high-range water-reducer (plasticizer) is used, measure the slump before plasticizer is added. Plasticized concrete shall have a slump ranging from 7 to 10-in.
- H. Proportion admixtures according to the manufacturer's recommendations. Two or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

TABLE 1
CONCRETE MIX REQUIREMENTS

Class	Design Strength (1)	Cement (2)	Fine Aggregate (2)	Coarse Aggregate (3)	Cementitious Content (4)
B	2500	C150 Type II	C33	57	440 min.
A	3000	C150 Type II	C33	57	480 min.
AA	4000	C150 Type II	C33	57	560 min.
AAA	5000	C150 Type II	C33	56	600 min.

Class	W/C Ratio (5)	Fly Ash	AE Range (6)	WR (7)	HRWR (8)	Slump Range Inches
B	0.62 max	--	3.5 to 5	Yes	*	1-4
A	0.54 max	--	3.5 to 5	Yes	*	1-3
AA	0.44 max	25% max	3.5 to 5	Yes	*	3-5
AAA	0.40 max	--	3.5 to 5	Yes	*	3-5

NOTES:

2. Minimum compressive strength in psi at 28 days
3. ASTM designation
4. Size Number in ASTM C33
5. Cementitious content in lbs/cu yd
6. W/C is Water-Cementitious ratio by weight
7. AE is percent air-entrainment
8. WR is water-reducer admixture
9. HRWR is high-range water-reducer admixture
10. *HRWR used at contractor's option

PART 3 EXECUTION

3.1 MEASURING MATERIALS

- A. Compose concrete of portland cement, fine aggregate, coarse aggregate, water and admixtures as specified. Use a batch plant acceptable to the Engineer for concrete production. Batch all constituents, including admixtures, at the plant except a high-range water-reducer may also be added in the field.
- B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Have scales certified by the local Sealer of Weights and Measures within 1 year of use.
- C. Measure the amount of free water in fine aggregates within 0.3 percent with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water as-batched on printed batching tickets.
- D. Dispense admixtures either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specific admixture.
 - 1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.
 - 2. Inject multiple admixtures separately during the batching sequence.

3.2 MIXING AND TRANSPORTING

- A. Provide ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, nonreversible, revolution counter showing the number of revolutions at mixing speeds.
- B. Transport ready-mix concrete to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.
- C. Keep the water tank valve on each transit truck locked at all times. Any addition of water must be directed by the Engineer. Incorporate added water by additional mixing of at least 35 revolutions. Meter all added water with the amount of water added shown on each delivery ticket.
- D. All central plant and rolling stock equipment and methods shall comply with ACI 318 and ASTM C94.
- E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Use metal or metal-lined non-aluminum discharge chutes with slopes not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20-ft long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.
- F. Retempering (mixing with or without additional cement, aggregate, or water) of concrete or mortar which has reached initial set will not be permitted.

- G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plant so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.
- H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Provide a printed record of the weight of cement and each aggregate as batched individually on each ticket. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cement and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck. Indicate the number of revolutions of the truck mixer.
- I. Temperature and Mixing Time Control
 - 1. In cold weather, do not allow the as-mixed temperature and concrete temperature at the time of placement in the forms to drop below 40 degrees F.
 - 2. If water or aggregate has been heated, combine water with aggregate in the mixer before cement is added. Do not add cement to mixtures of water and aggregate when the temperature of the mixture is greater than 90 degrees F.
 - 3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90 degrees F. If necessary, substitute well-crushed ice for all or part of the mixing water.
 - 4. Do not exceed the values shown in Table 2 for the maximum time interval between the addition of mixing water and/or cement to the batch and the placing of concrete in the forms.

TABLE 2
 MAXIMUM TIME TO DISCHARGE OF CONCRETE

<u>Air or Concrete Temperature (whichever is greater)</u>	<u>Maximum Time</u>
80 to 90 Degrees F (27 to 30 Degrees C)	45 Minutes
70 to 79 Degrees F (21 to 26 Degrees C)	60 Minutes
40 to 69 Degrees F (5 to 20 degrees C)	90 Minutes

- a. If an approved high-range water-reducer (plasticizer) is used to produce plasticized concrete, the maximum time interval shall not exceed 90 minutes.

3.3 CONCRETE APPEARANCE

- A. Remix concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste. If this does not correct the condition, reject the concrete. If the slump is within the allowable limit, but excessive bleeding, poor workability, or

poor finishability are observed, obtain changes in the concrete mix only by adjusting one or more of the following:

1. The gradation of aggregate.
 2. The proportion of fine and coarse aggregate.
 3. The percentage of entrained air, within the allowable limits.
- B. Provide concrete for the work that results in a homogeneous structure which, when hardened, will have the required strength, durability and appearance. Provide mixtures and workmanship such that concrete surfaces, when exposed, will require no finishing. When concrete surfaces are stripped, the concrete, when viewed in good lighting from 10-ft away, shall be pleasing in appearance, and at 20-ft shall show no visible defects.

3.4 PLACING AND COMPACTING

A. Placing

1. Verify that all formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the placement who can assure that reinforcing steel and embedded items remain in designated locations while concrete is being placed. Sprinkle semi-porous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.
2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.
3. Pumping of concrete will be permitted. Use a mix design and aggregate sizes suitable for pumping and submit for approval.
4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.
5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs and/or walls) has reached adequate strength.
6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

- a. After suitable bulkheads, screeds and jointing materials have been positioned, place the concrete continuously between construction joints beginning at a bulkhead, edge form, or corner. Place each batch into the edge of the previously placed concrete to avoid stone pockets and segregation.
- b. Avoid delays in casting. If there is a delay in casting, thoroughly spade and consolidate at the edge of that previously placed and the concrete placed after the delay to avoid cold joints. Then bring concrete to correct level and strike off with a straightedge. Use bullfloats or darbies to smooth the surface, leaving it free of humps or hollows.
- c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow 1 hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

- a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-ft. Place concrete for walls in 12 to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7-ft and the maximum free fall of concrete not exceeding 15-ft.
9. Perform underwater concreting in conformity with the recommendations of ACI 304R. The tremie system shall be used to place underwater concrete. Use tremie pipes in the range of 8 to 12-inch in diameter and space at not more than 16-ft on centers nor more than 8-ft from an end form. Where concrete is being placed around a pipe, provide at least one tremie pipe on each side of each pipe. Where the tremie system is not practical, direct pumped concrete for underwater placement may be used subject to approval of the system including details by the Engineer.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding or forking so that concrete is thoroughly worked around reinforcement, embedded items and openings and into corners of forms. Continuously perform puddling, spading, etc, along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting or planes of weakness.
2. Place and compact all concrete with mechanical vibrators. Obtain approval of the number, type and size of the units from the Engineer in advance of placing operations. Do not order concrete until sufficient approved vibrators (including standby units in working order) are on the job.
3. A minimum frequency of 7000 rpm is required for mechanical vibrators. Insert vibrators and withdraw at points from 18 to 30-in apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do

not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Consolidate concrete for slabs less than 8-in thick with vibrating screeds; slabs 8 to 12-in thick with internal vibrators and (optionally) with vibrating screeds. Always place vibrators into concrete vertically and do not lay horizontally or over.
5. Walls and Columns: Use internal vibrators (rather than form vibrators) unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize and perfect the surface. Insert the vibrators vertically at regular intervals, through the fresh concrete and slightly into the previous lift, if any.
6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete. Do not use vibrators to move or transport concrete in the forms. Continue vibration until:
 - a. Frequency returns to normal.
 - b. Surface appears liquefied, flattened and glistening.
 - c. Trapped air ceases to rise.
 - d. Coarse aggregate has blended into surface, but has not disappeared.

3.5 CURING AND PROTECTION

- A. Protect all concrete work against injury from the elements and defacements of any nature during construction operations.
- B. Curing Methods
 1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperature at the surface for a minimum of 7 days after placement. Use the following curing methods.
 - a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure 24 hours a day.
 - b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.
 - c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall NOT be placed on any concrete surface where additional concrete is to be placed, where concrete sealers or surface coatings are to be used, or where the concrete finish requires an integral floor product. Apply curing compound as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can

be absorbed into the concrete. Comply with the manufacturer's application recommendations.

2. Specified applications of curing methods.
 - a. Slabs for Water Containment Structures: Water curing only.
 - b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing or liquid membrane curing.
 - c. Structural Slabs (other than water containment): Water curing or liquid membrane curing.
 - d. Horizontal Surfaces which will Receive Additional Concrete, Coatings, Grout or Other Material that Requires Bond to the substrate: Water curing.
 - e. Formed Surfaces: None if nonabsorbent forms are left in place 7 days. Water cure if absorbent forms are used. Sheet cured or liquid membrane cured if forms are removed prior to 7 days. Water cure exposed horizontal surfaces of formed walls or columns for 7 days or until next placement of concrete is made.
 - f. Concrete Joints: Water cured or sheet material cured.
- C. Protect finished surfaces and slabs from the direct rays of the sun to prevent checking and crazing.
- D. Cold Weather Concreting:
 1. "Cold weather" is defined as a period when for more than 3 successive days, the average daily outdoor temperature drops below 40 degrees F. Calculate the average daily temperature as the average of the highest and the lowest temperature during the period from midnight to midnight.
 2. Conform cold weather concreting to ACI 306.1 and the additional requirements specified herein. Record temperatures at the concrete placement at 12 hour intervals (minimum).
 3. Discuss a cold weather work plan with the Engineer. Discuss the methods and procedures proposed for use during cold weather including the production, transportation, placement, protection, curing and temperature monitoring of the concrete. Also discuss the procedures to be implemented upon abrupt changes in weather conditions or equipment failures. Do not begin cold weather concreting until the work plan is acceptable to the Engineer. Approval of the work Plan by the Engineer shall not relieve the Contractor of their sole responsibility for the quality of the concrete work produced.
 4. During periods of cold weather, protect concrete to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.
 - a. Degree-days are defined as the total number of 24 hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (eg: 5 days at an average 70 degrees F = 350 degree-days).

- b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50 degrees F as 0 degrees F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.
 5. Salt, manure or other chemicals shall not be used for protection.
 6. Do not terminate the protection period for concrete being water cured during cold weather until at least 24 hours after water curing has been terminated.
- E. Hot Weather Concreting
1. "Hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation estimated in accordance with ACI 305R, approaching or exceeding 0.2 lbs/sqft/hr.
 2. Concrete placed during hot weather, shall be batched, delivered, placed, cured and protected in compliance with the recommendations of ACI 305R and the additional requirements specified herein.
 - a. Do not exceed 90 degrees F for the temperature of concrete being placed. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash set or cold joints.
 - b. Take all necessary precautions to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.
 - c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.
 3. Provide the Engineer with a work plan describing the methods and procedures proposed to use for concrete placement and curing during hot weather periods. Do not begin hot weather concreting until the work plan is acceptable to the Engineer. Approval of the work plan by the Engineer shall not relieve the Contractor of their sole responsibility for the quality of the concrete work produced.

3.6 REMOVAL OF FORMS

- A. Except as otherwise specifically authorized by the Engineer, do not remove forms before the concrete has attained a strength of at least 30 percent of its specified design strength, nor before reaching the following number of day-degrees of curing (whichever is the longer):

TABLE 3
MINIMUM TIME TO FORM REMOVAL

<u>Forms for</u>	<u>Degree Days</u>
Beams and slabs	500
Walls / Vertical surfaces	100

(See definition of degree-days in Paragraph 3.5.D above).

- B. Do not remove shores until the concrete has attained at least 70 percent of its specified design strength and has achieved sufficient strength to support safely its own weight and construction live loads.

3.7 INSPECTION AND FIELD TESTING

- A. The batching, mixing, transporting, placing and curing of concrete are subject to the inspection of the Engineer at all times. Advise the Engineer of readiness to proceed at least 24 hours prior to each concrete placement. The Engineer or GCDWR will inspect the preparations for concreting including the preparation of previously placed concrete, the reinforcing steel and the alignment, cleanliness and tightness of formwork. Do not place concrete without the inspection and acceptance of the Engineer or GCDWR.
- B. Sets of field control cylinder specimens will be taken by the Engineer or GCDWR Materials Testing Representative during the progress of the work, in compliance with ASTM C31. Take a minimum of one set of concrete test cylinders per day, one set for each 150 cubic yards of concrete, or one set for each 5,000 sq ft of surface area for slabs or walls of each class of concrete placed each day.
 - 1. A "set" of test cylinders consists of five cylinders: one to be tested at 7 days and two to be tested and their strengths averaged at 28 days. The other two may be used for special tests at 3 days or to verify strength after 56 days if 28-day test results are low.
 - 2. When the average 28-day compressive strength of the cylinders in any set falls below the specified design strength or below proportional minimum 7-day strengths (where proper relation between seven and 28-day strengths have been established by tests), change proportions, water content, or temperature conditions to achieve the required strengths.
- C. Cooperate in the making of tests by allowing free access to the work for the selection of samples, providing an insulated closed curing box for specimens, affording protection to the specimens against injury or loss through the operations, and furnish material and labor required for the purpose of taking concrete cylinder samples. Provide an appropriate number of curing boxes acceptable to the Engineer.
- D. Slump tests will be made in the field immediately prior to placing the concrete. Make such tests in accordance with ASTM C143. Reject concrete if the slump is greater than the specified range.
- E. Air Content: Test for air content shall be made on a fresh concrete samples. Air content for concrete made of ordinary aggregates having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used.
- F. The Engineer may have cores taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of

concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection or determining the continuation of concrete work.

- G. Cooperate in obtaining cores by allowing free access to the work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. Perform coring and collect core samples at the locations indicated by the Engineer and repair all core holes. The testing of the cores will be at the expense of GCDWR. GCDWR will pay for collection and repair of cores if the test results meet the required specifications.

3.8 CONCRETE FINISHING

A. Walls

1. Type W-1 (Ordinary Wall Finish)
 - a. Patch tie holes.
 - b. Surface tolerance Class C as specified in ACI 117.
 - c. Knock off projections larger than ½-inch.
 - d. Patch defective areas.
2. Type W-2 (Smooth Wall Finish)
 - a. Patch tie holes.
 - b. Surface tolerance Class B as specified in ACI 117.
 - c. Grind off projections larger than ¼-inch.
 - d. Patch defective areas and repair rough spots resulting from form release agent failure or other reasons to provide smooth uniform appearance.
3. Type W-3 (Smooth Rubbed Wall Finish)
 - a. Surface tolerance Class A as specified in ACI 117.
 - b. Remove projections larger than 1/8-inch.
 - c. Only water curing will be permitted on walls being rubbed.
 - d. Perform rubbing while green concrete can be physically worked and smoothed without adding other materials, if structurally possible, the day following placement. Finish no later than 3 days after placement has been completed.
 - e. Remove forms at such a rate that finishing, form tie filling, removal of projections, and patching can be completed on same day forms are removed while curing wall.
 - f. After pointings have set sufficiently to permit working on surface, thoroughly saturate entire surface with water for period of 3 hours and rub until uniform surface is obtained.
 - g. Rub either by hand with carborundum stone of medium-coarse grade or abrasive of equal quality, or mechanically operated carborundum stone.

- h. Obtain Engineer approval of mechanically operated carborundum stones before concrete finishing.
- i. Do not use cement grout, other than cement paste drawn from the concrete itself by rubbing process.
- j. Finishing past formed by rubbing by either brushing or floating as follows:
 - 1) Brushing:
 - a) Carefully strike with clean brush.
 - b) Brush in long direction of surface being finished.
 - 2) Floating:
 - a) Spread uniformly over surface and allow to reset.
 - b) Finish by floating with canvas, carpet face, or cork float, or rub down with dry burlap.
- k. Continue water curing of wall during finishing operation in areas not being rubbed.
- l. Move water curing onto rubbed areas as soon as water will not erode rubbed surface.

B. Slabs

1. General

- a. Finish slab concrete per the requirements of ACI 302.1R.
- b. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
- c. Do not use “jitterbugs” or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer or mortar, which will be weak and cause cracks or delamination, to accumulate.
- d. Do not dust surface with dry materials.
- e. Use evaporation retardant.
- f. Round off edges of slabs with steel edging tool, except where cove finish is shown. Use a steel edging tool with a ¼-inch radius for slabs subject to wheeled traffic.

2. Type S-1 (Steel Troweled Finish)

- a. Finish by screeding and floating with straightedges to bring surfaces to required finish elevation. Use evaporation retardant.
- b. While concrete is still green, but sufficiently hardened to bear a person’s weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
- c. Use sufficient pressure on wood floats to bring moisture to surface.

- d. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
- e. Burnish surface with an additional troweling. Final troweling shall produce ringing sound from trowel.
- f. Do not use dry cement or additional water during troweling, nor will excessive troweling be permitted.
- g. Power Finishing:
 - 1) Approved power machine may be used in lieu of hand finishing in accordance with directions of machine manufacturer.
 - 2) Do not use power machine when concrete has not attained necessary set to allow finishing without introducing high and low spots in slab.
 - 3) Do first steel troweling for slab S-1 finish by hand.
- 3. Type S-2 (Wood Float Finish)
 - a. Finish slab to receive fill and mortar setting bed by screeding with straight-edges to bring surface to required finish plane.
 - b. Wood float finish to compact and seal surface.
 - c. Remove laitance and leave surface clean.
 - d. Coordinate with other finish procedures.
- 4. Type S-3 (Underside Elevated Slab Finish)
 - a. When forming is removed, grind off projections on underside of slab and patch defective areas.
- 5. Type S-4 (Broomed Finish)
 - a. Finish as specified for Type S-1 floor finish, except omit final troweling and finish surface by drawing fine-hair broom lightly across surface.
 - b. Broom in same direction and parallel to expansion joints, or, in the case of inclined slabs, perpendicular to slope, except for round roof slab.
- 6. Type S-5 (Sidewalk Finish)
 - a. Slope sidewalk down ¼-inch per foot away from structures, unless otherwise shown.
 - b. Strike off surface by means of strike board and float with wood or cork float to true plane, then flat steel trowel before brooming.
 - c. Broom surface at right angles to direction of traffic or as shown.
 - d. Lay out sidewalk surface in blocks, as shown or as directed by Engineer, with grooving tool.
- C. Beams and Columns
 - 1. General: Inject cracks with crack repair epoxy. Patch and repair defective areas.
 - 2. Type B-1: Match wall Type W-1.

3. Type B-2: Match wall Type W-2.
4. Type B-3:
 - a. Repair rock pockets.
 - b. Fill air voids.
 - c. Match wall Type W-3.
5. Type C-1: Match wall Type W-1.
6. Type C-2: match wall Type W-2.
7. Type C-3:
 - a. Repair rock pockets.
 - b. Fill air voids.
 - c. Match wall Type W-3.

3.9 FAILURE TO MEET REQUIREMENTS

- A. Should the strengths shown by the test specimens made and tested in compliance with the previous provisions fall below the values given in Table 1, the Engineer has the right to require changes in proportions outlined to apply to the remainder of the work. Furthermore, the Engineer has the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load tests, the Engineer has the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet strength requirements confer with the Engineer to determine what adjustment, if any, can be made in compliance with Sections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The "purchaser" referred to in ASTM C94 is the Contractor in this Section.
- B. When the tests on control specimens of concrete fall below the specified strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. In the case of cores not indicating adequate strength, the Engineer, in addition to other recourses, may require, at the Contractor's expense, load tests on any of the slabs, beams, piles, caps, and columns in which such concrete was used. Tests need not be made until concrete has aged 60 days.
- C. Should the strength of test cylinders fall below 60 percent of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.
- D. Any concrete found to be defective from any cause whatsoever, at any time prior to Final Acceptance of the Work, shall be removed and replaced, or repaired at the

expense of the Contractor.

3.10 PATCHING AND REPAIRS

- A. It is the intent of this Section to require quality work, including adequate forming, proper mixture and placement of concrete and curing, so completed surfaces will require no patching.
- B. Repair defective concrete and honeycombed areas using methods complying with industry standards which meet the approval of the Engineer.
- C. As soon as the forms have been stripped and the concrete surfaces exposed, remove fins and other projections; fill recesses left by the removal of form ties; and repair surface defects which do not impair structural strength. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.
- D. Immediately after removal of forms remove plugs and break off metal ties. Promptly fill holes upon stripping as follows: Moisten the hole with water, followed by a 1/16-in brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface in the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.
- E. When patching exposed surfaces use the same source of cement and sand as used in the parent concrete. Adjust color if necessary by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of 1 to 5 days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.11 CONCRETE SCHEDULE

- A. The following (Table 4) are the general applications for the various concrete classes and design strengths:

TABLE 4
 CONCRETE SCHEDULE

Class	Design Strength (psi)	Description
A	3,000	Thrust blocking, slabs, curbs, and pavements
AA	4,000	Walls, beam systems, columns, and all other structural concrete
AAA	5,000	Pre-stressed concrete

END OF SECTION 03 33 00

SECTION 04 21 13

BRICK MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Brick
2.2	Mortar
3.1	Brick
3.2	Laying
3.3	Mortar

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Utility Pipe Jacking (33 05 23.16).
4. Tunnel Lining (33 05 23.71).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment, necessary to fully complete the Work indicated under this Contract and as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the type, size, and location of all brick masonry and accessories to be used in construction. Submittals shall include material properties data and mortar mix design.

PART 2 - PRODUCTS

2.1 BRICK

- A. All brick used shall, unless otherwise shown or specified, be of such quality as to meet ASTM Designation C62.
- B. Subject to compliance with requirements, provide the following or an approved equal:
 - 1. Grade SW hard grade, common, building brick of clay or shale 2- $\frac{1}{4}$ x 3- $\frac{3}{4}$ x 8 inches in size.

2.2 MORTAR

- A. Portland Cement: ASTM C150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C207, Type 'S.'
- C. Aggregate for Mortar: ASTM C144, except for joints less than $\frac{1}{4}$ inch thick, use aggregate graded with 100 percent passing the No.16 sieve.
 - 1. White-Mortar Aggregates: Natural white sand or ground white stone.

PART 3 - EXECUTION

3.1 BRICK

- A. Should brick be brought upon the site of the Work, of which only a portion is of acceptable quality, the Contractor shall at once remove the same and shall not offer that material again for inspection.

3.2 LAYING

- A. The brick shall be laid regularly and truly to line with joints not exceeding one-quarter ($\frac{1}{4}$) inch in thickness on the face and with joints completely filled with mortar as each brick is pushed into place and no subsequent filling of said joints shall be allowed. No bats or imperfect bricks shall be permitted to be used.
- B. The exposed faces of the brick masonry shall have all mortar projecting beyond the surface of the brick scraped off and the brickwork shall be thoroughly cleaned, and the joints pointed immediately after placing.
- C. No broken or cut brick shall be allowed to be used, except where necessary, as closures, and where cutting of bricks is necessary. Then such faces as are exposed in the same must be accurately trimmed to the contour of the face of the Work in which the bricks are laid.
- D. All brickwork shall be bonded as may be directed and adjoining courses shall break joint one-half ($\frac{1}{2}$) a brick as nearly as practicable. The brickwork shall be executed straight and vertical or regularly curved or battered as shown or specified. Whenever brick masonry is left for the night, or is left unfinished for any reason, the masonry shall be racked off or toothed as directed and mortar removed from the exposed surfaces of

the bricks. When new Work is joined to Work previously laid, the old brickwork must first be thoroughly scraped free from adhering mortar or earth, and thoroughly washed with water.

3.3 MORTAR

- A. The brick shall be laid in mortar consisting of one (1) part by volume of Portland Cement and two (2) parts by volume of clean, coarse, screened sand, thoroughly mixed dry, with sufficient water afterwards added slowly to give proper consistency. Twenty (20) pounds of lime per sack of cement may be added.

END OF SECTION 04 21 13

SECTION 31 11 00
CLEARING AND GRUBBING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	Submittals
1.3	Quality Assurance
1.4	Field Conditions
2.1	Equipment
3.1	Clearing and Grubbing
3.2	Timber
3.3	Disposal of Cleared and Grubbed Materials
3.4	Discing

B. SCOPE

1. Work included under this section includes providing all labor, equipment, and materials necessary to clear wooded areas and dispose of cleared materials in a legal manner.
2. Clearing and grubbing includes, but is not limited to removal from the project lands 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. Precautionary measures to prevent damage to existing features to remain is part of the work.

1.2 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1. Field Quality Control Submittals

- a. Photographs and/or videotape sufficiently detailed of existing conditions within the limits of construction and of trees and plantings, construction, and site improvements of the adjoining area that might be misconstrued as damage caused by site clearing.

1.3 QUALITY ASSURANCE

- A. Comply with applicable codes, ordinances, rules, regulations, and laws of local, municipal, state or federal authorities having jurisdiction over the project. Obtain all required permits for construction operations.
- B. Obtain pre-approval from the local authority having jurisdiction for open burning.

1.4 FIELD CONDITIONS

- A. Existing Conditions
 - 1. The area to be cleared and grubbed is shown schematically on the drawings. Minimize clearing of existing trees to maintain a natural buffer around the proposed work.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Furnish equipment with operators of the type normally used in clearing and grubbing operations including, but not limited to tractors, trucks, loaders, root rakes, and burning equipment.
- B. Furnish discing equipment capable of plowing the soil to a depth of 6 inches twice in a single pass.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

- A. The sites of all excavation and grading shall be first cleared of all paving, trees, stumps, roots, brush, organic matter, crops, paving, structures, fences, sidewalks, rubbish, debris, etc., which shall be removed or disposed of in a satisfactory manner in a legally permitted location.
- B. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated. When it is necessary to cut tree roots on the surface of the ground, the ends shall be cut off smooth, without splitting or shattering and scars greater than one inch in diameter shall be sealed with an approved asphalt sealant tree paint. The trunks of the trees shall be carefully protected from damage, and if unavoidable damage occurs, the injured portions shall be neatly trimmed and covered with an application of an approved asphalt sealant tree paint. Excavating machinery, cranes, etc., shall be handled with care to prevent damage to trees, particularly to overhanging branches, and branches shall not be cut off except by permission of GCDWR.

2. Grind stumps and remove roots, obstructions, and debris extending to a depth of eighteen (18) inches below exposed sub-grade.
 3. Use only hand methods for grubbing within tree protection zone.
 4. Chip removed tree branches and stockpile in approved areas or dispose of offsite, as directed by GCDWR.
- C. Grub and remove stumps and roots to a depth not less than two feet (2') below grade. Fill depressions caused by clearing and grubbing operations with proper backfill soil material, unless further excavation or earthwork is indicated by the Drawings or directed by GCDWR. Place fill material in horizontal layers or lifts, not exceeding a loose depth of eight (8) inches, and compact each layer to 85% of maximum dry density – Standard Proctor (ASTM D698).
- D. Grub, stockpile, and/or place in embankments surface rocks and boulders from the soil in accordance with the Specifications.
- E. Grub the entire construction area with heavy tractors with root rakes. Generally, conduct raking along the contour rather than up and down slopes so as to inhibit soil erosion.
- F. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas 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.
- G. Burying of residual materials will not be allowed.
- H. All Contractors should be aware that the Georgia Environmental Protection Division has issued a burning ban for thirteen (13) Metro Atlanta Counties, including Gwinnett. The ban went into effect in 1996 and shall continue each year from May 1 through September 30. This ban should be considered when bidding projects that require clearing and debris removal. It is the Contractor's responsibility to remove all construction debris from the jobsite. Any costs incurred as a result of the burning ban are the sole responsibility of the Contractor.

3.2 TIMBER

- A. Salvage all timber within the cleared area having a marketable value.
- B. The timber within the cleared area shall become the property of the Contractor and the Contractor shall be responsible for selling the timber.

3.3 DISPOSAL OF CLEARED AND GRUBBED MATERIALS

- A. Dispose of the cleared and grubbed materials by burning or chipping. Burning shall be permitted during approved burning seasons only. During non-burning season periods, use chipping for debris disposal. Remove chipped material from the site or disposed of in areas approved by GCDWR.

- B. If burning is allowed, do not allow a fire to be unattended. The Contractor is responsible for damage occasioned by such fires. Do not bury burned and nonflammable materials.
- C. Disposal of materials in streams will not be permitted. Do not pile materials in stream channels or along the banks where it might be washed away by flood.
- D. Remove all fence material within the areas to be cleared from the job site. Fence materials become the property of the Contractor.

3.4 DISCING

- A. After grubbing is complete, discing of the entire area is required. Perform discing in two directions at approximate right angles. Generally perform the second discing along the contour.
- B. The construction area is to be left free-draining with a finished agricultural appearance.

END OF SECTION 31 11 00

SECTION 31 13 11
TEMPORARY FENCING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Tree Save Barrier
3.1	Temporary Fencing

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Clearing and Grubbing (31 11 00).
2. Excavation and Fill (31 23 00).
3. Wetlands Protection (32 73 00).

1.2 REFERENCES

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

1.3 WORK INCLUDED

- A. The Contractor is responsible for installing and maintaining Orange Tree Save Barrier, as indicated on the plans or as directed by GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

PART 2 - PRODUCTS

2.1 TREE SAVE BARRIER

- A. Must have the following characteristics:
1. High visibility
 2. Lightweight and easy to handle
 3. UV stabilized fabric

4. 48" height
5. 100' prefabricated rolls or 300' fabric rolls
6. 60" heavy duty oak stakes

PART 3 - EXECUTION

3.1 TEMPORARY FENCING

- A. The Contractor shall install Tree Save Barrier as indicated on the Drawings, or as directed by GCDWR, to exclude the entry of equipment into designated save areas. Tree Save Barrier is to be installed at the beginning of construction before clearing and grubbing activities commence. Contractor shall be responsible for maintaining fence for its intended purpose until directed to remove fence by GCDWR. No work shall be allowed on private property and/or within GCDWR granted easements until Tree Save Barrier has been installed by the Contractor and inspected/confirmed by the Engineer and GCDWR. Where necessary, the Contractor shall obtain the services of a land surveyor, registered in the State of Georgia, to stake easement lines, right-of-way lines, and property lines to designate the limits of construction.

END OF SECTION 31 13 11

SECTION 31 23 00
EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes

<u>Paragraph</u>	<u>Title</u>
1.2	Submittals
1.3	Quality Assurance
1.4	Field Conditions
2.1	Bedding
2.2	Backfill
2.3	Top Soil
3.1	Initial Site Preparation
3.2	Protection of Trees and Shrubbery
3.3	Dewatering
3.4	Sheeting, Shoring, and Bracing
3.5	Excavation
3.6	Blasting
3.7	Unauthorized Excavations
3.8	Bedding
3.9	Backfilling
3.10	Fills and Embankments
3.11	Disposal of Waste and Unsuitable Materials
3.12	Final Grading
3.13	Top Soil
3.14	Settlement
3.15	Access by GCDWR's Material Testing Firm

B. Scope

1. The work covered by this section includes furnishing all labor, materials, and equipment required for all earthwork and earthwork related operations including, but not limited to, dewatering; excavating all classes of material encountered on the construction site; pumping, draining, and handling of water encountered in the excavations; handling, storage, transportation, and disposal of all excavated and unsuitable material; handling, storage, and transportation of all off-site borrow excavation; construction of fills and embankments; backfilling around structures and pipe; backfilling all trenches and pits; compacting; sheeting, shoring and bracing; preparation of subgrades; surfacing and grading, and all other appurtenant earthwork operations which may be necessary to complete the work as specified herein and as shown on the drawings.

C. General

1. The term "excavation" as used herein shall mean excavation of materials including earth, hardpan, rock, masonry, concrete – plain and reinforced, pavement, ashes, rubbish, muck, debris, etc.
2. Perform earthwork operations in a safe and proper manner with appropriate precautions being taken against all hazards.
3. Maintain all excavated and filled areas for structures, trenches, fills, topsoil areas, embankments and channels in good condition at all times until final acceptance by the GCDWR. Repair all damage caused by erosion or other construction operations using material of the same type as the damaged material.
4. Perform earthwork within the rights-of-way of the State Department of Transportation, the County Department of Transportation, and the respective cities in accordance with requirements and provisions of the permits issued by those 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.
5. Control grading in a manner to prevent water running into excavations. Avoid obstruction of surface drainage and provide means whereby storm water can be uninterrupted in existing gutters, other surface drains, or temporary drains. Provide free access to all fire hydrants, water valves, and meters.
6. No classification of excavated materials will be made. Excavation work includes 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.
7. 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 flood plains, particularly in areas where construction activities may encounter water-bearing sands and gravels or limestone solution channels. Provide all services, labor, equipment, and materials necessary or convenient to complete the work within the time specified in these Contract Documents.

1.2 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Requirements
 1. Perform all earthwork operations in compliance 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.

B. Field Testing

1. An independent testing laboratory will conduct tests for compaction and density, in each fill layer at intervals of approximately three hundred feet (300'). Depending on field conditions and results of testing, frequency of testing may be increased or decreased to ensure proper compaction. Make all necessary excavations and supply any samples of materials necessary for conducting compaction and density tests. Costs of compaction tests performed by an independent testing laboratory shall be paid by GCDWR. 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.

1.4 FIELD CONDITIONS

A. Existing Conditions

1. The elevations shown on the Drawings as existing are intended to give reasonable, accurate information about the relative elevations. They are not precise, and the Contractor should satisfy himself as to the exact quantities of excavation and fill required.

PART 2 PRODUCTS

2.1 BEDDING

- A. Unless otherwise specified, bedding material shall be angular, graded, crushed stone embedment and shall conform to Georgia DOT Specification Section 800 Gradation #57, varying in sizes 1/4" through 3/4".

2.2 BACKFILL

- A. Provide materials for backfill conforming to the following requirements:

Select Earth Backfill Fine, sound, loose earth containing optimum moisture content for compaction to 95 percent of maximum density (Standard Proctor ASTM D698), free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete less than 2 inches in maximum dimension except that the maximum particle size shall be 3/4 inch when used with PVC or other flexible thermoplastic pipe; provided material has been approved for such use by construction material testing firm.

Common Earth Backfill Sound, loose earth containing optimum moisture content for compaction to 95 percent of maximum density (Standard Proctor ASTM D698), free from all wood, vegetable matter, debris, and other objectionable material, and having scattered clods, stones, or broken concrete and pavement less than 6 inches in maximum dimension.

Sand	Natural or imported sand conforming to ASTM D1073.
Graded Aggregate	Graded aggregate conforming to Sections 310 and 815.01, Class A, Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges.
Class A Concrete	Class A concrete as specified in the section entitled "Cast-in-Place Concrete" of these Specifications.

2.3 TOP SOIL

- A. Top soil is defined as the surface layer of soil and sod that is suitable for use in seeding and planting. No refuse or any material toxic to plant growth is allowed in top soil.

PART 3 EXECUTION

3.1 INITIAL SITE PREPARATION

- A. Preparatory to the beginning of construction operations, remove from the project area all vegetable growth, trees, brush, stumps, roots, debris, and any other objectionable matter, including fences, buildings, and other structures shown on the Drawings in the construction areas which are designated for removal or which, if left in place, would interfere with the proper performance or completion of the contemplated work, would impair its subsequent use, or would form obstructions therein.
- B. Whenever the removal of pavements (other than gravel or surface treated types) is required, the Contractor shall outline the area to be removed by making straight saw cuts, and providing vertical cuts in straight lines in order to permit removal in a straight line. Should pavement breakage occur beyond original saw cut, Contractor will be required to make a new straight saw cut beyond the furthest point of breakage.
- C. Clear and grub the site in accordance with Section 31 11 00 – Clearing and Grubbing of these specifications.
- D. In all areas to be excavated, filled, paved, or graveled, strip the top soil to its full depth and store on site for subsequent reuse. Keep top soil separate from other excavated materials. Screen out and/or remove roots and other undesirable materials from top soil. Stored topsoil shall be used for finish grading in unpaved areas.
- E. Remove and dispose of all excess material resulting from clearing or site preparation operations. Dispose of such materials in a lawful manner and at a location where such materials can be lawfully disposed.

3.2 PROTECTION OF TREES AND SHRUBBERY

- A. Contractor shall be responsible for protection of tops, trunks, and roots of existing trees that are to remain on the project site or in parks, lawns, or other improved areas. Do not disturb and provide protection, if necessary, for all trees in areas where there is no excavation or embankment. Box, fence, or otherwise protect existing trees, which may be subject to construction damage, before any work is started. Remove the boxing when directed or at the completion of the project. Heavy equipment or stockpiles will not be permitted within branch spread. Remove interfering branches without injury to trunks and cover the scars with tree paints.
- B. Do not remove a tree unless absolutely necessary for construction, as approved by the Engineer or GCDWR. In areas beyond construction, right-of-way, or easements do not remove trees or shrubbery without the written consent of the property owner and approval of the GCDWR.
- C. In open or improved lawn areas, excavation is to be done, if possible, utilizing a tractor mounted backhoe. Take extreme care to avoid any damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies, which may be damaged by excavation equipment, excavate the trench with hand tools except as provided is in this section. As an alternate method, bores under landscaped areas may be approved by GCDWR to minimize disturbance of existing vegetation. This method of construction will be considered as convenience for the Contractor, and shall be paid the same as an open-cut excavation.

3.3 DEWATERING

- A. Provide and maintain at all times during construction ample means and devices with which to promptly remove and properly dispose of all water from any source entering the excavations or other parts of the work. Accomplish dewatering by methods which will ensure a dry excavation and preservation of the final lines and grades of the bottoms of excavations. Methods of dewatering may include sump pumps, well points, deep wells, or other suitable methods which do not damage or weaken structures, foundations, or subgrades. Shallow excavations may be dewatered using open ditches provided such ditches are kept open and free-draining at all times.
- B. Unless specifically authorized by the Engineer, do not place concrete or mortar in water nor allow water to rise over newly-placed concrete or mortar for at least 24 hours after placement. Do not expose concrete structures to unequal hydrostatic forces until the concrete has reached its specified 28-day strength. Ground water encountered within the limits of excavation shall be lowered to an elevation not less than twelve inches (12") below bottom of excavation before pipe laying or concreting is started. Exercise care to prevent damage to pipelines or structures resulting from flotation, undermining, or scour. Commence dewatering operations when ground or surface water is first encountered and continue until such times as water can safely be allowed to rise in accordance with the provisions of this section. Protect excavations from the entrance of surface water to the extent possible by the use of dikes and/or covers.

- C. Provide and maintain standby pumping equipment on the job site. Make available a minimum of one standby unit (a minimum of one for each ten in the event well points are used) for immediate installation should any pumping unit fail. Design and install well points or deep wells suitable for the accomplishment of the work and in compliance with all local codes.
- D. If foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, excavate and replace the affected areas with crushed rock at no cost to the GCDWR.
- E. Dispose of the water from the work in a suitable manner without damage to adjacent property. Do not allow conveyance of the water to interfere with traffic flow or treatment facilities operation. No water shall be drained into work built or under construction. The Contractor will be held responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
- F. Provide sedimentation and desilting basins as necessary to prevent the entrance of excessive or injurious amounts of sand and silt from surface runoff or dewatering operations into storm drains or receiving waters. At a minimum, provide a baffled structure having not less than five minutes detention time designed to have a "flow-through" velocity not exceeding 0.2 feet per second at the anticipated peak flow for desanding or desilting the water.
- G. Dispose of water in such a manner as not to be a menace to the public health and in accordance with applicable Environmental Protection Agency, Corps of Engineers, and State Environmental Protection Division standards and permits.
- H. Should sewage or any other odorous liquids be encountered during the Work, GCDWR shall be notified immediately. GCDWR will promptly notify appropriate regulatory agencies, if necessary. In addition, GCDWR will instruct Contractor as to any actions the Contractor can and cannot perform prior to any directives, which may be issued by the regulatory agencies. Any sewage will be pumped and hauled to an in-service manhole, pump station, or water reclamation facility, as directed by GCDWR. Any other liquids will be disposed of properly, as directed by GCDWR and/or any regulatory agencies having jurisdiction. GCDWR will then determine if actions taken by Contractor have caused the source of the odorous liquid to leak, and if so, Contractor shall be responsible for any fines and/or penalties levied by regulatory agencies having jurisdiction.

3.4 SHEETING, SHORING, AND BRACING

- A. Contractor shall sufficiently sheet, shore, and brace the sides of all excavations, as necessary, to prevent slides, cave-ins, settlement or movement of the banks, to maintain the excavation clear of all obstructions, and to provide safe working conditions. Use wood or steel sheeting of approved design and type in wet, saturated or flowing ground. Design all sheeting, shoring, and bracing with sufficient strength and rigidity to withstand the pressure exerted and to maintain shape and position under all circumstances.

- B. It is the Contractor's responsibility for correctly assessing the need for sheeting and analyzing the stresses induced. 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. Submit the results of sheeting and shoring analysis and design to the Engineer on request.
- C. Adequately sheet, shore, or brace excavations adjacent to existing or proposed buildings and structures, or in paved streets or alleys to prevent undermining beneath or subsequent settlement of such structures or pavements. Underpin adjacent structures when necessary to maintain structures in safe condition. Repair 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 at his own expense.
- D. Do not leave sheeting, shoring, or bracing materials in place unless otherwise specified or shown on the Drawings or ordered by the Engineer in writing. Remove such materials 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. Leave trench sheeting in place until backfill has been brought to a level 12 inches above the top of the pipe. Then cut off and remove the upper portion. Leave sheeting for structures in place until backfill has been brought to a level of 12 inches above the top of the bottom footing. Then cut off and remove the upper portion.
- E. Where in the opinion of the Engineer or GCDWR the removal of sheeting would endanger the Work built under this Contract or any adjoining improvements, such sheeting will be ordered to be left in place and the tops cut off as directed. Any timber directed to be left in place will not be paid for as supplemental price. No additional payment will be made for sheeting when directed to be left in place.
- F. In quicksand or soft ground, drive sheeting to such depth below bottom of the trench to prevent upheaval, or as directed.
- G. Fill and thoroughly compact all holes and voids left in the work by the removal of sheeting, shoring, or bracing.
- H. It shall be the sole and exclusive responsibility of the Contractor to meet local and OSHA safety requirements in meeting the need and adequacy of sheeting, shoring, bracing, or other provisions to protect workers and equipment in a trench or other excavation.

3.5 EXCAVATION

- A. General
 - 1. Excavation includes the removal of all material from an area necessary for the construction of a pipeline, structure, basin, flume, or building. Provide adequate

working space and clearances in excavations for the work to be performed therein.

2. Except where otherwise shown on the Drawings or specified herein, replace all material excavated below the bottom of concrete walls, footings, and foundations, at the Contractor's expense, with Class A concrete to the lines and grades shown on the Drawings.
3. Where quicksand, soft clay, spongy, swampy or other materials unsuitable for subgrade or foundation purposes are encountered below the excavation limits, remove and dispose of such to the level of suitable material. Backfill areas so excavated with Class A concrete or with compacted layers of crushed rock, sand, or other approved material conforming to the requirements specified herein for backfill to the lines and grades shown on the Drawings.
4. Place barriers at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Place lights along excavations from sunset each day to sunrise of the next day until the excavations are backfilled. Barricade all excavations in such a manner as to prevent persons from falling or walking into any excavation.

B. Excavation Methods

1. Use open-cut techniques for all excavation unless otherwise indicated on the Drawings or approved by the Engineer or GCDWR. In general, topsoil may be removed by machine methods. Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by the Engineer or GCDWR. Use material so removed in backfill, making embankments, filling low areas, or as otherwise directed.
2. Use hand tool excavation where necessary to protect existing utilities and structures.
3. Carefully cut or grade all slopes to the grades as detailed on the Drawings, and/or required by the Engineer. Tamp or otherwise compact slopes to maintain the material in position.
4. It is the Contractor's sole and exclusive responsibility to have all excavation conform to local and OSHA safety requirements.

C. Rock Excavation

1. All excavation is considered unclassified. Include all cost of rock excavation (excavating, blasting, loading, hauling, crushing, backfilling, and/or disposing) in the lump sum or unit price bid amount for the associated work.
2. Uncover and strip all loose materials and/or rock encountered in the process of excavation for structures over the entire limits of excavation. Uncover rock encountered for removal in a trench section for a distance of not less than 50 feet.

3. Excavate rock and large boulders in trenches over the horizontal limits of excavation and to depths as follows:

Size of Pipe (inches)	Depth of Rock Excavation Below Bottom of Pipe (inches)
3 and smaller	4
4 to 6	6
8 to 18	8
18 to 30	10
32 and larger	12

4. Backfill the space below the bottom of the pipe to the proper grade with compacted layers of crushed rock or sand conforming to the requirements specified herein for backfill. Where pipe sewers are constructed on concrete cradles, excavate rock to the bottom of the cradle as shown on the Drawings.
5. Excavate rock under structures to lines and grades shown on the Drawings. Unless specified otherwise, where rock excavation has been carried below required grade, backfill to grade with bedding material.
6. Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, excavate the portion of the foundation that is not rock below grade to reach a satisfactory foundation of rock. Backfill the portion below grade with bedding material.
7. Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, remove the rock for a depth of 12 inches below grade and backfill the space below grade to the proper grade with compacted layers of crushed rock conforming to the requirements specified herein for backfill.
8. Conduct drilling and blasting operations in accordance with the requirements of paragraph 3.6, below.
9. Complete rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation before construction of any structure is started in the vicinity.

D. Borrow Excavation

1. When sufficient amount of suitable excavated material to complete the Work is not available on the project site; or wherever the backfill of excavated areas or the placement of embankments or other fills requires specified material not available at the site or material in excess of suitable material available from the authorized excavations, obtain such materials from other sources. This may require the opening of borrow pits at points not immediately accessible from the Work. In such cases make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties, if any, for the

use of the material. Before a borrow pit is opened, the quality and suitability of the material to be obtained from the borrow pit shall be approved by the GCDWR's materials testing Engineer. No borrow excavation shall be made within the bed limits of any existing or projected public highway.

2. Clear, grub, and finish grade borrow pits in accordance with the requirements specified herein.

E. Structural Excavation

1. Structural excavation consists of the removal of all materials necessary for the construction of structures, including tanks, foundations, footings, wet wells, dry wells, box culverts, flumes, channels, buildings, and other miscellaneous structures.
2. Make the bottom of structural excavations true to the lines and grades shown on the Drawings. Do not undercut faces of excavations for extended footings. Except as provided herein for excavation of unsuitable material or rock, where the excavation is carried below the grade elevation shown on the Drawings, backfill the void thus made to the proper grade with Class A concrete at the Contractor's expense.

