

SECTION 1

GENERAL REQUIREMENTS AND PROCEDURES

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SECTION 000001 - GENERAL REQUIREMENTS AND PROCEDURES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The procedures provided herein detail the steps involved to obtain the approval of the City of Sopchoppy of a development that requires water service from the City of Sopchoppy. Such approval shall be applicable only to the proposed water system components and shall be a prerequisite to the acceptance of ownership of such improvements by the City of Sopchoppy. All construction work shall be subject to the approval of the City of Sopchoppy or their designated representative. Adherence to this procedure is in the best interest of the developer, his engineer, the City of Sopchoppy, and future customers of the City of Sopchoppy's Water System to ensure the systems are adequately sized and to minimize operation and maintenance problems in the future.
- B. The City of Sopchoppy will work closely with the developer and his engineer to minimize review time. The timely and accurate submittal of all required information is the best assurance of a quick and satisfactory review.
- C. This Manual of Standard Requirements for Water Systems for the City of Sopchoppy is intended to establish the minimum standards for construction of water distribution system expansions to be tied to and/or turned over to the City of Sopchoppy.
- D. All public water systems within the Sopchoppy Franchise areas as defined by the Wakulla County Board of County Commissioners shall be constructed in accordance with these standards as identified in the Table of Contents.
- E. State of Florida or Federal laws and regulations shall supersede the requirements of these standards where they are found to be in conflict.
- F. Only in areas not dealing directly with the water system components or in areas where these specifications are silent, Wakulla County ordinances and regulations shall supersede the requirements of these standards where they are found to be in conflict.
- G. Where any law, ordinance or regulation is less stringent than these standards, these standards shall take precedence.
- H. These standards may be amended or superseded by a vote of the Sopchoppy City Commission at any properly convened meeting. Any changes are fully affective on any development upon which the construction of the component impacted by the change has not been started. Changes required by higher governing authorities become effective immediately.
- I. INTENTION. It is the declared and acknowledged intention to secure a new water distribution system, complete, in accordance with the plans and specifications, and contract documents. All new work shall be in accordance with COS Specifications and Details and Approved Materials Manual.

- J. GENERAL. All materials shall be in conformance to National Sanitation Foundation (NSF) 61 and those listed in the COS Approved Materials Manual. Materials shall be warranted by the Contractor as to materials, workmanship and accuracy of as-built drawings for a period of two years from the date of completion of the work or beneficial use of the facilities. Workmanship shall be of good quality; i.e., mains shall be laid in a uniform alignment, fittings shall be properly restrained, trenches shall be properly excavated and backfilled, fire hydrants and valve boxes shall be adjusted to finished grade. All water mains shall be installed with tracer wire per COS standard location wire details.
- K. Contractor LICENSE AND APPROVAL. Utility reserves the right to approve or deny approval of Contractor prior to construction of any on-site or off-site utility facilities. Contractor must hold a State Of Florida Underground Utility Contractors license, that named contracting company being the one doing the work on project, and demonstrate acceptable experience in the field of utility construction.

1.2 DEFINITIONS

- A. Sopchoppy, City and Utility and the City of Sopchoppy, Florida – here after referred to as **COS**.
- B. COS, or Developer – The developer or COS for which the water system is being expanded or modified or any entity or person having authority to act on the behalf of the COS or developer.
- C. Contractor – The licensed company or individuals as contracted or employed by the COS or developer to perform the water system expansion construction.
- D. Engineer – The licensed engineer who develops the design and signs the FDEP permit application for the construction of the water system improvements.
- E. COS Engineer - The engineer or engineering firm who advises the COS as to the implementation and compliance with the COS's standards. The Engineer and the COS Engineer may be the same where the COS Engineer is also representing a developer.
- F. Approve: Where used in conjunction with COS's response to submittals, requests, applications, inquiries, reports and claims by Developer, the meaning of term "approved" will be held to limitations of COS's responsibilities and duties as specified in this Manual. In no case will "approval" by COS be interpreted as a release of developer from responsibilities to fulfill requirements of COS, State or other jurisdictional requirements.
- G. Approved Equal: The use of this phrase shall mean that in lieu of the product called for in the Specifications, the developer may submit to the COS another product for consideration. If approval is given, the COS will notify the developer in writing. Any modifications necessary, including piping, electrical, structural, etc. that may be required, will be the responsibility of the developer.
- H. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of work, either at project site or elsewhere; and to report (if required) interpret results of those inspections or tests.