F. Trench Excavation

1. Excavate trenches to the lines and grades shown on the Drawings with the centerlines of the trenches located on the centerlines of the pipes.
2. Make the sides of all trenches vertical to a minimum of one foot above the top of the pipe. From the bottom of the trench to twelve inches (12") above the pipe, the maximum width shall be as indicated on the Drawings. This distance will be measured at an elevation in trench which is 12 inches above the top of the pipe when laid to grade. Excavation of pipe trenches with side sloping to the bottom will not be permitted.
3. Wherever the prescribed maximum trench width is exceeded, use the next higher class (load factor) of embedment or encasement for the full trench width as actually cut, at no additional cost to the GCDWR.
4. Excavate the trenches to the required depth allowing for the placement of pipe bedding to the thickness shown on the Drawings.
5. Should the bottom of the trench become an unstable foundation for the pipe through the failure of the Contractor to adequately perform, remove the unstable material and fill the trench to the proper subgrade with crushed rock. No extra compensation will be allowed for this material or work. Should the trench be inadvertently excavated to a greater depth than necessary, provide crushed rock fill to the proper subgrade at no additional cost to the GCDWR.
6. Should the undisturbed material encountered at the grade depth constitute, in the opinion of the Engineer, an unstable foundation for the pipe, remove such unstable material and fill the trench to the proper subgrade with crushed rock.

7. Contractor shall not have more than five hundred feet (500') of trench open at any one time. New trenching will not be permitted to be excavated if there are previously excavated trenches that require backfill or surface area restoration. **Cleanup and grassing shall follow a maximum of 500 feet of pipe installation.**
8. Control drainage in the vicinity of excavation so the ground surface is properly pitched to prevent water from running into the excavation.

3.6 BLASTING

A. Requirements

1. Blasting for removing rock for excavation shall be properly permitted.
2. Contractor shall use all possible precautions against accidents or damages due to use or storage of explosives, and Contractor assumes all responsibility/liability associated with blasting activities.
3. ONLY **LICENSED** EMPLOYEES OR SUBCONTRACTORS WILL BE ALLOWED TO CONDUCT BLASTING ACTIVITIES – PROOF OF SUCH PROPER LICENSING **MUST** BE PROVIDED TO GCDWR **PRIOR TO** ENGAGING IN ANY BLASTING ACTIVITIES.
4. Furnish all labor, equipment and materials required to drill, blast, loosen, excavate, and dispose material to complete the work shown on the Drawings and specified herein.
5. The work includes, but is not be limited to:
 - a. Blast round design.
 - b. Planning and execution of appropriate site-specific safety measures to be employed during all blasting operations, and the safe handling and storage of high explosives and blasting agents.
 - c. Drilling blast holes, loading blast holes with explosives, and wiring and safe detonation of blast rounds.
 - d. Removal from the site of all excess excavated soil, debris, and rock as indicated in the contract Documents, or as directed by the Engineer, and disposal of excess materials at a permitted disposal site.
 - e. Dewatering and maintenance of groundwater and surface water in all excavations.
 - f. Performance of all surveys necessary to establish and verify the lines and grades and to determine the amount of material removed.
 - g. Implementation of monitoring program to monitor condition of existing structures and utilities in vicinity of proposed blasting operations to insure existing features remain undamaged by blasting procedures.
6. Make all excavations in conformance with the lines, grades, and cross sections on the Drawings or established by the Engineer. Where blasting is required, blasting should ensure removal of six inches (6") of rock below proposed grade

line. All over-blast shall be removed and the resulting over-excavation backfilled and compacted with #57 gradation stone coarse aggregate.

7. Conduct all blasting operations, including transporting and storing of explosives in compliance with the Georgia State Fire Commissioner's Rules and Regulations for Explosives and Blasting Agents, latest edition and all applicable local codes.
- B. Submittals
 1. Submit the following in accordance with the procedures and requirements set forth in Section 01 33 00 Submittal Procedures, at least thirty (30) working days prior to beginning any blasting operations:
 - a. Names, addresses, telephone numbers, and qualifications of the blasting subcontractor(s) and explosives supplier(s) that will be used, including the designated Blaster-In-Charge.
 - b. Copies of Training Certificates for the designated Blaster-In-Charge, blasting foreman and any other key personnel that will be responsible for the work, showing that they have received specialized training in the proper handling of explosives.
 - c. A Blasting Plan, indicating the methods, materials and equipment to be used. The Blasting Plan should indicate the types of explosives to be used, drilling patterns, and a general layout and schedule for executing the work in accordance with state regulations.
 - d. A ground vibration and air blast monitoring plan, indicating structures that will be monitored, monitoring equipment that will be used, and personnel that will perform the monitoring.
 2. At least 24 hours before each blast round, submit a detailed blast round design plan to the Engineer's or GCDWR's on-site representative. The blasting plan submitted is for quality control and record keeping purposes. Review by the Engineer does not relieve the Contractor of his responsibilities as provided herein. Include the following in the blast round design submittals:
 - a. Location (state, grid coordinates) and limits of the shot.
 - b. Number, diameter, and depth of blast holes to be detonated in the round, and a plan showing the drill hole pattern, spacing and distance to the free face.
 - c. Depth of overburden.
 - d. Total weight of explosives in the round and the types of explosives to be used.
 - e. Loading diagram showing the location of explosives, primers, and initiators; and location, depth, and type of stemming to be used in each hole.
 - f. Initiation sequence, including delay timer and delay system, total weight of explosive to be detonated on each delay, and a list of the timing of the delays.
 - g. Manufacturer's data sheet for all explosives, primers, and initiators to be used.

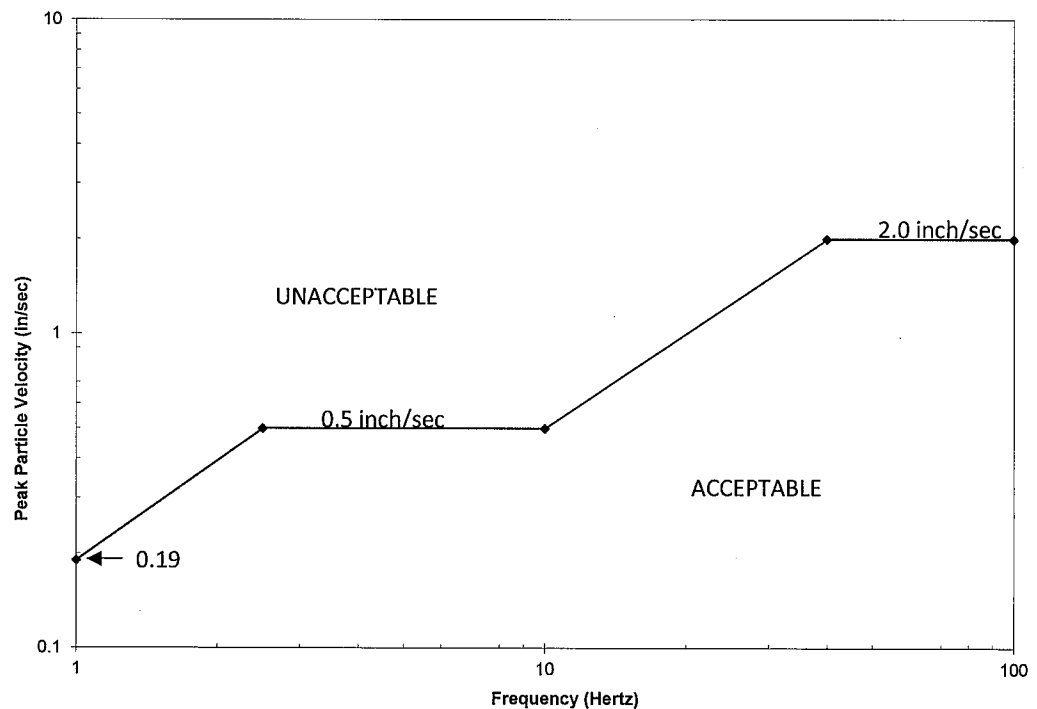
- h. Planned seismic monitoring positions, distances from the blast round, and seismograph types to be used to monitor vibrations and air blast overpressures.
- i. Type and amount of blasting mats and/or depth of soil cover to be used over the top surface of the shot.
- j. Any other information required by applicable state and federal regulations.
- 3. Within 24 hours after each blast round, submit a blasting report to the Engineer. Include the following in the blasting report:
 - a. Date and time of shot.
 - b. Foreman's name.
 - c. Number and depth of holes detonated.
 - d. Weather conditions at the time of detonation.
 - e. Type of explosives and detonators used.
 - f. Peak particle velocity of ground motion and primary frequency for all ground vibration monitoring stations.
 - g. Peak air blast overpressure measured.
 - h. Distance from the blast round to each monitoring station for vibrations and air blast.
 - i. Amount of explosive used in each hole, and maximum weight of explosive detonated on any single delay in the blast round.
- C. Pre-Blast Survey
 - 1. Contractor shall have an approved vibration consultant conduct the pre-blast survey on the residences and facilities adjacent to the proposed rock blasting in accordance with the submitted survey and monitoring plan. The survey shall include, but not be limited to the following:
 - a. A site plan or drawing of the structure to be examined showing the structure in relationship to the proposed rock blasting area and a full description of the structure including type of materials and construction.
 - b. Examination of the structure (interior and exterior surfaces) by experienced and qualified personnel, noting any visible structural and aesthetic flaws in or on the structure. Note existing cracks and flaws, with significant cracks measured, and all cracks and flaws photographed.
 - c. Upon completion of the examination, ask the structure's owner to review the report, note any corrections or omissions, and sign a statement that to the best of his knowledge, the examination report reflects the conditions of the structure prior to any rock blasting. If the structure's owner refuses to sign said report, it should be noted in the report by the examiner.
 - d. Nothing contained herein shall relieve the Contractor of responsibility for claims arising from his construction operations. Failure to inspect any structure, whether or not required by these Contract Documents, or inadequacy

of the inspections shall not relieve the Contractor of his responsibility. The Contractor shall indemnify the County from such claim.

- e. In the event that any property owner denies access for the survey of structures and facilities, notify such property owner, by certified mail, stating that this is final notification. Submit to the Engineer, copies of all correspondence between the Contractor and the property owner(s). The Engineer, upon review of the submitted correspondence may waive requirements set forth above. However, the Contractor is fully responsible for claims and damage arising from his construction operations regardless of property location.
 - f. Submit two (2) sets of copies of the examination reports to the Engineer for their records.
- D. Use of Explosives
- 1. When the use of explosives is necessary for the prosecution of the work, exercise the utmost care not to endanger life or property. Be responsible for any and all damage or injury to persons or property resulting from the use of explosives.
 - 2. Store all explosives in a secure manner, in compliance with all laws, and clearly mark all such storage places "DANGEROUS EXPLOSIVES".
 - 3. Notify any public utility company having facilities in close proximity to the site of the work of the intention to use explosives. Provide this notice sufficiently in advance to enable the utility companies to take whatever steps they may consider necessary to protect their property from injury. Also give the Engineer, all occupants of adjacent property, and all other Contractors working in or near the Project, notice of the intention to use explosives.
 - 4. Only non-electric type initiators maybe used.
- E. Blasting Operations
- 1. Provide explosives of such quantity and power and use in such locations as will neither open seams nor otherwise disturb the material outside the prescribed limits of excavation. As the excavation approaches its final limits, reduce the depth of holes for blasting and the amount of explosives used for each hole so that the underlying or adjacent rock will not be disturbed or shattered.
 - 2. Do not perform blasting within 100 feet of newly placed concrete that has cured less than 7 days. Do not perform blasting within 50 feet of any existing structure or any new structure in progress.
- F. Blast Monitoring
- 1. Exercise the utmost care not to damage property on-site and off-site. Notify each adjoining property owner within 5000 feet of the site of the anticipated ground vibrations and noise which will occur due to the blasting operations. Provide this notice 30 days in advance to enable the adjacent property owners to take whatever precautions they may consider necessary. Limit operations to minimize any disturbance to the adjacent property owners. Notify motorists on

adjacent roadways in accordance with state regulations. Take responsibility for any damage to any structure or utility line, pipes, etc., on-site and off-site as a result of his operations.

2. For each blast round, monitor and record noise and air blast overpressures at the site perimeter nearest the blast location and at the on-site or off-site structure located nearest to the round. Peak air blast overpressure shall not exceed 0.018 psi, measured at the site perimeter.
3. Sufficiently cover the site of every blast round with blasting mats or other devices to prevent any flying debris. The number and type of blasting mats must be satisfactory to the Engineer. The Contractor will be fully responsible for any damage caused by flying debris, both to on-site and off-site properties.
4. Whenever blasting is to be performed within 2500 feet of any structure, measure the peak particle velocities of ground vibration resulting from each blast at the structure. Monitor vibrations utilizing a seismograph capable of providing a record of particle velocity and frequency along three mutually perpendicular axes utilizing internal calibration. Measured peak particle velocity of ground motion at the monitored structure shall not exceed the values shown in the following graph:



G. Notification

1. Give twenty-four (24) hour notice to Engineer and adjacent residences and/or businesses prior to each blast.

H. Complaints

1. Submit notice of blasting complaints to Engineer in writing within twenty-four (24) hours of receipt thereof. Identify the origin of complaint in the notice and provide a brief description of alleged damages or other circumstances upon which the complaint is predicated. Assign a number to each complaint consecutively in the order of receipt. Assign each complaint a separate number and show in each letter complaint all previous complaint numbers registered by the same complainant. In addition, make a summary report each month to Engineer. Indicate date, time and name of person investigating the complaint and amount of damages (or an estimate thereof), if any, in the summary report.
- I. Post Blast Survey
 1. Contractor shall have the same vibration consultant who performed the pre-blast survey conduct the post-blast survey. The consultant shall examine all structures from which a complaint has originated after the blast. The survey shall include, but not be limited to the following:
 - a. A full description of the alleged damage caused by the blast. Where appropriate, provide a sketch to more fully describe the location and type of damage. Measure cracks and compare to any original measurements which may have been taken in the Pre-Blast Survey.
 - b. Take colored photographs of any alleged damage.
 - c. Submit two (2) copies of the Post Blast Survey report to the Engineer. The report shall include the consultant's assessment of the alleged damage and an opinion as to its likely cause.

3.7 UNAUTHORIZED EXCAVATIONS

- A. All excavations carried outside of the lines and grades given or specified, together with the disposal of such material and all excavations, and other work resulting from slides, cave-ins, swellings, or upheavals shall be at the Contractor's own cost and expense. All spaces beneath foundations resulting from unauthorized excavations, slides, or cave-ins shall be refilled at the Contractor's expense, with bedding materials or concrete, as directed. This is to include all landscaping outside of the lines and grades given or specified.

3.8 BEDDING

- A. All pipe bedding requirements, as specified, are to be considered minimum requirements, and as such, do not relieve Contractor of the responsibility to provide additional bedding necessary for proper support of the pipeline and appurtenances, or as directed by the Engineer or GCDWR.
- B. Bell holes shall be provided in all classes of bedding, so as to relieve pipe bells of all loads, but small enough to ensure support is provided throughout length of the pipe.
- C. Trench shall be excavated to allow the placing of bedding material for the full trench width, and spread to form a uniform support (foundation cushion) for the pipe and appurtenances, and then compacted as specified on the Drawings so that the pipe is

true to line and grade. Remaining bedding material shall be carefully placed such that bedding material fills and supports the haunch area and encases the pipe to the limits specified and compacted according to the bedding class specified, as indicated on the Drawings, or directed by the Engineer or GCDWR.

- D. Unless otherwise specified, at a minimum, Class 'D' Bedding shall be used for pressurized mains of ductile iron pipe material (sanitary sewer force main and water main).
- E. Unless otherwise specified, at a minimum, Class 'C' Bedding shall be used for gravity sanitary sewer of ductile iron pipe material.
- F. Unless otherwise specified, at a minimum, Class 'B' Bedding shall be used for gravity sanitary sewer of polyvinylchloride (PVC) pipe material.
- G. All pipe installed within rock excavation, shall be laid upon a minimum of six inches (6") of #57 gradation stone coarse aggregate.
- H. Groundwater Flow Dams will be required under certain conditions. If there is a large volume of groundwater, which will follow the crushed stone bedding downhill due to the elevations involved, and builds adequate pressure to washout the stone bedding, Flow Dams will be required. Flow Dams shall consist of clay bedding three feet (3') long and spaced every one hundred feet (100') along the pipeline route.

3.9 BACKFILLING

A. General

- 1. Unless otherwise specified herein, compact earth backfill to specified maximum dry density as determined by Standard Proctor, ASTM D-698. Compact or consolidate crushed stone to specified maximum dry density as determined by Modified Proctor, ASTM D-1557; or as directed by Engineer or GCDWR Testing Materials Representative.
- 2. Prior to placement, add sufficient water to secure optimum moisture content to material that is too dry for adequate compaction. Do not place material having excessive water content at any time.
- 3. Unless otherwise specified herein, place backfill material required to be compacted in horizontal layers not to exceed six (6) inches in thickness (before compaction) and compacted in place by ramming, tamping, or rolling. Accomplish compaction by power driven tools and machinery wherever possible. Accomplish compaction and consolidation of sand and crushed rock backfill using vibrating equipment.

B. Backfilling around Structures

- 1. Backfilling around structures consists of common earth backfill and shall be placed in 6-inch lifts and compacted to a minimum of 95 percent of the maximum density (determined by Standard Proctor D698) for the full depth of the excavation from the bottom to the finished grade. Do not place backfill against concrete structures until the concrete has reached its specified 28-day

compressive strength. Where practical, accomplish compaction of structural backfill by power-driven compaction equipment.

2. Where crushed rock mats under slabs and foundations are called for on the Drawings, excavate below grade to the depth of the crushed rock mat as shown on the Drawings and install a compacted crushed rock bed. Finish the bed to a true line or plane and even with the subgrade of the concrete foundations, piers, footings, or slabs. Before placing any crushed rock, remove all loose earth or debris. Extend this crushed rock mat 12 inches beyond all slabs and foundations or to edges of sheet piling.
3. Construct crushed rock mats, 12 inches or less in thickness, of compacted layers of crushed rock conforming to Section 815.01 Class A, Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges.
4. Construct the top 12 inches of crushed rock mats of thickness greater than 12 inches of compacted layers of crushed rock as specified above. Construct that portion below the top 12 inches of compacted layers of crushed rock as specified, with a modified gradation of 6 inches to dust as received from the crusher.
5. Compact fill under slab-on-grade to 98% Standard Proctor Density ASTM D698, at moisture content between 2 percent below and 3 percent above the optimum moisture content.
6. Compact granular structural fill under foundation elements, i.e., footings and base slabs for tanks and basins to 100 percent Standard Proctor Density ASTM D698, at moisture content between 2 percent below to 3 percent above the optimum moisture content.
7. Unless otherwise shown on the Drawings, do not use earth backfill to support footings, foundations, and structures.

C. Backfilling Trenches

1. Except as otherwise specified or directed, all forms, bracing, and lumber shall be removed before backfilling.
2. Backfill in paved areas shall include Initial, Final and Sub-base backfill; backfill in unpaved areas shall include Initial and Final backfill and final grading of ground surface; including areas damaged by the Contractor.
3. Trench bottoms of earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials as specified, as indicated on the Drawings, to give full support of the pipe, such that the pipe is firmly supported in the excavation throughout its entire length, and in such a manner as to prevent any subsequent settlement of the pipe. Rocks larger than two inches (2") diameter will not be permitted in the trench bottom or in the Initial backfill, up to a depth of twelve inches (12") above the top of the pipe. Bottom of excavation which is of loose granular soil, shall be compacted prior to placing bedding or pipe.

4. Initial backfill in trenches where pipe has been laid shall be placed in lifts not exceeding six inches (6") in thickness, and carefully and thoroughly consolidated by compacting simultaneously on both sides of the pipe to a height of twelve inches (12") above the pipe. Initial backfill material shall be free of rocks larger than two inches (2") in diameter, clods, organic matter, rubbish, or other unsuitable material. Initial backfill must be properly placed before any fill is deposited in large quantities from a machine bucket or other vehicle. During Initial backfill, dumping from a bucket must not be allowed to fall upon a pipe from a height of more than one foot (1'), and in all cases the bucket must be lowered so that the shock of the falling earth will not injure the pipe or structure. Only after the Initial backfill has been placed and compacted to a point of twelve inches (12") above the top of the pipe, may Work proceed in placing Final backfill. All precautions must be taken to avoid future settlement in these areas. Compaction shall be performed by approved mechanical compaction devices.
5. Final backfill under paved areas shall be placed in lifts not to exceed eight inches (8"), and shall be compacted to a density of not less than 95% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill in unpaved areas within road right-of-way shall be placed in lifts not to exceed eight inches (8") and shall be compacted to a density of not less than 90% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill in unpaved areas outside of road right-of-way shall be placed in lifts not to exceed eight inches (8") and shall be compacted to a density of not less than 85% of maximum dry density, as determined by Standard Proctor (ASTM D698). Final backfill material shall be free of clods, organic matter, rubbish, or other unsuitable material. Rocks larger than four inches (4") in diameter must be placed to the sides of the trench. Rocks larger than twelve inches (12") are not allowed.
6. Sub-base backfill is comprised of the top twelve inches (12") of Final backfill in paved areas and shall be free of rocks larger than four inches (4") in diameter, clods, organic matter, rubbish, or other unsuitable material. Sub-base backfill shall be placed in lifts not to exceed six inches (6"), and shall be compacted to 98% of maximum dry density, as determined by Standard Proctor (ASTM D698).
7. Backfilling shall not be performed in freezing weather (below 32° F) except by permission of GCDWR, and shall not be done with frozen material or upon frozen material.
8. All Final backfilling in unpaved areas shall be left free of rock on the ground surface, with smooth, even surfaces, properly graded and shall be maintained in this condition until vegetation is established. Where directed by GCDWR, Final backfill shall be mounded slightly above the adjacent ground to account for settlement. In case of settlement after backfill, Contractor shall correct the cause of the settlement and supply sufficient material satisfactory to GCDWR to make up for deficiency. Contractor must provide GCDWR with any independent material testing reports performed on behalf of the Contractor.

9. Fill trenches under concrete slabs and footings of structures with dry sand or crushed stone and tamp in 6 inch layers. Encase piping under concrete slabs and footings in concrete (6 inches minimum).

3.10 FILLS AND EMBANKMENTS

- A. Fills and embankments consist of all earth fills except backfills in trenches or around structures. Unless special material is specified or shown on the Drawings, material for fills and embankments consist of excavated material from structures or of a mixture of such excavated materials and materials borrowed from other sources by the Contractor. Provide all material used for fills and embankments free from wood, vegetable matter, debris, soft or spongy earth or clay, large rock, or other objectionable material. Do not allow rock over 2 inches in diameter to be used in conjunction with backfill material.
- B. Where the crown of a pipe extends above the surface of the ground, or provides less than three feet (3') of cover over the pipe, the pipe shall be covered and protected by an embankment. Unless otherwise specified, indicated on the Drawings, or directed by the Engineer or GCDWR, embankment shall be at least three feet (3') deep over the top of the pipe, at least four feet (4') wide at the top, with side slopes of not less than two horizontal to one vertical (2H:1V) extending to the surface of the ground. Provision shall be made for surface drainage.
- C. Place materials in the fill or embankment in successive layers 6 inches or less in thickness before compaction, each layer being approximately horizontal and extending to the full limit of the required cross section. Compact the fill at optimum water content over the entire surface to not less than 95 percent of the maximum density as determined by Standard Proctor (ASTM D698). Repeat the process for each layer of material until the fill or embankment conforms to the plan lines, grades, and cross sections.
- D. Clear the area over which the fill or embankment is to be constructed of all vegetation, debris, and other objectionable material and, if the ground is in a loose, un-compacted condition, compact it to a minimum 95 percent of maximum density determined as specified herein.
- E. Do not place material beyond the sloping lines of embankment.
- F. Place material for embankments or roadway fills in 6-inch maximum lifts and compact by rolling with power rollers weighing not less than 10 tons, with sheep-foot rollers, with vibrating rollers, or with pneumatic tire rollers, as required to accomplish the work. While and as each layer is deposited, apply water in sufficient amount to ensure optimum moisture to secure the compaction specified.
- G. The use of trucks, carryalls, scrapers, tractors, or other heavy hauling equipment shall not be considered as rolling in lieu of rollers, but the traffic of such hauling equipment shall be distributed over the fill in such a manner as to make the use of the compaction afforded thereby as an addition to compaction by the use of rollers.

- H. Wherever a trench passes through a fill or embankment, place and compact the fill or embankment material to an elevation 12 inches above the top of the pipe before the trench is excavated.

3.11 DISPOSAL OF WASTE AND UNSUITABLE MATERIALS

- A. Use all materials removed by excavation, which are suitable for the purpose, 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. Consider all materials not used for such purposes as waste materials and dispose thereof in a lawful manner and at a location where such materials can be lawfully disposed.
- B. Spread waste materials in uniform layers and neatly leveled and shaped. Provide spoil banks with sufficient and adequate openings to permit surface drainage of adjacent lands.
- C. Remove unsuitable materials, consisting of wood, shot rock, vegetable matter, debris, soft or spongy clay, peat, and other objectionable material from the work site and dispose of in a lawful manner.
- D. Do not dump unsuitable or waste material 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.
- E. Immediately remove and cleanup any material, which may spill or drip from vehicles while being transported on public streets, drives, or other paved surfaces, to the satisfaction of the Engineer, GCDWR, or the proper officials of the municipality in which the hauling or work is being done.
- F. Leave the surface of all graded and spoil areas in a smooth and level or evenly sloped condition, free from stones, rubbish, or other debris.
- G. Leave disturbed areas in a neat and finished appearance and either temporarily stabilized with mulch only or temporary grassing and mulch, or permanently stabilized with grassing and mulch. Meet the requirements in the section titled Erosion and Sedimentation Controls.

3.12 FINAL GRADING

- A. After other earthwork operations have been completed, grade the site of all structures, roads, and embankments within the limits and to the elevations shown on the Drawings. Conduct grading operations so as not to remove or loosen materials beyond the required limits. Leave the finished surfaces 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. Neatly trim and finish slopes and ditches to slopes shown on the Drawings.
- B. Unless otherwise specified or shown on the Drawings, grade and dress all finished ground surfaces to present a surface varying not more than plus or minus 0.10 foot as regards local humps or depressions.

3.13 TOP SOIL

- A. Prepare all areas to be sprigged or planted with grass as shown on the plans by grading to a smooth, even surface to a level 4 inches below the elevation of the finished grade shown on the Drawings. Bring the area to a neat finished grade by the addition of 4 inches of approved top soil.
- B. Top soil removed from the construction area may be stockpiled and reused or top soil may be obtained from approved borrow areas. If obtained from borrow areas, make suitable arrangements with the property owner and pay all costs incident to the borrowed material including royalties.

3.14 SETTLEMENT

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within one year after final acceptance of the work by the GCDWR.
- B. Make all repairs or replacements made necessary by settlement within 30 days after receipt of written notice from the Engineer or GCDWR.

3.15 ACCESS BY GCDWR'S MATERIAL TESTING FIRM

- A. Contractor shall allow and accommodate both scheduled and unscheduled sampling of excavation materials and backfill which include, but are not limited to excavating and setting aside directed materials for sampling, providing description, properties, moisture content, dry density, sieve analysis, Atterburg limits, compaction testing, permeability, etc.
- B. All cost associated with initial material testing will be paid by GCDWR. The cost of retesting due to the failure of Contractor to meet specifications of initial required material testing requirements of the Contract Documents shall be the responsibility of the Contractor.
- C. For scheduled testing, the Contractor shall give a minimum of twenty-four (24) hour notice when scheduling testing and/or evaluations.
- D. For unscheduled testing, Contractor shall cooperate fully with providing access to, and/or setting aside as directed, construction materials for obtaining samples for testing and/or evaluation.

END OF SECTION 31 23 00

SECTION 31 25 00

EROSION AND SEDIMENTATION CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Work Included
1.5	Submittals
1.6	Regulatory Compliance
2.1	Check Dam – Stone (Cd-S)
2.2	Construction Exits (Co)
2.3	Temporary Interceptor, Diversion, and Perimeter Dikes (Di)
2.4	Temporary Interceptor, Diversion, and Perimeter Ditches (Di)
2.5	Sediment Barrier - Temporary Silt Fence (Sd1-NS, Sd1-S)
2.6	Sediment Barrier – Hay Bales (Sd1)
2.7	Inlet Sediment Trap (Sd2)
2.8	Storm Drain Outlet Protection – Riprap (St)
2.9	Surface Roughening (Su)
2.10	Buffer Zone (Bf)
2.11	Disturbed Area Stabilization - Mulching Only (Ds1)
2.12	Disturbed Area Stabilization – Temporary Seeding (Ds2)
2.13	Disturbed Area Stabilization – Permanent Vegetation (Ds3)
2.14	Disturbed Area Stabilization – Sodding (Ds4)
2.15	Dust Control (Du)
2.16	Permanent Slope Stabilization (Ss)
2.17	Anionic Polyacrylamide – PAM (Pm)
3.1	Check Dam – Stone (Cd-S)
3.2	Construction Exits (Co)
3.3	Temporary Interceptor, Diversion, and Perimeter Dikes (Di)
3.4	Temporary Interceptor, Diversion, and Perimeter Ditches (Di)
3.5	Sediment Barrier - Temporary Silt Fence (Sd1-NS, Sd1-S)
3.6	Sediment Barrier – Hay Bales (Sd1)
3.7	Inlet Sediment Trap (Sd2)
3.8	Storm Drain Outlet Protection – Riprap (St)
3.9	Surface Roughening (Su)
3.10	Buffer Zone (Bf)
3.11	Disturbed Area Stabilization - Mulching Only (Ds1)
3.12	Disturbed Area Stabilization – Temporary Seeding (Ds2)
3.13	Disturbed Area Stabilization – Permanent Vegetation (Ds3)

- 3.14 Disturbed Area Stabilization – Sodding (Ds4)
- 3.15 Dust Control (Du)
- 3.16 Permanent Slope Stabilization (Ss)
- 3.17 Anionic Polyacrylamide – PAM (Pm)
- 3.18 Notice of Intent (NOI)
- 3.19 Inspections and Maintenance
- 3.20 Monitoring and Reporting
- 3.21 Notice of Termination (NOT)
- 3.22 Removal of Temporary Sediment Control Structures
- 3.23 Sequence of Construction of Temporary Sediment Control Measures
- 3.24 Specific Requirements
- 3.25 Permitting

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

- 1. Exploratory Excavation (02 32 19).
- 2. Clearing and Grubbing (31 11 00).
- 3. Excavation and Fill (31 23 00).
- 4. Riprap (31 37 00).
- 5. Wetlands Protection (32 73 00).
- 6. Turf and Grasses (32 92 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Contractor shall be familiar with the following referenced documents and keep them at the construction site at all times. These documents must be complied with as applicable.
 - 1. NPDES General Permit No. GAR100002 State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects (the NPDES permit), effective September 24, 2013 to July 31, 2018.
 - 2. 2016 Manual for Erosion and Sediment Control in Georgia (the "Green Book").
 - 3. State of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, (GDOT specifications), latest edition.
 - 4. National Stone Association, Aggregate Classification (NSA Classification).
 - 5. Gwinnett County, or local issuing authority Soil Erosion and Sediment Control Ordinance, latest edition.
 - 6. Approved and permitted Erosion, Sedimentation, and Pollution Control Plan (ES&PC Plan) utilizing Best Management Practices (BMP), as required by Georgia Erosion and Sedimentation Act and NPDES General Permit.

7. Comprehensive Monitoring Program (the CMP) as required by the NPDES General Permit.

1.3 DEFINITIONS

- A. Designer: For the purpose of this item, the term “Designer” means the person who has designed and stamped the Erosion Sedimentation and Pollution Control Plan, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references. This person has successfully obtained Georgia professional registration, met certain education requirements, and been certified as Level II Certified Design Professional, as prescribed by the Georgia Soil and Water Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.
- B. Contractor: For the purposes of this item, the term “Contractor” is synonymous with Contractor, General Contractor, Discharger, Operator, and Primary Permittee, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references.
- C. Qualified Person: For the purposes of this item, the term “Qualified Person” means a person, as used in language of permits, laws, rules, regulations, ordinances, and other soil erosion and sediment control references, who has successfully met certain education requirements and been certified as Level 1A, as prescribed by the Georgia Soil and Water Conservation Commission in consultation with the Georgia EPD and the Stakeholder Advisory Board.
- D. Other Definitions: Definitions as listed in the NPDES General Permit GAR 100002, Part I.B. shall apply in this section.

1.4 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary for implementing best management practices (BMPs) to prevent and minimize erosion and resultant sedimentation in all disturbed areas (cleared and grubbed) during and after construction. This item covers the Work necessary for the installation of structures and measures for the prevention and control of soil erosion and sedimentation. The Contractor shall furnish all material, labor, and equipment necessary for the proper installation, maintenance, inspection, monitoring, reporting, and removal (where applicable) of erosion and sediment control measures, and to cause compliance with the “NPDES General Permit No. GAR100002 State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects, effective September 24, 2013 to July 31, 2018”, under this item.
- B. The Work covered under this item shall include the furnishing, placement, maintenance, and removal of BMPs to include, but not limited to: check dams, construction exits, diversion dikes and ditches, temporary sediment barriers, inlet sediment traps, storm

drain outlet protection, surface roughening, buffer zone, dust control; providing information for, and signing Notice of Intent and Notice of Termination; all monitoring and recording per the Comprehensive Monitoring Program (the CMP); and all temporary and permanent vegetative and non-vegetative ground cover; and all labor, materials, and equipment necessary to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR.

- C. The Designer, Engineer, or GCDWR, may at any time during the project, direct the Contractor to provide additional erosion and sediment control measures, as necessary, to adequately control erosion and sedimentation in order to comply with all permits.

1.5 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Contractor shall submit to Engineer the proposed schedule for installation, maintenance, and removal of all temporary, permanent erosion, and sediment control measures. The schedule shall reflect the requirements of the section titled, Sequence of Construction of Temporary Sediment Control Measures, and must show the anticipated starting and completion date for all land disturbance activities including:
 - 1. Installation of temporary and permanent erosion and sediment control structures.
 - 2. Stormwater management facilities, if any.
 - 3. Timber salvage operations, Clearing, Grubbing, Demolition.
 - 4. Utility pipe installation.
 - 5. Rough and finished grading.
 - 6. Paving
 - 7. Landscaping, including all temporary mulching and seeding.
 - 8. Cleanup and restoration
 - 9. Landscaping, including all permanent seeding and sodding.
 - 10. Removal of temporary erosion and sediment control structures.

1.6 REGULATORY COMPLIANCE

- A. Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the local issuing authority, *and* fourteen (14) calendar days have passed since the Notice of Intent (NOI) has been properly filed with Georgia EPD. Contractor is the Primary Permittee and Operator under the provisions of the NPDES General Permit. As such, Contractor shall be required to sign certain certifications as described in the NPDES General Permit. Contractor shall comply with requirements specified in the Contract Documents, or as directed by the Engineer. Contractor shall also comply with all other laws, rules, regulations, ordinances, and requirements concerning soil erosion and sediment control established in the United States, the State of Georgia, and/or the

local issuing authority. The following documents and the documents referenced therein define the regulatory requirements for this item:

1. NPDES GENERAL PERMIT: NPDES General Permit No. GAR100002, State of Georgia Department of Natural Resources Environmental Protection Division Authorization To Discharge Under The National Pollutant Discharge Elimination System Storm Water Discharges Associated With Construction Activity For Infrastructure Construction Projects, effective September 24, 2013 to July 31, 2018. Governs land disturbance construction activities of one (1.0) acre or more. On applicable sites, Contractor is responsible for complying with terms and conditions of this Permit.
2. MANUAL FOR EROSION AND SEDIMENT CONTROL: Contractor shall follow Practices and Standards of the Georgia Soil and Water Conservation Commission 2016 Manual for Erosion and Sediment Control in Georgia, latest edition.
3. SWP3: When a Stormwater Pollution Prevention Plan (SWP3) is provided in the Contract Documents, the Contractor shall follow the practices described in the SWP3.

PART 2 - PRODUCTS

2.1 CHECK DAM – STONE (Cd)

- A. Geotextile plastic filter fabric underliner shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Section 881, latest edition.

2.2 CONSTRUCTION EXITS (Co)

- A. Geotextile underliner shall conform to AASHTO M288-96, Section 7.3, and shall be used in all instances to separate soil base and graded stone aggregate. Stone aggregate size shall conform to the National Stone Association's (NSA) R-2 Classification (1½" to 3½") stone.

2.3 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DIKES (Di)

- A. A ridge of compacted soil, constructed above, across, or below a slope.

2.4 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DITCHES (Di)

- A. A channel depression in soil, above, across, or below a slope.

2.5 SEDIMENT BARRIER - TEMPORARY SILT FENCE (Sd1-NS, Sd1-S)

- A. Non-Sensitive Areas (Type 'A'): Filter fabric shall be thirty-six inch (36") wide, woven fabric slit tape yarns allowed in one direction only, and must meet the requirements set forth in Section 171- Temporary Silt Fence, of the GDOT Standard Specifications,

Construction of Roads and Bridges, latest edition. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric complies with these specifications. Posts shall be a minimum of four feet (4') long and made of either wood or steel. Wood posts shall be 1½" x 1½" hardwood and made from Ash, Hickory, or Oak. Fabric shall be fastened to wood posts with at least 5 wire staples per post. Staples shall be 17 gauge minimum and shall have a crown at least ¾ inch wide and legs at least ½ inch long. Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the filter fabric to the posts.

- B. Sensitive Areas (Type 'C'): Filter fabric shall be thirty-six inch (36") wide, non-calendered woven fabric constructed with monofilament yarns only, and must meet the requirements set forth in Section 171- Temporary Silt Fence, of the GDOT Standard Specifications, Construction of Roads and Bridges. Contractor shall submit to Engineer copies of delivery invoices, certifications, or other documentation that the filter fabric complies with these specifications. Wire fence fabric shall be at least thirty-two inch (32") high and shall have at least six (6) horizontal wires. Vertical wires shall have a maximum spacing of twelve inches (12"). Top and bottom wires shall be at least 10 gauge and all other wires shall be at least 12½ gauge. Posts shall be steel and have a minimum length of five feet (5'). Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the woven wire and filter fabric to the posts.

2.6 SEDIMENT BARRIER - HAY BALES (Sd1)

- A. Hay bales may be made of hay or wheat straw and shall be wire or nylon bound and of rectangular shape.

2.7 INLET SEDIMENT TRAP (Sd2)

- A. Filter fabric used on constructing inlet sediment traps shall conform to the requirements listed above in paragraph 2.5.A. SEDIMENT BARRIER - TEMPORARY SILT FENCE (Sd1-A). For gravel drop inlet filters, stone shall conform to NSA's R-3 Specification (3 to 6 inch stone). Baffle Box Inlet Filters shall be constructed of 2 inch x 4 inch posts and 2 inch x 4 inch boards.

2.8 STORM DRAIN OUTLET PROTECTION - RIPRAP (St)

- A. Unless otherwise specified, stone furnished for riprap shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Sections 603 and 805, latest edition.
- B. Rock from onsite excavation may be used as stone riprap, provided it meets all of the following requirements:
1. The rock meets GDOT specifications as noted above in paragraph 2.8.A.,
 2. GCDWR construction material testing representative certifies the rock as suitable for the use intended,

3. GCDWR approves the use of onsite materials.

- B. Plastic filter fabric underliner shall meet the requirements of the Georgia Department of Transportation, Standard Specifications, Construction of Road and Bridges, Section 881, latest edition.

2.9 SURFACE ROUGHENING (Su)

- A. Soil slope steeper than 3:1.

2.10 BUFFER ZONE (Bf)

- A. A strip of undisturbed, original vegetated area bordering streams, ponds, wetlands, and lakes.

2.11 DISTURBED AREA STABILIZATION – MULCHING ONLY (Ds1)

- A. Dry straw shall be applied to a depth of 2 to 4 inches, at a rate of two tons per acre (2T/Ac.).
- B. Dry hay shall be applied to a depth of 2 to 4 inches, at a rate of two and one-half tons per acre (2½ T/Ac.).
- C. Wood waste (chips, sawdust, or bark) shall be applied to a depth of 2 to 3 inches.

2.12 DISTURBED AREA STABILIZATION – TEMPORARY SEEDING (Ds2)

- A. Seed shall be clean, delivered in original, unopened packages and bearing an analysis of contents. Guaranteed 95 percent pure with minimum germination rate of 85 percent. Summer seed mix shall be 40 percent by weight Fawn Fescue, 30 percent by weight Perennial Ryegrass, 15 percent by weight Orchard Grass, and 15 percent by weight Dutch White Clover. Winter seed mix shall be 35 percent by weight Fawn Fescue, 30 percent by weight Perennial Ryegrass, 30 percent by weight Hairy Vetch, and 5 percent by weight Dutch White Clover. Alternative mixes may be approved by the Engineer. Fertilizer shall be used as specified, and/or indicated on the Drawings. Fertilizer shall be commercial, chemical type, uniform in composition, free-flowing, conforming to state and federal laws, and suitable for application with equipment designed for that purpose. Fertilizer shall have a minimum percentage of plant food by weight for the following: Summer mix shall be 10 percent nitrogen, 10 percent phosphoric acid, and 6 percent potash. Straw mulch shall be threshed straw of oats, wheat, or rye free from obnoxious weeds and seeds, or shall be clean hay. Average stalk length shall be 6 inches. Wood waste or erosion control matting, such as jute or excelsior, is appropriate alternatives to hay or straw mulch for temporary stabilization.

2.13 DISTURBED AREA STABILIZATION – PERMANENT VEGETATION (Ds3)

- A. Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seeds shall be furnished in original, unopened, sealed standard containers. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

1.	<u>Seed Type</u>	<u>Percent</u>
	K31 Fescue	95
	Material other than grass seed	<u>5</u>
	Total	100

- B. The aggregate percent of material other than grass seed shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter, and weed seed not exceeding 1.0% by weight of pure live seed and other material in the mixture.
- C. Commercial fertilizer shall be composed of a formula of 20-12-10 and shall conform to applicable Georgia 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, which becomes caked or otherwise damaged making it unsuitable for use, shall not be accepted.
- D. Agricultural limestone shall be an acceptable grade of ground limestone, ground dolomite, or a mixture of limestone and dolomite meeting the following physical and chemical requirements:

1. Gradation		
	<u>Standard</u>	<u>Maximum Percent</u>
	<u>Sieve Size</u>	<u>(%) Retained</u>
	No. 8, maximum	10
	No. 100, maximum	75

- E. The vegetative mulch shall be the cereal straw from stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds and shall be relatively free of all other noxious and undesirable seeds. The straw shall be clean and bright, relatively free of foreign material and be dry enough to spread properly.
- F. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 2. The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of

good agricultural soils and which are harmful to or unnecessary for successful plant growth.

2.14 DISTURBED AREA STABILIZATION – SODDING (Ds4)

- A. Turfgrass Sod: Complying with “Specifications for Turfgrass Sod Materials” in TPI’s “Guideline Specifications to Turfgrass Sodding.” Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass, Carpetgrass, Axonopus, Centipede grass, St. Augustine grass, and Zoysiagrass.
- C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full sun: Kentucky bluegrass, a minimum of three cultivars.
 - 2. Sun and partial shade: Proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass.
 - b. 30 percent Chewings Red Fescue.
 - c. 10 percent Perennial Ryegrass.
 - d. 10 percent Redtop.
 - 3. Shade: Proportioned by weight as follows:
 - a. 50 percent Chewings Red Fescue.
 - b. 35 percent Rough Bluegrass.
 - c. 15 percent Redtop.
- D. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of good agricultural soils and which are harmful to or unnecessary for successful plant growth.

2.15 DUST CONTROL (Du)

- A. Dry straw shall be applied to a depth of 2 to 4 inches, at a rate of two tons per acre (2T/Ac.).
- B. Irrigation provided by use of a water truck to wet down the disturbed area.

- C. Asphalt emulsion shall be SS-1, SS-1h, CSS-1 or CSS-1h conforming to the requirements of AASHTO M140-70 or AASHTO M208-72.

2.16 PERMANENT SLOPE STABILIZATION (Ss)

- A. All matting and blanket materials shall be listed on the Georgia Department of Transportation Qualified Products List (QPL #49 for matting, and QPL #62 for blankets).

2.17 ANIONIC POLYACRYLAMIDE (Pm)

- A. Anionic Polyacrylamide shall be non-toxic and can be water-soluble chemical or log form. All Anionic Polyacrylamide products, whether in Powder, Liquid/Emulsion, or log form, shall meet the USEPA Grade 2 classification, "Generally Regarded as Safe (GRAS)". The Contractor shall submit Safety Data Sheets (SDS) to Engineer for approval of Anionic Polyacrylamide. Handling and application of the product shall adhere to the SDS requirements and recommendations.
- B. Liquid/Emulsion form of Anionic Polyacrylamide shall be Applied Polymer Systems, Series 600, or approved equal. Powder form of Anionic Polyacrylamide shall be Applied Polymer Systems, Series 700, or approved equal. Specific polymer type used shall be as per manufacturer's recommendation for Gwinnett County soil classifications.

PART 3 - EXECUTION

3.1 CHECK DAM – STONE (Cd-S)

- A. Install stone check dams as specified, indicated on the Drawings, or as directed by Designer, Engineer, or GCDWR.
- B. Installation: Install check dams in all ditches, channels, or swales draining disturbed areas of up to two (2) acres, and which are not installed with permanent, non-erodible lining or a vegetative cover as specified in paragraphs 2.13 and 2.14 of these specifications.. The specifications for the design criteria, material, installation, and maintenance of check dams are dependent on the upslope drainage area and are described below. A check dam shall not drain a disturbed area greater than two (2) acres.
 1. Construct check dam with graded size 5 to 10 inch stone. Hand placement may be required to ensure complete coverage of the entire width of ditch.
 2. The center of the check dam must be at least nine inches (9") lower than the edges. Dam height shall be a maximum of two feet (2'), as measured at center of check dam.
 3. Side slopes shall be 2:1 or flatter.
 4. Two (2) or more check dams placed in series shall be used for drainage areas greater than one (1) acre. Maximum spacing between dams shall be such that the

toe of the upstream dam is at the same elevation as the top of the downstream dam.

5. A geotextile underliner meeting the requirements of paragraph 2.1.A. shall be used as a separator between the graded stone and the soil base.

- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all check dams shall be inspected and maintenance performed, if needed, within 24 hours of inspection. Inspection shall occur at least once every seven (7) calendar days and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Dress dams with appropriate sized stone, as necessary, to maintain check dams in accordance with these specifications. At the earlier of: 1) Every fourteen (14) calendar days, or 2) when sediment reaches a depth of one-half (½) the original check dam height; all soil, silt, sediment and other material captured by the dam should be removed and returned upgrade on the construction site.

3.2 CONSTRUCTION EXITS (Co)

- A. Install construction exits as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: Construction exits shall be installed at all points where traffic shall be leaving the construction site onto a public or private right of way, street, alley, or parking area. All construction exits must be fully installed prior to the commencement of timber salvage, clearing, grubbing, grading, or other land disturbance construction operations.
 1. The stone pad thickness shall be a minimum of six (6) inches.
 2. The stone pad width shall equal the full width of all points of vehicular egress, but not less than twenty (20) feet wide.
 3. If the stone pad does not sufficiently remove the mud from tires prior to entering onto public right-of-way, washing is required. Washing shall be performed on a stabilized area, and the sediment-laden runoff shall be directed into an approved sediment trap.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all construction exits shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days and within 24 hours of rainfall an event that has precipitation of ½ inch or greater. At the earlier of: 1) fourteen (14) calendar days since construction exit was installed or last maintained, or 2) geotextile underliner is visible, or 3) if construction exit does not conform to specifications established in this section. Construction exit pad shall be top dressed with NSA's R-2 (1 ½ inch to 3 ½ inch stone) such that underliner is no longer visible and exit pad conforms to specifications.

3.3 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DIKES (Di)

- A. Install temporary interceptor, diversion, and perimeter dikes as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, to intercept and prevent stormwater runoff from entering disturbed areas from any other upgrade

area regardless of whether area is onsite or offsite. Dikes must divert runoff to a drainage ditch, sediment basin, temporary or permanent channel. Dikes shall remain in place until the disturbed area is permanently stabilized. Construct dikes of earth fill free from all perishable matter and refuse, such as scrap forms, wire, brush, rocks larger than six (6) inches or any foreign materials. Ashes, large stones, muck, or other soft materials shall not be used. Compact all dikes using construction equipment. Dikes shall be stabilized immediately after construction with temporary seeding to prevent sediment transport to downstream areas.

3.4 TEMPORARY INTERCEPTOR, DIVERSION, AND PERIMETER DITCHES (Di)

- A. Install temporary interceptor, diversion, and perimeter ditches as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. In general, temporary ditches shall be installed parallel and contiguous to, and upgrade of temporary dikes. Construct ditches to the lines and cross section indicated on the Drawings, provided that ditches have a minimum depth of one foot and side slopes have a slope of 2H:1V or flatter. Ditches shall be free of bank projections, trees, brush, stumps, or other objectionable materials or irregularities that shall impede normal flows. Downstream outlets of temporary ditches shall be constructed and stabilized prior to construction of the ditch. The outlet must discharge in such a manner as to not cause an erosion problem.

3.5 TEMPORARY SEDIMENT BARRIERS - SILT FENCE (Sd1-NS, Sd1-S)

- A. Install silt fence as specified, as indicated on the Drawings or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: In general, silt fencing shall be installed on the downgrade side of all areas to be disturbed as well as the perimeter of the project site. All posts used to install silt fence shall comply with the specifications of paragraph 2.5. Posts must be placed at least 18 inches in the ground and spacing cannot be more than four (4) feet center-to-center for Type 'C' fencing, and six (6) feet center-to-center for Type 'A' fencing. Fence fabric must be inserted below ground in a six (6) inch trench, and fence fabric must be fastened to posts according to the specifications of paragraph 2.5. Contractor shall install Type 'A' or Type 'C' silt fence, as specified, as indicated on the Drawings, or when directed by the Designer, Engineer, or GCDWR.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all silt fencing shall be inspected and maintenance performed, if needed, within 24 hours of inspection and once every seven (7) calendar days, and within 24 hours of a rainfall event that had precipitation of ½ inch or greater. All silt fencing materials, including fabric, post and fasteners must be replaced six (6) months after installation. At the earlier of: 1) every fourteen (14) calendar days, or 2) when sediment reaches a depth of one half the installed fence height; all soil, silt, sediment and other material captured by the silt fence should be removed and returned upgrade on the construction site. The silt fence shall be maintained such that it minimizes sediment transport as designed.

3.6 SEDIMENT BARRIER - HAY BALES (Sd1)

- A. Install hay or straw bales as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Installation: Place bales in a row with ends tightly abutting the adjacent bales. Corner abutment is not acceptable. Embed bales in the soil a minimum of 4 inches below grade. Build up backfilled soil a minimum of 4 inches above grade on the uphill side of the barrier and conform to grade on the downhill side of the barrier. Anchor each bale in place with 2" by 2" inch wood stakes or No. 3 reinforcing bars. The first stakes shall be driven toward the previously laid bale to force the bales together. Stakes shall be thirty six (36) inches long and shall be driven a minimum of eighteen (18) inches into the ground.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all hay bales shall be inspected and maintenance performed, if needed, within 24 hours of inspection once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Hay bales must be replaced thirty (30) calendar days after installation. At the earlier of: 1) every fourteen (14) calendar days, or 2) when sediment and other material captured by the hay bales reaches ½ the height of the original bales, such sediment should be removed and returned upgrade on the construction site. The hay bales shall be maintained such that they minimize sediment transport as designed.

3.7 INLET SEDIMENT TRAP (Sd2)

- A. Install inlet sediment traps as specified, as indicated on the Drawings, or as directed by the Designer, Engineer or GCDWR.
- B. Installation: Install in accordance with Chapter Six (6) of the 2016 Manual for Erosion and Sediment Control in Georgia. Excavation may only be used in combination with a filtering device such as stone or silt fence. All sediment traps should provide a minimum of 1.5 feet of sediment storage. Sediment traps must be self-draining.
- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all inlet sediment traps shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Clean and repair traps such that traps meet the specifications of this section and minimize sediment transport. At the earlier of: 1): Every fourteen (14) calendar days, or 2): when sediment reaches a depth of one-half (½) the original check dam height; all soil, silt, sediment and other material captured by the dam should be removed and returned upgrade on the construction site.

3.8 STORM DRAIN OUTLET PROTECTION – RIPRAP (St)

- A. Install storm drain outlet protection as specified, as indicated on the Drawings, or as directed by the Designer, Engineer or GCDWR.
- B. Installation: Prepare the ground surface where riprap will be placed to conform with lines and grades as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. Ground surface shall be smooth and free from obstructions, depressions, or debris. Place woven plastic filter fabric underliner on the prepared ground surface under all riprap. Place riprap to a uniform thickness as

specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR. If no thickness is specified, place riprap to a minimum thickness of eighteen (18) inches.

- C. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all storm drain outlets shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Repair storm drain outlet protection such that riprap meets the specifications of this section and minimizes sediment transport.

3.9 SURFACE ROUGHENING (Su)

- A. Perform surface roughening as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.
- B. Roughening is best used on cut and fill slopes steeper than 3H:1V, which will not be mowed. In those areas use the method of *grooving*, this consists of using machinery to create a series of ridges and depressions, and shall run perpendicular to the slope.
- C. Using a bulldozer tread for *tracking* as a method of roughening is discouraged, unless no alternatives are available. This causes undue compaction of surface soils and is counter-productive to establishing vegetative growth. When using *tracking* as a technique, use as few passes of the machinery as possible to minimize compaction of the ground surface.
- D. Roughened areas shall be vegetated (mulch, seed, sod, etc.) as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, as soon as possible to obtain optimum growth.

3.10 BUFFER ZONE (Bf)

- A. Construction within a buffer zone of a body of water designated as Waters of the United States must meet the requirements listed below in this specification paragraph.
- B. Definition: The buffer zone is officially defined as the distance, in feet, from the edge of the normal high water line (or for wetlands, the distance from the boundary of the wetland). For the purpose of Work in Gwinnett County, the buffer zone for small streams (as determined by the Engineer) shall start at the top of the bank and the buffer zone for larger streams (as determined by the Engineer) and rivers shall start at the edge of the vegetation. Buffer zones are specified in the table below.

C. <u>Type of Waters of the United States</u>	<u>Buffer</u>
Chattahoochee River	100 feet
Tributaries Within 2000 Feet of Chattahoochee River	35 feet
Big Haynes Creek	50 feet
Other Waters of the United States	25 feet

- D. Construction Activity: Construction activity within the buffer zone must be approved by a variance granted by Georgia EPD. Any encroachments must immediately be mulched and/or seeded in accordance with the requirements of paragraph 2.12. titled Disturbed Area Stabilization – Temporary Seeding. All construction within a buffer zone must be complete as soon as possible, and within 24 hours when possible of initial land disturbance within the buffer.

3.11 DISTURBED AREA STABILIZATION – MULCHING ONLY (Ds1)

- A. When mulch only is used without subsequent seeding, mulch shall be applied to provide full coverage of the exposed area. Dry straw or hay, and wood chips shall be applied uniformly by hand or mechanical equipment designed for that specific use.
- B. For areas to receive mulch only, apply at the following rates, to the following depths, and according to the following specifications:
1. Dry Straw or Hay: Spread at a rate of two and one half (2 ½) tons per acre. Apply to a depth of 6 to 10 inches. Apply uniformly and anchor as necessary.
 2. Wood Waste: Spread at a rate of 6 to 9 tons per acre. Apply to a depth of 2 to 3 inches. Apply wood waste only on slopes that are 3:1 or flatter. Anchoring is not necessary.
 3. Jute Matting or Excelsior Netting: Apply in accordance with manufacturer's recommendations.
 4. Asphaltic Emulsion: Apply at a rate of 1200 gallons per acre. Apply uniformly.
- C. If the area will eventually be covered with perennial vegetation, 20-30 pounds per acre of nitrogen, in addition to the normal amount of nitrogen, shall be applied to the area to offset the uptake of nitrogen caused by the decomposition of organic mulches.

3.12 DISTURBED AREA STABILIZATION – TEMPORARY SEEDING (Ds2)

- A. This section covers Work necessary for temporary stabilization of soil to prevent erosion following clearing, grubbing, grading or other construction, except wetlands. Temporary stabilization within a buffer zone of Waters of the United States shall meet the requirements of paragraph 3.10 titled Buffer Zone.
- B. General Criteria: The stabilization measures specified herein shall be initiated on all disturbed areas including dikes and ditches within 24 hours of completion to minimize erosion and soil transport. However, stabilization measures specified herein do not have to be initiated in the event that construction activities shall resume on that portion of the site within fourteen (14) days from the date activities temporarily ceased. For cleared areas which may not receive permanent vegetative or other stabilization measures for six (6) months or less, and a suitable growing season is not available for seeding to establish an erosion retardant cover, mulch may be applied according to the specifications below:
1. Contractor shall submit to Engineer, certificates of inspection of seed by state or federal authorities and copies of delivery invoices or other documentation of quantities of mulch and fertilizer.

2. Contractor shall give at least a three (3) day notice to GCDWR for the time and place of the grass planting.
 3. Contractor shall keep Engineer and GCDWR advised of schedule of operations.
- C. Application: Planting and seeding shall be performed in accordance with the following schedule:
1. Summer Seeding: No earlier than April 1 and no later than October 15.
 2. Winter Seeding: October 16 until weather conditions prohibit further construction operations as determined by the Engineer.
 3. Soil Preparation: Prior to seeding operations, and after surface has been shaped, graded, and compacted, scarify surface to a minimum depth of 1 inch.
 4. Seeding: All seedbeds shall be a minimum depth of 1 inch. Seedbeds shall be reviewed by GCDWR, prior to seeding. After soil has been scarified, apply required seed mix, as specified in this section, uniformly with a cyclone seeder, drill, culti-packer seeder, or hydro-seeder. When hydro-seeding is the selected method of seeding, prepare and apply slurry at the rate and proportion specified below:
 - Seed Mix 100 lbs/acre
 - Fertilizer 650 lbs/acre
 - Water as necessary
 5. The required fertilizer mix shall be uniformly applied at the time of seeding. Fertilizer shall not be applied to a land area within a buffer zone area of a body of water in a Waters of the United States.
 6. Upon completion of the seeding operations, apply straw mulch to a uniform thickness of 1 ½ inches to 2 ½ inches in depth. Mulch shall be loose enough to permit penetration of sunlight and air circulation, but dense enough to shade ground, reduce evaporation rate, and prevent or materially reduce erosion of underlying soil. Retain straw in place by applying asphaltic emulsion at a rate of 100 gallons per acre or mechanically tack the mulch into the soil to approximately 3 inches. Equipment used for tacking shall be specially designed for this use.
- D. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all stabilized areas shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Apply additional stabilization materials as needed.
- 3.13 DISTURBED AREA STABILIZATION – PERMANENT VEGETATION (Ds3)
- A. The subgrade for areas to be seeded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer

uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.

- B. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in The Piedmont Region “Zone One” as detailed in the 2016 Manual for Erosion and Sediment Control in Georgia. Seeding shall only be permitted during the planting season listed for The Piedmont Region. All seeded areas shall be uniformly mulched immediately after seeding.
- C. The Contractor shall be responsible for maintaining all planted areas including, watering, and reseeding defective area until a stand of grass covering ninety percent (90%) of the entire stabilized area is established, and Final Acceptance of the Work by the Engineer is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded as required.

3.14 DISTURBED AREA STABILIZATION – SODDING (Ds4)

- A. The subgrade for the areas to be sodded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.
- B. Sod shall be carefully placed and rolled to insure good soil contact

3.15 DUST CONTROL (Du)

- A. The stabilization measures contained in this section are for controlling surface and air movement of dust on construction sites.
- B. Temporary Methods: Dust may be controlled by use of mulches, tillage, and irrigation. For mulches, refer to paragraphs 2.11 and 3.11 Disturbed Area Stabilization – Mulching Only. For emergency measures to deploy before wind erosion starts, tillage and irrigation may be implemented. The practice of tillage is designed to roughen and bring clods to the surface. Irrigation to be accomplished by sprinkling water on the surface until the surface is wet and no longer produces dust. This must be repeated as necessary to minimize dust production.
- C. Permanent Methods: Applying topsoil (a less erosive soil material), crushed stone, and sodding to disturbed areas may be used to permanently control dust.

3.16 PERMANENT SLOPE STABILIZATION (Ss)

- A. Matting and blankets shall be installed as specified, as indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR.

- B. Matting and blankets can be applied in areas of concentrated flows, on slopes steeper than 2½H:1V with a height of ten (10) feet or greater, and cuts and fills within stream buffers.
- C. Installation: After the site has been shaped to the lines and grades as indicated on the Drawings, prepare a friable seedbed relatively free from clods and rocks more than one (1) inch in diameter, and any foreign material that will prevent contact of the mat or blanket to the soil surface. Staple mats or blankets to soil surface following manufacturer's recommendations.
- D. Maintenance: In accordance with paragraph 3.19 titled Inspections and Maintenance, all erosion control matting and blankets shall be inspected and maintenance performed, if needed, within 24 hours of inspection, once every seven (7) calendar days, and within 24 hours of a rainfall event that has precipitation of ½ inch or greater. Any dislocation or failure shall be repaired immediately. If washouts or breakage occurs, reinstall the matting or blanket after repairing damage to the slope or ditch. Continue to monitor these areas until they become permanently stabilized.

3.17 ANIONIC POLYACRYLAMIDE (Pm)

- A. This section covers the use of the chemical anionic Anionic Polyacrylamide to settle out silt and suspend solids from surface water and ground water prior to discharge. Application of Anionic Polyacrylamide shall utilize a method and amount as recommended by the manufacturer and approved by the Engineer. Anionic Polyacrylamide may be applied to disturbed areas in either Powder or Liquid/Emulsion form as described herein.
- B. Application: Liquid/Emulsion form of Anionic Polyacrylamide shall be applied to disturbed areas at a rate of 0.5 gallons of emulsion to 1000 gallons of water. Powder form of Anionic Polyacrylamide shall be applied at a rate of 4 pounds per acre of disturbed area.
- C. Maintenance: Apply additional Anionic Polyacrylamide as authorized or directed by the Engineer.

3.18 NOTICE OF INTENT (NOI)

- A. When land disturbance construction activities are equal to or greater than one (1.0) acre, and an Erosion Sediment & Pollution Control Plan has been approved by the governing jurisdiction, the Contractor, together with GCDWR shall prepare a Notice of Intent. GCDWR shall submit a properly executed NOI to Georgia EPD at least fourteen (14) calendar days prior to start of land disturbance activities.

3.19 INSPECTIONS AND MAINTENANCE

- A. Contractor shall designate a Qualified Person properly certified as such by Georgia Soil and Water Conservation Commission, to perform inspections required by this item. The following areas are to be inspected and maintenance performed, if needed, at least once every seven (7) calendar days and within twenty-four (24) hours of a rainfall event that has a precipitation of ½ inch or greater. Immediate action shall be taken to correct deficiencies to BMPs (Best Management Practices). GCDWR reserves the

right to stop all construction activities not related to maintaining BMP's until such deficiencies to BMPs are repaired. Areas to be inspected under this item are:

1. Disturbed areas of the construction site that have not undergone final stabilization.
 2. Erosion and sediment control structures.
 3. All locations where vehicles enter or exit the site.
 4. Material storage and construction lay down areas that are exposed to precipitation and have not been, or will not be finally stabilized for more than seven (7) calendar days.
- B. In areas that have been finally stabilized, inspections and, if necessary, maintenance by Contractor shall occur at least once per month for the duration of the contract or project, whichever is longer.
- C. During inspections the following shall be observed and appropriate maintenance procedures taken:
1. The conformance to specifications and current condition of all erosion and sediment control structures.
 2. The effectiveness and operational success of all erosion and sediment control measures.
 3. The presence of sediments or other pollutants in stormwater runoff at all runoff discharge points.
 4. The presence of sediments or other pollutants in receiving waters.
 5. Evidence of offsite tracking at all locations where vehicles enter or exit the site.
- D. An inspection checklist is included at the end of this item. This checklist must be completed during each inspection, dated, and signed by the Qualified Person conducting the inspection. Completed inspection checklist shall be kept onsite with the Contract Documents and submitted to GCDWR on a monthly basis. The Contractor shall repair deficiencies within twenty-four (24) hours of inspection.

3.20 MONITORING AND REPORTING

- A. **Monitoring:** The Contractor shall be responsible for the implementation of the Comprehensive Monitoring Program (CMP) as written by the Designer. The implementation must comply with EPD guidelines as set forth in NPDES Permit No. GAR 100002 – Infrastructure, Part IV.D.6. Sampling Requirements, Part IV.E. Reporting, and Part IV.F. Retention of Records.
- B. **Reporting:** The Contractor shall prepare and submit a summary of the monitoring results to the Engineer, the Designer and the EPD as required in the NPDES permit (Current Address: Northwest Georgia Regional Office, Georgia Environmental Protection Division, Suite 114, 4244 International Parkway, Atlanta, GA 30354). The County reserves the right to use its own resources to duplicate monitoring and verify the Work required by the Contractor in this section.

- C. Payment Procedures: There shall be no separate payment for Work covered under this section titled Monitoring and Reporting including monitoring, sampling, reporting, all labor, materials, and equipment necessary to complete the Work as specified. There shall be no separate payment for monitoring each location in the project that is to be monitored.

3.21 NOTICE OF TERMINATION (NOT)

- A. When all construction activities have ceased, final stabilization has been certified, and the site is in compliance with the NPDES permit, the Contractor, together with GCDWR shall submit a Notice of Termination.

3.22 REMOVAL OF TEMPORARY EROSION AND SEDIMENT CONTROL STRUCTURES

- A. At such time that temporary erosion and control structures are no longer required under this item, the Contractor shall notify the Designer, and Engineer of Contractor's intent and schedule for the removal of the temporary structures, and obtain Designer's and Engineer's approval in writing prior to removal. Once the Contractor has received such written approval from the Designer and Engineer, the Contractor shall remove, as approved; the temporary structures and all sediments accumulated at the removed structure shall be returned upgrade. In areas where temporary control structures are removed, the site shall be left in a condition that shall restore original drainage. Such areas shall be evenly graded and seeded as specified in paragraph 3.13 Disturbed Area Stabilization – Permanent Vegetation (Ds3).

3.23 SEQUENCE OF CONSTRUCTION OF TEMPORARY SEDIMENT CONTROL MEASURES

- A. Install all erosion and sediment control structures as specified, indicated on the Drawings, or as directed by the Designer, Engineer, or GCDWR, as the first item of Work within a given drainage area. Construction and installation of all erosion and sediment control structures shall begin downgrade of the area to be disturbed and proceed upgrade. Contractor shall, at all times, maintain all soil erosion and sediment control structures and practices throughout construction and until permanent vegetative cover is established.
- B. Time: Land disturbance activities are not authorized to begin until after all required erosion and sediment control permits are obtained from the United States, the State of Georgia, and/or the local issuing authority, *and* fourteen (14) calendar days have passed since Notice of Intent (NOI) is properly filed with Georgia EPD.

3.24 SPECIFIC REQUIREMENTS

- C. The requirements as specified, as indicated on the Drawings, are minimum requirements for the preventing or minimizing soil erosion and sediment transport. Contractor shall install and maintain soil erosion and sediment control measures in accordance with the requirements set forth in the 2016 Manual for Erosion and Sediment Control in Georgia, and said manual shall govern in case of conflicting

information, unless an item is clearly identified on the Drawings as a deviation from the Manual.

3.25 PERMITTING

- A. Land disturbance activity shall not commence until the Land Disturbance Permit has been issued by the local issuing authority, *and* fourteen (14) calendar days have passed since Notice of Intent (NOI) was properly filed with Georgia EPD.
- B. A Certified Design Professional properly certified as such by the Georgia Soil and Water Conservation Commission shall be responsible for performing the following duties with respect to the Erosion and Sedimentation Control Permit.
 - 1. Certified Design Professional shall prepare an Erosion, Sedimentation and Pollution Control Plan (ES&PCP), and shall submit same to the local issuing authority for approval, and shall provide Contractor with three (3) approved copies of the ES&PCP.
 - 2. Engineer shall obtain Land disturbance permits from local governments.
 - 3. The same Certified Design Professional who prepared the ES&PCP shall conduct the initial seven (7) day inspection after initial installation of BMPs.
- C. Contractor shall be responsible for performing the following duties with respect to the Erosion and Sedimentation Control Permit.
 - 1. Contractor shall execute the NOI as "Operator" and submit to GCDWR along with required fees, and GCDWR shall execute the NOI as "Owner" and then properly submit fully executed NOI and the required fees to Georgia EPD. No land disturbance activity shall be started until fourteen (14) calendar days have passed after the Notice of Intent (NOI) is properly submitted to Georgia EPD.
 - 2. Contractor shall employ a Qualified Person who shall perform inspections of BMPs as outlined in NPDES General Permit GAR 100002, Part IV, D.4.
 - 3. Contractor shall employ a Qualified Person who shall gather samples of storm water as outlined in NPDES General Permit GAR 100002, Part IV, D.6., and as further defined in the ES&PCP.
- D. Contractor shall employ a Qualified Person who shall prepare, submit and maintain all reporting and report submittal requirements as outlined in NPDES General Permit GAR 100002, Part IV, E. and F.

Gwinnett County Department of Water Resources

Erosion and Sediment Control Checklist

Instructions: Complete this checklist at least once per week and within 24 hours of any rainfall greater than ½ inch. Summarize deficiencies on this page (attach additional pages if necessary). Take action to correct problems within 24 hours. Keep this form in the project file.

Inspection Done by: _____ *Date:* _____

Item No.	Explanation of Deficiency or Deficiencies	Corrective Action Taken	Date Completed

Temporary Interceptor, Diversion and Perimeter Dikes Check List (Di)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
TDK -1	Installation	Are dikes properly placed to divert water to drainage ditches, sediment basins, or temporary or permanent channels?			
TDK -2	Installation	Are dikes constructed of earth fill free of refuse, such as wire, brush, rocks over 6 inches in diameter, ashes, muck, etc?			
TDK -3	Installation	Have dikes been compacted using construction equipment?			
TDK -4	Installation	Do dikes have a top width of at least 2 feet?			
TDK -5	Installation	Are dikes at least 18 inches above surrounding grade?			
TDK -6	Installation	Are side slopes of dikes 2:1?			
TDK -7	Installation	Have dikes been stabilized with vegetative cover (temporary seeding)?			
TDK -8	Maintenance	Are dikes still 2 feet across top and at least 18 inches high even after weathering?			
TDK -9	Maintenance	Do dikes have vegetative cover?			

Inspection done by: _____ *Date:* _____

Temporary Interceptor, Diversion, and Perimeter Ditches (Di)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
TDD -1	Installation	Are ditches properly placed parallel to, contiguous to, and upslope of temporary dikes?			
TDD -2	Installation	Do ditches have a minimum depth of one (1) foot?			
TDD -3	Installation	Are ditch side slopes 2:1 or flatter?			
TDD -4	Installation	Are ditch sides and bottoms free of projections, trees, brush, stumps, etc?			
TDD -5	Installation	Are ditches stabilized with a vegetative cover?			
TDD -6	Maintenance	Ditch side slopes have not eroded to be steeper than 2:1?			
TDD -7	Maintenance	Are ditches free of sediment and debris?			
TDD -8	Maintenance	Do ditches have vegetative cover?			

Inspection done by: _____ *Date:* _____

Temporary Sediment Barrier - Silt Fence (Sd1-S or Sd1-NS)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No												
SF -1	Installation	Is silt fence installed at proper intervals? <table border="0" style="width: 100%;"> <tr> <td style="text-align: left;"><u>Slope (feet)</u></td> <td style="text-align: right;"><u>Maximum Interval</u></td> </tr> <tr> <td><2%</td> <td style="text-align: right;">100</td> </tr> <tr> <td>2% to 5%</td> <td style="text-align: right;">75</td> </tr> <tr> <td>5% to 10%</td> <td style="text-align: right;">50</td> </tr> <tr> <td>10% to 20%</td> <td style="text-align: right;">25</td> </tr> <tr> <td>>20%</td> <td style="text-align: right;">15</td> </tr> </table>	<u>Slope (feet)</u>	<u>Maximum Interval</u>	<2%	100	2% to 5%	75	5% to 10%	50	10% to 20%	25	>20%	15			
<u>Slope (feet)</u>	<u>Maximum Interval</u>																
<2%	100																
2% to 5%	75																
5% to 10%	50																
10% to 20%	25																
>20%	15																
SF -2	Installation	Is proper type of silt fence installed? Type A (Sd1-NS) - Project duration is 6 months or greater or slope is greater than 3:1. Post spacing 6 feet max. Type C (Sd1-S) - Where fill slopes exceed a vertical height of 10ft and the slope is greater than 3:1. Post spacing 4 feet maximum. Has woven wire fabric.															
SF -3	Installation	Has silt fence been installed with a trench 6 inches into the ground?															
SF -4	Installation	Has silt fence post been installed at least 18 inches into the ground?															
SF -5	Maintenance	Has silt fence been in place less than 6 months?															
SF -6	Maintenance	Is silt fence controlling offsite migration of sediment?															
SF -7	Maintenance	Has sediment been removed from the up-slope side of the silt fence in the last 14 days?															
SF -8	Maintenance	Is sediment build-up less than one-half (1/2) the installed silt fence height?															
SF -9	Maintenance	Is silt fence free of damage, including Tears and holes?															
SF -10	Maintenance	Is silt fence horizontally tight?															
SF -11	Maintenance	Are post intact (unbroken and unbent)?															

Inspection done by: _____ Date: _____

Temporary Sediment Barrier – Hay Bales (Sd1)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
HB -1	Installation	Have hay bales been installed at the toe of all slopes higher than 3 feet or steeper than 5:1?			
HB -2	Installation	Have hay bales been installed at a maximum of 100ft intervals, if slope persist?			
HB -3	Installation	Are hay bales wire or nylon bound and rectangular shaped?			
HB -4	Installation	Are hay bales placed end to end with ends tightly abutting adjacent hay bale?			
HB -5	Installation	Are hay bales embedded into the soil a minimum of 4 inches below grade?			
HB -6	Installation	Are hay bales anchored with 2 inch x 2 inch wooden stakes or no. 3 reinforced bars, with a minimum length of 36 inches?			
HB -7	Installation	Are stakes driven in at an angle toward the previously placed hay bale, at least 18" into the ground?			
HB -8	Maintenance	Are hay bales intact?			
HB -9	Maintenance	Are stakes unbroken or unbent?			
HB -10	Maintenance	Is sediment build up less than one half (½) the original bale height?			
HB -11	Maintenance	Has sediment been removed from the upslope side of hay bale in last 14 days?			
HB -12	Maintenance	Have hay bales been installed less than thirty (30) calendar days ago?			
HB -13	Maintenance	Are hay bales in firm contact with ground surface with no undermining of soil?			

Inspection done by: _____ *Date:* _____

Construction Exits (Co)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
CE -1	Installation	Have construction exits been constructed prior to any construction operations at all points where traffic leaves the site to a right-of-way, street, alley, or parking area?			
CE -2	Installation	Are construction exits a minimum of 50 feet long and a right angle to the street, alley, etc?			
CE -3	Installation	Are construction exits a minimum of 20 feet wide?			
CE -4	Installation	Are construction exit pads a minimum of 6 inches in depth?			
CE -5	Installation	Have geotextile underliners been placed under the construction exit pads?			
CE -6	Installation	Have the construction exit pads been constructed of 1 ½ to 3 ½ inch diameter stone?			
CE -7	Maintenance	Are construction exit length, width, and depth being maintained?			
CE -8	Maintenance	Have construction exits been maintained within the last 14 days?			
CE -9	Maintenance	Is geotextile underliner still covered by stone (not visible)?			

Inspection done by: _____ *Date:* _____

Check Dams – Stone (Cd-S)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
CD -1	Installation	Were check dams constructed of appropriate materials? < 2 acres draining graded size 5 to 10 inch diameter stone			
CD -2	Installation	Is center of check dam at least 9 inches lower than the outer edges?			
CD -3	Installation	Is check dam height 2 feet maximum at center of check dam?			
CD -4	Installation	Are side slopes of check dam 2:1 maximum?			
CD -5	Installation	Are check dams properly spaced in series (toe of upstream check dam at same elevation as top of downstream check dam)?			
CD -6	Installation	Do check dams cover entire width of ditch or swale?			
CD -7	Installation	Are check dam heights lower than channel banks?			
CD -8	Installation	Are check dam heights lower than upstream property line elevation?			
CD -9	Maintenance	Are check dam dimensions and slopes being maintained?			
CD -10	Maintenance	Is sediment less than one-half (½) the original check dam height?			
CD -11	Maintenance	Are check dams in good contact with ground surface with no undermining of soil?			

Inspection done by: _____ *Date:* _____

Inlet Sediment Trap (Sd2)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
SD -1	Installation	Are inlet sediment traps constructed around all storm drain inlets that receive runoff from disturbed areas?			
SD -2	Installation	Are sediment traps constructed according to design?			
SD -3	Installation	Do sediment traps provide for a minimum of 1½ feet of sediment storage?			
SD -4	Installation	Are sediment traps self-draining?			
SD -5	Installation	If gravel is used for the filtering media, is it 3 to 6 inches in diameter?			
SD -6	Installation	If baffle box inlet filters were used, are they constructed of 2"x 4" or 4"x 4" posts and 2"x 4" boards?			
SD -7	Maintenance	Does sediment trap have adequate storage volume for subsequent rains?			
SD -8	Maintenance	Are sediment traps intact?			
SD -9	Maintenance	Are wooden components unbroken?			
SD -10	Maintenance	Is gravel overtaken with sediment?			
SD -11	Maintenance	Are filter fabrics free of tears or holes?			

Inspection done by: _____ *Date:* _____

Disturbed Area Stabilization (Ds1, Ds2, Ds3, Ds4)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
VS -1	Installation	Have disturbed areas been stabilized with temporary vegetation and mulched within 24 hours of completion?			
VS -2	Installation	Have disturbed areas awaiting permanent stabilization cover, where suitable growing season is not available, been stabilized with temporary vegetation and/or mulch?			
VS -3	Installation	Was surface prepared for seeding (by scarifying soil a minimum of 1 inch deep)?			
VS -4	Installation	Has seeding been performed according to growing seasons and required mixtures of seed and fertilizer?			
VS -5	Installation	Has mulch been loosely applied, after seeding, to a thickness of 1 ½ to 2 ½ inches?			
VS -6	Installation	Has mulch been retained using an asphaltic emulsion or mechanically tacked?			
VS -7	Installation	For areas which have not received temporary vegetation and have received mulch only: Has dry straw or hay mulch been applied to a thickness of 2 to 4 inches? Has wood waste been applied to a thickness of 2 to 3 inches?			
VS -8	Maintenance	Are stabilized areas intact with no signs of eroded areas?			
VS -9	Maintenance	Do disturbed areas that have been stabilized with mulch have the proper thickness of mulch?			
VS -10	Maintenance	Are previously stabilized areas intact and not in need of touch up seeding or mulching?			

Inspection Done by: _____ **Date:** _____

Storm Drain Outlet Protection (St)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
St -1	Installation	Are storm drain outlet protections constructed around all storm drain outlets?			
St -2	Installation	Are storm drain outlet protections constructed according to design?			
St -3	Installation	Are storm drain outlet protection aprons constructed straight – no bends?			
St -4	Installation	Is geotextile filter fabric present between soil and quarried stone?			
St -5	Installation	Is minimum thickness of stone pad at least 18” thick?			
St -6	Installation	Is apron constructed level (0.0%) grade?			
St -7	Maintenance	Has erosion occurred around or below riprap?			
St -8	Maintenance	Have riprap stones been dislodged?			
St -9	Maintenance	Are filter fabrics free of tears or holes?			

Inspection done by: _____ *Date:* _____

Permanent Slope Stabilization (Ss)

Item No.	Installation or Maintenance	Explanation	N/A	Yes	No
Ss -1	Installation	Are mats installed in concentrated flow areas?			
Ss -2	Installation	Are mats installed on slopes steeper than 2½:1 with a height 10 feet or greater?			
Ss -3	Installation	Are mats installed in cuts and fills within stream buffers?			
Ss -4	Installation	Are mats in direct contact with soil surface (no foreign materials between mats and ground)?			
Ss -5	Installation	Are mats stapled to the ground with U-shaped staples having legs at least 6 inches long?			
Ss -6	Maintenance	Do mats show signs of erosion or undermining?			
Ss -7	Maintenance	Are mats dislocated, broken, or washed out?			

Inspection done by: _____ **Date:** _____

END OF SECTION 31 25 00

SECTION 31 37 00

RIPRAP

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Assurance
2.1	Rock Riprap
2.2	Filter Blanket Material
3.1	Equipment
3.2	Preparation of Foundation
3.3	Placement of Filter Blanket
3.4	Construction of Plain Rock Riprap
3.5	Construction of Hand Placed Plain Rock Riprap
3.6	Protection of Structures

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Erosion and Sedimentation Controls (31 25 00).

1.2 REFERENCES

A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

B. Standards

1. ASTM International (ASTM)
 - a. C94/C94M – Standard Specifications for Ready-Mix Concrete
 - b. C136 – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - c. C150 – Standard Specification for Portland Cement
 - d. C535 – Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary for hauling and properly placing stone riprap at the locations and to the limits indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. Place riprap on slopes of embankments or other surfaces or around structures as protection against the erosive action of water.
- C. Where shown on the Drawings, place a filter blanket course of crushed rock, or sand and gravel, or an approved filter fabric under the riprap.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall include the following:
 - 1. Product Data
 - a. Description and location of sources of Riprap bedding and Riprap.
 - 2. Certificates
 - a. Quarry Certificate of Conformance and supporting documentation showing riprap bedding and/or riprap meet Standard Specification gradation and materials requirements for the Class or Type specified.
 - 3. Test and Evaluation Reports
 - a. Certified test results for riprap gradation, abrasion resistance, and bulk density.
 - 4. Source Quality Control Submittals
 - a. Trip tickets showing source, type, and weight of each load of material delivered to the site.

1.5 QUALITY ASSURANCE

A. Qualifications

1. Suppliers

- a. Riprap Source: Quarry which produces riprap and meets Georgia DOT Qualifications for same.

PART 2 - PRODUCTS

2.1 ROCK RIPRAP

- A. Construct rock riprap using sound, dense, durable stones, or rock fragments, free from cracks, pyrite intrusions and other structural defects. Stones which will be used with

mortar shall be free from dirt, oil, or other material that might prevent good adhesion with the mortar. Avoid using stones with a laminated structure.

- B. When the crushed aggregate is subjected to five alternations of the sodium sulfate soundness test, the weighted percentage of loss shall be not more than 12 percent.
- C. Use stones generally of rectangular or cubic shape. Do not use flat or elongated stones having a small dimension less than 1/3 of the large dimension.
- D. At least thirty-five percent (35%) of the stones or rock fragments for plain rock riprap shall weigh 75 pounds or more. The sizes of the stones shall be well graded from the smaller to the larger, with the largest stones being a maximum of two cubic feet in size. Stone shall be Type I as per section 805.01 of Georgia Department of Transportation Standard Specifications, latest edition.
- E. At least ninety percent (90%) of the stones or rock fragments for hand placed rock riprap shall weigh 50 pounds or more and shall be not less than 12 inches long, 12 inches deep, and 8 inches wide.

2.2 FILTER BLANKET MATERIAL

- A. Provide filter blanket material consisting of fragments of sound, durable stone or crushed rock, free from disintegrated stone, alkali, salt, vegetable matter, or adherent coating. Provide aggregate reasonably free from thin or elongated pieces. The percentage of wear of the aggregate as outlined in AASHTO Test No. T-96 shall not exceed 7 percent.
- B. Aggregate shall have the following gradation:

Sieve Size	Total Percent Passing by Weight
1 1/4	100
1	95-100
3/4"	70-100
3/8"	50-85
No. 4	33-65
No. 10	20-45
No. 40	8-25
No. 200	0-10

- C. The material finer than the No. 10 sieve shall be of such characteristics and gradation that will prevent the mass from setting up or becoming cemented together.

PART 3 - EXECUTION

3.1 EQUIPMENT

- A. Have all equipment necessary for the satisfactory performance of the work on hand before construction will be permitted to begin.
- B. Provide wooden or metal tamps of sufficient weight and number to properly compact the slopes on which the riprap or slope pavement is to be placed.

- C. Provide a mechanical mixer for mixing cement grout or, if the Engineer approves hand mixing for cement grout, a watertight mixing platform or mixing box of adequate size.

3.2 PREPARATION OF FOUNDATION

- A. Immediately prior to the construction of riprap, trim the slopes or ground surface within reasonably close conformity to the lines and grades indicated on the drawings, and thoroughly compact by the use of hand or mechanical tamps.
- B. On slopes, place the bottom of the riprap at least 2 feet below the natural ground surface, unless otherwise shown or directed.
- C. Do not place material on a frozen or otherwise unsuitable slope.

3.3 PLACEMENT OF FILTER BLANKET

- A. Where shown on the drawings, place a filter blanket course under the riprap on the prepared subgrade.
- B. Place filter blanket immediately prior to placement of riprap. Compaction of the filter blanket is not required except where called for by the Engineer.
- C. Where specifically permitted by a Soils Engineer, a synthetic filter fabric may be substituted for the filter blanket course. Filter fabric shall be especially designed for use as slope stabilization under riprap and shall be acceptable to the Soils Engineer. Place filter fabric in strict conformance with the manufacturer's written instructions and recommendations.

3.4 CONSTRUCTION OF PLAIN ROCK RIPRAP

- A. Unless otherwise shown or specified, construct plain rock riprap using a crane and clam-shell. Place the rock as nearly as practicable in final position using powered equipment. If necessary, work larger rocks up to the surface when the material on the surface does not meet the weight specification or when the voids next to the foundation material are too large.
- B. Keep the quantity of small stones as low as possible, sufficient only to fill the voids between the larger stones. Take care that this small material is well distributed throughout the mass and not allowed to segregate or form pockets of small stone. Break down all bridging. Fill large interstices, or open channels, or voids by chinking or otherwise manipulating the stones.
- C. When riprap is to be built on existing riprap, take special care to provide positive anchorage of the new riprap to the existing riprap.
- D. Conform the finished riprap surface to the slope lines shown on the drawings. No objectionable, hazardous, or unsightly projections above the general plane surface will be permitted.
- E. Thoroughly chink and fill the main stones with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. Continue this work with the progress of the construction. Tamping

of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.

- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case break down these stones to come within 4 inches of the normal surface.

3.5 CONSTRUCTION OF HAND PLACED, PLAIN ROCK RIPRAP

- A. Construct hand placed plain rock riprap upon the prepared foundation by hand placing so that the stones are as close together as is practicable in order to reduce the voids to a minimum. Begin construction of riprap on sloped surfaces at the bottom and progress upward in approximately horizontal layers.
- B. When rock riprap is constructed in more than one layer, place it so that it will be thoroughly tied together with the larger stones protruding from one layer into the other.
- C. Provide a standard depth of rock riprap of 12 inches unless otherwise indicated or directed. The absolute minimum depth of riprap is 10 inches. Provide an average rock riprap depth of 12 inches for each 25 square feet of surface.
- D. Place each stone so that the depth will be perpendicular to the surface upon which it is set. Place the length so that it will be against the adjoining stones. Place the stones in such a manner as to stagger all joints as far as it is possible and practicable.
- E. Thoroughly chink and fill the main stones with the smaller stones by throwing them over the surface in any manner that is practicable for the smaller stones to fill the voids. Continue this work with the progress of the construction. Tamping of the stones will not be required if the stones have been placed in a reasonable and satisfactory manner.
- F. Knapping of the stones will not be required except stone protruding more than 4 inches above what is considered the normal surface of the stones, in which case break down these stones to come within 4 inches of the normal surface.

3.6 PROTECTION OF STRUCTURES

- A. Carefully protect all structures from damage by equipment or impact of stones or blocks. Correct all damage at own expense.

END OF SECTION 31 37 00

SECTION 32 12 16

ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2	Products
3.1	Preparation
3.2	Construction
3.3	Quality Acceptance

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all Work in accordance with the Contract Documents.

1. Paving Removal (02 41 13.13)
2. Excavation and Fill (31 23 00)
3. Traffic Control (34 41 16.10)
4. Roadway Construction (34 71 00)

- C. This section provides general requirements for asphalt paving work associated with pipeline installation. However, it is the Contractor's responsibility to ensure all asphalt paving work meets the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.3 WORK INCLUDED

The Contractor shall furnish all labor, equipment, and materials necessary to install asphalt paving as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item. Submittals shall be as required by and in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. PRECONSTRUCTION CONDITIONS
Photographs or videotape, sufficiently detailed, of existing conditions of project site that might be misconstrued as damage, caused by debris, or construction material removal.

PART 2 - PRODUCTS

All PRODUCTS shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

PART 3 - EXECUTION

3.1 PREPARATION

Preparation shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

3.2 CONSTRUCTION

- A. Provide the Engineer and GCDWR at least one day's notice prior to beginning construction or prior to resuming production if operations have been temporarily suspended.
- B. All paving operations shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

3.3 QUALITY ACCEPTANCE

Quality Acceptance shall be in accordance with the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

END OF SECTION 32 12 16

SECTION 32 16 13

SIDEWALKS, CURBS, AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Quality Control
2.1	Materials
3.1	Preparation
3.2	Joints
3.3	Finishes
3.4	Construction
3.5	Curing

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all Work in accordance with the Contract Documents.

1. Paving Removal (02 41 13.13)
2. Cast-In-Place Concrete (03 30 00)
3. Excavation and Fill (31 23 00)
4. Asphalt Paving (32 12 16)
5. Traffic Control (34 41 16.10)
6. Roadway Construction (34 71 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.
 1. Where section numbers are identified throughout this specification, the reference is to the Georgia Department of Transportation Standard Specifications Construction of Roads and Bridges, latest edition.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to install concrete sidewalks, curbs, and gutters as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

1.5 QUALITY CONTROL

- A. Tolerances: Construct concrete surfaces within 0.05 feet of the indicated elevation on the Drawings, and deviating not more than 3/8-inch from a ten-foot straightedge placed anywhere on the surface.
- B. Strictly conform to requirements for compaction of subgrade, air entrainment of concrete, and curing of concrete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Concrete: All concrete shall be Class "A" in accordance with GDOT Standard Specifications Section 500.03, and have a 28-day compressive strength of 3,000 psi.
- B. Joint filler: Nonextruding joint material, furnished in a single piece for the full depth and width required for the joint, unless otherwise specified by the Engineer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate and compact the subgrade as specified in Section 31 23 00, true to the grade and cross section as indicated on the Drawings.
- B. Place forms or extrusion machine guides to exact elevation and location specified. Visually check forms and machine guides and adjust where necessary to ensure smooth curves and transitions in grade. Provide close spacing on curves to maintain a smooth curve.

3.2 JOINTS

- A. Expansion Joints: Install expansion joints at intervals as indicated on the Drawings, but not exceeding 40 feet for walks and curbs, and wherever new concrete abuts existing construction. Additional joints are to be placed at tangent points of circular curbs and other places where stresses may develop.
- B. Contraction (Control) Joints:
 - 1. Sidewalks: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing contraction joints in sidewalks shall be 3/4 inch deep and spaced at a distance equal to the width of the walk.
 - 2. Curb and Gutter: For formed work, use full depth steel forms to achieve contraction joints. For extruded work, cut contraction joints with a saw

immediately after concrete reaches adequate hardness to allow sawing. Contraction joints in curb and gutters shall be 1 ½ inch deep and spaced at 10 feet intervals.

3. Concrete flatwork: Cut joints with a saw immediately after concrete reaches adequate hardness to allow sawing. Contraction joint depth shall be ¼ of the concrete thickness. Spacing and pattern shall be as indicated on the Drawings, or as directed by the Engineer.
- C. Premolded expansion joint filler must be cut to full cross section of the proposed construction and shall extend the full depth, width, and length of the construction. Trim expansion joint material protruding after the concrete has been finished as directed by the Engineer or GCDWR. All longitudinal expansion joints shall be placed as indicated on the Drawings.

3.3 FINISHES

- A. Pedestrian and Wheelchair Ramps: Non-slip finish.
- B. All others: Broom finish.

3.4 CONSTRUCTION

- A. Place forms true to line, grade, and cross section, as indicated on the Drawings.
- B. Brace forms adequately before placing the concrete. Place concrete in forms and thoroughly tamp, vibrate or work it into all corners, removing air pockets. Allow forms to remain in place until the concrete has set sufficiently to hold its shape.
- C. Begin each phase of screed, float, and trowel and finish work as soon as the concrete can be properly worked. Completely finish sidewalks and flat work with forms in place.
- D. Remove forms on the front face of curbs as soon as the concrete will hold its shape and finish the face. For gutters, a strike-off template of the form and shape of the gutter shall be used to shape the top surface of the gutter. Round top edges of curb and edges of gutter using a radius tool matching the radius indicated on the Drawings. Finish the edges where templates have been removed or expansion joint material has been placed with an edging tool with a radius of not over 1/4-inch, and then all lines or marks removed with a wet brush.
- E. Remove all tool marks with a wetted brush or wooden float, and the finished surface shall present a uniform and smooth appearance.

3.5 CURING

- A. Cure concrete as specified in Section 03 30 00 Cast-In-Place Concrete.

END OF SECTION 32 16 13

SECTION 32 92 00
TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
1.5	Warranty
2.1	Seed
2.2	Sod
2.3	Topsoil
3.1	Preparation of Seeded or Sodded Areas
3.2	Seeding and Sod Replacement
3.3	Sod Removal/Replacement
3.4	Topsoil
3.5	Mulching
3.6	Watering
3.7	Maintenance

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Removal of Construction Material (02 42 11)
3. Clearing and Grubbing (31 11 00)
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Trees (32 93 43)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to properly restore all ground surfaces, irrespective of the type, which may be disturbed in the progress of Work required under this contract.