- I. Acceptance – The written acceptance and assumption of ownership and maintenance responsibility for the constructed water utilities by the COS after completion of all construction, testing and permit certifications as required by these standards.

1.3 STATEMENT OF AVAILABILITY

- A. If requested, a "Statement of Water Availability" (Statement) will be issued to the COS or Developer requesting service, providing adequate capacity is currently available. The Statement is not a guarantee that capacity will be available when needed and does not address pressure or fire flow considerations. Capacity is guaranteed only upon receipt by the COS of all capacity and impact fees. Pressure and fire flow capacities will be determined based upon COS's review of the developer's plans, specs and calculations. A request for a Statement must be made upon the form of Appendix A and shall be accompanied by a location map indicating location of the proposed development. Upon review of the request for a Statement, COS will respond with either:
 - 1. Unconditionally Available –COS currently has uncommitted supply capacity adequate to serve the project and service is available adjacent to the site. Offsite extensions may be required for flow and pressure considerations.
 - 2. Conditionally Available - COS currently has uncommitted supply capacity adequate to serve the project but service is not currently available adjacent to the site. Offsite extensions will be required for flow and pressure considerations.
 - 3. Statement Not Available - COS currently does not have uncommitted supply capacity adequate to serve the project. Service may or may not be currently available adjacent to the site. Supply or storage capacity improvements will be required before service can be provided.

1.4 PERMITS

- A. Developer shall have construction plans approved by the COS, County, and the Florida Department of Environmental Protection. The Contractor will be responsible for conforming with requirements of these approvals.
- B. The Developer will notify all permitting agencies when construction commences.
- C. All permits required by the County and COS relating to trades such as electrical, building, sitework, etc. are to be obtained by the Contractor.
- D. All permits required by the State or Federal authorities inclusive of FDOT permits, FDEP wetlands permitting, National Forrest permitting, etc. are to be obtained by the COS or Contractor as they may determine. All such permits shall be transferable to the COS as may be necessary to allow the continuing existence and maintenance of the constructed water system components. All fees associated with the continuing existence of the utility shall be prepaid for a period of five (5) years from the date of acceptance by the COS either to the permitting agency or to the COS.
- E. The Contractor shall be responsible for obtaining and providing records of all permits required for performing work under this contract, except the FDEP permits, and wetland permits, which if required, will be secured by the COS or developer.

1.5 RESPONSIBILITY

- A. The developer shall be responsible for the cost of the permit processing as well as the installation and construction of the water facilities on the COS's property and from the COS's property to the existing system to two points where lines are sufficient in size to supply adequate service approved by the COS.
- B. All connection fees for water service shall be paid to the COS. These fees are due and payable prior to the connection of any service or tap. The COS will be responsible for the installation of all individual meters and accessories up to but not including services of 2 inches in diameter. Larger services are to be installed and paid for by the COS or Developer under the direct supervision of a representative of the COS.
- C. In the event the COS requires installation of larger facilities than would normally be needed by the developer to provide water service, and fire protection to the development, the Developer shall bear the difference in cost of the larger facilities. A written agreement on cost sharing must be prepared in advance of construction. The developer shall provide to the COS such easements, rights-of-way, or rights-of-access to any and all parts of water facilities. Such rights shall be formalized prior to acceptance of the facilities by the COS. The widths shall be as prescribed by the COS. Easements shall be provided at no cost to the COS. Easements shall include access to all abutting unserved parcels lying within the COS franchise area.