- B. These items shall include in general, but without limitation, the spreading of topsoil, fertilizing, seeding, sod placement/replacement, and mulching required to restore disturbed areas as necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. It is the intent of these specifications to place seed on all disturbed, non-established areas (i.e. cross-country easements, pasture, etc.); and to place topsoil and sod on all disturbed, established, improved areas (i.e. lawns or other well improved grass areas) that existed as such prior to construction. All disturbed areas are to be restored to same or better general conditions than existed prior to commencement of the Work. Items covered under this section are considered as permanent restoration. Areas disturbed outside the lines and limits of the right-of-way and easements indicated on the Drawings shall be restored at the expense of the Contractor, unless directed otherwise by GCDWR.
- C. Standard Specifications: The requirements of the manual for Erosion and Sediment Control in Georgia, latest edition, shall apply as applicable.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall include, but not be limited to product data for seed, fertilizer, agricultural limestone, vegetative mulch, sod and topsoil.
- C. The Contractor shall submit plans showing in detail, the type, location, fertilizer ratios, and percentage cover of all seeding and sodding to be used in construction.

1.5 WARRANTY

- A. All plantings, seeded or sodded, shall be guaranteed for a period of one (1) year after Final Completion of the project. Any areas showing evidence of settlement or loss of topsoil shall be rebuilt and replanted as required. Any plantings that are dead or dying during the Warranty Period must be replaced, and at Contractor's expense.

PART 2 - PRODUCTS

2.1 SEED

- A. Seed shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act. All seeds shall be furnished in sealed standard containers. The minimum percentage by weight of pure live seed in each lot of seed shall be as follows:

1. Seed Type	Percent
K31 Fescue	95
Material other than grass seed	<u>5</u>
Total	100

- B. The aggregate percent of material other than grass seed shall include all non-viable seed, chaff, bulbs, live seed of crop plants other than those specified above, harmless inert matter, and weed seed not exceeding 1.0% by weight of pure live seed and other material in the mixture.
- C. Commercial fertilizer shall be composed of a formula of 20-12-10 and shall conform to applicable Georgia 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, which becomes caked or otherwise damaged making it unsuitable for use, shall not be accepted.
- D. Agricultural limestone shall be an acceptable grade of ground limestone, ground dolomite, or a mixture of limestone and dolomite meeting the following physical and chemical requirements:

1. Gradation

<u>Standard Sieve Size</u>	<u>Maximum Percent (%) Retained</u>
No. 8, maximum	10
No. 100, maximum	75

- E. The vegetative mulch shall be the cereal straw from stalks of oats, rye, wheat, or barley. The straw shall be free of prohibited weed seeds and shall be relatively free of all other noxious and undesirable seeds. The straw shall be clean and bright, relatively free of foreign material and be dry enough to spread properly. If the above straw specifications cannot be met practicably, the foliage of the following plants may, with GCDWR's approval, be substituted: Smooth Brome, Timothy, Orchard Grass, Red Canary Grass, Tall Fescue, Red Top, Millet, Blue Stem, Indian Grass, Red Clover, White Clover, Alfalfa, Crimson Clover, Birds Foot Trefoils, and Vetch. The foliage shall be taken relatively free of noxious and undesirable seeds and foreign material. The asphalt emulsion shall be SS-1, SS-1h, CSS-1 or CSS-1h conforming to the requirements of AASHTO M140-70 or AASHTO M208-72.

2.2 SOD

- A. Turfgrass Sod: Complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture, strongly rooted, and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Bermudagrass, Carpetgrass, Axonopus, Centipedegrass, St. Augustinegrass, and Zoysiagrass.
- C. Turfgrass Species: Sod of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.5 percent weed seed:
 - 1. Full sun: Kentucky bluegrass, a minimum of three cultivars.
 - 2. Sun and partial shade: Proportioned by weight as follows:

- a. 50 percent Kentucky bluegrass.
 - b. 30 percent Chewings Red Fescue.
 - c. 10 percent Perennial Ryegrass.
 - d. 10 percent Redtop.
3. Shade: Proportioned by weight as follows:
- a. 50 percent Chewings Red Fescue.
 - b. 35 percent Rough Bluegrass.
 - c. 15 percent Redtop.

2.3 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7.4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
 2. The Contractor shall furnish topsoil free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated stone, plant stumps, large roots, litter, or other materials that are not integrally a natural component of good agricultural soils and which are harmful to or unnecessary for successful plant growth.

PART 3 - EXECUTION

3.1 PREPARATION OF SEEDED OR SODDED AREAS

- A. The sub grade for the areas to be seeded or sodded shall be brought to a uniform grade, free of large stones. Topsoil shall be uniformly graded, trimmed, and raked free from unsuitable material, ridges, bumps, or depressions. Over this area, spread agricultural lime at the rate of 50 pounds per 1000 square feet, and spread fertilizer uniformly on the surface of the ground at the rate of 35 pounds per 1000 square feet. Mix the lime and fertilizer uniformly into the top four (4) inches of the soil by suitable harrows, rotary tillers, or other approved equipment.

3.2 SEEDING AND NEW SOD PLACEMENT

- A. Sod of the same species as existing grass shall be placed on all established lawns and other established, improved grass areas, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. If sod species required is out of season at time of placement, seeding may be allowed as a temporary measure, and then only with Contractor obtained written permission from the affected property owner and approval from GCDWR, until such time as the sod species is in season and will be placed at that time. Sod shall be carefully placed and rolled to ensure good soil contact

- B. Seed may be placed on all non-established, disturbed areas, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. Seeding shall be performed using a properly proportioned mixture of inoculated seed approved for use in The Piedmont Region "Zone One" as detailed in the Manual for Erosion and Sediment Control in Georgia. Seeding shall only be permitted during the planting season listed for The Piedmont Region. All seeded areas shall be uniformly mulched immediately after seeding.
- D. The Contractor shall be responsible for maintaining all planted areas including, watering, and reseeding defective area until a stand of grass covering ninety percent (90%) of the entire stabilized area is established, and Final Acceptance of the Work by the Engineer is obtained. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and reseeded as required.
- E. Any deviations from grass species as specified, as indicated on the Drawings, or differs from existing grass; or alternatives proposed due to unavailability of seasonal grasses; or inappropriateness of sod or seeding due to the time of year; must be presented to, and approved by GCDWR, along with written approval by property owner obtained by Contractor.

3.3 EXISTING SOD REMOVAL AND REPLACEMENT

- A. On existing, well-established "sod" type lawns and other improved, well-established grass areas, in lieu of placing new sod, existing sod/grass may be removed and replaced at completion of construction in that area. Existing sod/grass shall be carefully removed, kept watered and alive, and replaced after backfilling has been properly completed. Sod replacement shall be performed using sod of type and grade of that which was disturbed. Sod shall be carefully placed and rolled to ensure good soil contact.

3.4 TOPSOIL

- A. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of four (4) inches shall be available. The Contractor shall furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source and from piles of uniform texture, drainage, and other characteristics so as to constitute a homogenous soil meeting the requirements of the Georgia Department of Transportation. Do not place topsoil containing frost or in muddy conditions. If utilizing existing material obtained from the initial excavation of the worksite for reuse as top soil, the Contractor must first obtain approval from GCDWR construction material testing representative as to suitability of its content, including approval of location and method of storage of topsoil for reuse.

3.5 MULCHING

- A. Uniformly mulch all seeded areas in a continuous blanket immediately after seeding. Apply the mulch so as to permit some sunlight to penetrate and the air to circulate and

at the same time shade the ground, reduce erosion, and conserve soil moisture. Approximately 25 percent of the ground shall be visible through the mulch blanket.

- B. Hold mulch on slopes greater than 3 to 1 ratio in place by the use of an approved mulch binder. Thoroughly mix binder and apply with the mulch. Apply emulsified asphalt or cutback asphalt at the approximate rate of 5 gallons per 1,000 square feet as required to hold the mulch in place.
- C. 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. Apply mulch and binder by suitable blowing equipment at closely controlled application rates.

3.6 WATERING

- A. Maintain the proper moisture content of the soil to insure adequate plant growth until a satisfactory stand is obtained. If necessary, perform watering to maintain an adequate water content in the soil.
- B. Accomplish watering by hoses, tank truck, or sprinklers in such a way to prevent erosion, excessive runoff, and overwatered spots.

3.7 MAINTENANCE

- A. After the grass has grown to a height of 2 inches and before final acceptance, apply one additional application of nitrogen at the rate of 50 lbs/acre.
- B. 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 the foliage is damp. Do not apply nitrogen between October 15 and March 15 except in Zone 4. Mow grass at regular intervals to maintain at a maximum height of 2-1/2 inches. Do not cut more than 1/3 of grass blade at any one mowing.
- C. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- D. Immediately reseed areas that show bare spots.
- E. Apply fertilizer at approximately 600 lbs/acre each spring after initial plant establishment until Final Acceptance.
- F. The Engineer may require replanting of an area that shows unsatisfactory growth for any reason at any time. Except as otherwise specified or permitted, prepare replanting areas according to the Specifications as if they were the initial planting areas.

END OF SECTION 32 92 00

SECTION 32 93 43

TREES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Trees
2.2	Tree Save Barrier Fence
3.1	Warranty
3.2	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Removal of Construction Material (02 42 11)
3. Clearing and Grubbing (31 11 00)
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to install select nursery trees or riverbank joint plantings for creek crossings, and install tree save barrier fence to protect designated trees, vegetation, and construction areas, to direct construction work activity away from protected areas, as indicated on the approved Drawings.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.

- B. The Contractor shall submit detailed plans for tree planting, including location and spacing, hole size, fertilizer rates, and staking requirements.

PART 2 - PRODUCTS

2.1 TREES

- A. All trees shall be nursery grown.
- B. Trees shall be a minimum of 2 inches in diameter as measured 12 inches above the ground. Trees shall be a minimum of 8 feet tall. The exact species of trees and river bank joint plantings must be approved by the Engineer or GCDWR prior to planting.
- C. Refer to Contract Documents for type, size, and quantity.

2.2 TREE SAVE BARRIER FENCE

- A. Materials for tree/vegetation and construction safety protection barriers shall conform to the following requirements:
 - 1. Mesh Safety Barrier Fencing (orange color) as manufactured by Tenax, or approved equal.
 - 2. Posts shall be a minimum length 6 feet, and made of wood or steel. Wood posts shall be 1½" x 1½" hardwood and made from Ash, Hickory, or Oak. Steel posts shall be "U", "T", or "C" shaped with a minimum weight of 1.3 pounds per foot, and have projections for fastening the mesh fabric to the posts.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Tree Save Barrier Fencing: Install temporary tree save barrier fencing as designated on the Drawings, or where directed by the Engineer or GCDWR, to protect remaining vegetation from construction damage. Maintain temporary fencing and remove when construction is complete.
- B. The tree save barrier fencing shall be constructed of orange color safety barrier fencing securely fastened to fence posts spaced a maximum of 5 feet on center. Posts are 6 feet in length with 2 feet set into the ground, and 4 feet extending above ground. The fencing shall be attached to the post with a minimum of four (4) nylon-locking ties, evenly placed at each post.

3.2 WARRANTY

- A. All trees and riverbank plantings shall be guaranteed for a period of one (1) year after substantial completion of the project. Any trees or plantings that are dead or dying during the Warranty Period must be replaced, and at Contractor's expense.

- B. Damaged temporary fencing shall be repaired or reinstalled as directed by the Engineer or GCDWR, and at Contractor's expense.

3.3 WORKMANSHIP

- A. All trees shall be delivered with a burlap root bag, and installed with supporting wires when necessary. Riverbank planting shall be provided by an individual experienced with such plantings and their installation. Riverbank joint plantings shall be installed according to the directions of the supplier. The proposed location of trees must be marked with a stake and approved by the Engineer or GCDWR prior to planting.
- B. All tree save barrier fencing shall be properly maintained during the construction period. Damaged temporary fencing shall be repaired or reinstalled as directed by the Engineer or GCDWR.

END OF SECTION 32 93 43

SECTION 33 05 16.13

PRECAST CONCRETE UTILITY STRUCTURES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
2.2	Precast Manhole Sections
2.3	Precast Box Sections
2.4	Aluminum Access Hatches
3.1	Construction
3.2	Frames and Covers
3.3	Drop Manholes
3.4	Steps
3.5	Adjusting Manhole Frame and Cover to Grade
3.6	Air Release Manhole Vent Adjustment

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents. Some sections may not be included in the specifications depending on the type of project, water or sewer.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Rehabilitation of Sewer Utilities (33 01 30.71).
4. Bypass Pumping (33 01 30.74).
5. Ductile Iron Pipe (33 11 13.05).
6. Air Release and Vacuum Valves (33 12 16.10 and 33 12 16.12).
7. Sanitary Utility Sewerage Piping (33 31 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, tools, labor, and equipment necessary to install precast concrete utility structures including manholes, concrete boxes, and appurtenances as detailed on the Drawings, including excavation and

foundation cushion, base sections, riser sections, cone and flat top, frame, and cover as required for the proper completion of this Work.

- B. Standard precast concrete manholes shall include all manholes built with standard precast 48-inch interior diameter riser, and eccentric cone section complete with steps and must be fully operational. **The use of T-base type manholes is prohibited.**
- C. Manholes larger than Standard 48-inch base shall include the base and a flat top reducer section to transition to a 48-inch diameter riser section.
- D. Additional vertical feet of 48-inch manhole sections shall include all riser and cone sections complete with steps generally used in conjunction with manhole bases larger than 48 inches in diameter, cast-in-place manholes or subsurface chambers.
- E. Manhole drops shall include all exterior drop pipe additions to manholes complete with drop pipe, pipe encasement, excavation and foundation cushion.
- F. Manhole coring shall include all work to core into an existing manhole or structure and the furnishing and installation of a flexible manhole boot. The manhole coring shall not be backfilled until approved by GCDWR. Manholes must be cored using an industry standard coring machine and shall not be performed using any type of hammer, chisel, jackhammer, or other method.
- G. Construct manhole frame and cover to grade as follows:
 - 1. Manholes in unpaved, unmaintained areas shall be 18-inches above finish grade;
 - 2. Manholes in unpaved, maintained areas shall be "flush" with the ground;
 - 3. Manholes in paved areas shall be to finish grade.
- H. Adjust manhole frame and cover to grade. Manholes needing adjustment to grade greater than one (1) foot must use manhole riser section and final adjust frame and cover with a maximum of three (3) courses of brick.
- I. Following adjustment of concrete structure top, the disturbed area shall be restored to match the existing surrounding area.
- J. Cast manhole frames and covers shall include all frames, covers, and brick work used in conjunction with precast or cast-in-place concrete manholes or subsurface chambers.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the size, location, dimensions, and accessories of all manholes to be used in construction. Include information for frames, covers, grates, sealants, connectors, waterproofing, steps, grout, and other materials required. The Contractor shall receive approval from the Engineer, before any material may be delivered at the jobsite.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All materials shall be new. All Work shall be performed and finished in a workmanship manor. The precast concrete structures, rings and covers, and aluminum access hatches shall conform to the standards specified in this section. Precast concrete structures shall not be supported on the pipe or valve. Structures shall rest on a #57 crushed stone bedding foundation cushion having a minimum thickness of twelve inches (12"). Structures shall have a proper cut out, shape, and coring to fit valve and pipe.

2.2 PRECAST MANHOLE SECTIONS

- A. Precast manhole riser and cone sections shall be of the dimensions indicated on the Drawings, or required, and shall meet the latest requirements of ASTM Des. C-478, latest revision. Risers shall be a minimum 48-inch interior diameter, machine made with tongue and groove ends. Joints shall be jointed by an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints". Type 1, rope form (Kent Seal or approved equal).
- B. Manhole bases shall have inside diameters based on the size and type of pipe being connected to the manhole as specified, as indicated on the Drawings or as directed by the Engineer or GCDWR. Where sixty inch (60") diameter and larger bases are used, a flat top reducer section shall be used to transition to a forty-eight inch (48") diameter riser section.
- C. Cone tops shall be eccentric type. No concentric cones will be allowed.
- D. Manhole wall thickness shall be in accordance with the following schedule:

<u>Manhole diameter</u>	<u>Wall thickness</u>
48"	5 inches
60"	6 inches
72"	7 inches
84"	8 inches
96"	9 inches

- E. Should precast reinforced concrete manhole sections be brought to the site of the Work which are deemed unacceptable in quality by the Engineer or GCDWR, the Contractor shall at once remove the same and shall not offer that item again for inspection. No refurbished or repaired manhole specified herein shall be permitted for installation.

2.3 PRECAST BOX SECTIONS

- A. Precast concrete box base and riser sections shall be of the dimensions indicated on the Drawings, or required, and shall meet the latest requirements of ASTM Des. C-478 Rev. B. Risers shall be a minimum forty-eight inch (48") interior diameter, machine made with tongue and groove ends. Joints shall be jointed by an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing

- Compound, Preformed Plastic for Pipe Joints". Type 1, rope form (Kent Seal or approved equal).
- B. Precast concrete box bases shall have inside dimensions based on the size and type of pipe being connected to the box as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
 - C. Precast concrete box wall thickness shall be a minimum of eight inches (8") with a HS20 live load rating and a maximum burial depth rating of thirty-two feet (32').
 - D. Precast concrete box base slab thickness shall be a minimum of ten inches (10"). If indicated on the Drawings, or required, for resistance of buoyancy forces, base slab extensions shall be provided.
 - E. Monolithic tops shall be provided for precast concrete boxes. Tops shall be rated for a HS20 live load with either a standard cast iron manhole ring and cover cast into the top, or an aluminum access hatch cast into the top as indicated on the Drawings. Aluminum access hatches shall meet the requirements of these specifications, paragraph 2.4.
 - F. Should precast, reinforced concrete box sections be brought to the site of the Work which are deemed unacceptable in quality by the Engineer or GCDWR, the Contractor shall at once remove the same and shall not offer that item again for inspection. No refurbished or repaired box sections shall be permitted for installation.

2.4 ALUMINUM ACCESS HATCHES

- A. Aluminum hatches installed on precast concrete vaults outside of the road right-of-way shall be designed for a live load of three hundred pounds per square foot (300 lbs./SF), with a maximum deflection of 1/150th of the span.
- B. Aluminum hatches installed on precast concrete vaults within the road right-of-way shall be designed for a HS20 live load.
- C. Aluminum hatches shall be constructed of ¼" aluminum diamond plate. Channel frame shall be ¼" aluminum with an anchor flange around the perimeter, and have a minimum cross-sectional area of seven and one-half square inches (7½ sq. in.) to allow for adequate water drainage. Door shall be equipped with heavy forged brass hinges with stainless steel pins. Spring operators shall be provided for smooth, easy, and controlled door operation throughout the entire arc of opening and closing. Operation shall not be affected by temperature. The door shall automatically lock in the vertical position by means of a heavy steel hold-open arm with release handle. A type 316 stainless steel snap lock with a gasketed cover plug and removable handle shall be provided. A 1½" drainage coupling shall be located in the front right corner of the channel frame. All hardware shall be type 316 stainless steel. Factory finish shall be mill-finish with bituminous coating applied to all surfaces in contact with concrete.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Base: Manhole bases shall be precast and shall be of the size and minimum thickness, as specified, as indicated on the Drawings, or as directed by the Engineer. Vault or other concrete box bases may be precast, or cast-in-place, if approved by the Engineer. Cast-in-place box bases shall be Class 'A' concrete conforming to the requirements of Section 03 30 00 CAST-IN-PLACE CONCRETE. Bases shall be placed on a twelve inch (12") foundation cushion comprised of #57 crushed stone bedding, and suitable provision shall be made to assure a watertight connection of the pipe to the manhole. Manufactured holes in precast base section shall be provided with an annular clear opening around pipe of a minimum four inches (4"). Openings in base sections shall be precast at the factory at locations and heights as specified, as indicated on the Drawings, or as directed by the Engineer. Knocking out of holes in the field shall not be permitted. Holes in precast bases to receive sewer pipes shall be provided with flexible manhole boots of high quality synthetic rubber, which shall be A-Lok, Z-Lok, Kor-N-Seal Flexible Connectors manufactured by NPC Systems, Inc., or approved equal. The outer end of the boot shall fit around the outside of the pipe and shall be secured to the pipe by means of a stainless steel strap clamp. The synthetic rubber shall be suitable for use in sanitary sewage service.
- B. Risers: Manhole risers and box risers shall be constructed of precast reinforced concrete unless otherwise specified or indicated on the Drawings.
- C. Cones: Manhole cone and slab top reducers shall be constructed of precast concrete. A maximum of four (4) courses of brick shall be used to adjust the elevation of the manhole frame and cover to finished grade. Eccentric manhole cones are required.
- D. Precast Risers Rings (or Grade Rings): are to be used to bring the manhole up to grade.
- E. Vault Boxes: shall have a crushed stone bottom. Vault tops shall be accurately cored to accommodate valve operator, and shall be fitted with a flat slab top.
- F. The top of the wall of all manholes shall be leveled off with mortar so as to form a flat surface upon which the manhole frame is to rest. Manholes shall be carried to such height above sewers as indicated on the Drawings, or as directed by the Engineer.
- G. After joints between precast sections have been made, the inside of the joint opening shall be sealed by troweling in a cement mortar to a minimum one and one half inch (1½") thickness.
- H. Inverts and tables shall be precast, and shall have the same radius as the outflow pipe. Invert walls shall be constructed to a height corresponding to the spring line of the influent and effluent pipes with smooth rounded walls. Inverts shall be appropriately channeled for all stub connections to the manhole.
- I. The flow channel through manholes shall be made to conform in shape and slope to that of the sewers. Minimum drop through manhole shall be two tenths feet (0.2'), or as specified, as indicated on the Drawings, or directed by the Engineer, to prevent solids deposition. Tables are to be gently sloped and troweled smooth from manhole wall to invert wall height and constructed of aggregate-mix cement with smooth, veneer finish.
- J. All aluminum in contact with concrete shall have been painted with a coal tar pitch paint.

3.2 FRAMES AND COVERS

- A. A cast iron/ductile iron frame and cover shall be cast with the following wording "Gwinnett County Water" Or "Gwinnett County Sewer", depending on the application.
- B. Use 'Traffic' frame and cover for structures under pavement, and areas not subject to flooding. Provide heavy duty Vulcan Foundry No. V-1357, or approved equal.
- C. Use 'Bolt Down' frame and cover for structures outside of pavement and in areas subject to flooding. Provide Vulcan Foundry V-2358 watertight, or approved equal.
- D. Traffic frames and covers shall be properly set in place in full bed of mortar and adjusted so as to make the top of the frame conform to the finished surfaces when located in street and public highways. In other locations, they shall be so adjusted as to conform to such elevations as are indicated on the Drawings, or as directed by the Engineer.
- E. Bolt Down frames and covers shall be cast into the precast manhole cones or slab tops at the place of manufacture of the concrete structure, unless Drawings indicate that an adjustment to exact elevation is required. In that case, Bolt Down frames and covers shall be set as described for Traffic frames and covers.
- F. Manholes in wooded or non-maintained areas shall be a minimum of 18 inches above ground level. Manholes on sloped ground in unmaintained areas shall be a minimum of 18 inches above ground on the uphill side of the manhole. The cast iron frame shall be cast into the concrete cone. Manholes in maintained grass areas shall be flush with the finished grade.

3.3 DROP MANHOLES

- A. Manhole outside drops shall be provided for any size sewer line (including 6") entering manhole at an elevation of twenty-four inches (24") or greater above the manhole invert, or at such other locations as indicated on the Drawings, or directed by the Engineer. Drop connections shall be constructed using either ductile iron pipe (DIP) or PVC, whichever material matches incoming pipe material. Ninety degree (90°) elbows shall have a concrete thrust block poured below the elbow. Maximum inside drop allowed is twenty-four inches (24").

3.4 STEPS

- A. Steps shall be M.A. Ind. Inc. # PS-1-PF, or approved equal, and shall be built into the precast concrete risers of the manholes. The uppermost step shall not be over twelve (12") inches below the cast iron manhole frame, and these steps shall be continued in alignment downward along the interior vertical side of the manhole to a point no lower than the crown of the largest pipe. All steps shall be built into the precast concrete risers and shall be spaced not more than twelve (12") inches apart. Steps shall be placed directly above each other and not staggered. Steps shall not descend over any pipe connection into the manhole, unless approved by the Engineer or GCDWR.

3.5 ADJUSTING MANHOLE FRAME AND COVER TO GRADE

- A. Where indicated on the drawings and/or directed by the Engineer, the Contractor shall adjust the elevation of manhole frames and covers to be flush with the proposed finished grade. The Contractor shall use brick and mortar or precast concrete grade rings to raise the frame and cover to the correct elevation and re-grout the frame in place to secure it to the manhole. In no case shall more than four (4) courses of brick or four grade rings be used for adjustment. If adjustment requires more than four (4) courses, a new manhole riser section shall be installed below the top cone section and the frame and cover adjusted thereafter.

3.6 AIR RELEASE MANHOLE VENT ADJUSTMENT

- A. The Contractor shall adjust the elevation of air release manhole vent pipes as required and/or directed by the Engineer. The vent adjustment shall be made by either: removal of the vent pipe from the manhole and replacement with a new vent pipe of the required length, or by cutting and welding new pipe sections into the existing vent pipe. If a complete new vent pipe is installed, the Contractor shall properly grout and support the new vent pipe into the existing manhole structure. Upon completion of the vent pipe installation, the Contractor shall repaint the vent pipe to match the existing vent pipe using one coat of primer and two coats of acrylic epoxy paint as approved by the Engineer.

END OF SECTION 33 05 16.13



SECTION 33 05 23.16
UTILITY PIPE JACKING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Overview
1.4	Work Included
1.5	Qualifications
1.6	Submittals
2.1	Materials
3.1	General
3.2	Maintaining Traffic and Public Safety
3.3	Steel Casing – Jack and Bore
3.4	Steel Casing - Open Cut Installation
3.5	Uncased Boring/Free Bore

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Brick Masonry (04 21 13).
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00).
7. Traffic Control (34 41 16.10).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 OVERVIEW

- A. The Contractor shall be held fully responsible for protecting against surface subsidence, damage, or disturbance to adjacent property and facilities from Contractor's construction methods. In case loose material is encountered and cave-ins occur or are anticipated, all jacking/auguring shall be discontinued, shoring shall be provided and all voids filled or pressure grouted. Supplemental measures and alternative methods must receive approval of the Engineer before jacking/auguring operation recommences. Any

settlement or upheaval of the existing roadway pavements during the jacking and boring operation, and throughout the warranty period, shall be repaired/restored at the Contractor's expense.

- B. Following completion of the jacking operations, the carrier pipe shall be inserted within the casing; its invert placed upon approved skids or casing insulators (for mains with diameters of 6-inches or greater), previously set on inner-base of the casing. The ends of the casing shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- C. All jacking/auguring operations must be performed in compliance with the rules and regulations of the Gwinnett County Department of Transportation (GCDOT), State of Georgia Department of Transportation, or other authorities having jurisdiction.
- D. All sheeting placed for the jacking/auguring operation must be completely removed by the Contractor prior to backfill.

1.4 WORK INCLUDED

- A. The Contractor shall under this item, furnish all material, labor, tools, and equipment necessary for the complete installation of an uncased boring, jacked steel casing, free bore, or installation of steel casing by open-cut method, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. The Work shall include, but is not limited to: bore pit excavation, sheeting, shoring, plating, and installing safety barriers for the protection of workers, vehicular and pedestrian traffic, and the general public; steel pipe casing, skids, excavation, rock excavation, backfill, restoration of site, grout, brickwork, earth augers, jacking machine, welder, and other accessories necessary for a complete installation as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. When the bore pit excavation and/or the jacking/augering operation occurs along existing right-of-way, care must be taken to ensure all Work is performed within the right-of-way, or arrangements must be made with the owner of the affected property to permit any encroachment onto the affected property.

1.5 QUALIFICATIONS

- A. Utility pipe jacking operations shall be performed by a qualified contractor who has constructed at least five (5) similar installations, which were constructed within one (1) year of each other, and have been in continuous successful operation for not less than five (5) years.

1.6 SUBMITTALS

- A. Submit to the Engineer, per the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, evidence of Utility Pipe Jacking experience as specified in paragraph 1.5.A. of this specification.
- B. The Contractor shall submit for approval to the Engineer, GCDWR, GCDOT, (and Georgia DOT when work is within a state road right-of-way), all working drawings and

schedules of procedure proposed to be followed in the prosecution of the Work under this item.

- C. Working drawings shall show in detail, the size and location of jacking pits together with all sheeting and shoring to be used in supporting embankments, trench walls, and all other structural details together with large scale plan and profile of the proposed jacked installation and affected structures.
- D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
- E. Contractor shall not proceed with the Work until final approval has been given by the Engineer, GCDWR, GCDOT, and/or GDOT.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Steel casing pipe shall conform to the requirements of ASTM A139, Grade A.
- B. For steel casing pipe up to twenty inch (20") diameter, wall thickness shall be a minimum of 0.375 (3/8) inch, with the pipe having sufficient strength to withstand superimposed loads and jacking stresses. For steel casing pipe twenty four inch (24") and greater, wall thickness shall be a minimum of 0.500 (1/2) inch.
- C. Subject to compliance with requirements, provide products of smooth wall steel pipe.

PART 3 - EXECUTION

3.1 GENERAL

- A. Unless otherwise specified, the ends of casings shall be sealed with brick bulkheads using brick and mortar.

3.2 MAINTAINING TRAFFIC AND PUBLIC SAFETY

- A. All working operations of the Contractor, their subcontractor(s), and/or their agents or employees, must be subordinated to the free and unobstructed use of the roadway, and structures encountered in the execution of jacking and boring operations.
- B. The Contractor shall proceed with the Work in such a manner as will permit: regular transaction of business by commercial operations adjacent to the project site, without delay or danger to persons or property; free access to and from private residences; and will allow the safe flow of traffic and pedestrians around the work site. The Contractor shall employ the use of traffic control devices as necessary, as specified in Section 34 41 16.10 TRAFFIC CONTROL. The Contractor shall suspend all operations relating to jacking and boring until necessary safety precautions have been met.
- C. Schedules shall set forth the sequence of the various operations, together with the time proposed to begin and complete the phases of the Work.

3.3 STEEL CASING – JACK AND BORE

- A. The Contractor shall jack a steel casing pipe as indicated on the Drawings, using a special earth auger machine. The casing shall be jacked to the line and grade indicated on the Drawings.
- B. Each joint of casing shall be **fully** welded around its entire circumference to the adjacent joint prior to being jacked.
- C. All steel casing buried underground or submerged shall have a standard bituminous outside coating conforming to AWWA Standard Specifications.
- D. Following completion of the jacking operations, the carrier pipe shall be inserted within the casing and its invert supported by pre-fabricated casing spacers. The ends of the casing shall be sealed with brick bulkheads using brick and mortar.

3.4 STEEL CASING - OPEN CUT INSTALLATION

- A. Where indicated on the Drawings, or permitted or directed by the Engineer or GCDWR, the Contractor shall place the steel casing directly in an open ditch for subsequent installation of a carrier pipe after backfill. Except for the method of installation, all requirements of this item shall apply. Ditch preparation, backfill, and compaction shall be as required for direct-bury ductile iron pipe.

3.5 UNCASSED BORING / FREE BORE

- A. When indicated on the Drawings, or permitted or directed by the Engineer or GCDWR, the Contractor shall use a special earth auger machine to bore a controlled hole to the line and grade, as indicated on the Drawings. Said hole shall be of a constant diameter, which shall not exceed four (4) inches larger than the bell diameter of the proposed carrier pipe, and shall be maintained until the pipe is installed through the hole. If the annular space between the earthen hole and the carrier pipe exceeds six (6) inches, then the Contractor shall fill such space by pressure grouting or pumping in a flowable fill to eliminate possible settlement.
- B. At no time will free bores in excess of forty feet (40') be permitted.

END OF SECTION 33 05 23.16

SECTION 33 05 23.71

TUNNEL LINING

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Overview
1.4	Work Included
1.5	Qualifications
1.6	Submittals
2.1	Manufacturers
2.2	Materials
3.1	Bulkheads
3.2	Construction Procedure
3.3	Excavation
3.4	Grouting
3.5	Liner Plates
3.6	Bypass Pumping
3.7	Safety Precautions

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Exploratory Excavations (02 32 19).
2. Cast-in-Place Concrete (03 30 00).
3. Brick Masonry (04 21 13).
4. Excavation and Fill (31 23 00).
5. Erosion and Sedimentation Controls (31 25 00).
6. Turf and Grasses (32 92 00).
7. Bypass Pumping (33 01 30.74).
8. Traffic Control (34 41 16.10).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 OVERVIEW

- A. The method of construction for tunnel liner and manner of doing work shall be that selected by the Contractor but subject, at all times, to the prior approval by the Engineer and GCDWR. Unlined tunneling shall not be permitted.

1.4 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all materials, labor, tools, and equipment necessary for the complete installation of a lined tunnel, as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. The Work shall include, but is not limited to: excavation, liner plates, sheeting, grouting operation, brickwork, cradles, bases, fills, bolts, and other appurtenances; furnishing the services of qualified representatives of the liner plate manufacturer, and all labor, supervision, materials, tools, and accessories necessary to complete the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.5 QUALIFICATIONS

- A. Tunneling operations shall be performed by a qualified contractor who has constructed at least five (5) similar installations, which were constructed within (1) year of each other and have been in continuous successful operation for not less than five (5) years.

1.6 SUBMITTALS

- A. Submit to the Engineer, per the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, evidence of Tunnel Lining experience as specified in paragraph 1.5.A. of this specification.
- B. The Contractor shall submit to the Engineer, GCDWR, GCDOT, (and GDOT when work is within a state road right-of-way), all working drawings and schedules of procedure the proposed to be followed in the prosecution of the Work under this item.
- C. Working drawings shall show in detail the means and methods of tunneling operations together with all sheeting and shoring, materials of construction and installation, and all other structural details together with large scale plan and profile of the proposed tunneled pipe installation and affected structures.
- D. Schedules shall set forth the sequence of the various operations together with the time the Contractor proposes to begin and complete the several phases of the Work.
- E. The Contractor shall not proceed with the Work until final approval has been given by the Engineer, GCDOT, and/or GDOT.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with the requirements, provide products by one (1) of the following: Warren, Contech, Commercial Pantex Sika Inc., or approved equal.

2.2 MATERIALS

A. TUNNEL LINER PLATES

1. Have the panels formed inward and made at least of No.8 gauge (.1644 inches) standard tunnel liner plates for Warren and Commercial liner plates and at least of No.10 gauge (.1345 inches) tunnel liner plates for Contech liner plates and be coated per GCDOT specification.
2. The plates shall be hot rolled, cold formed steel conforming to ASTM: A1011/A1011M with the following mechanical properties before cold forming:

Tensile strength =	49,000 psi
Yield strength =	30,000 psi
Elongation, 2 inches =	25%

PART 3 - EXECUTION

3.1 BULKHEADS

- A. The ends of the tunnel liner shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. All sheeting placed for the tunnel operations must be completely removed by the Contractor.

3.2 CONSTRUCTION PROCEDURE

- A. Unless otherwise specified or approved by the Engineer, follow the construction procedure outlined in paragraphs 3.3. Excavation, 3.4 Grouting, 3.5 Liner Plates, 3.6 Bypass Pumping, and 3.7 Safety Precautions, of this specification.

3.3 EXCAVATION

- A. Excavate and dispose of all materials whatever character encountered, including rock, within the external limits of the tunnel, in such a manner as to assure no settlement in the ground or structures over or near the tunnel. Conform to the outside of the tunnel section as nearly as possible.
- B. Fill voids formed outside of liner plates by the removal of rock by packing with cement mortar as directed by the Engineer or GCDWR.
- C. In the finished excavations, no deviation in excess of four (4) inches from the lines and grades given shall be tolerated. Remedy any excess deviation.
- D. Where tunneling is done with the use of a shield, Contractor shall have the shield designed by an experienced designer, subject to the approval of the Engineer. Make shield structurally sufficient to carry all loads that may be imposed upon it and equip it with steering devices and a sufficient number of jacks to propel the shield accurately to line and grade. Carry jack reactions into the liner plates and sufficient number of rings back of the shield to properly distribute the thrust. Use timber breastworks if necessary

to cause the angle of repose of the excavated material to fall within the limits of the shield.

- E. If poling plates are used in lieu of a shield, make of steel and of an interlocking design adequate for the Work.

3.4 GROUTING

- A. Grout the space between the plates and the excavation. As specified, as indicated on the Drawings, the carrier pipe shall be inserted into the space inside of the liner plates; placed upon approved skids or insulators (for mains with diameters of 6-inches or greater) previously set in the tunnel. The ends of the tunnel shall be sealed with brick bulkheads using brick and mortar meeting requirements of Section 04 21 13 BRICK MASONRY, and as indicated on the Drawings.
- B. Grouting shall be subject to the direction of the Engineer or GCDWR. All voids in the area outside the plates shall be pressure grouted every 10 feet, at the end of the work shift, or more frequently if soil conditions dictate. Before grouting any segment of tunnel liner, that segment shall be sealed sufficiently between the liner plates and the surrounding soil to retain the grouting pressure. These seals shall be located as follows:
 - At the entrance of the tunnel
 - Between grout intrusion nipples
 - Within one (1) foot of the end of the tunnel at the end of the work shift
- C. Perform grouting by a suitable machine, capable of forcing grout into all voids which it is desired to fill. A maximum pressure of 50 pounds per square inch at the grouting nipple may be required.
- D. Make grout of Portland Cement and water as specified, as indicated on the Drawings, or as directed by the Engineer. Where large voids are to be filled, fine sand in a proportion of not more than two (2) parts of sand to one (1) part of cement, may be used as directed by the Engineer.
- E. Take care to avoid causing grout to flow into pipes or conduits. If grout flows into pipe or conduits, remove it.

3.5 LINER PLATES

- A. Line tunnel excavation with rolled or pressed steel liner plates of the quality and type herein specified. Assemble liner plates in a true circle having an outside diameter in place as specified, as indicated on the Drawings.
- B. Provide at least one-sixth ($1/6^{\text{th}}$) of the plates with grout holes; tapped for 1- $1/2$ inch pipe and provide with cast iron screw plugs.
- C. Steel liner plates shall be installed as soon as possible, but no more than five feet (5') of tunnel shall remain unlined while tunneling operations are in progress. Not more than one foot (1') of tunnel shall be left unlined at the end of the day's operation.
- D. Liner plates shall be installed in accordance with the manufacturer's recommendations and shall be self-supporting.

- E. Punch all plates for $\frac{3}{4}$ inch bolts and use all bolt holes in installing. Upon completion of any ring of liner plates, retighten bolts in the two (2) rings previously completed.
- F. The use of steel liner plates shall not relieve the Contractor of full responsibility to properly shore, brace, and protect the tunnel excavation. Provide such temporary supports as may be necessary to properly support the face of headings and the roof and sides of the tunnel until the sewer pipe has been installed and the cradle and sand or grout fill has been placed.
- G. Completely excavate, place the steel lining, and grout each section of tunnel as specified, as indicated on the Drawings, or as directed by the Engineer for the entire distance between shafts or headings before pipe is placed.
- H. Damaged spelter coating shall be repaired in accordance with Georgia Department of Transportation Standard Specifications Section 645. Any plates having damaged spelter or bituminous coatings shall be repaired or replaced at the Contractor's expense.

3.6 BYPASS PUMPING

- A. Furnish and maintain adequate temporary bypass pumping equipment with proper standby units meeting requirements of Section 33 01 30.74 BYPASS PUMPING, to permit the concrete and pipe to be placed in the dry. Continue bypass pumping until all concrete and grout has received its' initial set.

3.7 SAFETY PRECAUTIONS

- A. The tunneling operation is to begin in a pit sheeted and shored as necessary, and begin at and proceed from one end. All of the applicable requirements of Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Section 615, latest edition shall be observed. The Contractor shall conduct the operations in such a manner that all Work shall be performed below the level of the roadbed. The Contractor shall be responsible for coordinating and scheduling all of the Work with the Georgia Department of Transportation (GDOT), or Gwinnett County Department of Transportation (GCDOT), whoever has jurisdictional authority for the roadway being tunneled.
- B. All tunneling Work, at one particular location, shall be completed before Work is started at another location.
- C. If the tunnel installation Work is being conducted in a manner detrimental to the over passing roadway, or to the safety of the traveling public, all operations of tunneling shall cease until the necessary safety precautions have been made. In the event that distress occurs to the roadway due to the tunneling, the Contractor shall be required to submit to the Engineer, for approval by GDOT or GCDOT, a plan to repair the roadway as well as incur the costs of repair.
- D. A temporary bulkhead against the face of the excavation shall be provided and well braced during each cessation of work while the heading is within twenty feet (20') of railroad tracks or highway pavement.

- E. Furnish and maintain an adequate forced ventilation installation and comply with all the requirements and regulations of the State of Georgia and such other public bodies as have jurisdiction.
- F. Do not consider air from pneumatic tools and equipment as ventilating air. Make suitable provisions for abating dust during construction.
- G. Make first aid equipment appropriate to Work of this nature, available at all times.
- H. Furnish and maintain an adequate lighting system as required by the Work, or as directed by the Engineer.
- I. Provide and maintain all shoring and sheeting necessary for the safety of workers.

END OF SECTION 33 05 23.71

SECTION 33 11 13.05
DUCTILE IRON PIPE (WATER)

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Submittals
1.4	Quality Assurance
1.5	Delivery, Storage, and Handling
1.6	Warranty
2.1	Manufacturers
2.2	Materials
3.1	Thrust Restraint
3.2	Chlorination of Pipelines and Accessories
3.3	Connections to Existing Lines
3.4	Cutting Pipe
3.5	Inspection
3.6	Marking
3.7	Storing and Materials
3.8	Tapping
3.9	Testing
3.10	Unloading and Laying

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Erosion and Sedimentation Controls (31 25 00).
4. Turf and Grasses (32 92 00).
5. Precast Concrete Utility Structures (33 05 16.13).
6. Utility Pipe Jacking (33 05 23.16).
7. Water Service Connections (33 12 13).
8. Water Utility Distribution Valves (33 12 16).
9. Air Release and Vacuum Valves – Water (33 12 16.10).
10. Water Utility Distribution Fire Hydrants (33 12 19).
11. Relocate and Reconnect Hydrants, Valves, and Meters (33 12 19.81).
12. Traffic Control (34 41 16.10).
13. Roadway Construction (34 71 00).

1.2 REFERENCES

A. Reference Standards

1. American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - a. ANSI/AWWA C104/A21.4: Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
 - b. ANSI/ AWWA C105/A21.5: Polyethylene Encasement for Ductile-Iron Pipe Systems
 - c. ANSI/ AWWA C110/A21.10: Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids
 - d. ANSI/ AWWA C111/A21.11: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 - e. ANSI/ AWWA C115/A21.15: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
 - f. ANSI/ AWWA C150/A21.50: Thickness Design of Ductile-Iron Pipe
 - g. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast for Water
 - h. ANSI/ AWWA C153/A21.53: Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service
 - i. ANSI/ AWWA C600: Installation of Ductile-Iron Water Mains and their Appurtenances
 - j. ANSI/ AWWA C606: Grooved and Shouldered Joints
 - k. ANSI/ AWS D11.2: Guide for Welding Iron
2. Hereafter in this specification the specific referenced ANSI/AWWA standards are referred to either by their full description as in the first column of the above standards list, or only by their abbreviated AWWA "C" designation or abbreviated ANSI designation (e.g. AWWA C151 is meant to refer to ANSI/AWWA C151/A21.51, ANSI A21.51 is meant to refer to ANSI/AWWA C151/A21.51, etc.).

1.3 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, the following:
 1. Product data:
 - a. Complete engineering data including, but not limited to, descriptive data, material specifications, and piping diagrams, as appropriate, to support the design of the piping.
 - b. Copies of the manufacturer's approved installation instructions for types of joints being used.

- c. Complete description of warranty to be provided.
- 2. Shop Drawings
 - a. Drawings showing plan and elevation, as required, of piping and all required fittings and appurtenances
 - b. Dimensional drawings of joints showing the manufacturer's allowable deflections.
- 3. Certificates
 - a. Upon request, furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section.

1.4 QUALITY ASSURANCE

A. Qualifications

1. Manufacturers

- a. All pipes shall be subject to inspection at the place of manufacture, in accordance with the provisions of the referenced standards, as supplemented by the requirements herein.
- b. During the manufacture of the pipe, give the Engineer access to all areas where manufacturing and testing is in process and permit the Engineer to make all inspections necessary to confirm compliance with the Specifications.
- c. Except as modified herein, test all materials used in the manufacture of the pipe in accordance with requirements as applicable.
- d. Perform said material tests at no additional cost to the Owner. The Engineer shall have the right to witness all testing conducted by the Manufacturer, provided that the Manufacturer's and Contractor's schedule is not delayed for the convenience of the Engineer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements

- 1. Inspect all pipe and fittings prior to unloading onto the site. Reject any damaged or defective materials and remove from site immediately.

B. Storage and Handling Requirements

- 1. Store ductile iron pipe and fittings in accordance with the manufacturer's requirements.

1.6 WARRANTY

- A. The Contractor shall warranty for a period of twelve (12) months from Final Completion, all water mains, appurtenances, trenches, roadway and other paved areas, landscaping, and other areas disturbed by the construction of the project, to be free

from defects, and to be installed in compliance with all laws, regulations, codes, specifications, plans, directions, and construction practices which govern said installations.

- B. The Contractor shall be responsible for repairs to any defective or leaking pipe, fittings, etc. Should trenches settle during the Warranty Period, Contractor shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any defects, leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement. No bell clamps or wrap around corsets are allowed as a means of repair on new pipelines.
- C. Within the Warranty Period, where no loss of customer service or property damage is involved, the Contractor shall begin work on requested repairs or corrective measures within twenty-four (24) hours following notification by GCDWR. If property damage or loss of customer service is involved, the Contractor shall begin work within four (4) hours of notification by GCDWR.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide products by one (1) of the following manufacturers: American Cast Iron Pipe Company, U.S. Pipe, McWane Ductile, or approved equal.

2.2 MATERIALS

A. DUCTILE IRON PIPE

1. All ductile iron pipes shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Ductile iron pipe shall have cement mortar lining (standard thickness) in accordance with ANSI/AWWA C104/A21.4.
2. Ductile iron pipe shall be cast, cleaned, cement lined, coated, tested, and certified at a single manufacturing facility.
3. Ductile iron pipe shall be in nominal laying lengths of 18 or 20 feet of nominal diameters specified.
4. All ductile iron pipes shall be marked in accordance with AWWA C151 designations at intervals of five feet (5') or less on pipe barrel. As a minimum, pipe marking shall include manufacturer name or trademark, nominal pipe size, specification designation, and date of manufacture.

B. FITTINGS

1. All ductile iron fittings shall be asphaltic coated at the point of manufacture in accordance with AWWA C151. Fittings shall have cement mortar lining (double thickness) in accordance with AWWA C104.
2. All ductile iron fittings shall be marked in accordance with AWWA C110.