1.6 SERVICE AGREEMENT

- A. Developers wishing to construct water system expansions to be turned over to the COS shall enter into a Utility Service Agreement (Section 1.18) with the COS establishing a contractual relationship between the COS and the Developer. This agreement shall be independent and separate from the water service agreements as required for individual users.

1.7 REVIEW FEE

- A. A review fee shall be paid to the COS by all developers in the case of new construction involving facilities to be connected to the COS Water System. The review fee is intended to cover the cost of engineering review of construction plans and specifications by the COS. A deposit will be required when application for service is requested in the amount of \$20.00 per Equivalent Residential Unit (ERU), or a minimum of \$200. An ERU shall be computed as 300 gallons per day on an average daily flow basis.
- B. The deposit received above will be held until the review is complete and actual costs have been calculated. The difference in actual costs for review and the deposit amount received shall be refunded to the developer or due from the developer as applicable. Additional fees may be requested if several reviews for the same project are required based upon inadequate submittals.
- C. Review fees shall be independent and separate from the tap fees as due for the setting of each individual service meter.

1.8 SUBMITTAL REQUIREMENTS/REVIEW/INSPECTION

A. General

1. At time of application for service the following shall be submitted by the developer's engineer to the COS:
 - a. the deposit for the review fee
 - b. two project location maps on tax aerials
 - c. 2 sets of plans and technical specifications
 - d. permit applications ready for COS's signature
 - e. design calculations
 - f. two copies of the executed User's Agreement
2. The developer shall be responsible for providing the Florida Department of Environmental Protection (F.D.E.P.) a certification of completion that includes the As-Built drawings certified by a professional engineer. Completion of punch list items and check-out/inspection of the systems by the COS are required before final acceptance by the COS. Representatives of the COS shall also witness tests of the systems. All submittals to the COS shall be signed, dated and sealed by a Professional Engineer registered in Florida.
3. Developer is authorized to proceed with construction upon receipt of approved plans and specs from COS and upon receipt of any other permits, easements or authorizations as may be required by other agencies having jurisdiction.

B. Sale of Taps

1. Water taps will not be sold within the Project until the water system is accepted by the COS in accordance with paragraph A. above.

C. Plans and Specifications

1. General: All submitted plans shall be standard size sheet (30" x 42", 24" x 36" or 11" x 17") with title block. Graphic scale(s) shall be provided on each sheet and all lettering shall be 1/8" or larger to permit photographic reproduction. All plans sheets and the title page of submitted specifications must be signed, sealed and dated by the developer's engineer.
2. Master Plan: The entire water system expansion shall be shown on a single Project Plan and/or Master Plan. This Plan shall indicate the general locations of all mains, valves, hydrants, and services with respect to the proposed development improvements and the existing water systems. Main sizes shall be indicated on this Plan. Where a wastewater collection system is included in the development, it shall also be shown on the master plan. The plan shall also include the approximate location of intersecting boundaries of abutting parcels along with their COS's names, addresses and approximate parcel acreage.
3. Location Map: A location map shall be provided of the project area and area surrounding to easily identify general location of the project. The map of the area surrounding shall consist of a minimum one-half mile radius and a minimum scale of 1 inch = 2000 feet (shown graphically).
4. Plan View: Water mains may be shown in plan view only.
 - a. As a minimum, the plan drawings shall include the following information:

- 1) General information such as north arrow, names of designer and engineer, revision block with dates, graphic scale(s) and sheet number.
 - 2) Profile with elevations at 100 foot intervals, or more frequently if required by good design practice.
 - 3) Development layout with horizontal and vertical controls.
 - 4) All conflicts with other utility and drainage systems.
 - 5) Pipe data including size, lengths, and material.
 - 6) Size, type, and locations of fittings, valves, hydrants, and other related appurtenances.
 - 7) Limits of pipe deflection.
 - 8) Limits of special interior coatings.
 - 9) Limits of special bedding requirements.
 - 10) Pipe restraint requirements.
 - 11) Details of connection to existing systems.
 - 12) Construction notes regarding cover, horizontal and vertical control, special construction requirements, and references to standard and special details.
5. Details: The plans shall include all applicable standard drawings as shown in Section 4 of this manual. Special details shall be prepared by the developer's engineer for aerial and underwater crossings of rivers, streams, canals and ditches. Other special details shall be prepared by the developer's engineer as required.
 6. Scale: The master plan shall be prepared at a scale not to exceed 1" to 200'. Plan and profile sheets shall not exceed a scale of 1" to 50' Horizontal and 1" to 5' Vertical. Special details shall be of sufficiently large scale to show pertinent construction information.
 7. General Notes: The General Notes as included in Section 4 shall be included on all plans submitted to the COS or used in construction of water system expansions.

D. Design Calculations/Permit Documentation

1. The design of water improvements associated with the COS shall be in compliance with the design standards in Section 2, the specifications contained in Section 3, and the standard drawings contained in Section 4. Design calculations must be reviewed and approved by the COS prior to action taken on permit documentation. It shall be the responsibility of the developer to obtain and comply with all applicable Federal, State and Local regulatory permits. The developer shall also be responsible for the costs associated with such permitting. The developer shall supply copies of all permit documentation to the COS.

E. Construction Inspection and As-Built Drawings

1. A COS designated representative(s) may periodically inspect construction subject to these standards and specifications.
2. Contractor shall give the COS a minimum of 48 hours notice prior to performing the following items of work:
 - a. Any major tie-ins or valve placements prior to backfill.
 - b. Hydrostatic tests of pressure pipework.
 - c. Disinfection of Mains.
3. The Contractor shall verify that the listed items are ready to be inspected and/or tested prior to notifying the COS. Following notification, the Engineer and the COS

Representative will then make the necessary trip to witness the test or inspection. If the inspection is not ready to be made or the required testing fails to meet specifications, then the COS or Contractor shall pay all costs associated with that inspection trip herein established at \$50 per trip as a condition of acceptance.

4. After all required improvements have been installed; the developer's engineer shall submit certification to the system that the improvements have been constructed substantially according to approved plans and specifications. Noncompliance with approved plans or specifications or evidence of faulty materials or workmanship shall be called to the attention of the developer or developer's engineer and if not corrected in an expeditious manner, the COS may suspend its approval of the system expansion and withhold activation of the facilities. Laboratory tests may be required when appropriate.
5. The Engineer shall generate a complete set of record drawings utilizing the Contractor's markups and whatever other sources as may be required to provide a complete set of record drawings. Engineer shall submit one set of signed and sealed 24" x 36" prints and an electronic file of the record drawings to the COS as a precedent to Acceptance. The electronic file shall be in AutoCAD format of the current or next-to-current version
6. Record Drawings submitted to the COS as part of the project acceptance shall comply with the following requirements:
 - a. Drawings shall be legibly marked to record actual construction.
 - b. Drawings shall show actual location of all underground and above ground water piping and related appurtenances. All changes to piping location including horizontal and vertical locations of utilities and appurtenances shall be clearly shown and referenced to permanent surface improvements. Drawings shall also show actual installed pipe material, class, etc.
 - c. Drawings shall clearly show all field changes of dimension and detail including changes made by field order or change order.
 - d. Drawings shall clearly show all details not on original contract drawings but constructed in the field. All equipment and piping relocation shall be clearly shown.
 - e. Location of all hydrants, valves, and valve boxes shall be shown. All valves shall be referenced from at least two and preferably three permanent points. One reference point shall be the center line of the roadway. Water services shall also be referenced to the nearest lot lines.
7. Contractor shall provide GIS Location Data in accordance with and as specified in Section 001620 - Geographic Information System (GIS) for all items described in Paragraph 1.8.E.6.
8. Each sheet of the plans shall be signed, sealed and dated by the developer's engineer as being "As-Builts" or "Record Drawings." Construction plans simply stamped "As-Builts" or "Record Drawings" and lacking in above requirements will not be accepted, and will be returned to the developer's engineer. The formal acceptance by the COS will not be issued until correct "Record Drawings" have been approved.
9. If final inspection of the project reveals it to not be in compliance with the approved plans and specifications, a reinspection fee will be assessed for each required reinspection.
10. Upon acceptance of the work, COS shall issue a certification of final acceptance.