C. PUSH-ON PIPE AND FITTINGS

1. All Push-On ductile iron pipe shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51. Pipe shall be a minimum Pressure Class 350 for four inch (4") through twelve inch (12"), Pressure Class 250 for fourteen inch (14") through twenty inch (20"), and Pressure Class 200 for twenty-four inch (24") through sixty-four inch (64") diameter pipe. For locations where the system hydraulic pressure exceeds the rated pipe working pressure and/or depth of cover exceeds maximum depth of cover in accordance with AWWA C151, a licensed Professional Engineer shall specify the required pipe pressure class to be used.
2. Push-On Ductile Iron Fittings shall be manufactured with body thickness and radius of curvature conforming to ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.
3. At a minimum, fittings four inch (4") through twenty inch (20") diameter shall be rated for 350 psi, and twenty-four inch (24") through sixty-four inch (64") diameter shall be rated for 250 psi.
4. Joint deflection shall be five degrees (5°) for four-inch (4") through twelve-inch (12"); four degrees (4°) for fourteen-inch (14"); three degrees (3°) for sixteen-inch (16") through twenty-four-inch (24"); and two and one-half degrees (2½°) for thirty-inch (30").

D. FLANGED PIPE AND FITTINGS

1. All Flanged Ductile Iron Pipe shall be manufactured in accordance with the latest requirements of AWWA C115.
2. Wall thickness of pipe shall be as required for pressure class in paragraph 2.2.C.1.
3. Flanged Ductile Iron Fittings shall be manufactured in accordance with the latest requirements of AWWA C110, rated for 250 psi. Design of flanged ductile iron fittings shall be as indicated on the Drawings, or as directed by the Engineer. In general, use flanged fittings with long radius elbows, except where space limitations prohibit use of same. Design of special flanged fittings, including wall castings, shall conform to dimensions and details as indicated on the Drawings, or as directed by the Engineer.
4. Flanged Ductile Iron Pipe twelve inches (12") or less in length (spool pieces), shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than twelve inches (12") in length shall be screw on type and attached to a threaded pipe section, and shall be factory fabricated. Pipe threads shall be of such length that, with flanges screwed home, the end of the pipe projects beyond the face of the flange. Flange and pipe to be faced to give a flush finish to the pipe and flange surface normal to the axis of the pipe. The flanges shall be of such design that flange neck completely covers the threaded portion of the pipe to protect same against corrosion. Flanges on ductile iron pipe and fittings are to be coated with coal tar pitch paint after machining.
5. Flanged ductile iron pipe and fittings to be faced and drilled in accordance with the latest requirements of AWWA C115/A21.15, Class 125, unless special

drilling is specified, or required. Where cap bolts or studs are required, flanges shall be drilled and tapped accordingly. Pipe with screw type flanges to be assembled at the point of manufacture unless otherwise specified, or directed by the Engineer.

6. Ductile iron blind and companion flanges shall be in accordance with the latest requirements of AWWA C110/A21.10. Regular or eccentric Ductile Iron Reducing Flanges shall be to the thickness of, and drilled to, the template of the regular companion flange of corresponding outside diameter.
7. Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

E. MECHANICAL JOINT PIPE AND FITTINGS

1. Mechanical Joint Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51.
2. Mechanical Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10 or AWWA C153/A21.53 and joints in accordance with ANSI/AWWA Standard C111/A21.11.

F. RESTRAINED JOINT PIPE AND FITTINGS

1. Restrained Joint Push-On Ductile Iron Pipe Barrels shall be manufactured in accordance with the latest requirements of AWWA C151/A21.51, as manufactured by American Cast Iron Pipe Lok-Ring or Flex-Ring, U.S. Pipe TR-FLEX, or approved equal.
2. Restrained Joint Ductile Iron Fittings shall be manufactured with body thickness, laying length, and radii of curvature conforming to the latest requirements of AWWA C110/A21.10, and joints in accordance with the latest requirements of AWWA C111/A21.11.

G. GASKETS

1. Push-On and Mechanical Joint:
 - a. Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on both the gasket and each spigot end of the pipe. Lubricant shall be NSF 61-approved and shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather, and shall adhere to either wet or dry pipe. **Only lubricant furnished with the pipe by the pipe manufacturer shall be used.**
 - b. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11, and shall be styrene butadiene rubber (SBR), and shall be ANSI/NSF Standard 61 certified for contact with potable water.

2. Flanged:

- a. Form flanged joints with through, stud, or cap bolts, as required, of the size and length specified by the manufacturer to thoroughly make up the joint. Use only full face type in all flanged joints; red rubber gaskets one-sixteenth inch (1/16") thick, as manufactured by the U.S. Rubber Company, or equal.
- b. Except as otherwise specified or noted, machine bolts, stud bolts, and cap bolts shall be made from alloy steel, complying with the requirements of ASTM A194-64, Grade 2 or 2H.
- c. For bolts, nuts, and threads, conform to the latest requirements of the following ANSI Standards and ASTM Designations:
 - i. Semi-finished, hexagonal bolt heads and nuts, meeting ANSI B18.2-60, heavy series dimensions.
 - ii. Bolt threads after plating, coarse thread series, Class 2A; and nut threads after plating, coarse thread series, Class 2B:ANSI B1.1-60.
 - iii. Galvanizing (if used): ASTM 153-61.
 - iv. Studs and nuts to be utilized underground or in contact with liquids –alloy steel, Grade B8: ASTM A193-64.

H. EXTERIOR COATING

1. Where corrosive soils, or where the pipe is located within ten feet (10') of a utility line that has cathodic protection that can cause a deleterious effect on the piping system, the exterior of ductile iron pipe shall be base-coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m² (0.6554 oz/ft²) of pipe surface area. A finishing layer of asphaltic topcoat shall be applied to the zinc. The mean, dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The coating system shall conform in every respect to ISO 8179-1 "*Ductile Iron Pipes – External zinc-based coating – Part 1: Metallic zinc with finishing layer, Second Edition 2004-06-01.*"
2. When soils with electrical or stray currents are encountered, polywrap may be added to the zinc-coated pipe for additional corrosion protection. Polyethylene tube encasement shall be prefabricated, manufactured and supplied in accordance with ANSI/AWWA C105/A21.5, "*Polyethylene Encasement for Ductile Iron Pipe Systems.*" The wrap shall be overlapped one foot in each direction at joints, and secured in place around the pipe, and any wrap at tap locations shall be polyethylene taped tightly to prevent the entrance of foreign matter prior to tapping and inspected for any needed repairs following the tap.
3. Piping system buried underground or submerged, shall have a standard asphaltic outside coating as specified. Exposed pipe and fittings shall have an outside coating of universal primer.

PART 3 - EXECUTION

3.1 THRUST RESTRAINT

A. Location

1. Buried Piping: Where shown and where required to restrain force developed at pipeline tees, plugs, caps, bends, and other locations where unbalanced forces exist because of hydrostatic testing and normal operating pressure.
2. Exposed Piping: At all joints in piping.

B. Where specified, or as directed by the Engineer or GCDWR, plugs, caps, tees, and bends deflecting 22½ degrees or more shall be restrained. Restraint joint pipe and fittings shall be restrained to the minimum restraint lengths specified in the Contract Documents with one (1) of the following methods:

1. Method 'A': Restrained joint pipe and fittings.
2. Method 'B': One (1) of the following dual (2) independent restraints:
 - a. Mechanical joint restraint Mega-Lug, or equal, plus Thrust Blocking
 - b. Mechanical joint restraint Mega-Lug, or equal, plus Rodding.

C. Where indicated on the Drawings, or specified in the Contract Documents, 11¼ degree bends or less may be restrained with only one (1) method of restraint.

D. Thrust Ties

1. Steel Pipe: Attach with lugs fabricated in accordance with details shown on Drawings.
2. Ductile Iron Pipe: Attach with socket clamps anchored against a grooved joint coupling or flange.
3. Flanged Coupling Adapter: For exposed installations, install manufacturer's anchor studs through the coupling or sleeve or use dismantling joints.

E. Mechanical Joint Valve Restraint in Proprietary Restrained Joint Piping

1. Install pipe joint manufacturer's adapter gland follower and pipe end retainer, or mechanical joint anchor gland follower.

F. Thrust Blocking

1. Place between undisturbed ground and fitting to be anchored.
2. Quantity of Concrete: Sufficient to cover bearing area on pipe and provide required soil bearing area as shown.
3. Place blocking so that pipe and fitting joints will be accessible for repairs.
4. Place concrete in accordance with Section 03 30 00 – Cast-in-Place Concrete.

3.2 CHLORINATION OF PIPELINES AND ACCESSORIES

- A. Before being placed in service, all new water main pipelines and accessories shall be disinfected by chlorination. All chlorinating equipment, materials, labor, and supplies shall be furnished by the Contractor.
- B. Prior to chlorination, all mud, dirt, debris and other foreign matter shall be removed from the pipeline by a thorough flushing through fire hydrants or by other approved means. Each valved section of newly laid pipe shall be flushed independently. This shall be performed prior to the pressure test to ensure removal of any trapped air within the pipe.
- C. Unless directed otherwise by GCDWR, cuts made in existing lines for the insertion of valves or fittings, for repairs or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valves, fittings, etc., by spraying with a one percent (1%) hypochlorite solution.
- D. The preferable point of application of the chlorinating agent shall be at the beginning of the pipe line extension, or any valved section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a tapping saddle. Use of fire hydrants for insertion of the chlorinating agent is specifically prohibited.
- E. FIRE HYDRANTS SHALL NOT BE USED AS SAMPLING POINTS. A SAMPLING TAP MUST BE INSTALLED AT ALL TEST POINTS.
- F. Back pressure, causing a reversal of flow or negative pressure in the pipe being treated, shall be prevented.
- G. During the process of chlorinating the newly laid pipe, all valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.
- H. Disinfection of water mains shall be performed in strict accordance with the latest requirements of AWWA C651, and the latest requirements of Georgia Environmental Protection Division's *Minimum Standards for Public Water Systems*. Should the initial chlorination treatment prove ineffective, the chlorination procedure shall be repeated until confirmed test results show that water sampled from the newly laid pipe conforms to the requirements as specified above. The highly chlorinated water shall be retained in the pipe, as specified above, to destroy all non-spore-forming bacteria. After the chlorine treated water has been retained for the required time, the water shall be tested for residual chlorine in the extremities.
- I. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the entire length of the newly laid main shall test, both chemically and bacteriologically, to be the same water quality as the water being served to the public through the existing pipelines.
- J. When water main is in close proximity to creeks, streams, ponds, or other bodies of water, Contractor may be directed by GCDWR to de-chlorinate any water flushed from the main and discharged to the body of water to prevent damage to aquatic organisms, plants, fish, etc. Method and system of de-chlorination must be pre-approved by GCDWR.

- K. After flushing, GCDWR shall notify the GCDWR Environmental Laboratory that the main is ready for a bacteriological sample to be processed. Bacteriological test sites should be installed as indicated on the Drawings, or as directed by GCDWR. Two (2) consecutive sets of acceptable samples, taken at least twenty-four (24) hours apart, shall be collected from the new main. At least one (1) set of samples shall be collected from every twelve hundred feet (1,200') of new water main; plus one (1) set from the end of the line (dead end or cul-de-sac), and at least one (1) set from each branch. Both sets of samples must receive two (2) acceptable ("passed") test results in order for the line to receive a "Passed" certification and be placed into service.
- L. NOTE: WHEN THE ENVIRONMENTAL LABORATORY REPRESENTATIVE ATTEMPTS TO OBTAIN AN ACCEPTABLE SAMPLE, IF THEY OBSERVE AIR, DISCOLORED WATER, TRASH, DEBRIS, TOO HIGH CHLORINE RESIDUAL, OR NO CHLORINE RESIDUAL, IN THE WATER, NO SAMPLE WILL BE TAKEN UNTIL THE MAIN IS RE-FLUSHED.

3.3 CONNECTIONS TO EXISTING LINES

- A. Connections to existing pipelines shall, in general, be made by the use of tapping sleeves and valves, except as specifically indicated on the Drawings to be otherwise, or directed by the Engineer. In certain instances, it may be specified or directed by the Engineer or GCDWR to tap a dry line. In this circumstance, a tapping sleeve and valve is required and the tap accomplished utilizing a standard tapping machine. UNDER NO CIRCUMSTANCES WILL THE CONTRACTOR BE PERMITTED TO BURN A HOLE IN THE MAIN USING OXYACETYLENE TOOLS.
- B. The closing of any existing mainline valve or valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction *and* presence of GCDWR. All such shutdowns *must* be approved in advance by GCDWR. The Contractor shall provide all labor and equipment sufficient to find and uncover valves, and cleanout valve boxes for access to existing valves required to complete or repair any work installed under this Contract. GCDWR will provide all records and information available to assist in the locating of covered valves. This assistance shall not relieve the Contractor of responsibility to locate any necessary valve to accomplish the Work.
- C. The Contractor will be responsible for notifying, with the assistance of GCDWR, all customers who will be affected by the interruption of water service, a minimum of twenty-four (24) hours in advance of the planned shutdown. No service may be interrupted without GCDWR prior approval. No extra payment will be allowed for a connection to a valved "stub-out" line or to a line where no customers will be affected by the tie-on or cut-in.

3.4 CUTTING PIPE

- A. Wherever the pipe requires cutting to fit into the line, or to fabricate joints, the Work shall be performed in such a manner as to leave a smooth end at right angles to the axis of the pipe. Any breakage will be at the Contractor's expense. When a piece of pipe is cut to fit into the line, lead joints on existing piping will be removed. Lead joints are to be disposed of at an approved offsite facility.

- B. Use a cutting saw for all cutting of ductile iron pipe. Remove all burrs from inside and outside edges of all cut pipes.

3.5 INSPECTION

- A. Submit under the requirements of Section 01 33 00 SUBMITTAL PROCEDURES, copies of the Manufacturer's Sworn Certificate of Inspection and Testing of all ductile iron pipe and ductile iron fittings provided for the Work. All ductile iron pipe and fittings will be subject to inspection and approval by GCDWR after delivery of material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged ductile iron pipe or fittings are not permitted to be used in the Work.
- B. Such inspection by GCDWR does not relieve the Contractor of full responsibility for the material installed. FAILURE BY GCDWR TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

3.6 MARKING

- A. All ductile iron pipes shall be marked in accordance with the latest requirements of AWWA C151/A21.51. Additional pipe markings shall include the manufacturer's initials, pressure or class designation, and size conspicuously on each pipe.
- B. All ductile iron fittings shall be marked in accordance with the latest requirements of AWWA C110/A21.10.
- C. Ductile iron pipes and fittings received shall be furnished by the Contractor with a manufacturer's list, in duplicate, of all pieces of pipe and fittings received on the project, including copies of shipping documents from the manufacturer and/or supplier. Said lists shall, at a minimum, indicate the manufacturer's name, serial or mark number, weight, class or pressure designation, length, size, and description of each typical piece received.

3.7 STORING OF MATERIALS

- A. All tools, materials, machinery, and equipment required in the Work may be stored in compact, neat, stockpiled manner adjacent to the worksite, in a suitable location, and in such a manner as to cause the least inconvenience to the affected property owners, ensure traffic safety, and so as not to endanger the general public in any way. All active, existing fire hydrants, water and gas shut-off boxes, must at all times, be kept unobstructed and accessible at all times. All water and gas valves, underground power, and telephone line manholes must be left uncovered and unobstructed by such storing of materials.

3.8 TAPPING

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, piping shall be tapped to receive piping. Taps shall be installed utilizing tapping sleeves or saddles as specified.

1. Direct taps where threads are cut into the pipe barrel shall not be permitted. Holes shall be drilled accurately, and at right angles to the axis of the pipe or fittings. Where plugs are drilled, holes shall be at right angles to the face of the plug.
2. The cutting of tap holes with oxyacetylene is specifically prohibited. On sixteen inch (16") and larger mains, the Contractor will be required to demonstrate to the satisfaction of GCDWR that they are qualified to perform the Work.

3.9 TESTING

- A. Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section of water main, as may be determined or defined by GCDWR, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI, as measured at the lowest elevation of the test section. Where static pressure of the existing water supply exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section, shall be equal to the static pressure plus 50 PSI. If elevation differentials, within a test section, vary by more than forty-five (45) vertical feet, then the test section shall be broken into shorter lengths by the insertion of additional valves.
- B. All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the "closed" position.
- C. ALL TESTING OF WATER MAINS, FITTINGS, AND APPURTENANCES SHALL BE CONDUCTED IN THE PRESENCE OF, AND UNDER THE DIRECTION OF GCDWR. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the pressure on the water main; 2) a corporation cock in the main to attached gauge or pump connection; 3) plugs to seal taps after use in testing; 4) a suitable pump, piping, appliances, labor, fuel, and other appurtenances necessary to conduct the pressure tests; 5) a valve wrench and labor to accompany GCDWR to verify that all valves, including fire hydrant branch valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure, as noted above, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. GCDWR will make water available necessary for flushing and testing of water mains. The Contractor shall provide whatever means necessary for transporting or conveying the water from a designated source to the test section of main.
- D. NOTE: THE USE OF FIRE HYDRANTS AS A CONNECTION FOR EITHER HYDROSTATIC TESTING OR INJECTION OF CHLORINE SOLUTIONS FOR DISINFECTION IS EXPRESSLY PROHIBITED.
- E. Before applying the specified test pressure, all air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor to install additional ¾" service taps at the highest elevation, including any intermediate points of the pipe section to be tested, or at locations directed by GCDWR. Any such taps installed must be removed by the Contractor prior to Final Completion of the main.

- F. The test pressure shall be maintained for a minimum of two (2) hours to allow for thorough examination for leakage, and permit GCDWR to confirm that all the air has been removed, and that all valves within the test section of pipe are fully open. The pipeline shall be made watertight under the test pressure.
- G. A Testing Allowance in compliance with the latest requirements of AWWA C600, Section 5.2 and Table 6 shall be applied. The Testing Allowance shall be defined as the quantity of makeup water that must be supplied to the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. No pipe installation will be accepted if the amount of makeup water is greater than that allowed by AWWA C600.
- H. Any exceeding of the testing allowance or leakage developed during the test shall be corrected at the Contractor's expense by tightening, replacing packing or gaskets, or replacing defective portions of the piping system. Caulking will not be permitted. If defective portion cannot be located, the Contractor, at his expense, shall remove and reconstruct as much of the original work as necessary to obtain a facility meeting the testing requirements specified herein.
- I. No separate payment will be made for testing.
- J. After the section of main has been completely tested, chlorinated, and successfully passed the required bacteriological tests, it shall be placed in service immediately upon direction from GCDWR. The Contractor shall supply all labor and equipment necessary to place the main and all appurtenances in service.

3.10 UNLOADING AND LAYING

- A. Ductile iron pipe shall be loaded, transported, and unloaded in accordance with latest requirements of AWWA C600. Do NOT skid or roll pipe handled on skid ways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately set aside, and thoroughly inspected by GCDWR before any decision is made regarding its acceptability. Do not damage casting and linings. If damage occurs to the lining, make repairs or replacement as directed by GCDWR. If there is any question regarding acceptability of said suspect materials by GCDWR, the Contractor shall remove and replace the questionable materials.
- B. Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take care to prevent the pipe coating from being damaged, particularly on the inside of the pipe and fittings.
- C. Pipe may not be "strung" along the project jobsite within highway rights-of-way, unless specifically directed to do so by GCDWR, and then only after receiving permission from the road authority which has jurisdiction.
- D. The Contractor shall carefully examine all pipe and fittings for defects just before laying, and lay no pipe or fitting which is known to be defective. In the event that defective pipe or fittings is discovered after having been laid, the Contractor shall

remove and replace with sound pipe or fittings in a satisfactory manner at Contractor's expense.

- E. Standard depth of cover is four feet (4') below the final grade elevation of the edge of pavement of existing or proposed roadway surface. In the event the road shoulder final grade is below the final grade elevation of the edge of pavement of the roadway surface, then a minimum of four feet (4') of earth cover shall be maintained at all times, measured on the down-slope side of the pipe trench. In the event the road shoulder final grade is above the final grade elevation of the edge of pavement of the roadway surface, then the pipe shall be placed at an elevation of four feet (4') below the final grade elevation of the edge of pavement of the roadway surface and covered with compacted earth. In no case shall depth of cover exceed twelve feet (12') without prior written authorization from GCDWR.
- F. Pressurized flow Ductile Iron Pipe shall be laid using a minimum of Class 'D' bedding. If laying in rock trench, the trench bottom shall be undercut to allow a minimum of six inches (6") of bedding material to be placed and compacted to establish the required elevation indicated on the Drawings.
- G. It is the Contractor's responsibility to maintain a clean worksite and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on the site, and shall be thoroughly cleaned before being laid. During any breaks in the laying of the pipe, and when ending the construction for the day, the Contractor shall install a mechanical or fitted plug to the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out, and inspected by GCDWR, before new or further pipe installation may commence.

END OF SECTION 33 11 13.05

SECTION 33 12 13

WATER SERVICE CONNECTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Definitions
1.4	Work Included
1.5	Submittals
2.1	Materials
3.1	House Service Connections
3.2	Relocate, Replace, or Lower Existing Services
3.3	Abandon Existing Services
3.4	Extra Long Service Line Installation
3.5	New Meter Installation
3.6	Existing Meter Change Out
3.7	Salvage Existing Meter
3.8	Relocate Large Meters/ Check Valves

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Sidewalks, Curbs, and Gutters (32 16 13).
3. Turf and Grasses (32 92 00).
4. Utility Pipe Jacking (33 05 23.16).
5. Ductile Iron Pipe (33 11 13.05).
6. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 DEFINITIONS

- A. House Service Connection is defined as the water line between the water main and the water meter.

1.4 WORK INCLUDED

- A. The Contractor, under this item, shall furnish all materials, labor, tools, and equipment to properly install, relocate, or replace all water house service connections, service lines, meters, and meter boxes, as indicated on the Drawings. If in the process of conducting the Work, Contractor discovers previously unknown services, additional services, or connections affected by construction of the new main, Contractor shall immediately notify GCDWR for direction concerning the services. New service connections to water mains shall be made in accordance with the Drawings, or as directed by GCDWR. New service connection taps shall be made as pipe is installed and shall be directly in line with the meter. The Contractor shall make all reconnections of house water services (presently connected to existing water mains), to water mains constructed under this Contract. Contractor shall remove from service the portion of the house water service connected to the existing water main by closing the corporation stop on the house water service at the existing main. All house service connections shall be installed using copper service lines, compression fittings, and shall meet current GCDWR Meter Installation Standards.
- B. Contractor shall make all pavement, curb, and sidewalk cuts, excavation, sheeting, shoring, boring, backfilling, and landscaping or sodding/seedling repairs required for the house service connections; this includes any disturbed areas associated with long side services on both sides of the roadway. Trenches shall be backfilled and pavement courses installed as specified under Sections 31 23 00 EXCAVATION AND FILL, 32 12 16 ASPHALT PAVING, and 34 71 00 ROADWAY CONSTRUCTION.
- C. Contractor shall make all relocations of existing house services from existing main to new water main as indicated on the Drawings, or as directed by GCDWR, whether or not the existing main is to be abandoned as part of this Contract. When existing main is to remain in service, or when directed by GCDWR, Contractor shall abandon all portions of the existing service by excavating the service connection at the existing main and closing the corporation stop for each service to be abandoned.
- D. All temporary relocations or replacements of house service connections necessary to perform the Work, shall be made at Contractor's expense. Any replacements made necessary due to the negligent or careless operations by the Contractor shall be accomplished immediately, if customer service is affected. The Work shall be of first class workmanship, and shall be completed using only approved materials as specified, as indicated on the Drawings, or as directed by the Engineer.
- E. NOTE: House water service connections shall not be reconnected to new mains until the new mains have been disinfected, tested, and passed for placing into service, as provided in Section 33 11 13.05 DUCTILE IRON PIPE (WATER), paragraph 3.2. Chlorination of Pipelines and Accessories.

1.5 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all water service connections and accessories to be used in construction, along with product data sheets for all piping/tubing, valves, meter boxes, and accessories to be used for house service connections.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Service lines shall consist of copper, galvanized steel, or Munciplex (or approved equal) pipe with fittings and appurtenances in accordance with the following:
 - 1. Copper Pipe (Tubing): Shall be manufactured and furnished in accordance with ASTM Specifications B88, Type 'K'. Fittings shall be of the compression "pack-joint" coupling type.
 - 2. Galvanized Steel Pipe: shall be standard weight galvanized steel pipe with screw joints conforming to ASTM A53 REV A 1988. Fittings shall be galvanized, except that the nipples and couplings shall be of the same materials as the pipe.
 - 3. Munciplex (or approved equal): shall be furnished in SDR 9 copper tube sizes (CTS) in accordance with ASTM F876 and AWWA C800. AWWA C904 compression joint brass valves and fittings (with stainless steel inserts) are for 1-1/2" and 2" services only, and shall be compatible with AWWA C800 tubing.
 - 4. Appurtenances such as corporation stops, curb stops, adaptors for copper and galvanized steel and service lines shall meet the requirements of ASTM B-62 bronze construction, and AWWA C800 for threads. Adaptors shall be furnished as required for connecting copper and galvanized steel pipe. Corporation stops, curbs stops, and adaptors shall be as manufactured by AYMcdonald, Ford, Mueller, or equal. Double strap saddles for tapping the main shall be Dresser Style No. 91, Smith-Blair Style No. 313, or equal; and shall be tapped for mueller threads. Where saddles required, no extra payment shall be allowed.
 - 5. NOTE: The use of soldered joints or flare joints on copper pipe and fittings is expressly prohibited.

PART 3 - EXECUTION

3.1 HOUSE SERVICE CONNECTIONS

- A. When new or replacement water mains are installed, all existing service connections shall be switched to the new water main. The Contractor shall perform all work required for reconnecting the existing meter to the new water

main including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified above.

- B. Long side service connections shall be installed via boring under the paved road in accordance with Section 33 05 23.16 UTILITY PIPE JACKING.

3.2 RELOCATE, REPLACE, OR LOWER EXISTING SERVICES

- A. As indicated on the Drawings, or as directed by GCDWR, to connect, relocate, or replace an existing water service the following is required:
 - 1. If existing service line is one inch (1") or less, and either galvanized or polybutylene or other pipe material, the entire service line from the main to the meter shall be copper, as specified above in paragraph 2.1.A.1.
 - 2. If existing service line is one and one-half inch (1-1/2") or two inch (2"), and is galvanized pipe which is greater than 10-years-old and shows evidence of significant corrosion internally or externally, or is PVC, then the entire service line from the main to the meter shall be replaced with Galvanized Steel Pipe or Municipex (or approved equal), as specified above in paragraph 2.1.A.2. and 2.1.A.3.
 - 3. Shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the water connections as specified. Long side services shall include the related boring necessary to complete the installation. Service line connections, coupled to existing copper service lines to avoid additional service bores, shall be considered short-sided connections. Relocating existing meters and lowering existing service shall include all materials, tools, equipment, and labor to properly relocate services to a depth and location as directed by GCDWR.

3.3 ABANDON EXISTING SERVICES

- A. The Contractor shall abandon existing service connections as indicated on the Drawings, or as directed by the Engineer. Service connections shall be abandoned by removing the existing meter, meter box, curb stop, and service piping. For services connected to ductile iron pipe, the tap in the main shall be sealed with a brass plug. For services connected to PVC pipe, the tap on the main shall be sealed with a repair sleeve. In either case, the plug or sleeve shall be checked for leaks at normal operating pressures prior to backfilling the excavated area.

3.4 EXTRA LONG SERVICE LINE INSTALLATION

- A. When a new service line is to be installed across a road with more than five (5) lanes, it shall be considered an extra long service installation. For these conditions, the Contractor shall install a new copper or galvanized pipe service line, depending on the size of the service, via boring under the road with a minimum of four feet of cover over the new service pipe.

3.5 NEW METER INSTALLATION

- A. Where indicated on the Drawings, or directed by the Engineer or GCDWR, the Contractor shall install new meter connections to existing or new water mains. The Contractor shall perform all work required for installing the new meter including, but not limited to, shoring, backfilling, landscape repairs, the furnishing of all labor, materials, tools, appliances, and equipment to complete the meter installation using copper or galvanized steel pipe, depending on the size of the service, tapping saddles, corporation stops, curb stops, and valve boxes. The meter shall be provided by GCDWR and installed by the Contractor.

3.6 EXISTING METER CHANGE OUT

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall change out existing water meters. The Contractor shall provide all labor and equipment required for the meter change out. GCDWR shall provide the new meters for installation by the Contractor.

3.7 SALVAGE EXISTING METER

- A. Where indicated on the Drawings, or as directed by the Engineer or GCDWR, the Contractor shall salvage existing water meters. The Contractor shall provide all labor and equipment required for removal of the meter and transporting and delivering such meters for salvage to GCDWR Central Facility, 684 Winder Highway, Lawrenceville, GA 30045. Work shall include placing a plug or cap on the ends of the piping from where the meter was removed.

3.8 RELOCATE LARGE METERS/CHECK VALVES

- A. Where indicated on the Drawings, or directed by the Engineer, the Contractor shall relocate large meters and check valves. The Contractor shall provide all labor and equipment required for removal of the meter/check valve and its associated vault and piping, transporting and delivering such meters and check valves to the new location, and install the new meter/check valve including all excavation, bedding, piping connections, vaults, isolation valves, and related appurtenances for a complete installation. Work shall include placing a plug in or connecting the ends of the piping from where the meter/check valve was removed.

END OF SECTION 33 12 13



SECTION 33 12 16

WATER UTILITY DISTRIBUTION VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessory Equipment
2.2	Butterfly Valves
2.3	Gate Valves
2.4	Tapping Sleeves and Valves
2.5	Line Stop Type Valves
2.6	Insertion Type Valves
2.7	Valve Markers
3.1	Painting
3.2	Placing
3.3	Tapping Sleeves and Valves
3.4	Testing
3.5	Wet Cut-Ins

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Turf and Grasses (32 92 00).
3. Ductile Iron Pipe (33 11 13.05).
4. Roadway Construction (34 71 00).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor, under this item, shall furnish all the materials, labor, and equipment to properly set in place, at the locations indicated on the Drawings, or as directed by the Engineer, all gate valves and butterfly valves, tapping sleeves and valves, and other valve-type assemblies of the size and types specified, which are necessary for the proper completion of the Work; including all excavation required for their installation.

1.4 SUBMITTALS

- A. Before any valves or operating devices are manufactured, the Contractor shall submit, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and receive approval of the Engineer, detailed drawings and product data for each size and type of valve to be provided, including detail of the size and location of all valves and accessories, as specified, as indicated on the Drawings, or as directed by the Engineer.

PART 2 - PRODUCTS

2.1 ACCESSORY EQUIPMENT

- A. All valves, which are to be buried in the ground, shall be provided with a valve box and cover. One (1) adjustable (4'6" to 7'0") gate valve operating key for 2" square operating nuts shall be provided for each 10 valves (or fraction thereof) installed on each project. Key shall be Pollard No. 54801, or equal. Final payment shall be withheld until all accessories are provided to GCDWR. Where the depth of cover is more than five feet (5'), Contractor shall provide suitable, permanently installed valve stem extension and guide at no extra cost to GCDWR. In no case shall depth of cover exceed twelve feet (12') without written authorization from GCDWR.

2.2 BUTTERFLY VALVES

- A. Provide butterfly valves meeting the latest requirements of AWWA C504, and shall be as manufactured by Mueller, Kennedy, Pratt, or approved equal.
- B. Provide butterfly valves that shall be hand-operated, with bodies of cast or ductile iron with integrally cast hubs for shaft bearing housing, and adapted for joints as indicated on the Drawings, or as directed by the Engineer. Except as modified herein, furnish valves of the short body laying length with operators sized on the basis of actual line pressure and velocity. Butterfly valves shall be a minimum Class 150 or as indicated on the Drawings, or directed by the Engineer.
- C. Furnish valves having Type 304 stainless steel valve shaft, keyed for operator connection and connected to the disc with Type 304 stainless steel pins secured in place. Orient shaft as indicated. Furnish two-way thrust bearings, preset at the factory and permanently grease lubricated. Provide resilient valve seat of natural rubber per ASTM D2000, or Buna N type per ASTM D2000 providing uninterrupted 360 degree seating completely adjustable around circumference. Furnish mating seat of Type 304 or 316 Stainless Steel. Apply the resilient seat to the body, recessed in a groove, or to the disc per ANSI/AWWA C504, Sec. 9.5.
- D. Furnish valve discs, seating at 90 degrees to the pipe axis, of ductile iron per ASTM Des. A536, Grade 65-45-12, cast iron per ASTM Des. A48, Class 40, or fabricated steel per ASTM Des. A36.
- E. All butterfly valves shall open by turning the operating nut to the left (counter-clockwise).
- F. Butterfly valves shall only be used on sizes twelve inches (12") and larger.

- G. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.

2.3 GATE VALVES

- A. Gate valves shall conform to the latest requirements of AWWA C509 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, M&H, or approved equal.
- B. Gate valves shall be hand operated, non-rising stem, and bronze mounted of the resilient seat type with cast or ductile iron bodies, and adapted for joints as indicated on the Drawings, or as directed by the Engineer.
- C. All gate valves shall open by turning the operating nut to the left (counter-clockwise).
- D. Valve stems shall be manganese bronze with the collar cast solid with the stem. The threads of stems and stem nuts shall be of the square or Acme type. The ultimate tensile strength shall not be less than 65,000 pounds per square inch and an elastic limit of not less than one-half ($\frac{1}{2}$) of the ultimate tensile strength.
- E. Valves shall be provided with 'O' ring seals. Ring seal plate shall be fitted with two (2) 'O' rings: the upper ring serving as a dirt seat, the lower ring as a pressure seal. Design shall permit replacement of 'O' rings while the valve is under pressure in the fully opened position. 'O' rings shall be Precision Rubber Products Corporation, Quality Compound No. 122-70, or approved equal.
- F. Gate valves shall only be used in sizes two inch (2") through twelve inch (12"), of the resilient-seated type.

2.4 TAPPING SLEEVES AND VALVES

- A. Tapping sleeves for size on size taps 16" x 16" and larger shall be ductile iron with mechanical joint ends, such as manufactured by American Valve and Hydrant, Mueller Company, or equal. Split Steel prefabricated tapping sleeves as manufactured by JCM, Smith-Blair, or equal, may be used for size on size taps 12" x 12" and smaller, and for all taps smaller than "size on size". Outlets shall be sized to permit a tap to be made using a full size shell cutter. The existing pipe shall be thoroughly cleaned prior to the installation of the sleeve. The use of strap saddles for taps larger than two inch (2") is not permitted. Shop drawings for split steel sleeves must be approved by the Engineer prior to use.
- B. For asbestos-concrete pipe and Class 200 PVC pipe, the Contractor must use "Ford" stainless steel full circle tapping sleeve or approved equal, which contains a full gasketed surface within the sleeve body to allow for the variances in the manufactured O.D. of the asbestos-concrete pipe.
- C. Tapping valves shall conform to the requirements for gate valves herein before stipulated, except for modifications necessary to permit the use of full size shell cutter.

2.5 LINE STOP TYPE VALVES

- A. Line stop valves shall provide a means to install a temporary blockage of flow in an existing pressurized water main without removing the main from service. The line stop valve shall be installed through a single circular hole cut into the top of the pipe. Line stop valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The line stop valve shall consist of three sub-assemblies: the valve body, which shall be mounted pressure tight around the main; the valve cartridge, which shall be inserted into the valve body; and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. At the completion of the line stoppage, the line stop valve shall be removed, and the valve body shall remain on the main. A blind flange shall be installed on the valve body to seal against leaks.

2.6 INSERTION TYPE VALVES

- A. Insertion type valves shall provide a means to install a permanent block (open-close) valve into an existing pressurized water main without interruption of flow through the pipe and no reduction of line pressure. The insertion valve shall be installed through a single circular hole cut into the top of the pipe. Insertion valves shall be Insta-Valve System by Hydra-Stop, or approved equal.
- B. The insertion-type valve shall consist of three subassemblies; the valve body, which shall be mounted pressure tight around the main, the valve cartridge, which shall be inserted into the valve body, and the cartridge closure flange, which shall secure and permanently seal the cartridge to the body.
- C. The maximum operating pressure of the insertion type valve shall be 150 psi, with a maximum test pressure of 200 psi.

2.7 VALVE MARKERS

- A. Valve markers shall be furnished and installed with each valve installed with exception of fire hydrant valves. The markers shall be of Class 'A' Concrete, as specified in Section 03 30 00 CAST-IN-PLACE CONCRETE, four inch (4") square by five feet (5') long, and shall be of the same construction as that of highway right-of-way markers. The words, "Water Valve" shall be cast vertically into the marker beginning two inches (2") below the top of the marker. There shall be a one and one-quarter inch (1¼") brass plug cast into the marker one inch (1") below the letter 'E' of the word "Valve", which shall be stamped in the field by the Contractor, after installation, with the distance, in feet, from the valve marker to the valve box. The markers shall be installed as close to the right-of-way line opposite the valve as is possible, with the brass plug facing the valve. The marker shall be located so as to avoid damage by traffic. The top of the marker shall generally be set twenty-four inches (24") above finished grade. The markers may be set somewhat lower in areas where it may be considered obtrusive, such as lawns; however, at no time shall the marker be installed at less than eighteen inches (18") above finished grade.

PART 3 - EXECUTION

3.1 PAINTING

- A. All valves where not constructed of brass, bronze, or of finished steel shall be painted at the point of manufacture in accordance with AWWA Specifications for Painting, Ductile, Cast Iron Water Pipes, and Fittings, except machined surfaces, which shall be given a suitable coating of grease or other protective material.

3.2 PLACING

- A. All valves shall be set accurately and carefully to the lines and grades indicated on the Drawings, or as directed by the Engineer, and shall be joined to the pipe utilizing such approved joints as herein specified for ductile iron water mains.
- B. Tapping sleeves and valves, and insert valves, shall be installed in accordance with the manufacturer's recommendation.
- C. Valve boxes shall be centered plumb over the operating nut of the valve with the cover flush with the surface of the finished pavement, finished grade after landscaping, or as directed by GCDWR. The valve box shall not be in direct contact with the bonnet of the valve, and shall be supported in such a manner as not to transmit shock, stress, or load directly to the valve. A formed or pre-cast concrete collar shall be placed around the valve box top as indicated on the Drawings. Valve shall be provided with thrust blocking as indicated on the Drawings, or as directed by the Engineer. VALVE BOXES ARE TO BE OF THE ADJUSTABLE SLIP-TYPE. SCREW ADJUSTING VALVE BOXES ARE NOT PERMITTED.
- D. Where indicated on the Drawings, or as directed by the Engineer, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves twenty-four inches (24") and larger, to prohibit movement of the pipe when the valve is closed.
- E. On GCDOT road projects where final grade shall not be obtained until after the waterline construction is completed, the Contractor may install six inch (6") SDR 35 PVC pipe to a grade directed by GCDWR, until final grade is reached. After final grade is completed, the Contractor may install valve boxes, valve markers, and pads as required.

3.3 TAPPING SLEEVES AND VALVES

- A. The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing water mains at locations indicated on the Drawings, or as directed by the Engineer. The Contractor shall provide the tapping machine and competent supervision for the making of taps. It is the Contractor's responsibility to verify the type, size, O.D., and class of the existing pipe before ordering the tapping sleeve and valve.
- B. Prior to making the tap, the Contractor, in the presence of GCDWR, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 200 PSI (PNEUMATIC, or AIR-PRESSURE TESTING IS PROHIBITED). The Contractor shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials, which will not permit the tapping

- valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.
- C. Back taps shall not be permitted unless specifically authorized by GCDWR. Any said authorized backtaps shall be constructed using mechanical joint fittings and mechanical joint retainer glands, Mega-Lug or equal, and single joints of pipe. Threaded rod shall only be permitted from the steel casing to the first fitting. Welding eye bolts directly to the casing for the purpose of installing threaded rod is NOT permitted.
 - D. All valves, which are buried in the ground, shall be provided with a valve box and cover. Where the depth of cover is more than five feet (5'), the Contractor shall provide suitable, permanently installed valve stem extensions and guides, which have been approved by GCDWR prior to fabrication and placement.

3.4 TESTING

- A. All valves shall be tested at the point of manufacture in accordance with the specific AWWA Standard for that size and type of valve and made drop-tight when tested under the hydrostatic head specified herein. After the valves have been set in place, and are ready to operate, the Contractor shall hydrostatically field-test each valve as part of the hydrostatic test of the main. Any valve not proved to be "bubble-tight", shall either be repaired to make it so, or be removed from the line and replaced. Valves repaired or replaced shall be re-tested for leakage prior to acceptance by GCDWR.

3.5 WET CUT-INS

- A. The Contractor shall, under this item, provide all labor and equipment necessary to make a cut-in to an existing water main for the purpose of making a connection, installing a valve, fire hydrant assembly, or other fittings and appurtenances. A "wet cut-in" is defined to be the physical cutting into any existing water main, which will result in the interruption of service to an existing customer, or which shall necessitate the removal of water contained within the existing main from the excavation, which is caused by cutting into the pipe. Wet cut-ins shall not be allowed to be performed on Fridays.

END OF SECTION 33 12 16

SECTION 33 12 16.10

AIR RELEASE AND VACUUM VALVES - WATER

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	Workmanship

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Cast-in-Place Concrete (03 30 00).
2. Excavation and Fill (31 23 00).
3. Precast Concrete Utility Structures (33 05 16.13).
4. Ductile Iron Pipe (33 11 13.05).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish all material, tools, labor, and equipment necessary to properly install, including excavation, adjust, test, and place in successful service, at the locations indicated on the Drawings, or as directed by the Engineer or GCDWR, all air release and vacuum valves required for the proper completion of the Work.
- B. The Work shall include, in general but without limitation, all air release and vacuum valves, all valves, piping, and saddles indicated on the Drawings, pre-cast manhole base or vault, riser, and slab top with cast iron frame and cover or hatch, including excavation together with all accessories and appurtenances required for a complete installation.
- C. Wherever the Work disturbs existing structures or landscaping, the Contractor shall replace same to no less than original condition.
- D. It is the intent of this contract to require an installation under this item, complete in every detail whether or not indicated on the Drawings, or specified. Consequently, the

Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly install, adjust, test, and place in successful service a complete installation as specified herein.

1.4 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and shall show in detail, the size and location of all air release and vacuum valves and accessories to be used in construction. Product data shall be submitted including materials of construction, dimensional drawings, installation requirements, and operation and maintenance manuals for each size and type of valve being provided.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Furnish materials which are new, unused, and as specified.
- B. Air Release and Vacuum Relief Valves shall be automatic float operated valves designed to exhaust large quantities of air during the filling of a piping system and close upon liquid entry. The valve shall open during draining or if a negative pressure occurs. The valve shall also release accumulated air from a piping system while the system is in operation and under pressure. The valve shall perform the functions of both air release and air/vacuum valves and furnished as a single body.
- C. Combination Air Valves shall be GA Industries, Val-Matic, Crispin, or approved equal.
- D. Valves shall be manufactured and tested in accordance with AWWA C512. Valves shall be certified to ANSI/NSF 61.
- E. Valve shall provide a through flow area equal to the nominal size. Floats shall be unconditionally guaranteed against failure including pressure surges. The cover shall be bolted to the body and sealed with a flat gasket. A resilient bumper shall be provided on four inch (4") and larger sizes to cushion the float during sudden opening conditions. The resilient seat shall be replaceable and provide drop tight shut off to the full valve pressure rating.
- F. The air release valve shall have a leverage mechanism with sufficient mechanical advantage so that the valve will open under full operating pressure. Simple lever designs shall consist of a single pivot arm and a resilient orifice button. Compound lever designs shall consist of two levers and an adjustable threaded resilient orifice button.
- G. The valve body and cover shall be constructed of ASTM A126 Class B cast iron for Class 125 and Class 250 valves. Class 300 ductile iron valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The float, guide shafts, and bushings shall be constructed of Type 316 stainless steel. Non-metallic floats, linkage, or bushings are not acceptable. Resilient seat shall be Buna-N.
- H. Operation of the valve shall be as follows:

1. Valves shall not exhibit leaks or weeping of liquid past the large orifice seal at operating pressures of 7.3 psi to twice rated working pressure.
2. Valves shall respond to the presence of air/gas by discharging it through the small orifice at any pressures within a specified design range, 7.3 psi to 250 psi and shall remain leak tight in the absence of air.
3. Valves shall react immediately to pipeline drainage or liquid column separation by the full opening of the large orifice so as to allow unobstructed air intake at the lowest possible negative internal pipeline pressure.
4. Provide a heavy duty vented cast iron manhole frame and cover, East Jordan Iron Works 2603, or equal, or an aluminum hatch, whichever is indicated on the Drawings.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Provide workmanship, which is first class, in every respect. Have installation performed by workers thoroughly experienced in such Work.
- B. The Work shall meet all requirements of pertinent laws, codes and regulations.

END OF SECTION 33 12 16.10



SECTION 33 12 19

WATER UTILITY DISTRIBUTION FIRE HYDRANTS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Accessories
2.2	Hydrants
2.3	Automatic Flushing Device
3.1	Painting, Coating, and Lubricating
3.2	Setting Hydrants

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Water Utility Distribution Valves (33 12 16).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall, under this item, furnish and install at the locations indicated on the Drawings or as directed all fire hydrants necessary or required for the proper completion of the Work under this Contract.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail the size of all fire hydrants and accessories to be used in construction, including product data, materials of construction, and operation and maintenance data.

PART 2 - PRODUCTS

2.1 ACCESSORIES

- A. The Contractor shall furnish one (1) adjustable hydrant wrench for each ten (10) hydrants installed, or fraction thereof. Wrench to be Pollard No. P-665-1, or equal. Final payment shall be withheld until all accessories are provided to GCDWR.

2.2 HYDRANTS

- A. Fire hydrants shall be manufactured in full compliance with the American Water Works Association Standard for Dry - Barrel Fire Hydrants, C502-80, and as herein amended. Hydrants approved for use are American Flow Control B-62-B, M&H 129, Mueller IMP-PRT2, Clow Medallion, U.S. Metropolitan 250 M-94, or EJ 5CD250, or equal.
- B. Type - Three-way, post type, dry top traffic model with compression main valve opening against and closing in the direction of normal water flow.
- C. Size - Internal main valve diameter shall be a minimum of 5- $\frac{1}{4}$ ".
- D. Identification - Each hydrant shall have the name of the manufacturer, the year when made, and the nominal valve size in legible, raised letters cast on the barrel or bonnet.
- E. Dry Top Bonnet - Each hydrant shall be constructed with a moisture-proof lubricant chamber which encloses the operating threads and which provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be comprised of a top "O" ring serving as a dirt and moisture barrier and lower "O" ring which shall serve as a pressure seal.
- F. Operating Nut - The operating nut shall be of regular pentagon shape measuring 1- $\frac{1}{2}$ " point to flat; i.e., National Standard, and shall open by turning counter-clockwise (left). Nozzle caps shall have the same cross-section as the operating nut and shall come with heavy duty, non-kinking chains. Chains shall be securely affixed to the hydrant upper barrel and permit free turning of the caps.
- G. Traffic Design - The hydrant barrel sections shall be connected at the ground line in a manner that shall prevent damage to the hydrant when struck by a vehicle. The main valve rod sections 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.
- H. Main Valve - The main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.
- I. Main Valve Seat - 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 without the employment to torque compressed gaskets. The hydrants 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.

- J. Drain - The drain mechanism shall be designed to operate automatically 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 ports shall be required in the main valve assembly to drain the hydrant barrel.
- K. Inlet Connection - Cast iron inlet elbow shall have a 6 inch mechanical joint connection complete with accessories.
- L. Extensions - Barrel extension sections shall be available in 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.
- M. Nozzles - No lead shall be allowed in nozzle installation.
- N. Testing - All fire hydrants shall be tested in strict accordance with ANSI/AWWA-C502 at the supplier's expense. Certificate of Compliance shall be furnished to GCDWR upon their request.

2.3 AUTOMATIC FLUSHING DEVICE

- A. Automatic flushing device shall have a 1" brass FIP inlet, leading vertically into a 1" automatic solenoid valve. Automatic solenoid valve shall have an internal, self-cleaning debris screen, and have a 220 psi rating. Each unit shall be furnished with a stand-alone valve controller. Valve controller shall not require a second hand-held device for programming. Controller shall have a minimum of 9 possible flushing cycles per day, shall be submersible to 12 feet, operate with 9 volt battery and have resin-sealed electrical components. Solenoid shall have no loose parts when removed from the valve. Each unit shall have a single-valve, all brass, sampling point. Removal of the 1" solenoid valve shall be possible via an o-ring connector located under the valve after removal of the stainless steel access plate. The valve assembly shall be housed in a PVC enclosure and each unit shall be self-draining, non-freezing. All above-ground components shall be contained within a UV-resistant locking cover. Automatic flushing valves shall be as manufactured by Kupferle, or equal.

PART 3 - EXECUTION

3.1 PAINTING, COATING, AND LUBRICATING

- A. All iron parts of the hydrant, inside and outside, shall be thoroughly 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.
- B. 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 Owner approved equal. After installation, each hydrant shall be painted with two (2) field coats of Glamortex Enamel as manufactured by the Inertol Company or Owner approved equal; color to be silver.

- C. All bronze, threaded, and contact moving parts shall, during shop assembly, be lubricated and protected by a coating of rust proof compound to prevent damage in shipment and storage.

3.2 SETTING HYDRANTS

- A. Hydrants shall be placed at the locations indicated on the Drawings in a manner to provide complete accessibility and so that the possibility of damage from vehicles or injury to pedestrians shall be minimized. Contractor shall install proper "bury" hydrants or shall use, at no cost to GCDWR, proper length extensions to insure that each fire hydrant is installed in accordance with the manufacturer's recommendation and the requirements of the Specifications. When placed behind curb, the hydrant barrel shall be so set that no portion of the pumper or hose nozzle caps shall be less than six (6) inches, nor more than twelve (12) inches from the gutter face of the curb. Place gravel as shown on the Drawings. All pipes connecting the fire hydrant to the main line shall be ductile iron pipe meeting these specifications or approved connecting pieces.
- B. The use of PVC pipe for hydrant branch piping is specifically prohibited. The connection of the hydrant to the supply main must be through either a Ductile Iron Tee or a tapping sleeve and include an outlet valve at the point of connection. Using a tapping sleeve where the Drawings indicate a Tee shall not result in any additional cost to GCDWR.

END OF SECTION 33 12 19

SECTION 33 12 19.81

RELOCATE AND RECONNECT HYDRANTS, VALVES, AND METERS

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
3.1	Existing Materials and Appurtenances
3.2	Work

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Excavation and Fill (31 23 00).
2. Precast Concrete Utility Structures (33 05 16.13).
3. Ductile Iron Pipe (33 11 13.05).
4. Water Utility Distribution Fire Hydrants (33 12 19).

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. The Contractor shall perform the Work of this item with due regard to the requirements of Section 33 11 13.05 Ductile Iron Pipe as concerns the overrun of authorized shutdowns, authorized shutdowns, and hours for authorized shutdowns.

1.3 WORK INCLUDED

- A. The Contractor shall, where specified, indicated on the Drawings, or directed by the Engineer, disconnect, relocate and reconnect existing hydrants, check valves and large meters.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show, in detail, the size and location of all hydrants, valves, meters, and accessories to be used in construction.

- C. Per Section 33 05 16.13 Precast Concrete Utility Structures, Contractor shall furnish and install a pre-cast concrete vault with aluminum hatch. Shop drawings for the vault and hatch must be approved by the Engineer prior to installation.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 EXISTING MATERIALS AND APPURTENANCES

- A. Existing valves and hydrants, which are suitable for reuse, shall be cleaned and, if required, shall have their internal parts reworked, and shall be properly placed in the Work where indicated or required. Outlets on hydrants shall be re-oriented, if required.
- B. The Contractor shall perform the disconnecting, relocating, and connecting carefully so as to avoid damaging the materials or appurtenances. Materials or appurtenances damaged in the course of the Work shall be replaced or repaired by the Contractor at his own expense and to the approval of GCDWR.

3.2 WORK

- A. Relocate/Reconnect Existing Hydrant - Includes disconnection from existing mains, plugging and blocking openings in the main and reconnecting and/or relocating hydrant to new main in accordance with the manufacturer's recommendations and the requirements of these specifications. The placement of the relocated hydrant shall meet the requirements for fire hydrant installation as shown on the Drawings and/or specified in Section 33 12 19.
- B. Adjust Existing Hydrant – Where indicated on the Drawings or directed by the Engineer, the Contractor shall raise or lower the above ground portion of an existing hydrant to the elevations indicated or directed by the Engineer. All work shall be completed with compatible parts as provided by the fire hydrant manufacturer, or GCDWR approved equal.
- C. Salvage Hydrants and/or Valves – Includes removal of the hydrant, closing and plugging of hydrant valve, and abandonment of hydrant valve in place per these specifications. Hydrants for salvage shall be transported to a location designated by GCDWR.
- D. Relocate Large Meter/Check Valve/Vault - Relocate 3", 4", 6", and 8" water meters or check valves including removal of the existing meter and vault and reinstallation of the existing meters and vaults to the new location. Existing meters and vaults shall be carefully removed, stored (if construction phasing requires), and properly reinstalled in the Work (including all excavation and backfilling) where indicated or as required.
- E. Furnish and Install Concrete Vault - Vault shall be pre-cast concrete with aluminum hatch meeting the requirements of Section 33 05 16.13 of these specifications.

- F. Adjust Valve Box – Where indicated on the Drawings, required by existing or proposed grades, or as directed by the Engineer, the Contractor shall make adjustments to existing valves boxes so they are flush with grade. Adjustments shall be made by adding or removing sections of ductile iron pipe beneath the valve box. In non-paved locations, a concrete ring shall be placed around the top of the valve box. If the existing valve box is not plumb or centered over the operating nut, the Contractor shall re-center and the valve box and return it to a plumb position. Where valves are to be abandoned, the Contractor shall close the valve, remove the valve box, fill the resulting hole with suitable compacted fill material, and restore the surface to match the surrounding area. This work shall include all excavation, backfill, and restoration required to set the valve box as directed and return the site to its preconstruction conditions.
- G. All Work performed under this item shall be performed at the locations and in the manner indicated in the Drawings or as otherwise required by GCDWR.

END OF SECTION 33 12 19.81

SECTION 34 41 16.10

TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
2.2	Worker Safety Apparel
2.3	Traffic Control Devices
3.1	Maintaining Traffic
3.2	Traffic Control

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00).
2. Exploratory Excavations (02 32 19).
3. Paving Removal (02 41 13.13)
4. Utility Line Removal (02 41 13.23)
5. Removal of Construction Material (02 42 11)
6. Clearing and Grubbing (31 11 00)
7. Excavation and Fill (31 23 00).
8. Erosion and Sedimentation Controls (31 25 00).
9. Asphalt Paving (32 12 16)
10. Sidewalks, Curbs, and Gutters (32 16 13)
11. Roadway Construction (34 71 00)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all materials, equipment, and labor (including employment of off-duty Gwinnett County Police Officer(s)), necessary to maintain traffic control during construction. This Work shall consist of furnishing, installing, maintaining, and removing necessary traffic signs, pedestrian signs, barricades, lights, signals, cones, pavement markings, and other traffic control devices, as specified by MUTCD,

indicated on the Drawings, or as directed by the Engineer or GCDWR; and shall include flagging and other means for guidance and protection of vehicular, worker, and pedestrian traffic, and shall include both maintaining existing devices and installing additional devices through the Work Zone.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. Submittals shall show in detail, the type, number, and location of all traffic control measures to be used in the execution of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Unless otherwise specified, all materials furnished for traffic control shall meet the requirements of the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, Sections 148 and 150, latest edition; Georgia Department of Transportation, Special Provision, Section 150-Traffic Control, latest edition; and the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

2.2 WORKER SAFETY APPAREL

- A. All workers within the right-of-way who are exposed to traffic or to work vehicles and construction equipment shall wear high-visibility safety apparel that meets the Performance Class for the risk exposure.

2.3 TRAFFIC CONTROL DEVICES

- A. All traffic control devices used during the execution of the Work shall meet the Standards utilized in the Manual on Uniform Traffic Control Devices (MUTCD), latest edition.

PART 3 - EXECUTION

3.1 MAINTAINING TRAFFIC

- A. All working operations of the Contractor, Subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highway, and structures encountered in the prosecution of the Work under this item.
- B. The Contractor shall proceed with the Work in such manner as shall permit regular transaction of business by the GCDOT and/or property owner without delay or danger

to life or property, and shall place necessary barricades, warning signs, signals, lights, and if necessary, flaggers or Police Officer(s) for the protection of the traveling public.

- C. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give a minimum of twenty-four (24) hour notice to owner(s)/tenant(s) of private drives before interfering with them.
- D. In making open-cut street crossings, Contractor shall not block more than one-half (½) of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side of the street to facilitate traffic flow.

3.2 TRAFFIC CONTROL

- A. Contractor's proposed plan of operation shall supplement the approved traffic control plan as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.
- B. All traffic control devices shall be in an acceptable condition when first installed on the Project and shall be maintained throughout the construction period. All unacceptable traffic control devices shall be replaced within twenty-four (24) hours.
- C. In the execution of the Work, if it becomes necessary to remove any existing signs, markers, etc., they shall be removed, stored and reinstalled as directed by the Engineer or GCDWR, to line and grade in the same condition as when removed.
- D. All temporary traffic control devices shall be removed within seven (7) calendar days after completion of construction.
- E. When necessary to provide a safe work zone for the Contractor and GCDWR employees, off-duty Police Officer(s) may be utilized to assist in maintaining safe traffic control. Use of Police Officer(s) shall be used when safety necessary, in areas of high traffic volume, installation in roadways, road closures and lane closures, or in areas of low visibility. The Contractor shall contact the Gwinnett County Police Department Uniform Division Office at (770) 513-5820 to schedule an off-duty Police Officer(s). Arrangements for Police Officer(s) must be made a minimum of forty-eight (48) hours prior to the Work to allow time for Police Officer(s) to be scheduled. Depending on the situation, the Police Officer(s) onsite may request additional Police Officer(s), if needed.

END OF SECTION 34 41 16.10



SECTION 34 71 00
ROADWAY CONSTRUCTION

PART 1 - GENERAL

1.1 SUMMARY

A. SECTION INCLUDES:

<u>Section</u>	<u>Title</u>
1.2	References
1.3	Work Included
1.4	Submittals
2.1	Materials
3.1	General Conditions
3.2	Materials and Workmanship
3.3	Restoring Driveway and Parking Area Pavements
3.4	Roadway Permits
3.5	Restoring Roadway Pavements

B. RELATED SECTIONS

The following listed sections do not purport to be all inclusive, as it is the Contractor's responsibility to do all the Work in accordance with the Contract Documents.

1. Submittal Procedures (01 33 00)
2. Removal of Construction Material (02 42 11)
3. Paving Removal (02 41 13.13)
4. Cast-in-Place Concrete (03 30 00).
5. Excavation and Fill (31 23 00).
6. Asphalt Paving (32 12 16).
7. Sidewalks, Curbs, and Gutters (32 16 13)
8. Traffic Control (34 41 16.10)

1.2 REFERENCES

- A. Drawings and general provisions of the Contract, including general and supplementary conditions and Division 1 Specification Sections, apply to this section.
- B. Gwinnett County Department of Transportation Standard Specifications.
 1. Where section numbers are identified throughout this specification, the reference is to the Georgia Department of Transportation Standard Specifications, Construction of Roads and Bridges, latest edition.

1.3 WORK INCLUDED

- A. The Contractor shall furnish all labor, equipment, and materials necessary to restore all pavements (parking areas, driveways, sidewalks, curbs, gutters, etc.) of whatever

construction and irrespective of the type, which may be damaged, disturbed, or required to be removed in the process of the Work.

- B. These items shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, gravel, asphalt and other bituminous material necessary for the proper completion of the Work as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR.

1.4 SUBMITTALS

- A. Submit for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES all working drawings and schedules of materials and methods proposed to be followed in the execution of the Work under this item.
- B. The Contractor shall furnish samples, manufacturer's product data, test reports, and material certifications as required above in Paragraph 1.1.B RELATED SECTIONS.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. For asphalt and other bituminous paving, refer to Specification SECTION 32 12 16 ASPHALT PAVING, PART 2 – PRODUCTS.
- B. For concrete paving, sidewalks, curbs, and gutters, refer to Specification SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS, PART 2 – PRODUCTS.

PART 3 - EXECUTION

3.1 GENERAL CONDITIONS

- A. Contractor's attention is directed to the provisions of Specification SECTION 31 23 00 EXCAVATION AND FILL, Paragraph 3.1 BACKFILLING, requiring Final and Sub-base backfill and compaction of backfill under areas to be paved. Any settlement which may occur during the Warranty Period of one (1) year following Substantial Completion certification, shall be corrected at the Contractor's expense, including repaving and/or replacing of streets, curbs, gutters, parking areas, and driveways which settle during the Warranty Period.
- B. The Contractor shall repave all areas over trenches in public streets as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR, promptly after completion of Final and Sub-base backfill to provide full use of the street with a minimum of delay.
- C. No additional payment shall be made for excavation or disposal of excavated material required for placement, or removal of backfill placed above the required elevation of the pavement or for preparation of sub grade, and the cost thereof shall be considered as being included in the Unit Prices Bid for paving and curbing items.

- D. Should settlements, cracks, or other indications of failure appear in adjoining pavements, the adjoining damaged paving shall be removed per provisions of SECTION 02 41 13.13 PAVING REMOVAL, Paragraph 3.1 TRENCH PAVING REMOVAL, to the extent necessary to secure firm, undisturbed bearing, and shall be repaved to Standards as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- E. Where necessary to cut a concrete sidewalk, driveway, or parking area, entire slabs or sections shall be removed and replaced to an edge of paving or joint, unless otherwise directed by GCDWR.
- F. The Contractor shall replace all sidewalks removed or disturbed by the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Sidewalks shall be constructed to the same dimensions and materials as were originally placed. The sub-base shall be thoroughly rolled or tamped and shall be wet just before, if necessary, concrete is placed, but shall show no pools of water.
- G. The Contractor shall restore all curbs, combination curbs and gutters, which have been removed or disturbed in the process of the Work in accordance with SECTION 32 16 13 SIDEWALKS, CURBS, AND GUTTERS. Curbs and gutters shall be made to conform accurately in size, line, grade, and materials as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. In restoring curbs and gutters, the subsoil and foundation material shall be compacted as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, so as to prevent any settlement of concrete curb and/or gutter.
- H. In paved areas, the Contractor shall adjust all utility structures (manhole frame/cover, vault tops, valve boxes, etc.) to final grade per provisions of SECTION 33 05 16.13 PRECAST CONCRETE UTILITY STRUCTURES.

3.2 MATERIALS AND WORKMANSHIP

- A. Materials to be used in the repair and restoration of pavements, driveways, sidewalks, and curbs and gutters shall be as specified above in this section in Paragraph 2.1 MATERIALS. All materials removed during the excavation of the Work shall be disposed of by the Contractor per provisions of SECTION 02 42 11 REMOVAL OF CONSTRUCTION MATERIAL. All workmanship shall be first class.

3.3 RESTORING DRIVEWAY AND PARKING AREA PAVEMENTS

- A. The Contractor shall restore driveway and parking area pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed and backfill completed, the Contractor shall furnish, place and maintain wherever the pavements have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR. Driveways and parking areas shall be constructed as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, but concrete shall not be less than 4 inches thick. Surface finish is to match existing; edges are to be saw cut in straight lines, both horizontally and vertically; expansion joints to

be used as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative. In general, concrete driveways shall be replaced from back of curb to a point ten (10) back from back of curb, or to the closet expansion joint nearest the construction disturbance. The limits of this type of restoration shall be approved by GCDWR prior to construction of that area in order to determine payment quantities.

- B. All Concrete shall conform to Specification SECTION 03 30 00 CAST-IN-PLACE CONCRETE, Paragraph 2.1 CONCRETE.

3.4 ROADWAY PERMITS

- A. The Contractor's attention is called to the requirements that Contractor must obtain all road opening permits from GCDOT, and must assist GCDWR in obtaining all permits required by the Georgia Department of Transportation.
- B. All fees shall be borne by the Contractor.

3.5 RESTORING ROADWAY PAVEMENTS

- A. The Contractor shall restore roadway pavements removed or disturbed during construction. After the pipe has been laid, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore and maintain wherever the pavements or road surfaces have been removed or damaged in the process of the Work, asphaltic concrete surfaces, concrete surfaces, or stone surfaces as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative.
- B. All roadway restoration shall be done, and all highway utilities and traffic controls are to be maintained, in accordance with the laws, ordinances, rules, regulations and Standards, including the use of standard signs, of the jurisdictional authority in which such pavement is located. The Contractor shall provide all such bonds or checks, which may be required by the highway authorities to ensure proper restoration of paved areas, at no cost to GCDWR. All road closures and detours must be submitted and approved by the authorities within whose jurisdiction they are located.
- C. The Contractor shall resurface the entire street from curb to curb, or any other area as directed by the Engineer or GCDWR. Asphaltic concrete paving shall conform to the requirements of SECTION 32 12 16 – ASPHALT PAVING.
- D. If prior to the expiration of the Warranty Period, the asphalt, concrete or stone road surfaces within the lines of excavation, or adjacent thereto, shall have been damaged or injured, due to undermining, or for any other cause which may be attributed to the Work by the Contractor, then the Contractor shall remove such damaged or injured surfaces, foundations of same, and all loose earth. Contractor shall then backfill and compact damaged area as specified, as indicated on the Drawings, or as directed by the Engineer or GCDWR construction material testing representative, and furnish, place, and maintain an asphalt, concrete or stone road surface until the Warranty Period has expired.

- E. Asphalt, concrete or stone road surfaces, which the Contractor is required to replace, shall at the expiration of the Warranty Period, be in as good or better condition than at the time of Contract award.
- F. All cuts required in restoring pavements shall be made by channeling machine, pneumatic tools, or such other methods as shall furnish a clean, straight cut both horizontally and vertically, in the pavement and pavement base without undue shattering.

END OF SECTION 34 71 00



APPENDIX A – SUPPLEMENTAL SPECIFICATIONS

48-INCH PCCP REPLACEMENT

(I-85 INTERCHANGE AT SR 324)

GCDWR Project No. M0735-78



SECTION A-01 22 15
SUPPLEMENTAL MEASUREMENT AND PAYMENT
BID PROJECTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This section defines the *project specific* Bid Item(s) of Work listed on the Bid Form Description as Supplemental Measurement and Payment numbers, and the method of determining payment for each said item. Payment shall be made for each Bid Item based on the description in this Specification Section.
- B. Bid Prices included on the Bid Form shall be full compensation for all materials, labor, equipment, tools, construction equipment and machinery, heat, utilities, transportation, taxes, overhead, markup, incidentals and services necessary for the execution and completion of the Work in the Contract Documents to be performed under this Contract. For the Work described, the unit price, actual used and installed quantities of each bid item shall be measured in the field and certified by the Engineer and/or GCDWR upon completion of construction in the manner set forth for each item in this and other sections of the Specifications. Payment for all items listed on the Bid Form will constitute full compensation for all Work as specified, indicated on the Drawings, or as directed by the Engineer or GCDWR.
- C. The Contractor shall assist and fully cooperate with the Engineer and/or GCDWR to determine proper measurement of quantities for each item providing complete and reasonable backup documentation as requested by the Engineer and/or GCDWR to substantiate payment due.

1.2 BID ITEMS

- A. The following item SUP#1 through SUP#5 comprise items in the Base Bid Total as listed on the Bid Form.

SUP#1. UNIT PRICE FOR CULVERT REPLACEMENT

MEASUREMENT: The quantity to be paid under this item shall be LUMP SUM for all work required to replace the existing culvert at approximately station 19+05.

PAYMENT: The Unit Price Bid for this item shall include all labor, equipment, and materials required for the culvert replacement as indicated on the Drawings, including ditch grading, demolition and disposal of existing culvert, catch basin, and appurtenances, flared end section, 18” reinforced concrete pipe, demolition and disposal of existing culvert, 18” corrugated metal pipe and connection to existing pipe, replacement of existing double wing catch basin, replacement landscape all disturbed landscaping shrubs, trees, etc., excavation, bedding, and backfill.

SUP#2. DEMOLISH EXISTING BOX CULVERT AND STREAM BANK RESTORATION:

MEASUREMENT: The quantity to be paid for under this item shall be LUMP SUM for all work including equipment, materials, and labor for the demolition and off-site disposal of the existing double 5'x4' box culvert and stream bank restoration as required by the Drawings.

PAYMENT: The Unit Price Bid for this item shall include all labor, equipment, and materials required for demolition and of the existing double 5'x4' box culvert, headwalls, footing, and all associated items. Off-site disposal costs associated with the demolition are also included in this item. The Unit Price Bid shall also include all equipment, materials and labor for restoration of the stream bank once the box culvert has been removed in accordance with the Drawings.

SUP#3. CONTROLLED LOW STRENGTH FLOWABLE FILL:

MEASUREMENT: The quantity to be paid for under this item shall be CUBIC YARDS for all work including equipment, materials, and labor for the installation of Non-Excavatable Controlled Low Strength Flowable Fill (CLSF) as required by the Drawings.

PAYMENT: The Unit Price Bid for this item shall include all labor, equipment, and materials required for installation of CLSF as required by the Drawings or as directed by the engineer including but not limited to filling and sealing the existing 48" PCCP pipe within the limits shown on the Drawings and filling and sealing the new 100 LF - 66" diameter steel casing with CLSF material. No payment will be made for CLSF not required to be installed by the Drawings or as directed by GCDWR.

SUP#4. GDOT CLASS "B" CONCRETE:

MEASUREMENT: The quantity to be paid for under this item shall be CUBIC YARDS for all work including equipment, materials, and labor for GDOT Class "B" Concrete installed as required by the Drawings or as directed by GCDWR.

PAYMENT: The Unit Price Bid for this item shall include all labor, equipment, and materials required for installation of GDOT Class "B" Concrete as required by the Drawings. In addition, price shall include the removal and offsite disposal of existing earth or rock materials that have been disturbed within the lateral bearing zone of the concrete thrust blocks. No payment will be made for GDOT Class "B" Concrete not required to be installed by the Drawings or as directed by GCDWR.

SUP#5. ADDITIONAL PIPE BEDDING:

MEASUREMENT: The quantity to be paid for under this item shall be the actual number of CUBIC YARDS of additional pipe bedding material placed due to the same trench installation of the new 48" DIP at a higher vertical elevation than the existing 48" PCCP at the locations indicated on the Drawings, or as directed by GCDWR.

PAYMENT: The Unit Price Bid per cubic yard (CY) of additional pipe bedding material including all labor, materials, tools, and equipment necessary for the placement and compaction of the additional bedding material to complete the Work as specified, as indicated on the Drawings, or as directed by GCDWR. Payment will not be made when additional pipe bedding material is used by the Contractor due to over excavation or for the Contractor's convenience.

END OF SECTION A-01 22 15



APPENDIX B – GEOTECHNICAL REPORTS

48-INCH PCCP REPLACEMENT

(I-85 INTERCHANGE AT SR 324)

GCDWR Project No. M0735-78





December 22, 2016

Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Attention: Mr. Tony Harris

Reference: **Report of Geotechnical Exploration**
48-Inch PCCP Replacement - Old Camp Branch Road
Buford, Georgia
S&ME Project No. 1280-16-089

Dear Mr. Harris:

S&ME, Inc. (S&ME) has completed the authorized geotechnical exploration for the proposed 48-inch diameter PCCP Replacement along Old Camp Branch Road in Buford, Georgia. Our services were provided in general conformance with the scope of work described in our Proposal Number 12-1600511 dated November 1, 2016 as authorized by Gwinnett County P.O. Number 2000299948, dated November 7, 2016.

1.0 Purpose

The primary purpose of this exploration was to explore the subsurface conditions at the requested locations relative to the existence of rock or groundwater within the depth of the planned excavation and to recommend parameters for design of pipe thrust resistance measures by others. We were also requested to observe the current condition of the existing double box culvert where jack-and-bore procedures will be required to install the new pipe beneath the culvert.

2.0 Project Description

Based on our review of project documents and discussions with Mr. Tony Harris of Gwinnett County Department of Water Resources (GCDWR) and Mr. Bill Crowder of Precision Planning, Inc. (PPI), we understand that the GCDWR plans to install a 48-inch diameter ductile iron pipe to replace the existing PCCP water main along the old alignment of Camp Branch Road in Buford, Georgia. The Appended Site Location Map (Figure 1) indicates the approximate project location.

We were provided the *Water Main Plan and Profile, Alternate (Sheet 4 ALT)*, dated October 5, 2016, by PPI for the pipe replacement from project Station 0+00 to Station 11+00. The approximate locations of six requested borings were shown on the drawing. We understand that



the project extends beyond the limits shown on Sheet 4 ALT, but we were not requested to explore those areas.

The new water main installation will require excavations on the order of 10 to 23 feet. The majority of the new pipe will be installed using "cut-and-cover" methods. Forty feet of 66-inch diameter steel casing will be required where the new line passes beneath the existing concrete double box culvert at approximate Station 2+15. The casing beneath the box culvert will require jack and bore methods for installation. One hundred feet of 66-inch diameter steel casing will also be required from Station 3+50 to 4+50, which will be beneath the future Interstate exit ramp alignment. The casing for the future Interstate ramp alignment is expected to be installed by "cut-and-cover" methods.

3.0 Exploratory and Testing Procedures

3.1 General

Initially, S&ME contacted Georgia 811 to have them locate member utilities in the vicinity of the proposed drilling. Test locations were established in the field by Mr. Shea Vincent of S&ME by estimating right angles and measuring/pacing distances from site features and existing landmarks. Based on the methods used to establish the locations of the test borings, this information should be considered approximate. Refer to the Boring Location Plan (Figure 2) in the Appendix for the approximate location of each boring (the six planned borings plus two offset borings). The approximate elevation of the ground surface at each boring location was estimated from the existing topography shown on the provided plan. If more precise location or elevation data is desired, a licensed surveyor should be retained to provide that data.

3.2 Test Borings

The subsurface conditions along the planned alignment were explored on December 14, 2016 with soil test borings. The borings were performed in general accordance with ASTM D6151, the *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling* by mechanically twisting hollow-stem augers through the upper soil veneer (at Borings B-04, B-05, B-05A, B-06 and B-06A) and the existing pavement (at Borings B-01, B-02, and B-03) and subsequently through the underlying materials with a drill rig. Four standard penetration resistance tests (SPT) were performed with a split spoon sampler in the upper 10 feet (unless auger refusal was met shallower than 10 feet). Penetration resistance tests were performed at 5-foot intervals thereafter. The sampler was first seated 6 inches and then driven an additional foot with blows of 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "standard penetration resistance" (N-value) with units of blows per foot (bpf). The N-value provides a general indication of in-situ soil consistency and has been correlated with certain engineering properties of soils. Very dense residual materials described as partially weathered rock or boulders were



encountered in several borings. In these materials, 50 hammer blows drove the sampler less than 6 inches and the Boring Logs show the penetration for 50 blows as 50/4", 50/1", etc.

Subsurface water level readings were attempted in each boring promptly after completion of the soil drilling process and after all borings were completed. Upon completion of drilling and sampling, the boreholes were backfilled with soil cuttings and a borehole closure device. The old roadway surface at Borings B-01, B-02, and B-03 was patched with a commercial cold-mix asphalt patching material after backfilling. Relatively dry soils were encountered at the depth of termination or auger refusal in the borings; therefore, the boreholes were not left open overnight for obtaining delayed subsurface water level measurements.

Soil samples obtained during the exploration were transported to our laboratory and reviewed by our engineering staff. The purposes of this review were to check the field descriptions, visually estimate the percentages of the soils' constituents (sand, clay, etc.), and observe evidence of soil origin. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, but the transitions may be more gradual.

4.0 Site, Geologic, and Subsurface Conditions

4.1 Site Conditions

The borings were drilled along an approximate one quarter mile stretch of an old alignment of Camp Branch Road near its intersection with Gravel Springs Road in Buford, Georgia. The northern approximately half of the alignment is currently covered with asphalt pavement, while the other half is unpaved. A double barrel box culvert underlies the alignment at approximate project Station 2+15 where a small creek crosses through the project area. The creek flows roughly from north to south. Boulders were observed in the fill embankment on both sides of the old roadway in areas near the existing culvert.

4.2 Area Geology

Fill soils have been placed by man in conjunction with previous utility or roadway construction, mass grading, farming, or waste disposal. Fill can be comprised of different soil types from various sources and can also be comprised of or contain boulders, debris from building demolition, organics, topsoil, trash, etc. The engineering properties of fill depend primarily on its composition, density, and moisture content. We do not expect that documentation regarding the construction or compaction of the fill materials exists.

Soils which have been eroded, transported, and deposited in and adjacent to water courses such as the existing creek at the site are termed "alluvium". Alluvial materials can vary significantly from their residual soil source and can range in particle size from clay to gravel depending on the depositional environment. Alluvial materials frequently are soft or loose, and wet. Differing



soil types and consistencies/relative densities can occur in relatively short horizontal and vertical distances.

The site is located within the Piedmont Physiographic Province of Georgia. According to the 1976 "Geologic Map of Georgia" prepared by the Georgia Department of Natural Resources, the site is underlain by granitic gneiss. The residual soils encountered in this physiographic region are the product of in-place physical and chemical weathering of the parent igneous and metamorphic rocks. The typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced. These upper soils are underlain by sandy silts and silty sands that generally become harder with depth to the top of parent bedrock. The boundary between soil and rock is typically not sharply defined.

A transitional zone between the soil overburden and parent bedrock is locally termed "partially weathered rock" (PWR). Partially weathered rock is defined, for engineering purposes, as residual material with standard penetration resistances exceeding 100 blows per foot. Weathering is facilitated by fractures, joints, and by the presence of less resistant rock minerals. Consequently, the profile of the partially weathered rock and hard rock can be quite irregular and erratic, even over short horizontal distances. It is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil overburden, as well as just above the top of bedrock.

4.3 Subsurface Conditions

Subsurface information in this report is based upon the appended Boring Logs that were prepared using our test boring field logs and our engineer's visual classification of the split-barrel soil samples obtained during standard penetration testing. Depths or thicknesses of materials are estimates and should be considered approximate. Subsurface conditions can change significantly over relatively short horizontal distances and may be different within the depths drilled at other locations on the site.

The following is a generalization of subsurface conditions encountered at the borings. The reader should refer to the individual boring logs for more detailed descriptions of subsurface conditions at each exploratory location.

4.3.1 Surface Materials

Borings B-01, B-02 and B-03 were drilled in the paved part of the former alignment of Camp Branch Road. The asphalt pavement was about 2 to 3 inches thick and the crushed stone base course was approximately 4 inches thick at the boring locations. Topsoil was not encountered at the ground surface in the other borings.



4.3.2 *Fill Materials*

Soils described as fill materials were encountered in each of the borings to depths ranging from 1 to 9 feet. The fill materials were typically described as very firm red-brown or tan sandy silts. The fill materials in the southern part of the alignment (Borings B-05, B-05A, B-06 & B-06A) contained pieces of crushed stone, rock fragments and boulders. N-values in the fill ranged from 18 to over 100 bpf. Some of the N values may have been inflated due to rock fragments within the soil matrix or the presence of boulders.

4.3.3 *Alluvial Materials*

Borings B-05 and B-05A were drilled near the existing stream and encountered alluvial materials beneath the fill soils from 6 to 12 feet below the ground surface. The alluvial materials were described as medium dense tan and red-brown silty sands. The N-values in the alluvial soils ranged from 20 to over 100 bpf.

4.3.4 *Residual Materials*

Borings B-01 through B-04 encountered residual soils beneath the fill and alluvium described above. The residual soils were typically described as medium dense to dense silty sands and contained some lenses of PWR. N-values in the residual materials ranged from 15 to over 100 bpf.

4.3.5 *Partially Weathered Rock*

Partially weathered rock (PWR) was encountered as lenses in the residuum and as a continuous layer in Borings B-03 and B-04 beginning depths ranging from about 10 to 14 feet.

4.3.6 *Auger Refusal Materials*

Materials that could not be penetrated by the soil augers used for this exploration were encountered in Borings B-03 through B-06 (and associated offset boring attempts) at depths ranging from 1 to 23 feet below the ground surface. The refusal materials in Borings B-03 and B-04 are inferred to be bedrock materials.

The refusal materials in Borings B-05, B-05A, B-06 and B-06A could be boulders placed in the fill materials, boulders in the alluvial materials, or bedrock beneath the fill or alluvium. Sufficient data could not be obtained with the soil test borings of this exploration to allow us to determine the source of the refusal at these borings.

4.3.7 *Groundwater*

Groundwater was not encountered above the refusal or termination elevations of the borings of this exploration at the time of drilling. We note that this exploration was performed after an extended period with below average rainfall in the project vicinity. Groundwater levels will fluctuate with seasonal and yearly rainfall and temperature variations; therefore, future groundwater levels may be higher or lower than those measured during this exploration. The groundwater table typically parallels the original ground surface near streams, and thus may later be encountered within the depths drilled during this exploration.



5.0 Conclusions and Recommendations

5.1 Further Exploration

As the borings in the southern part of the alignment could not extend to the planned pipe invert elevation due to obstructions within or beneath the fill and/or alluvial soils, we suggest consideration be given to having the area further explored by excavation of observation pits using a large hydraulic excavator (trackhoe). A large hydraulic excavator can typically remove small to medium size boulders embedded in soils and some partially weathered rock within the upper 15 to 20 feet. Such excavations should reveal conditions that allow a determination to be made if the refusal materials encountered in the borings were boulders or bedrock. If that determination is made prior to bidding, the bid documents can reflect the additional information.

5.2 Groundwater Control

The borings of this exploration did not encounter groundwater within the depths drilled. We note that several borings met refusal above planned pipe invert elevation. Also, the borings were drilled after an extended period of dry weather in the project area. In the Piedmont Geologic Province, the groundwater level often roughly parallels the ground surface topography in the vicinity of streams. Thus, based on the water observed in the stream on site, we recommend that the groundwater level be assumed to be approximately 12 feet below the ground surface for design purposes in the area of this exploration. Where groundwater is encountered in the pipe trench and jack and bore pits, it can typically be controlled with local pumps in temporary sumps embedded in bedding stone for the pipe or in the base of the pit excavations. We recommend that the project documents require that dewatering be the sole responsibility of the contractor.

5.3 Excavation Difficulty

Residual soils with standard penetration resistance values up to about 30 bpf can generally be excavated using conventional tracked hydraulic excavators and pusher-assisted scrapers. High consistency residual soils (N-values >30 bpf) and partially weathered rock are likely to be encountered during excavation for the pipe and casing installation. Excavating these materials in confined areas generally requires large tracked excavators such as a Caterpillar 320 or equivalent.

Excavation below the level where our soil augers encountered refusal likely will require the use of rock excavation methods such as explosives or pneumatic tools. Additionally, some layers or lenses of partially weathered rock or rock in the overburden soil zone may require these excavation methods to be employed. If the refusal levels in Borings B-05 and B-06 were on boulders, rock excavation techniques may not be required to remove those materials, depending on their size and the project documents. The elevations and areas of known rock and partially weathered rock (as indicated by the borings of this explorations or other means) should



be considered in the bid documents. However, recognize that rock or partially weathered rock layers may be encountered at varying elevations throughout the site.

Where rock is encountered above pipe invert elevation, consideration should be giving to blasting prior to over burden soil removal. This will help expedite pipe construction. In blasting rock, holes are drilled into the rock to place the explosives. To enhance fracturing of the rock to the depth planned for removal, the blast holes are commonly drilled to a greater depth than the limit of excavation. This often results in rock being broken and loosened below the depth of planned excavation. When rock is broken and loosened below the planned depth for removal, it is termed "overblast". All rock broken or loosened below the depth of planned excavation will need to be removed from the trench and replaced with bedding stone to provide uniform support for the pipe. This overblast should be considered when calculating volumes of rock to be removed. Dealing with the overblast should be specifically discussed with the contractor prior to construction. Care should be exercised during blasting to limit the amount of overblast.

Special care should be taken to remove any overblast from the areas around any thrust blocks or other lateral restraint devices for the pipe.

We recommend that the project specifications include a performance type definition of rock to help limit disputes regarding material classifications. A sample rock definition is included in the Appendix. We recommend classifying excavated materials as either rock or soil.

5.4 Jack and Bore Installation

While data in the area of the jack and bore casing beneath the existing culvert is limited by the shallow refusal at Boring B-05 (which may have resulted from boulders within fill or alluvium) we expect that the excavations for the jacking and receiving pits may require removal of partially weathered rock or rock to achieve grade. Excavation bracing may also be required for support of the excavation sidewalls if sufficient room is not available to safely slope the excavation sides. The available data also indicates that the bore for the pipe casing may also have to be made through rock or partially weathered rock. We recommend that the project documents require the contractor to include unit pricing for pit excavation and bore excavation in rock or rock-like materials. If additional data is obtained by excavation of observation pits, these recommendations can be amended.

5.5 Temporary Slopes

Excavations for this project should be sloped or shored in accordance with OSHA and local regulations and requirements. The slopes should be designed by the contractor's OSHA-certified trench safety Competent Person (a registered engineer for deep trenches or shoring). We recommend that temporary slope inclinations be no steeper than 1 ½ H: 1V for trenches excavated in dry conditions.

5.6 Backfill Materials

Upon completion of the pipe construction, the pipe trench and jack and bore pits should be backfilled with compacted fill materials. Maximum particle sizes for structural fill placed as backfill around the new pipe should be limited to about 3 inches to reduce the chance of damaging the conduits and to help facilitate adequate compaction using the smaller equipment usually necessary when backfilling utility trenches. Backfill and other structural fill should be placed in relatively thin (4- to 8-inch) layers and compacted to at least 95 percent of the soil's maximum dry density as determined by the standard Proctor compaction test (ASTM D698). Higher degrees of compaction may be needed in the area of the future I-85 ramp. Also higher degrees of compaction and backfill materials other than soil may be required in some places by GCDWR standard trench backfill details.

If groundwater flow into the excavations hinders compaction of the backfill, it may be necessary to backfill the excavations with consolidated No. 57 sized crushed stone up to the level of the infiltrating water.

Where the excavations are made through zones of partially weathered rock or rock, the excavated materials will likely be too coarse for re-use as backfill around the utilities. Thus, they will need to be segregated from the excavated soil materials. These more coarse materials can likely be used as backfill in the zone from two feet above the pipe to not shallower than three feet from the ground surface, provided they can be placed and compacted into a well consolidated essentially "void free" mass and that process is approved by GCDWR. Double-handling of some materials should be budgeted for excavations expected to be made in high consistency materials.

5.7 Recommended Design Parameters for Lateral Restraint

As requested, we offer the following recommended parameters to be used in the design of lateral restraint measures (thrust blocks, etc.). The design parameters are based on the data obtained during this exploration and empirical relationships. Quantitative laboratory testing was not performed to confirm the values. Please note that the parameters in the areas of Borings B-05 and B-06 are based on the assumption that the materials at the pipe level will be at least as strong as residual soils encountered in other borings for this exploration. These values should be considered preliminary and should be confirmed by S&ME prior to construction by observation of conditions exposed in observation pits, or during construction by observation of exposed conditions.



Boring No.	Approx. Station No.	Approx. Refusal Elevation (feet)	Material Description at Pipe Bearing Elevation*	Allowable Bearing Pressure (psf)	Angle of Internal Friction (Φ' , Degrees)	Passive Earth Pressure Coefficient (K_p)	Effective Vertical Stress at Pipe elevation (psf)
B-06, B-06A	0+70, 0+95	1107 to 1098	Unknown (Shallow Refusal)	2,000 psf	28	2.8	1,500
B-05, B-05A	1+70, 1+80	1097 to 1094	Unknown (Shallow Refusal)	2,000 psf	28	2.8	1,600
B-04	3+20	1085	Partially Weathered Rock	3,000 psf	38	4.2	1,600
B-03	4+45	1096	Rock	4,000 psf	40	4.6	1,700
B-02	6+00 15 ft. Left	Refusal Not Encountered	Residual Soil	2,500 psf	35	3.7	1,600
B-01	10+00 15 ft. Left	Refusal Not Encountered	Residual Soil	2,500 psf	35	3.7	1,600

The parameters presented in the table above assume that the materials in the vicinity of the lateral restraint measures (thrust blocks, etc.) are in an undisturbed condition. S&ME should be retained to observe the conditions at each lateral restraint measure to confirm that the exposed conditions are consistent with the findings of this exploration and that the materials have not been disturbed by blasting, excavation, or other means. Any materials in the bearing (lateral or vertical bearing) zone that have been disturbed must be removed and the area backfilled with mass concrete. If S&ME is not retained to observe the bearing conditions, the recommendations contained above are not considered valid.

6.0 Condition of Existing Culvert

The existing double barrel concrete box culvert was observed on December 14, 2016 by our principal geotechnical and materials engineer, Mr. Kenneth A. Ball, P.E. Representative photographs of wingwalls and the interior of the culvert taken from outside the culvert are included in the Appendix. We also retained a subcontract pipe video contractor to remotely video the culvert so that the conditions that were not observable from the ends could be



reviewed. The video was also performed on December 14, 2016. A copy of the video was provided to Mr. Tony Harris and Mr. Bill Crowder via email on December 22, 2016.

We assess the culvert to be in generally good condition, with a few small cracks in the wingwalls at the ends of the culvert and some diagonal, vertical, and horizontal cracks in the interior of the culvert. Most of the cracks are very thin to hairline, but diagonal cracks at the upstream (north) end of each barrel are slightly wider. From review of the video, there are some minor calcium carbonate (or similar) deposits and some minor rust staining at some cracks in the top of the barrels.

We do not believe any of the cracks are a structural concern and do not recommend any remedial measures. However, if you are concerned with possible future degradation of the wide cracks at the upstream ends of the barrels, consideration should be given to routing along the length of the cracks and installing a GDOT-approved concrete crack filler, or similar. If you choose to proceed with some routing and crack filling, we suggest that be done after the new pipe installation work is completed.

There was minor siltation in the upstream ends of the barrels, but cleanout is unnecessary. A boulder in the northern part of the western barrel should be removed.

7.0 Limitations of Conclusions and Recommendations

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

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants, or the presence of any biological materials (mold, fungi, and bacteria). If there is a concern about these items, other



studies should be performed. S&ME can provide a proposal and perform these services, if requested.

S&ME should be provided the opportunity to review the final plans and specifications to confirm that earthwork and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by observation and monitoring of construction activities.

8.0 Acknowledgement

We appreciate the opportunity to serve as the geotechnical consultant during this phase of the project. Please contact us with any questions about this report, or if we may be of further service.

Sincerely,

S&ME, Inc.