F. Operation and Maintenance Manuals

1. Where the improvements included in the development include storage, pumping or well facilities, the developer shall submit three complete sets of Operation and Maintenance Manuals (O&M) to the COS at completion of construction (or before). The COS will review the O&M manuals for completeness before final system acceptance by the COS.

1.9 APPROVED MATERIALS

1. Approved Materials for the various products specified in this manual are identified in Section 4 – Approved Materials. It is the intent of the COS to review and update the specified materials as appropriate to ensure efficient operation of the services and facilities under the jurisdiction of this manual. For this purpose, the system shall evaluate technical submittals from interested manufacturers or suppliers at least once every two years.

1.10 PRECAUTIONS

1. All means and methods of construction and all associated safety precautions and activities are the responsibility of the COS and Contractor and not be the responsibility of the COS.
2. Contractor is responsible for contacting all utility companies to obtain locations of all existing utilities or obstructions that he may encounter during construction. It is the Contractor's liability to protect all such utility lines, including service lines and appurtenances, and to replace any which may be damaged by the Contractor's equipment, or forces during construction of the project at no expense or liability to the COS.
3. The Contractor shall at all times during construction activity control turbidity caused by construction related acts as required by State and Federal regulations. The Contractor shall obtain any permits for such activities.
4. The pumping and discharge of trench water or flushing water shall be in accordance with all local, State, and Federal agencies that control such activities. The Contractor shall obtain any permits for such activities.

1.11 PROJECT LAYOUT AND CONTROL

1. All work shall be laid out and constructed by the Contractor in the general location and arrangement as illustrated in the approved plans. Adjustments to the design location shall be made by the Contractor with coordination through the Engineer's representative and the COS's representative to avoid existing utilities and other conflicts while protecting the conformance of the installation with permit requirements.

1.12 WARRANTY OF TITLE AND WAIVER OF LIEN

1. No material, supplies or equipment for the work shall be purchased by the COS or Contractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The COS and Contractor shall warrant good title to all materials, supplies and equipment installed or incorporated in the work and agree upon completion of all work to deliver the premises, together with all improvements and appurtenances constructed or placed

thereon by them, to the COS free from any claims, liens or charges. They further agree that neither they nor any person, firm, or corporation furnishing any material or labor for the work shall have any right to a lien upon the premises or any improvements or appurtenances thereon as a result of the COS's or Contractor's failing in their commitment or any person, firm or corporation furnishing any material or labor for any work covered by this contract. The COS and Contractor shall not at any time suffer or permit any lien, attachment, or other encumbrances under the law of Florida or otherwise by any person or persons whomsoever to remain on file with the COS against any money due or to become due for any work done or materials furnished under the contract or by reason of any other claim or demand against the Contractor. Such lien, attachment, or other encumbrance, until it is removed, shall preclude the Acceptance of the work by the COS.

1.13 SUBMITTAL DATA

1. The Contractor shall be required to submit to the Engineer pertinent information, shop drawings and literature on all materials and items of equipment to be installed in conjunction with these specifications. Before ordering or installing any of the equipment or materials, the Contractor shall have one copy of submittal data on each item approved by the Engineer in writing and returned to him. Contractor shall maintain one complete set of approved shop drawings with the approved project plans on the project site during all times of construction activity.

1.14 CLEAN UP

1. Before final inspection and acceptance of the work, clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, regrassing if necessary, to as good condition as existed before work started.