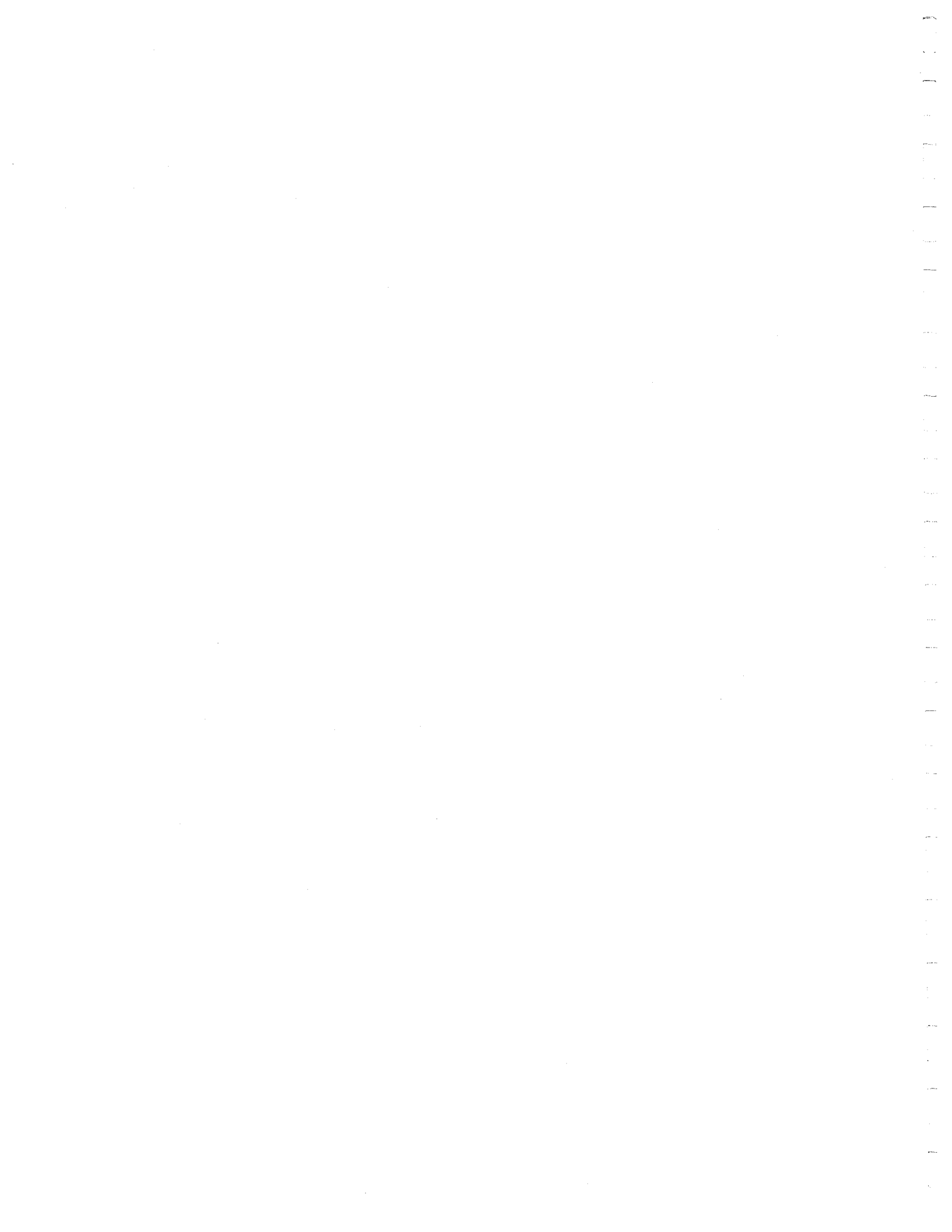

William S. Vincent, E.I.T.
Project Professional


Timothy J. Mirocha, P.E.
Principal Engineer
Ga. Reg. No. 21386

WSV/TJM/ptc

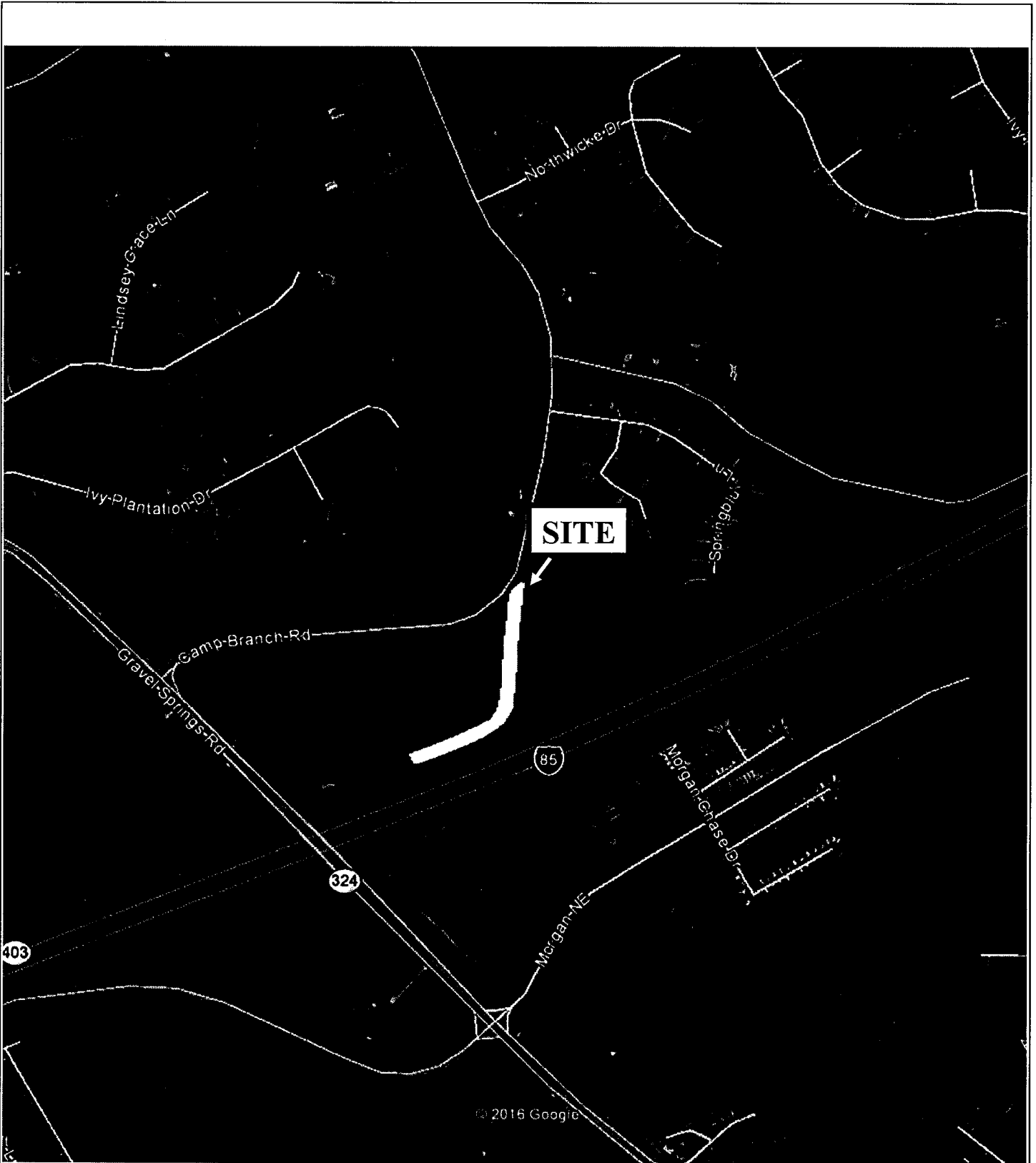
Cc: Precision Planning, Inc./Mr. Bill Crowder






Attachments

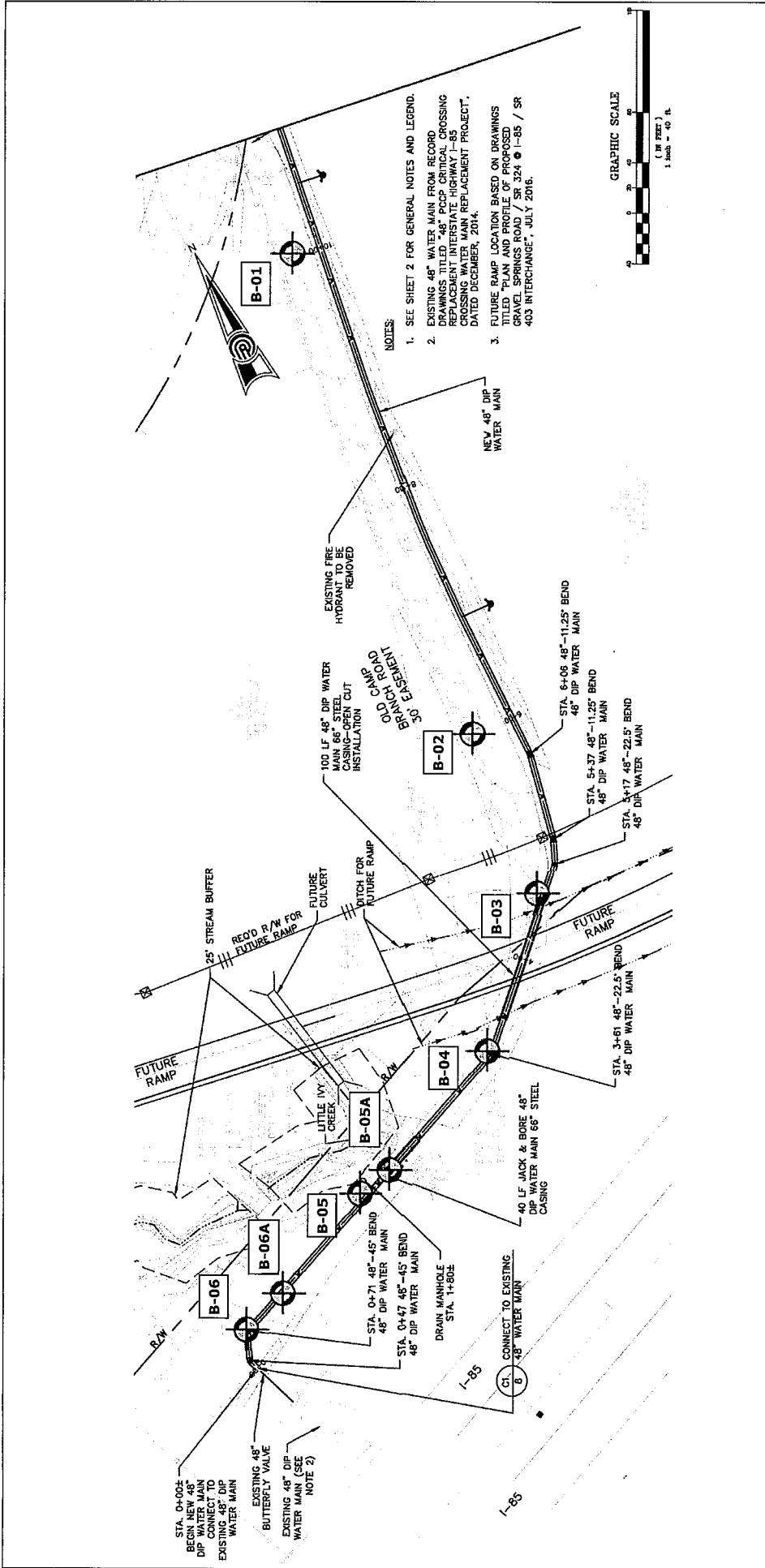




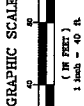
Source: Google Earth™

	<p>SITE LOCATION PLAN 48-Inch PCCP Replacement Camp Branch Road Buford, Georgia</p>	<p>HORIZONTAL SCALE: N/A</p>	<p>VERTICAL SCALE: N/A</p>
	<p>PROJECT NUMBER: 1280-16-089</p>	<p>PREPARED BY: W. Vincent, E.I.T.</p> <p>DATE: December 19, 2016</p>	<p>REVIEWED BY: T. Mirocha, P.E.</p> <p>FIGURE: 1</p>





- NOTES:**
1. SEE SHEET 2 FOR GENERAL NOTES AND LEGEND.
 2. EXISTING 48\"/>



	<p>LEGEND:</p> <p> - Approximate Boring Location</p>	<p>SOURCE: 48-IN PCCP Replacement (I-85 Interchange at SR 324) Alternate, Drawing 4 ALT as prepared by Precision Planning, Inc. Dated October 5, 2016</p>
	<p>BORING LOCATION PLAN 48-Inch PCCP Replacement Old Camp Branch Road Easement Buford, GA</p>	<p>DRAWING FOR ILLUSTRATIVE PURPOSES ONLY</p>
<p>S&ME PROJECT NO: 1280-16-089</p>	<p>HORIZONTAL SCALE: See Graphic Scale Above</p>	<p>VERTICAL SCALE: See Graphic Scale Above</p>
<p>DATE: December 19, 2016</p>	<p>PREPARED BY: W. Vincent, E.I.T.</p>	<p>REVIEWED BY: T. Mirocha, P.E.</p>
<p>FIGURE NO: 2</p>		



PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089	BORING LOG B-01
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CLIENT: Gwinnett County DWR	ELEVATION: 1139.0 ft	NOTES: STA 10+00, 15'L
DATE DRILLED: 12/14/16	BORING DEPTH: 15.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60&80
5	1135				1	8-9-10		19		
					2	8-9-11		20		
					3	12-12-14		26		
					4	10-11-13		24		
15	1125		Boring terminated at 15 feet		5	7-9-12		21		

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.
 5. SOIL DESCRIPTIONS BASED ON SAMPLES OBTAINED.



PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-02	
CLIENT: Gwinnett County DWR	ELEVATION: 1121.0 ft	NOTES: STA 6+00, 15'L	
DATE DRILLED: 12/14/16	BORING DEPTH: 25.0 ft		
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD		
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured		
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE		
SAMPLING METHOD: Split Spoon			

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)				
							10	20	30	60/80	
1120			ASPHALT - 3 inches CRUSHED STONE BASE COURSE - 4 inches		1	8-12-13					25
5			FILL: SANDY SILT (ML) - very stiff, tan, dry RESIDUUM: SILTY SAND (SM) - medium dense to very dense, gray and tan, trace mica, with PWR lenses, dry		2	7-10-12					22
1115					3	25-50/5					50+
10					4	18-24-30					54
1110					5	50/3					50+
15					6	9-10-12					22
1105					7	22-50/5					50+
20											
1100											
25			Boring terminated at 25 feet								

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: **48" PCCP Replacement**
Camp Branch Road | Buford, Georgia
 S&ME Project No. 1280-16-089

BORING LOG B-03

CLIENT: Gwinnett County DWR	ELEVATION: 1113.0 ft	NOTES: STA 4+45
DATE DRILLED: 12/14/16	BORING DEPTH: 17.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	6080
0	1113.0		ASPHALT - 3 inches							
0	1113.0		CRUSHED STONE BASE COURSE - 4 inches		1	14-9-9				18
0	1113.0		FILL: SANDY SILT (ML) - very stiff, red-brown and tan, dry							
5	1110		RESIDUUM: SILTY SAND (SM) - medium dense, tan and gray, trace mica, fine grained, dry		2	12-10-12				22
10	1105		RESIDUUM: SILTY SAND (SM) - medium dense, tan and gray, trace mica, fine grained, dry		3	11-11-12				23
10	1105		RESIDUUM: SILTY SAND (SM) - medium dense, tan and gray, trace mica, fine grained, dry		4	10-10-12				22
15	1100		PARTIALLY WEATHERED ROCK: SILTY SAND (SM) - very dense, gray and white		5	14-50/3				50+
17			Refusal at 17 feet Boring terminated at 17 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-04	
CLIENT: Gwinnett County DWR	ELEVATION: 1108.0 ft	NOTES: STA 3+20	
DATE DRILLED: 12/14/16	BORING DEPTH: 23.0 ft		
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD		
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured		
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE		
SAMPLING METHOD: Split Spoon			

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
0	1108		FILL: SANDY SILT (ML) - very stiff, tan, with some crushed stone and topsoil, moist		1	5-8-11	19			
5	1105		RESIDUUM: SILTY SAND (SM) - medium dense to dense, tan and gray, trace mica, moist		2	22-18-20	38			
8	1100		PARTIALLY WEATHERED ROCK: SILTY SAND (SM) - very dense, gray and white, moist		3	8-7-8	15			
10	1095				4	8-8-8	16			
15	1090				5	50/5	50#			
20	1085				6	50/3	50#			
23	1085		Refusal at 23 feet Boring terminated at 23 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-05	
CLIENT: Gwinnett County DWR	ELEVATION: 1106.0 ft	NOTES: STA 1+70	
DATE DRILLED: 12/14/16	BORING DEPTH: 9.0 ft		
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD		
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured		
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE		
SAMPLING METHOD: Split Spoon			

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)				
							10	20	30	60/80	
1105			FILL: SANDY SILT (ML) - very stiff to hard, red-brown and tan, moist		1	5-9-11		20			
5					2	15-16-18		34			
1100			ALLUVIUM: SILTY SAND (SM) - tan and red-brown, with some sandy silt and rock fragments, moist		3	9-9-11		20			
			Refusal at 9 feet Boring terminated at 9 feet		4	50/6					50#

S&ME BORING LOG - NEW BORING LOGS 1280-16-088 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.
 5. SOIL DESCRIPTIONS BASED ON SAMPLES OBTAINED.



PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089	BORING LOG B-05A
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CLIENT: Gwinnett County DWR	ELEVATION: 1106.0 ft	NOTES: STA 1+80 Straight auger drilling to attempt to collect SPT data past 9 ft (sample interval 13-1/2 to 15 feet)
DATE DRILLED: 12/14/16	BORING DEPTH: 12.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	

SAMPLING METHOD: **Split Spoon**

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
1105		[Cross-hatched pattern]	FILL: SANDY SILT (ML) - very stiff to hard, red-brown and tan, moist							
5										
1100		[Dotted pattern]	ALLUVIUM: SILTY SAND (SM) - tan and red-brown, with some sandy silt and some rock fragments, moist							
10										
1095			Refusal at 12 feet Boring terminated at 12 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.
 5. SOIL DESCRIPTIONS BASED ON SAMPLES OBTAINED.




PROJECT: **48" PCCP Replacement**
Camp Branch Road | Buford, Georgia
 S&ME Project No. 1280-16-089

BORING LOG B-06

CLIENT: Gwinnett County DWR	ELEVATION: 1108.0 ft	NOTES: STA 0+70 Refusal met on boulder fill at 1 ft in 3 offset borings.
DATE DRILLED: 12/14/16	BORING DEPTH: 1.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
			FILL: SILTY SAND (SM) - very dense, gray and tan, with some rock fragments and boulders, moist Refusal at 1 feet Boring terminated at 1 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-06A	
CLIENT: Gwinnett County DWR	ELEVATION: 1107.0 ft	NOTES: STA 0+95	
DATE DRILLED: 12/14/16	BORING DEPTH: 9.0 ft		
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD		
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured		
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE		
SAMPLING METHOD: Split Spoon			

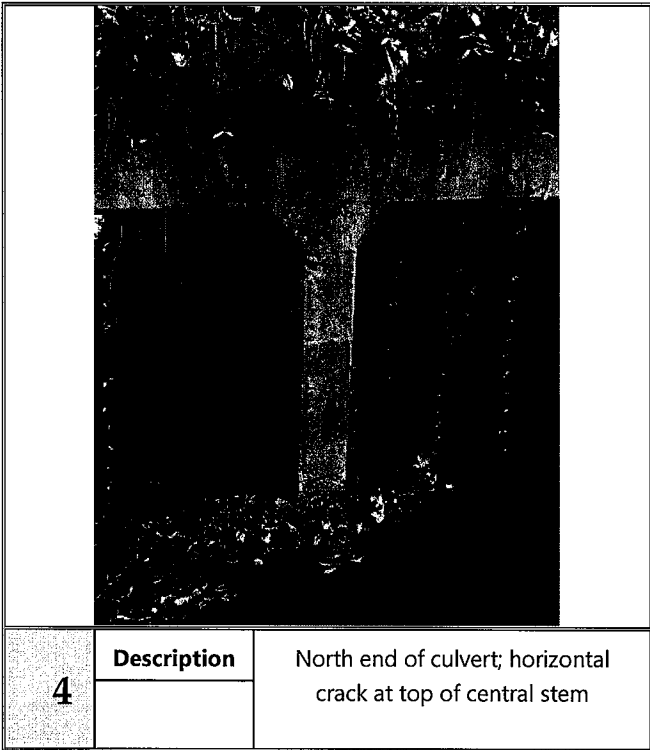
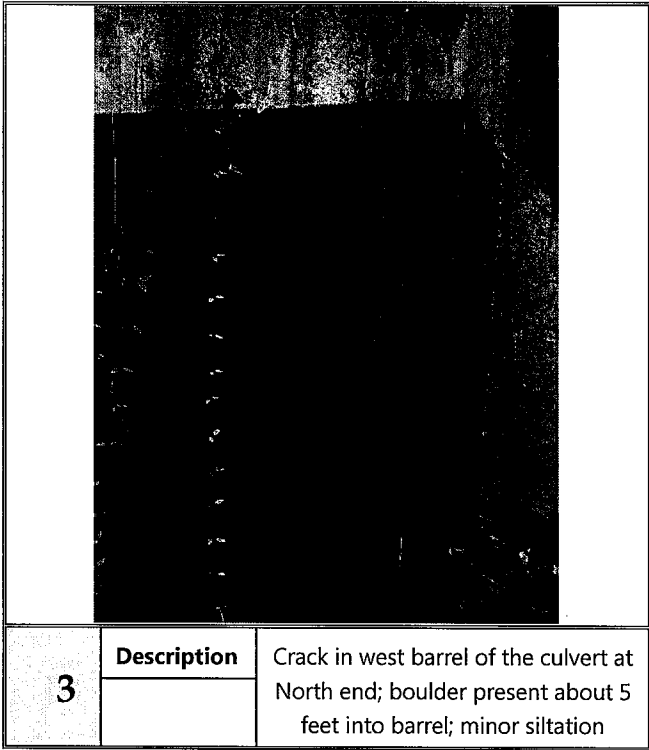
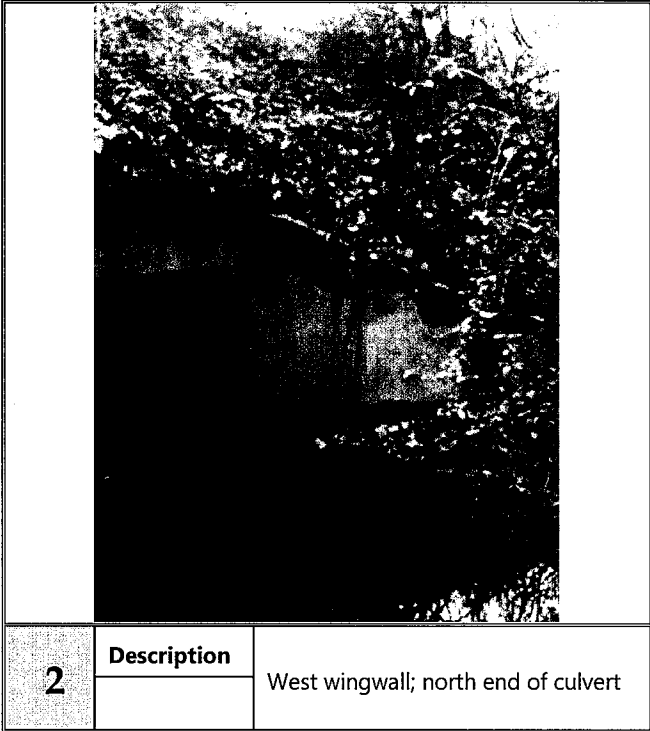
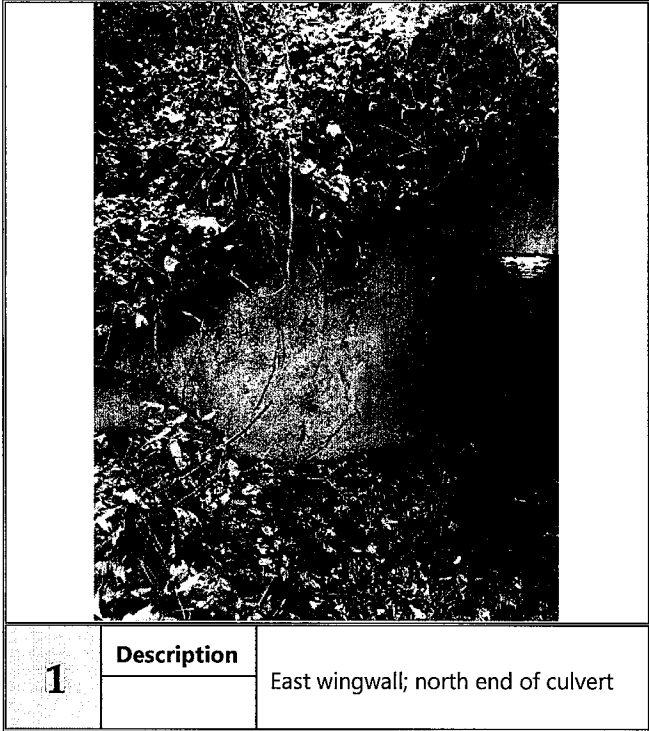
DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
1105			FILL: SILTY SAND (SM) - very dense, gray and tan, with some rock fragments and boulders, moist		1	8-13-20				33
					2	7-14-19				33
5					3	50/2				50#
1100					4	50/2				50#
			Refusal at 9 feet Boring terminated at 9 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

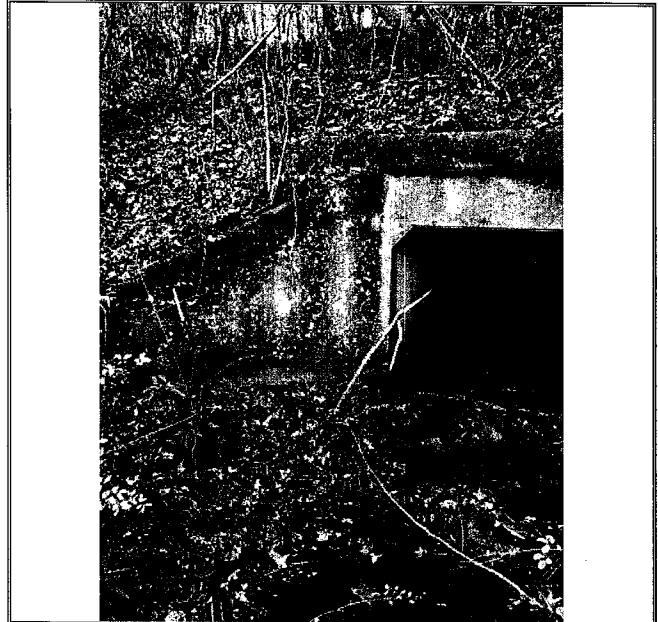
- NOTES:**
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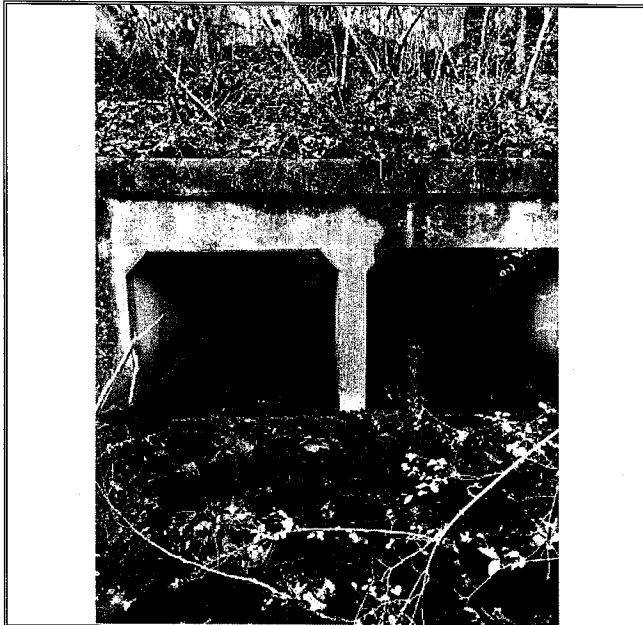




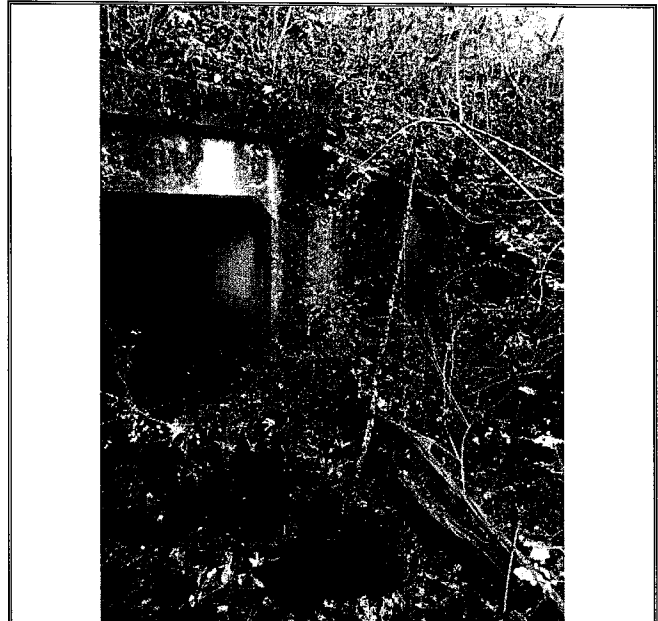
5	Description	Crack in east barrel of culvert at north end; minor siltation



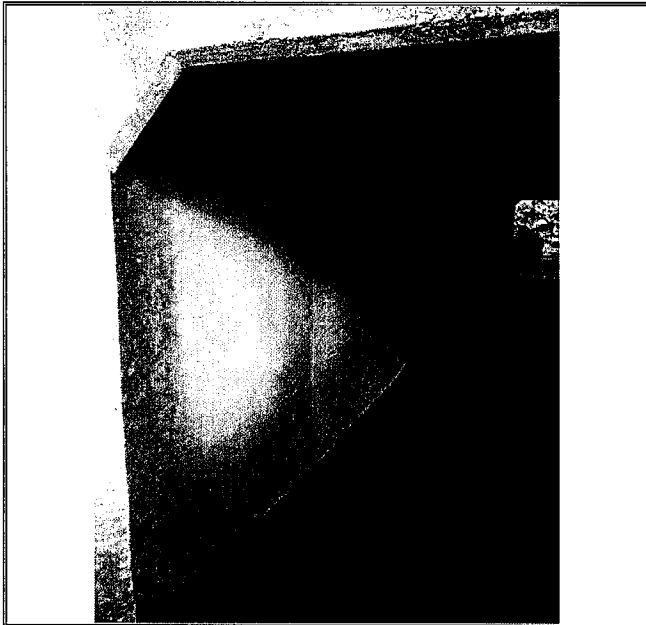
6	Description	South end of culvert; west wingwall



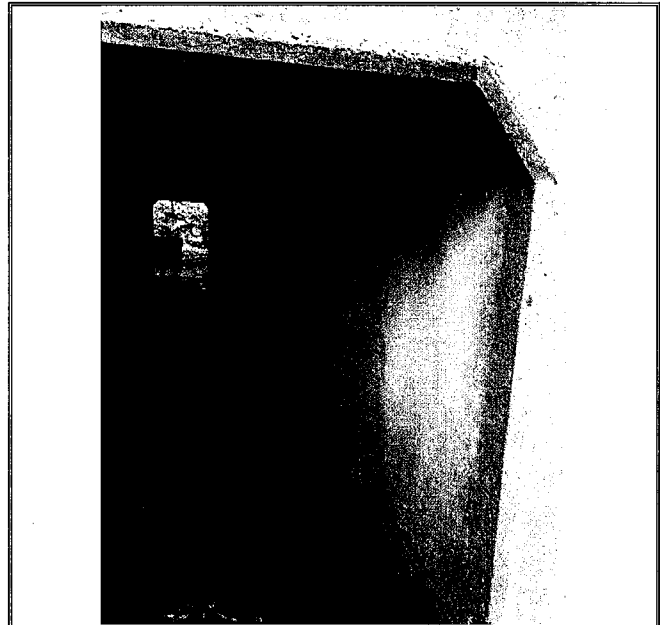
7	Description	South end of culvert



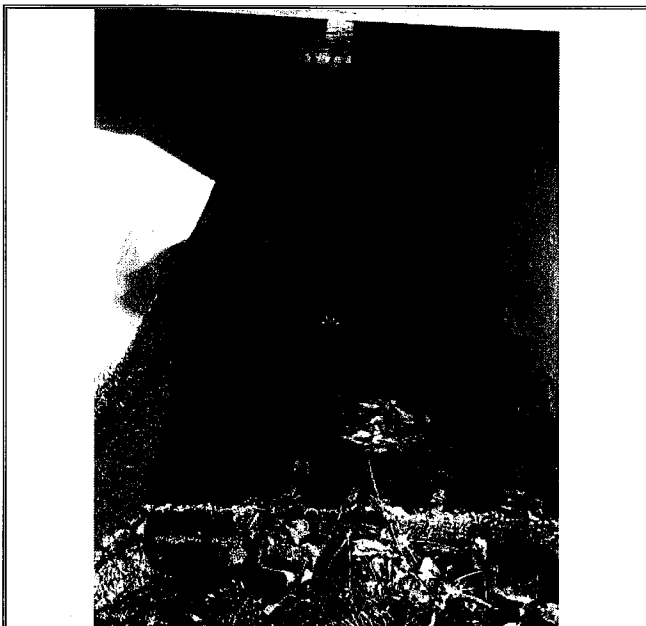
8	Description	South end of culvert; east wingwall



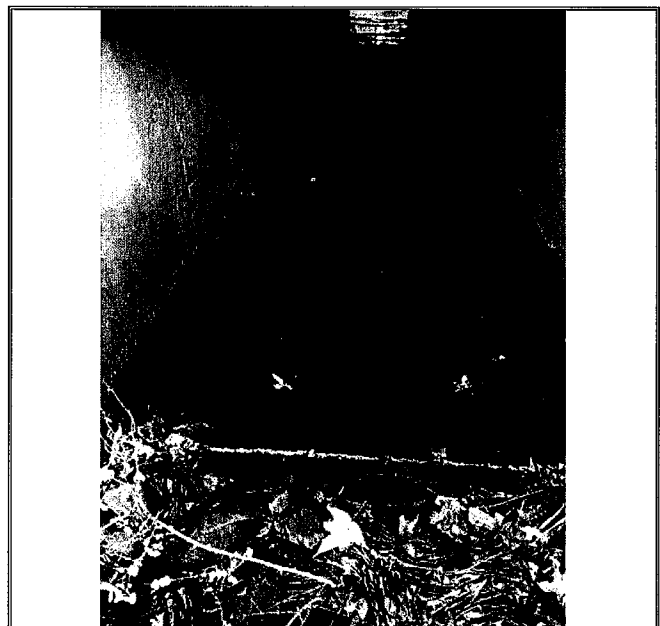
9	Description	South end of culvert; west barrel, west side



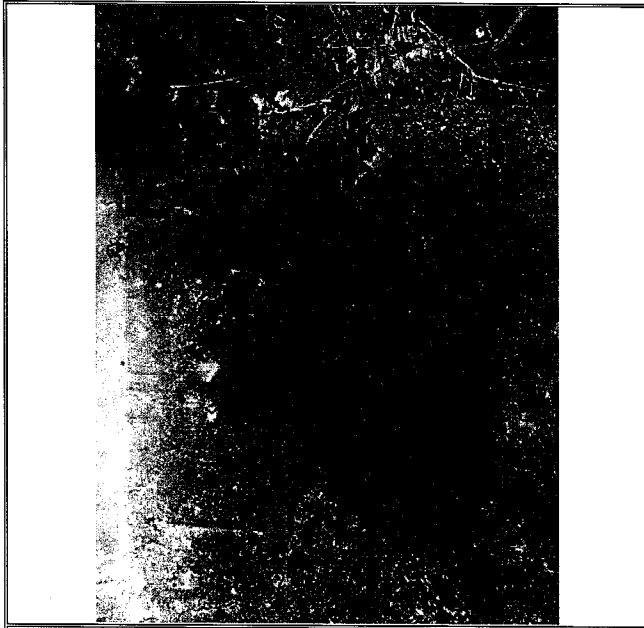
10	Description	South end of culvert; west barrel, east side



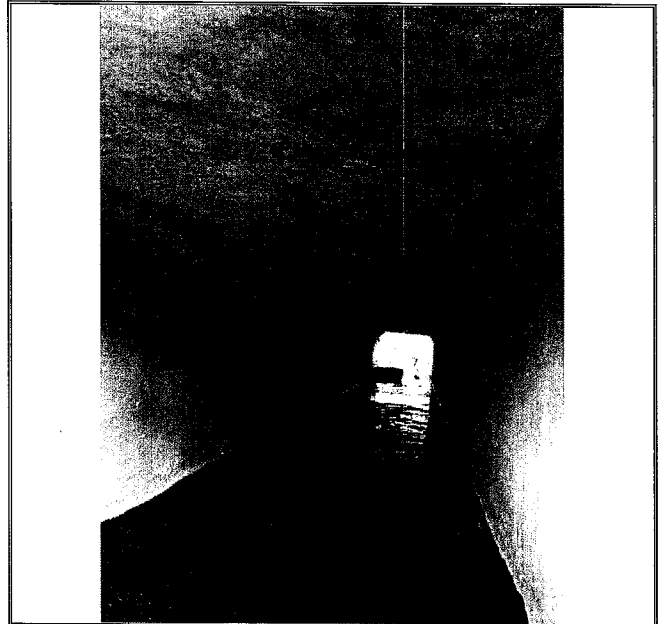
11	Description	South end of culvert; west barrel, base slab, no siltation



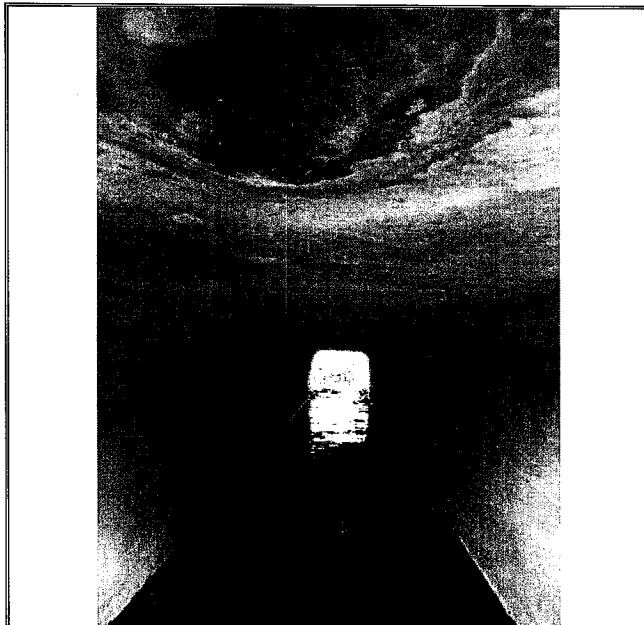
12	Description	South end of culvert; east barrel, base slab, no siltation



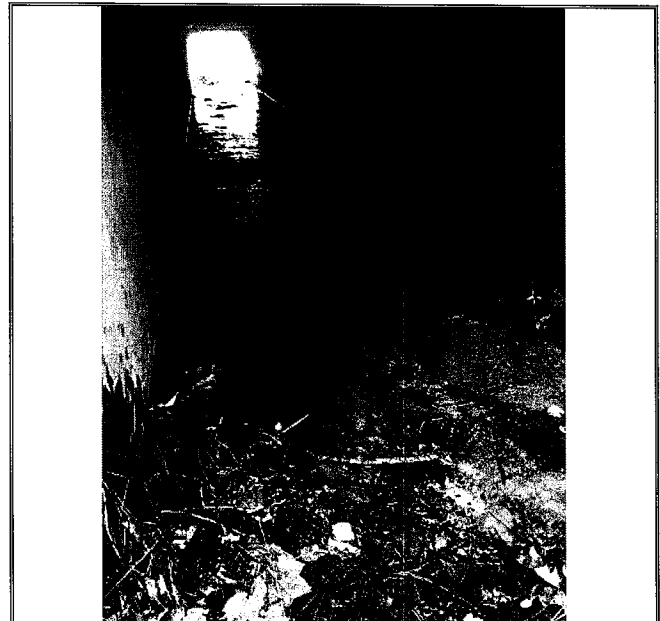
13	Description	South end of culvert; east wingwall, small crack at top



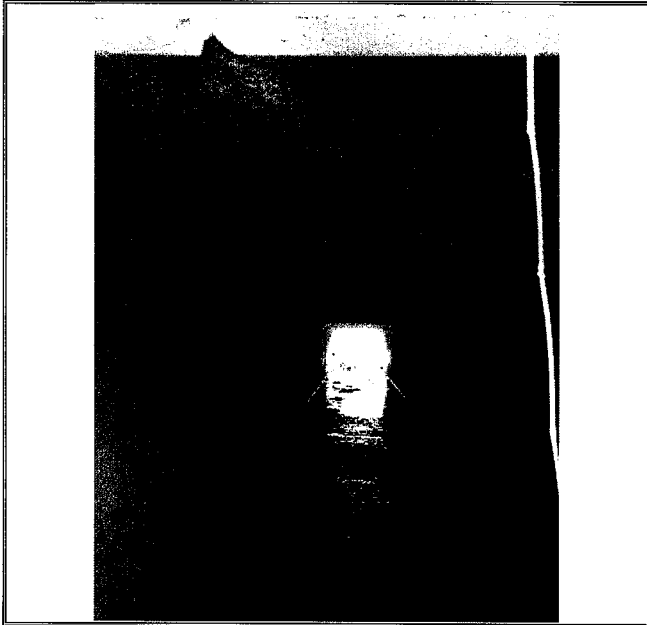
14	Description	South end of culvert; top of west barrel



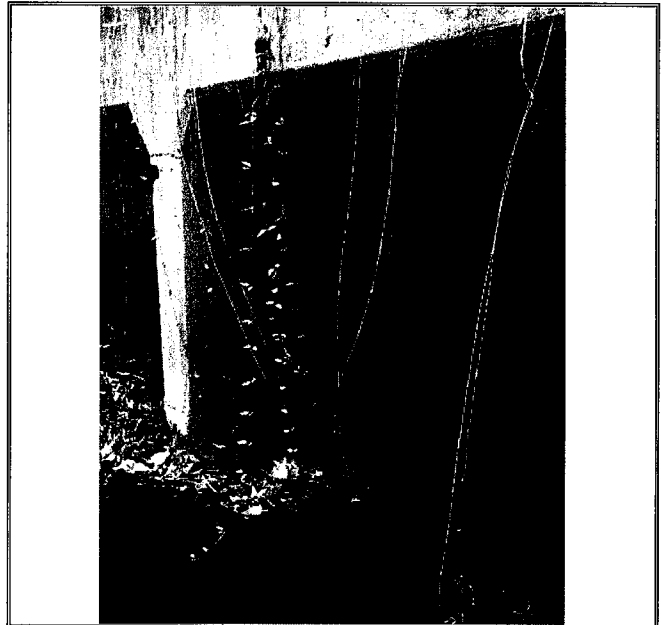
15	Description	South end of culvert; top of east barrel



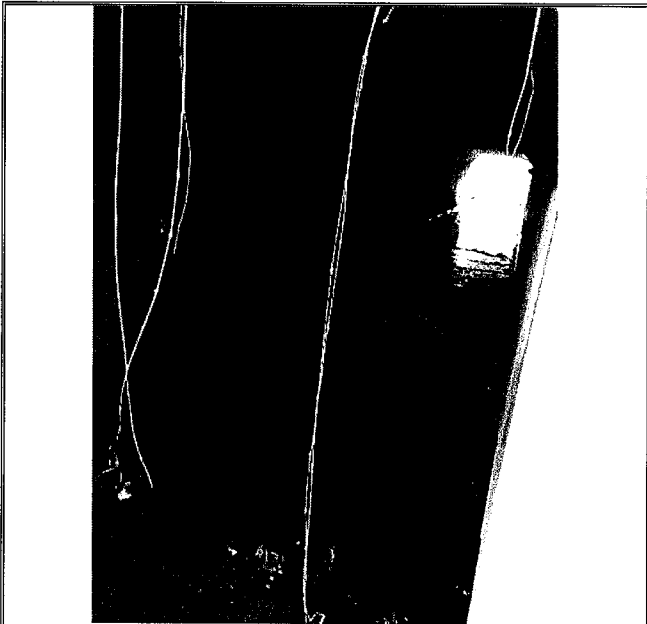
16	Description	North end of culvert; base slab of east barrel, some siltation



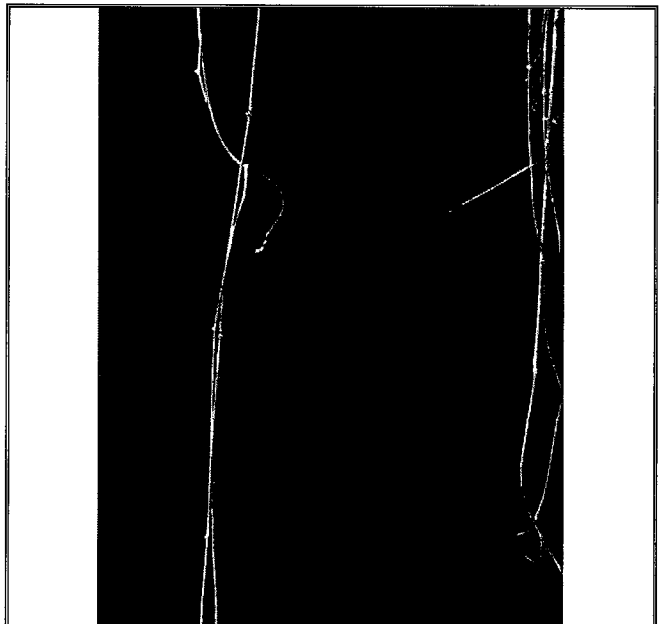
17	Description	North end of culvert; top of east barrel



18	Description	North end of culvert; horizontal crack in central stem, east side of west barrel



19	Description	North end of culvert; base slab of west barrel, some siltation and boulder



20	Description	North end of culvert; west barrel, vertical crack in east wall (central stem) about 5 feet from north end





PROCEDURES

ROCK DEFINITION

We suggest that *Rock* be defined as the following:

General Excavation:

Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a draw bar pull rated at not less than 56,000 pounds (Caterpillar D8K or equivalent) or excavated by a front-end loader with a minimum bucket breakout force of 25,600 pounds (Caterpillar 977 or equivalent).

Trench Excavation:

Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 33,000 pounds (Caterpillar 325 or equivalent).





March 30, 2017

Gwinnett County Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Attention: Mr. Tony Harris

Reference: **Revised Report of Geotechnical Exploration**
48-Inch PCCP Replacement - Camp Branch Road
Buford, Georgia
S&ME Project No. 1280-16-089

Dear Mr. Harris:

S&ME, Inc. (S&ME) is pleased to provide this *Revised Report of Geotechnical Exploration* for the subject project. The report has been revised to include the findings of the supplemental test pit exploration performed to provide additional information in areas where our previous soil test borings met shallow refusal along the planned pipe alignment. Our services were provided in general conformance with the scope of work described in our Proposal No. 12-1600511, Change Order No. 1. This additional work was authorized by Mr. Tony Harris via email on February 6, 2017. This work was performed as a Change Order to our original P.O. (GCDWR P.O. Number 2000299948).

1.0 Purpose

The primary purpose of the initial exploration and the supplemental exploration was to explore the subsurface conditions along limited portions of the pipe alignment in the area of project Station 0+00 to 11+00± relative to the existence of rock or groundwater within the depth of the planned excavation and to recommend parameters for design of pipe thrust resistance measures by others.

As a part of our original exploration, we were also requested to observe the condition of the existing double box culvert where jack-and-bore procedures were expected to be required (at the time of our original exploration) to install the new pipe beneath the culvert. We now understand that the existing double box culvert will be removed and no jack-and-bore installations will be required.

2.0 Project Description

Based on our review of project documents and discussions with Mr. Tony Harris of Gwinnett County Department of Water Resources (GCDWR) and Mr. Bill Crowder of Precision Planning, Inc. (PPI), we understand that the GCDWR plans to install a 48-inch diameter ductile iron pipe to replace the existing PCCP water main along the old alignment of Camp Branch Road in Buford, Georgia. The Appended Site Location Map (Figure 1) indicates the approximate project location.



We were provided the 90 % for Design Review version of the *Water Main Plan and Profile (Sheet 4)*, dated March 30, 2017, as prepared by PPI for the pipe replacement from project Station 0+00 to Station 11+00 (Note: this plan has been modified from its original version based on the data collected during the original and supplemental exploration). We understand that the project extends beyond the limits shown on Sheet 4 ALT, but we were not requested to explore those areas. We have also been provided with several pictures taken during the 2014 installation of the waterline south of project Station 0+00.

The new water main installation will require excavations on the order of 10 to 29 feet. The new pipe will be installed using "cut-and-cover" methods. One hundred feet of 66-inch diameter steel casing will also be required from Station 3+60 to 4+60, which will be beneath the future Interstate exit ramp alignment. The casing for the future Interstate ramp alignment is also expected to be installed by "cut-and-cover" methods. The existing double-box culvert near Station 2+15 will be removed. We also understand that the existing waterline may remain active during part of the construction, and that the existing waterline will not be removed and will be filled with "flowable fill" from the new tie in point at project Station 0+00 to a point near project Station 5+00.

3.0 Exploratory and Testing Procedures

3.1 General

S&ME contacted Georgia 811 to have them locate member utilities in the vicinity of the proposed exploration locations. Test locations were established in the field by Mr. Shea Vincent of S&ME by estimating right angles and measuring/pacing distances from site features, existing landmarks, and/or stakes placed in the field by PPI. Based on the methods used to establish the locations of the test borings and test pits, this information should be considered approximate. Refer to the Boring Location Plan (Figure 2) or Test Pit Location Plan (Figure 3) in the Appendix for the approximate location of each boring/test pit (the six planned borings, two offset borings, and six test pits). The approximate elevation of the ground surface at each boring location was estimated from the existing topography shown on the provided plan. If more precise location or elevation data is desired, a licensed surveyor should be retained to provide that data.

3.2 Test Borings

The subsurface conditions along the planned alignment were explored on December 14, 2016 with soil test borings. The borings were performed in general accordance with ASTM.D6151, the *Standard Practice for Using Hollow-Stem Augers for Geotechnical Exploration and Soil Sampling* by mechanically twisting hollow-stem augers through the upper soil veneer (at Borings B-04, B-05, B-05A, B-06 and B-06A) and the existing pavement (at Borings B-01, B-02, and B-03) and subsequently through the underlying materials with a drill rig. Four standard penetration resistance tests (SPT) were performed with a split spoon sampler in the upper 10 feet (unless auger refusal was met shallower than 10 feet). Penetration resistance tests were performed at 5-foot intervals thereafter. The sampler was first seated 6 inches and then driven an additional foot with blows of 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "standard penetration resistance" (N-value) with units of blows per foot (bpf). The N-value provides a general indication of in-situ soil consistency and has been correlated with certain engineering properties of soils. Very dense residual materials described as partially weathered rock or boulders were encountered in several borings.



In these materials, 50 hammer blows drove the sampler less than 6 inches and the Boring Logs show the penetration for 50 blows as 50/4", 50/1", etc.

Subsurface water level readings were attempted in each boring promptly after completion of the soil drilling process and after all borings were completed. Upon completion of drilling and sampling, the boreholes were backfilled with soil cuttings and a borehole closure device. The old roadway surface at Borings B-01, B-02, and B-03 was patched with a commercial cold-mix asphalt patching material after backfilling. Relatively dry soils were encountered at the depth of termination or auger refusal in the borings; therefore, the boreholes were not left open overnight for obtaining delayed subsurface water level measurements.

Soil samples obtained during the exploration were transported to our laboratory and reviewed by our engineering staff. The purposes of this review were to check the field descriptions, visually estimate the percentages of the soils' constituents (sand, clay, etc.), and observe evidence of soil origin. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, but the transitions may be more gradual.

3.3 Test Pit Excavations

The subsurface conditions near the planned alignment were further explored on February 17, 2017 with the excavation of 6 test pits (5 planned pits and 1 offset pit). The test pits were performed by excavating the soil at each planned location with a subcontracted Komatsu PC-220 tracked excavator. As each pit was excavated, our senior staff engineer made notes of observations, periodically probed the soils in the upper three feet of the excavations using a small-diameter steel rod to generally assess consistency, noted degrees of excavation difficulty, and checked for infiltration of groundwater or trapped water into the excavation. Portions of the excavated materials were periodically checked for apparent relative moisture content and material type by visual/manual methods.

4.0 Site, Geologic, and Subsurface Conditions

4.1 Site Conditions

The explorations were performed along an approximate one quarter mile stretch of an old alignment of Camp Branch Road near its intersection with Gravel Springs Road in Buford, Georgia. The northern approximately half of the alignment is currently covered with asphalt pavement, while the other half is unpaved. A double barrel box culvert underlies the alignment at approximate project Station 2+15 where a small creek crosses through the project area. The creek flows roughly from north to south. Boulders were observed in the fill embankment on both sides of the old roadway in areas near the existing culvert.

4.2 Area Geology

Fill soils have been placed by man in conjunction with previous utility or roadway construction, mass grading, farming, or waste disposal. Fill can be comprised of different soil types from various sources and can also be comprised of or contain boulders, debris from building demolition, organics, topsoil, trash, etc. The engineering properties of fill depend primarily on its composition, density, and moisture content. We understand that the existing waterline may have been installed in the 1970's and thus do not expect that documentation regarding the construction or compaction of the fill materials exists.



Soils which have been eroded, transported, and deposited in and adjacent to water courses such as the existing creek at the site are termed "alluvium". Alluvial materials can vary significantly from their residual soil source and can range in particle size from clay to gravel depending on the depositional environment. Alluvial materials frequently are soft or loose, and wet. Differing soil types and consistencies/relative densities can occur in relatively short horizontal and vertical distances.

The site is located within the Piedmont Physiographic Province of Georgia. According to the 1976 "Geologic Map of Georgia" prepared by the Georgia Department of Natural Resources, the site is underlain by granitic gneiss. The residual soils encountered in this physiographic region are the product of in-place physical and chemical weathering of the parent igneous and metamorphic rocks. The typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced. These upper soils are underlain by sandy silts and silty sands that generally become harder with depth to the top of parent bedrock. The boundary between soil and rock is typically not sharply defined.

A transitional zone between the soil overburden and parent bedrock is locally termed "partially weathered rock" (PWR). Partially weathered rock is defined, for engineering purposes, as residual material with standard penetration resistances exceeding 100 blows per foot. Weathering is facilitated by fractures, joints, and by the presence of less resistant rock minerals. Consequently, the profile of the partially weathered rock and hard rock can be quite irregular and erratic, even over short horizontal distances. It is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil overburden, as well as just above the top of bedrock.

4.3 Subsurface Conditions – Soil Test Borings

Subsurface information in this report is based upon the appended Boring Logs that were prepared using our test boring field logs and our engineer's visual classification of the split-barrel soil samples obtained during standard penetration testing. Depths or thicknesses of materials are estimates and should be considered approximate. Subsurface conditions can change significantly over relatively short horizontal distances and may be different within the depths drilled at other locations on the site.

The following is a generalization of subsurface conditions encountered at the borings. The reader should refer to the appended individual boring logs for more detailed descriptions of subsurface conditions at each exploratory location.

4.3.1 *Surface Materials*

Borings B-01, B-02 and B-03 were drilled in the paved part of the former alignment of Camp Branch Road. The asphalt pavement was about 2 to 3 inches thick and the crushed stone base course was approximately 4 inches thick at the boring locations. Topsoil was not encountered at the ground surface in the other borings.

4.3.2 *Fill Materials*

Soils described as fill materials were encountered in each of the borings to depths ranging from 1 to 9 feet. The fill materials were typically described as very firm red-brown or tan sandy silts. The fill materials in the southern part of the alignment (Borings B-05, B-05A, B-06 & B-06A) contained pieces of crushed stone, rock fragments and boulders. N-values in the fill ranged from 18 to over 100 bpf. Some of the N values may have been inflated due to rock fragments within the soil matrix or the presence of boulders.



4.3.3 *Alluvial Materials*

Borings B-05 and B-05A were drilled near the existing stream and encountered alluvial materials beneath the fill soils from 6 to 12 feet below the ground surface. The alluvial materials were described as medium dense tan and red-brown silty sands. The N-values in the alluvial soils ranged from 20 to over 100 bpf and may also have been inflated due to rock fragments.

4.3.4 *Residual Materials*

Borings B-01 through B-04 encountered residual soils beneath the fill and alluvium described above. The residual soils were typically described as medium dense to dense silty sands and contained some lenses of PWR. N-values in the residual materials ranged from 15 to over 100 bpf where PWR lenses were encountered in the residual soil layer.

4.3.5 *Partially Weathered Rock*

Partially weathered rock (PWR) was encountered as lenses in the residuum and as a continuous layer in Borings B-03 and B-04 beginning depths ranging from about 10 to 14 feet.

4.3.6 *Auger Refusal Materials*

Materials that could not be penetrated by the soil augers used for this exploration were encountered in Borings B-03 through B-06 (and associated offset boring attempts) at depths ranging from 1 to 23 feet below the ground surface. The refusal materials in Borings B-03 and B-04 are inferred to be bedrock materials.

The refusal materials in Borings B-05, B-05A, B-06 and B-06A could be boulders placed in the fill materials, boulders in the alluvial materials, or bedrock beneath the fill or alluvium. Sufficient data could not be obtained with the soil test borings of this exploration to allow us to determine the source of the refusal at these borings.

4.3.7 *Groundwater*

Groundwater was not encountered above the refusal or termination elevations of the borings of this exploration at the time of drilling. We note that this exploration was performed after an extended period with below average rainfall in the project vicinity. Groundwater levels will fluctuate with seasonal and yearly rainfall and temperature variations; therefore, future groundwater levels may be higher or lower than those measured during this exploration. The groundwater table typically parallels the original ground surface near streams, and thus may later be encountered within the depths drilled during this exploration.

4.4 **Subsurface Conditions – Test Pit Excavations**

Attached is a Test Pit Record with our engineer's visual classifications of soil types and origin, assessed relative moisture contents, levels at which water entered the excavations, and other pertinent information. Note that the soil descriptions and the boundaries between differing soil types are approximate.

4.4.1 *Surface Materials*

Due to the methods used during our supplemental exploration, our Test Pit Record does not specifically denote the types of materials encountered at the surface of our test pits. However, we do note that the



soils encountered at the surface were generally consistent that that which was encountered during our original exploration.

4.4.2 *Fill Materials*

Fill materials were encountered in each of our test pits from depths ranging from 6-inches (in TP-05) to 11 feet (in TP-03). The fill generally consisted of orange-brown or tan-brown silty sands with numerous boulders/rock fragments throughout. Rock fragments/boulders ranged in size from 6-inches to up to 4-feet in diameter. The approximate diameter of rock fragments/boulders, when encountered, are more closely described in the Test Pit Record. In many cases, the fill material included roots, topsoil, logs, trash, and other debris.

In Test Pit TP-02, the excavation damaged what appeared to be an abandoned 4± inch yellow plastic pipe, similar to that used as natural gas piping. We contacted GA 811, who facilitated a site meeting with representatives from the City of Buford Gas Department. The representatives with the gas department visited the site, observed the damaged pipe, and informed us that the line which was damaged was not active or may have been waste/leftover pipe that had been buried. We note that we did not encounter other utilities in the remaining excavations.

In Test Pits TP-01, TP-03, TP-04, and TP-04A, fill materials were encountered throughout the depth of the excavation until refusal or "practical refusal" was met.

4.4.3 *Alluvial Materials*

Test Pit TP-02 encountered a layer of brown and gray silty sand from 8 to 12 ½ feet below the surface. This material was described by or senior staff engineer as alluvium, but could have been alluvial soils that were placed as fill during previous activities on the site. This material was encountered until refusal was met in TP-02 at a depth of 12 ½ feet.

4.4.4 *Residual Materials*

Residual soils were encountered in Test Pit TP-05. Upper residual soils were classified as red-brown and tan-brown sandy silt. Underlying residual soils were classified as tan-brown and gray silty sand. Test Pit TP-05 was terminated at a depth of 19 ¼ feet in the residual soils, as this was the excavator's maximum practical reach.

4.4.5 *Excavator Refusal Materials*

Where the Test Pit Record indicates refusal, the backhoe bucket encountered what we believed to be bedrock (Test Pits TP-01, TP-02, and TP-03). Where the Test Pit Record indicates "prohibiting excavation" (Test Pits TP-04 and TP-04A), the backhoe bucket could not penetrate the material it was attempting to excavate (very large boulders) without expending impractical time and effort.

4.4.6 *Groundwater*

Groundwater was observed seeping from the sidewall of the Test Pit TP-04A excavation at a depth of 10 ½ feet. Groundwater was not encountered in the other test pits at the time of excavation. We note that pits TP-01, TP-02, and TP-03 were left open for approximately 3 hours and groundwater was not observed



seeping into the pits at that time. As noted previously, groundwater levels will fluctuate with seasonal and yearly rainfall and temperature variations; therefore, future groundwater levels may be higher or lower than those measured during this exploration. The groundwater table typically parallels the original ground surface near streams, and thus may later be encountered within the depths of our excavations during this exploration.

5.0 Conclusions and Recommendations

5.1 Groundwater Control

The borings of this exploration did not encounter groundwater within the depths drilled; however, as noted above, Test Pit TP-04A did encounter groundwater seeping into the excavation at 10 ½ feet.

We note that several borings and test pits met refusal above planned pipe invert elevation. Also, the borings were drilled after an extended period of dry weather in the project area. In the Piedmont Geologic Province, the groundwater level often roughly parallels the ground surface topography in the vicinity of streams. Thus, based on the water observed in the stream on site, we recommend that the groundwater level be assumed to be approximately 10 to 12 feet below the ground surface for design purposes in the area of this exploration. Where groundwater is encountered in the pipe trench, it can typically be controlled with local pumps in temporary sumps embedded in bedding stone for the pipe or in the base of the pit excavations. We recommend that the project documents require that dewatering be the sole responsibility of the contractor.

5.2 Excavation Difficulty

Residual soils with standard penetration resistance values up to about 30 bpf can generally be excavated using conventional tracked hydraulic excavators. High consistency residual soils (N-values >30 bpf) and partially weathered rock are likely to be encountered during excavation for the pipe and casing installation. Excavating these materials in confined areas generally requires large tracked excavators such as a Caterpillar 320 or equivalent. We note that in Test Pits TP-04 and TP-04A, large boulders were encountered throughout the depth of the pits and water was observed seeping into TP-04A. Excavation difficulty (due to the size of the boulders) can be expected near these locations.

Excavation below the level where our soil augers and our excavator met refusal will almost certainly require the use of rock excavation methods such as explosives or pneumatic tools. We do note that we were provided several photographs from GCDWR (dates ranging from September 2014 to October 2014), that revealed that rock excavation techniques were likely utilized as bedrock appeared to be present well above the bottom of the trench. The photographs were reported to have been taken south of the location where the planned pipe will connect to the existing 48-inch water main at STA 0+00.

Additionally, some layers or lenses of partially weathered rock or rock in the overburden soil zone may require these excavation methods to be employed. The elevations and areas of known rock and partially weathered rock (as indicated by the borings/pits of this exploration or other means) should be considered in the bid documents. However, recognize that rock or partially weathered rock layers may be encountered at varying elevations throughout the site. We do note that one of the very large boulders encountered in Test Pit TP-04 had a rock blasting drill hole cut through it.



Where rock is encountered above pipe invert elevation, consideration should be giving to blasting prior to over burden soil removal. This will help expedite pipe construction. In blasting rock, holes are drilled into the rock to place the explosives. To enhance fracturing of the rock to the depth planned for removal, the blast holes are commonly drilled to a greater depth than the limit of excavation. This often results in rock being broken and loosened below the depth of planned excavation. When rock is broken and loosened below the planned depth for removal, it is termed "overblast". All rock broken or loosened below the depth of planned excavation will need to be removed from the trench and replaced with bedding stone to provide uniform support for the pipe. This overblast should be considered when calculating volumes of rock to be removed. Dealing with the overblast should be specifically discussed with the contractor prior to construction.

Care should be exercised during blasting to limit the amount of overblast. Special care should be taken to during remove any overblast or disturbed soils from the areas around any thrust blocks or other lateral restraint devices for the pipe.

The existing 48 inch diameter water main may remain active during construction. If the line is active, the rock excavation contractor should take measures to prevent damage to the line from accelerations or physical movement from blasting or other excavation methods.

We recommend that the project specifications include a performance type definition of rock to help limit disputes regarding material classifications. A sample rock definition is included in the Appendix. We recommend classifying excavated materials as either rock or soil.

5.3 Temporary Slopes

Excavations for this project should be sloped or shored in accordance with OSHA and local regulations and requirements. The slopes should be designed by the contractor's OSHA-certified trench safety Competent Person (a registered engineer for deep trenches or shoring). We recommend that temporary slope inclinations be no steeper than 1 ½ H: 1V for trenches excavated in dry conditions.

We note that the Test Pits were backfilled with compactive effort consisting of limited tamping with the excavator bucket. The test pit backfill should not be expected to be well compacted. Sidewall slopes may need to be flattened if test pity backfill soils are encountered.

5.4 Backfill Materials

Upon completion of the pipe construction, the pipe trench should be backfilled with compacted backfill materials. Maximum particle sizes for structural fill placed as backfill around the new pipe should be limited to about 3 inches to reduce the chance of damaging the pipe and to help facilitate adequate compaction using the smaller equipment usually necessary when backfilling utility trenches. Backfill and other structural fill should be placed in relatively thin (4- to 8-inch) layers and compacted to at least 95 percent of the soil's maximum dry density as determined by the standard Proctor compaction test (ASTM D698). Higher degrees of compaction may be needed in the area of the future I-85 ramp. These recommendations are not intended to supersede GCDWR standard trench backfill details.

If groundwater flow into the excavations hinders compaction of the backfill, it may be necessary to backfill the excavations with consolidated No. 57 sized crushed stone up to the level of the infiltrating water.



Where the excavations are made through zones of partially weathered rock, rock, or boulder fill, the excavated materials will likely be too coarse for re-use as backfill around the utilities. Thus, they will need to be segregated from the excavated soil materials. These more coarse materials can likely be used as backfill in the zone from two feet above the pipe to not shallower than three feet from the ground surface, provided they can be placed and compacted into a well consolidated essentially "void free" mass and that process is approved by GCDWR. Double-handling of some materials should be budgeted for excavations expected to be made in high consistency materials.

Based on the quantity and size of boulders encountered in our test pits and the above recommendations, it should be expected that imported structural fill materials will be needed if the boulders encountered in our test pits and the rock removed after rock excavation methods cannot be broken down into functional sizes.

5.5 Recommended Design Parameters for Lateral Restraint

As requested, we offer the following recommended parameters to be used in the design of lateral restraint measures (thrust blocks, etc.) for the lateral bends in the pipe in the project area evaluated for this exploration. The design parameters are based on the data obtained during this and the previous exploration and empirical relationships. Quantitative laboratory testing was not performed to confirm the values.

Due to the proximity of the existing pipe and previous backfill to the thrust bearing areas of the proposed pipe bends at Stations 0+09, 0+32, & 4+90, we recommend that the thrust resistance parameters of the old fill be utilized in design. If the existing pipe backfill can be removed (within the zone of thrust resistance) and replaced with properly compacted structural fill, higher properties can be recommended. We understand that removal and replacement of the existing backfill is not desired and the table below presents our recommended parameters with that understanding.

Boring / Test Pit No.	"Bend" Approx. Station No.	Approx. Invert Elevation (feet)	Material Description at Thrust Bearing Elevation*	Allowable Bearing Pressure (psf)	Angle of Internal Friction (Φ' , Degrees)	Passive Earth Pressure Coefficient (K_p)	Effective Vertical Stress at Pipe Elevation (psf)
B-06 B-06A TP-01 TP-02	0+09	1090	Rock w/ adjacent Old Fill	2,000 psf	28	2.8	1,750
B-06 B-06A TP-01 TP-02	0+32	1090	Rock w/ adjacent Old Fill	2,000 psf	28	2.8	1,700
B-04 TP-04	3+50	1086	Partially Weathered Rock	3,000 psf	38	4.2	1,850



Boring / Test Pit No.	"Bend" Approx. Station No.	Approx. Invert Elevation (feet)	Material Description at Thrust Bearing Elevation*	Allowable Bearing Pressure (psf)	Angle of Internal Friction (Φ' , Degrees)	Passive Earth Pressure Coefficient (K_p)	Effective Vertical Stress at Pipe Elevation (psf)
B-03 TP-05	4+69	1086	Rock	4,000 psf	40	4.6	2,100
B-03 TP-05	4+90	1105	Old Fill	2,000 psf	28	2.8	1,100

The parameters presented in the table above assume that the materials in the vicinity of the lateral restraint measures (thrust blocks, etc.) are in an undisturbed condition. S&ME should be retained to observe the conditions at each lateral restraint measure to confirm that the exposed conditions are consistent with the findings of this exploration and that the materials have not been disturbed by blasting, excavation, or other means. Any materials in the bearing (lateral or vertical bearing) zone that have been disturbed must be removed and the area backfilled with mass concrete. If S&ME is not retained to observe the bearing conditions, the recommendations contained above are not considered valid.

6.0 Limitations of Conclusions and Recommendations

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

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants, or the presence of any biological materials (mold, fungi, and bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services, if requested.

S&ME should be provided the opportunity to review the final plans and specifications to confirm that earthwork and other recommendations are properly interpreted and implemented. The recommendations



in this report are contingent on S&ME's review of final plans and specifications followed by observation and monitoring of construction activities.

7.0 Acknowledgement

We appreciate the opportunity to serve as the geotechnical consultant during this phase of the project. Please contact us with any questions about this report, or if we may be of further service.

Sincerely,

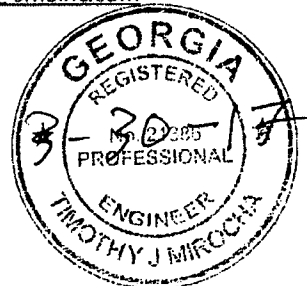
S&ME, Inc.

W. Shea Vincent, E.I.T.
Staff Professional
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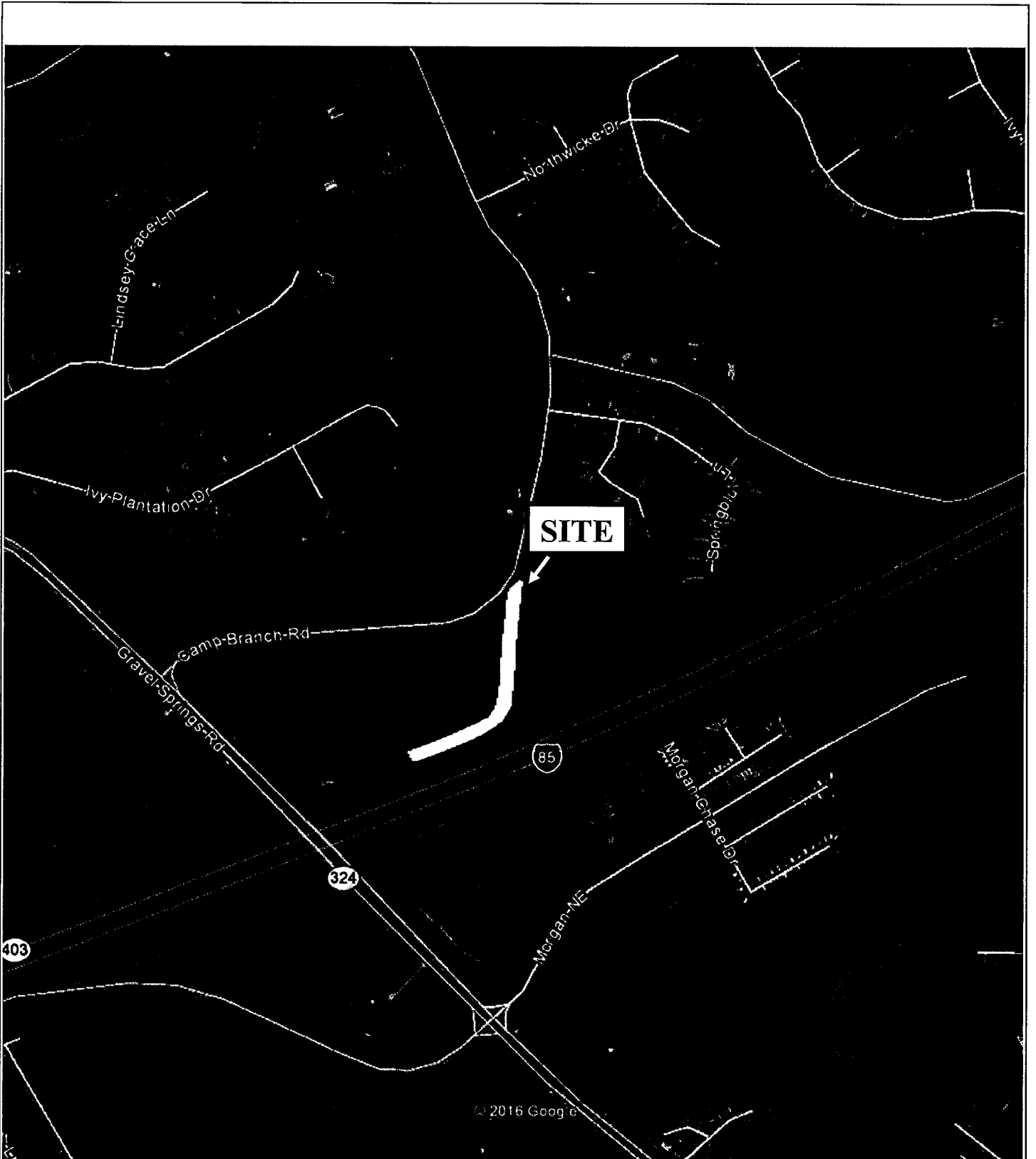
Timothy J. Mirocha, P.E.
Principal Engineer
GA. Reg. No. 21386
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WSV/TJM/ptc


Cc: Precision Planning, Inc. - Mr. Bill Crowder



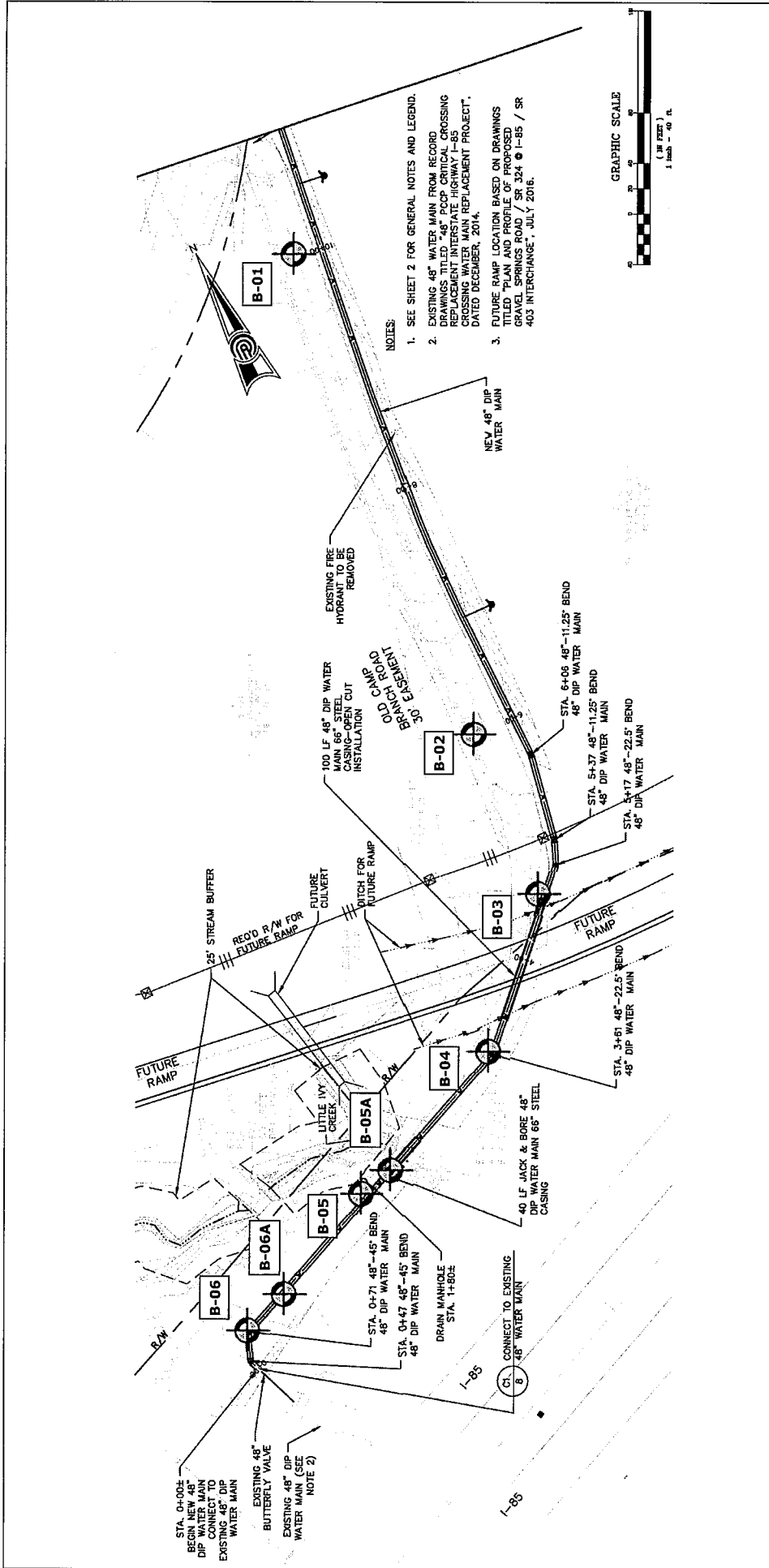
Attachment





Source: Google Earth™

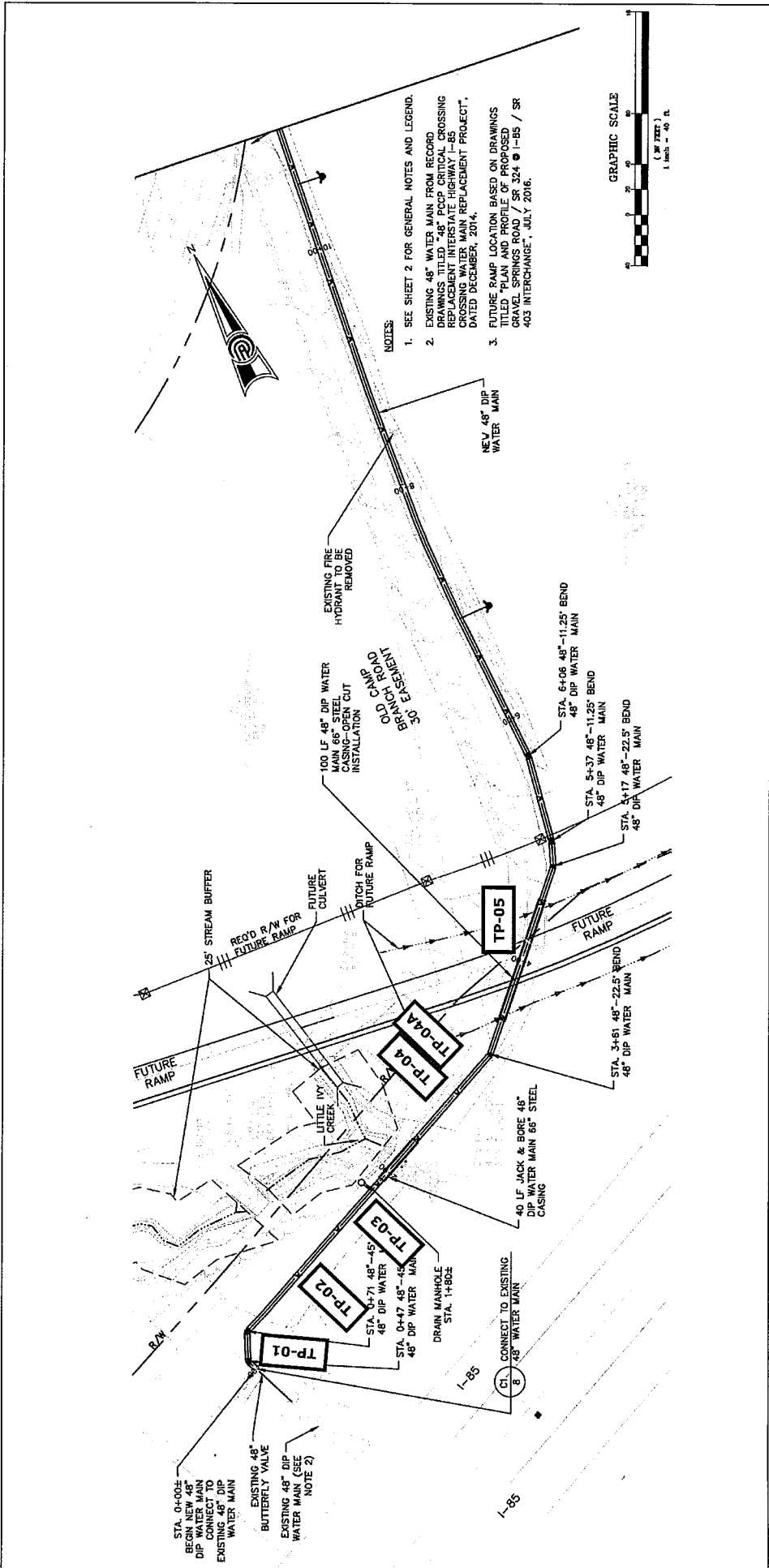
	SITE LOCATION PLAN 48-Inch PCCP Replacement Camp Branch Road Buford, Georgia	HORIZONTAL SCALE: N/A	VERTICAL SCALE: N/A
		PREPARED BY: W. Vincent, E.I.T.	REVIEWED BY: T. Mirocha, P.E.
	PROJECT NUMBER: 1280-16-089	DATE: December 19, 2016	FIGURE: 1






	<p>LEGEND:</p> <p> - Approximate Boring Location</p> <p>BORING LOCATION PLAN 48-Inch PCCP Replacement Old Camp Branch Road Easement Buford, GA</p>	<p>SOURCE: 48-IN PCCP Replacement (I-85 Interchange at SR 324) Alternate, Drawing 4 ALT as prepared by Precision Planning, Inc. Dated October 5, 2016</p>
	<p>DRAWING FOR ILLUSTRATIVE PURPOSES ONLY</p> <p>HORIZONTAL SCALE: See Graphic Scale Above</p> <p>VERTICAL SCALE: See Graphic Scale Above</p> <p>PREPARED BY: W. Vincent, E.I.T.</p> <p>REVIEWED BY: T. Mirocha, P.E.</p>	<p>DATE: December 19, 2016</p> <p>FIGURE NO: 2</p>





	LEGEND: TP-XX - Approximate Test Pit Location		SOURCE: 48-IN PCCP Replacement (I-85 Interchange at SR 324) Alternate, Drawing 4 ALT as prepared by Precision Planning, Inc. Dated October 5, 2016
	TEST PIT LOCATION PLAN 48-Inch PCCP Replacement Old Camp Branch Road Easement Buford, GA		DRAWING FOR ILLUSTRATIVE PURPOSES ONLY
S&ME PROJECT NO: 1280-16-089		HORIZONTAL SCALE: See Graphic Scale Above	VERTICAL SCALE: See Graphic Scale Above
DATE: March 20, 2017		PREPARED BY: W. Vincent, E.I.T.	REVIEWED BY: T. Mirocha, P.E.
FIGURE NO: 3			



PROJECT: **48" PCCP Replacement**
Camp Branch Road | Buford, Georgia
 S&ME Project No. 1280-16-089

BORING LOG B-01

CLIENT: Gwinnett County DWR	ELEVATION: 1139.0 ft	NOTES: STA 10+00, 15'L
DATE DRILLED: 12/14/16	BORING DEPTH: 15.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)							
							10	20	30	6080				
			ASPHALT - 3 inches											
			CRUSHED STONE BASE COURSE - 4 inches		1	8-9-10					19			
			FILL: SANDY SILT (ML) - very firm, red-brown, moist											
5	1135		RESIDUUM: SILTY SAND (SM) - medium dense, red-brown, fine grained, dry		2	8-9-11					20			
			RESIDUUM: SILTY SAND (SM) - medium dense, gray and tan, dry											
					3	12-12-14					26			
10	1130				4	10-11-13					24			
15	1125				5	7-9-12					21			
			Boring terminated at 15 feet											


S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ_S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.
 5. SOIL DESCRIPTIONS BASED ON SAMPLES OBTAINED.



CLIENT: Gwinnett County DWR	ELEVATION: 1121.0 ft	NOTES: STA 6+00, 15'L
DATE DRILLED: 12/14/16	BORING DEPTH: 25.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: 3 1/4" Hollow Steam Auger

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)				
							10	20	30	60/80	
	1120		ASPHALT - 3 inches CRUSHED STONE BASE COURSE - 4 inches		1	8-12-13					25
			FILL: SANDY SILT (ML) - very stiff, tan, dry								
5			RESIDUUM: SILTY SAND (SM) - medium dense to very dense, gray and tan, trace mica, with PWR lenses, dry		2	7-10-12					22
	1115				3	25-50/5					50#
					4	18-24-30					54
10					5	50/3					50#
	1110										
15					6	9-10-12					22
	1105										
20					7	22-50/5					50#
	1100										
25			Boring terminated at 25 feet								

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

- NOTES:**
1. THIS LOG IS ONLY A PORTION OF A REPORT PREPARED FOR THE NAMED PROJECT AND MUST ONLY BE USED TOGETHER WITH THAT REPORT.
 2. BORING, SAMPLING AND PENETRATION TEST DATA IN GENERAL ACCORDANCE WITH ASTM D-1586.
 3. STRATIFICATION AND GROUNDWATER DEPTHS ARE NOT EXACT.
 4. WATER LEVEL IS AT TIME OF EXPLORATION AND WILL VARY.
 5. SOIL DESCRIPTIONS BASED ON SAMPLES OBTAINED.



PROJECT:	48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089	BORING LOG B-03
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CLIENT: Gwinnett County DWR	ELEVATION: 1113.0 ft	NOTES: STA 4+45
DATE DRILLED: 12/14/16	BORING DEPTH: 17.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)							
							10	20	30	6080				
			ASPHALT - 3 inches											
			CRUSHED STONE BASE COURSE - 4 inches											
	1110		FILL: SANDY SILT (ML) - very stiff, red-brown and tan, dry											
5			RESIDUUM: SILTY SAND (SM) - medium dense, tan and gray, trace mica, fine grained, dry											
	1105													
10														
	1100		PARTIALLY WEATHERED ROCK: SILTY SAND (SM) - very dense, gray and white											
15														
			Refusal at 17 feet Boring terminated at 17 feet											

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016) GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT:	48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089	BORING LOG B-04
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CLIENT: Gwinnett County DWR	ELEVATION: 1108.0 ft	NOTES: STA 3+20
DATE DRILLED: 12/14/16	BORING DEPTH: 23.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
5	1105		FILL: SANDY SILT (ML) - very stiff, tan, with some crushed stone and topsoil, moist		1	5-8-11	19			
10	1100		RESIDUUM: SILTY SAND (SM) - medium dense to dense, tan and gray, trace mica, moist		2	22-18-20	38			
10	1100				3	8-7-8	15			
10	1100				4	8-8-8	16			
15	1095		PARTIALLY WEATHERED ROCK: SILTY SAND (SM) - very dense, gray and white, moist		5	50/5	50+			
20	1090				6	50/3	50+			
23	1085		Refusal at 23 feet Boring terminated at 23 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016), GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: **48" PCCP Replacement**
Camp Branch Road | Buford, Georgia
 S&ME Project No. 1280-16-089

BORING LOG B-05

CLIENT: Gwinnett County DWR	ELEVATION: 1106.0 ft	NOTES: STA 1+70
DATE DRILLED: 12/14/16	BORING DEPTH: 9.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)					
							10	20	30	60/80		
1105			FILL: SANDY SILT (ML) - very stiff to hard, red-brown and tan, moist		1	5-9-11					20	
						2	15-16-18					34
1100			ALLUVIUM: SILTY SAND (SM) - tan and red-brown, with some sandy silt and rock fragments, moist			3	9-9-11					20
			Refusal at 9 feet Boring terminated at 9 feet			4	50/6					50+


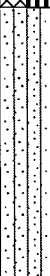
S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ_S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-05A
CLIENT: Gwinnett County DWR	ELEVATION: 1106.0 ft	NOTES: STA 1+80 Straight auger drilling to attempt to collect SPT data past 9 ft (sample interval 13-1/2 to 15 feet)
DATE DRILLED: 12/14/16	BORING DEPTH: 12.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
1105			FILL: SANDY SILT (ML) - very stiff to hard, red-brown and tan, moist							
1100			ALLUVIUM: SILTY SAND (SM) - tan and red-brown, with some sandy silt and some rock fragments, moist							
1095			Refusal at 12 feet Boring terminated at 12 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016), GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: **48" PCCP Replacement**
Camp Branch Road | Buford, Georgia
 S&ME Project No. 1280-16-089

BORING LOG B-06

CLIENT: Gwinnett County DWR	ELEVATION: 1108.0 ft	NOTES: STA 0+70 Refusal met on boulder fill at 1 ft in 3 offset borings.
DATE DRILLED: 12/14/16	BORING DEPTH: 1.0 ft	
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD	
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured	
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE	
SAMPLING METHOD: Split Spoon		

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. ()	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60&80
			FILL: SILTY SAND (SM) - very dense, gray and tan, with some rock fragments and boulders, moist Refusal at 1 feet Boring terminated at 1 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016) GPJ_S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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PROJECT: 48" PCCP Replacement Camp Branch Road Buford, Georgia S&ME Project No. 1280-16-089		BORING LOG B-06A	
CLIENT: Gwinnett County DWR	ELEVATION: 1107.0 ft	NOTES: STA 0+95	
DATE DRILLED: 12/14/16	BORING DEPTH: 9.0 ft		
DRILL RIG: Diedrich D-50	WATER LEVEL: Dry ATD		
DRILLER: Piedmont Environmental	CAVE-IN DEPTH: Not measured		
HAMMER TYPE: Automatic	LOGGED BY: Timothy Mirocha, PE		
SAMPLING METHOD: Split Spoon			

DRILLING METHOD: **3 1/4" Hollow Steam Auger**

DEPTH (feet)	ELEV. (')	GRAPHIC LOG	MATERIAL DESCRIPTION	TESTS	SAMPLE DATA	BLOWS	STANDARD PENETRATION TEST DATA (blows/ft)			
							10	20	30	60/80
1105			FILL: SILTY SAND (SM) - very dense, gray and tan, with some rock fragments and boulders, moist		1	8-13-20			33	
					2	7-14-19			33	
5					3	50/2				50#
1100					4	50/2				50#
			Refusal at 9 feet Boring terminated at 9 feet							

S&ME BORING LOG - NEW BORING LOGS 1280-16-089 (DEC 20 2016).GPJ S&ME 12-1-2010 DATA TEMPLATE.GDT 12/21/16

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TEST PIT RECORD



Gwinnett County Department of Water Resources
 48-Inch PCCP Replacement | Buford, Georgia
 S&ME Project No. 1280-16-089
 February 17, 2017

Boring No.	Depth		DESCRIPTION
	From	To	
TP-01 STA 0+15± Offset: 15' R Elevation: 1109± ft.	0	2'	FILL – Silty Sand (SM), tan-brown, medium to coarse grained, trace clay, moist, with some debris/trash and approx. 6-inch to 1-foot diameter rocks/boulders
	2'	9'	FILL – Silty Sand (SM), tan-brown and brown, with organics (roots, logs, and topsoil), and 1' to 3' diameter rocks/boulders (most around 2' diameter)
	9'		Refusal at 9 feet on rock No groundwater ATE; No groundwater after approx. 3 hours
TP-02 STA 1+00± Offset: 10' R Elevation: 1107± ft.	0	3'	FILL – Silty Sand (SM), tan-brown and orange-brown, medium to coarse grained, moist, with some clay, some approx. 6" diameter rock fragments
	3'	8'	FILL – Silty Sand (SM), orange-brown and gray, medium to coarse grained, moist, some rock/boulders (approx. 1' diameter or less)
	8'	12 ½'	POSSIBLE ALLUVIUM (or alluvium placed as fill) – Silty Sand (SM), brown and gray, medium grained, moist to wet, with some organics (roots, topsoil) and some rocks/boulders (most less than 1-foot diameter)
			Refusal at 12 ½ feet on rock No groundwater ATE, no groundwater after approx. 3 hours
TP-03 STA 1+75± Offset: 10' R Elevation: 1106± ft.	0	2 ½'	FILL – Silty Sand (SM), tan-brown and gray, medium grained, moist, with some debris/trash and rocks/boulders (approx. 6-inch to 1-foot diameter)
	2 ½'	7'	FILL – Silty Sand (SM), orange-brown and red-brown, coarse grained, moist, with some rocks/boulders (most less than 1-foot diameter)
	7'	11'	FILL – Silty Sand (SM), gray and orange-brown, coarse grained, moist to wet, with some organics (logs) and some rocks/boulders (approx. 6-inch to 1 ½-foot diameter)
	11'		Refusal at 11 feet on rock No groundwater ATE, no groundwater after approx. 3 hours
TP-04 STA 2+75± Offset: 12' L Elevation: 1107± ft.	1'	3'	FILL – Silty Sand (SM), tan-brown and orange-brown, medium to coarse grained, moist, with some organics (roots), and some rocks/boulders (mostly 1-foot to 3-foot diameter) and one very large boulder (approx. 5-foot diameter)
	3'		Practical Refusal - Very large boulders prohibiting excavation beyond 3 feet No groundwater ATE, backfilled upon completion

ATE : At the Time of Excavation

TEST PIT RECORD



Gwinnett County Department of Water Resources
 48-Inch PCCP Replacement | Buford, Georgia
 S&ME Project No. 1280-16-089
 February 17, 2017

Boring No.	Depth		DESCRIPTION
	From	To	
TP-04A STA 2+90± Offset: 15' L Elevation: 1107± ft.	0	4'	FILL – Silty Sand (SM), tan-brown, medium to coarse grained, moist, with some organics (roots) and some rocks/boulders 1-foot to 2-foot diameter (mostly 1-foot diameter) and 2 large boulders (approx. 4-foot diameter)
	4'	11'	FILL – Silty Sand (SM), tan-orange-brown and gray, medium to coarse grained, moist to wet, with some organics (roots, logs) and some rocks/boulders (1' to 2' diameter) [Wet starting at approx. 10 feet]
	11'		Practical Refusal - Very large boulders prohibiting excavation beyond 11 feet Groundwater seeping at 10 ½ feet ATE and after approx. 1 ½ hours
TP-05 STA 4+05± Offset: 3' L Elevation: 1110± ft.	0	6"	FILL – Silty Sand (SM), tan-brown, medium grained with some small rock fragments (less than 4-inch diameter)
	6"	2 ½'	RESIDUUM – Silty Sand (SM), red-brown and tan-brown, medium grained, moist with trace organics (roots)
	2 ½'	19 ¼'	RESIDUUM – Silty Sand (SM), tan-brown and gray, medium grained, moist, trace mica
	19 ¼'		Excavation Terminated at 19 ¼ feet (maximum practical excavator reach) No groundwater ATE, backfilled upon completion

ATE : At the Time of Excavation



PROCEDURES

ROCK DEFINITION

We suggest that *Rock* be defined as the following:

General Excavation:

Any material which cannot be excavated with a single-tooth ripper drawn by a crawler tractor having a draw bar pull rated at not less than 56,000 pounds (Caterpillar D8K or equivalent) or excavated by a front-end loader with a minimum bucket breakout force of 25,600 pounds (Caterpillar 977 or equivalent).

Trench Excavation:

Any material which cannot be excavated with a backhoe having a bucket curling force rated at not less than 33,000 pounds (Caterpillar 325 or equivalent).