1.15 WARRANTY

1. Concurrent with the acceptance of the work, the Developer shall submit to the COS a warranty covering the work for a period of two years from the date of acceptance. The warranty shall reimburse the COS for and hold the Developer harmless from any losses arising from the failure of the work during the warranty period.
2. In the case of physical failure of any component within the warranty period, the Developer or, at the option of the COS, the COS shall repair the work or have it repaired and the Developer shall reimburse the COS for any such costs incurred. If the defect is of a minor nature not threatening the continuation of service, the COS will notify the Developer of such defect and allow the Developer up to thirty days to correct the defect before undertaking the repairs.
3. The Warranty shall be accompanied by a bond or cash deposit in the amount of 10% of the value of the work accepted by the COS as certified by the Engineer. Any remaining cash deposits will be refunded at the expiration of the warranty period with no interest due.

1.16 FINAL INSPECTION & ACCEPTANCE

- A. As soon as work is substantially complete, the Contractor will request a final inspection. This inspection will be made by the COS's Representative, the Engineer, the COS's Representative, and the Contractor. Any work remaining to be completed or any defective work will be listed on a punch list and delivered to the Contractor. This punch list may be updated as work items are completed or if other defects are discovered.
- B. Final acceptance of any portion of the project will occur after all punch list items are completed as certified by the Engineer and the work is in accordance with the plans and specifications.
- C. All facilities will be subject to inspection and acceptance by any Governmental and State Agency having jurisdiction prior to acceptance by the COS.
- D. Final acceptance by the COS will only take place after the satisfaction of these standards and the receipt of the following items:
 - 1. One copy of the recorded final plat of the development
 - 2. Copy of FDEP Authorization to place the improvements into service
 - 3. One copy of all required submittals as approved by the Engineer
 - 4. One copy of all required permits and certifications as required by the standards
 - 5. Record drawings, GIS data, warranty and easements as required by these standards
- E. REPORTS. Reports of hydrostatic and leakage tests and sterilization of the newly completed systems shall be submitted to the COS prior to requesting acceptance of the system.

1.17 SILENCE OF SPECIFICATIONS

- A. The apparent silence of these standard specifications and supplemental specifications as to any details or the omission from it of a detailed description concerning any point shall be regarded as meaning that all work shall be performed in accordance with the following:
 - 1. Florida DOT Standard Specifications for Road and Bridge Construction, Latest Edition
 - 2. The applicable FDEP requirements
 - 3. Ten States Standards, Latest Edition

1.18 UTILITY SERVICE AGREEMENT FOR WATER SERVICES (see next page)

**UTILITY SERVICE AGREEMENT
FOR
WATER SERVICE**

THIS AGREEMENT is made and entered into by and between the COS, Florida, a governmental body, corporate and politic, ("Sopchoppy") and _____ (the "Developer"). This Agreement shall be effective as of the date on which it has been signed by both the Developer and Sopchoppy or their representatives, as indicated below.

WHEREAS, the Developer owns certain land in Wakulla County, Florida, more particularly described in Exhibit "A" to this Agreement (the "Property") and intends to construct on the Property _____ development to be known as _____ (the "Project"); and

WHEREAS, the Developer desires the Sopchoppy to provide to the Project water service at a projected average daily flow ____of gallons per day;

WHEREAS, Sopchoppy is willing to provide such service upon the terms and conditions hereinafter set forth;

NOW, THEREFORE, in consideration of the premises and the mutual covenants herein contained the Developer and Sopchoppy hereby agree as follows:

1. The Developer shall, at the sole cost and expense of the Developer:
 - A. Construct or cause to be constructed such mains, hydrants, services, and other facilities as may be necessary for Sopchoppy to provide such water service to the Project. Services to serve each lot or parcel within the Project shall be stubbed out to the property line.
 - B. Construct or cause to be constructed such other facilities outside the Property as are generally described in Exhibit "B" to this Agreement.
2. The Developer shall pay all Project costs of any kind, including the cost of any necessary relocation of existing utilities, and shall secure such permits and easements as may be required.
3. All such design and construction shall be in accordance with the Manual of Standard Requirements for Water Systems for the COS (Sopchoppy Standards).
4. No such construction shall be commenced until plans and specifications therefore have been submitted to and approved in writing by Sopchoppy and other agencies or permitting authorities having jurisdiction.
5. Employees and agents of Sopchoppy may at any reasonable time during or after construction enter upon the Property for the purpose of inspecting such facilities.
6. Upon completion of construction such facilities shall be certified by the engineer for the Developer and shall be subject to final inspection by Sopchoppy. Upon determination by Sopchoppy that the facilities have been constructed by the Developer in accordance with the Sopchoppy Standards and all applicable requirements other agencies having jurisdiction, and upon payment by the Developer of all applicable rates, fees and charges established by Sopchoppy, Sopchoppy shall accept the facilities and provide service to the Project. No facility shall be connected to any utility system of Sopchoppy and no individual service connection shall be made to any such facility prior to the acceptance of such facility by Sopchoppy.
7. Upon acceptance of any facility by Sopchoppy, such facility, together with all permits, easements, warranties, engineering drawings, and other matters owned by the Developer in connection therewith shall be delivered to and owned by Sopchoppy. The Developer shall

execute such instruments of conveyance as Sopchoppy may require, and shall provide Sopchoppy as-built drawings as specified in the Sopchoppy Standards.

8. The Developer hereby warrants the facilities to be free of defects in material, workmanship and design for one (1) year after acceptance thereof by Sopchoppy. Any such defect appearing within one (1) year after acceptance shall be corrected by the Developer or, at the option of Sopchoppy, shall be corrected by Sopchoppy and the Developer shall reimburse Sopchoppy for the cost of such correction within 30 days after receipt of a statement for same.

9. The Developer shall not engage, directly or indirectly, in the ownership or operation of a water within or serving the Property or the Project.

10. The Developer hereby releases and agrees to hold harmless, indemnify, protect and defend Sopchoppy, its members, officers, employees and agents from any and all claims, damages, actions or causes of action relating to the planning, design and construction of such facilities, or relating to any denial by the Florida Department of Environmental Regulation or other authority of any permit to provide utility service to the Property, or any failure by the Developer to construct such facilities or develop the Property.

11. This Agreement may not be amended except by a written amendment executed by the Developer and by Sopchoppy. All documents necessary for the implementation of this Agreement, including all permits, engineering design and construction contracts, plans and specifications for the facilities as and when approved and filed with Sopchoppy are a part of this Agreement and incorporated herein by reference.

12. This Agreement shall be governed by the laws of the State of Florida.

EXECUTED by the Developer or its representative this _____ day of _____, 20____.

DEVELOPER

BY: _____

Witness

TITLE: _____

EXECUTED by the undersigned representative of the COS, Florida this _____ day of _____, 20____.

City of Sopchoppy

BY: _____

Witness

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SECTION 2
DESIGN STANDARDS

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SECTION 000002 - DESIGN STANDARDS

PART 2 - GENERAL

2.1 SUMMARY

- A. The following minimum requirements are considered acceptable to the COS in the distribution of water for domestic consumption and fire protection.
- B. Deviations from these standards may be allowed by the COS only upon a finding by the COS that, in accordance with sound engineering standards, the granting of the deviation will not work to increase the likelihood of a system failure. No deviation will be allowed unless it is clearly noted on the approved construction plans.
- C. When these standards differ from County, State and/or Federal requirement, the more stringent requirement shall apply.
- D. The distribution system of a waterworks includes the mains, valves, hydrants, consumer service pipes and meters, and other appurtenances. The system should be designed to provide an adequate supply of water to the consumers and for fire protection at all times.
- E. COS details and specifications (latest available copy) shall be included in all plans submitted for work within the COS utility system. No person shall modify, change, omit, or replace any portion of those details and specifications without the express written consent of COS. In any instance where the Design Engineer has included his written specifications or details in the plans, then the more stringent of the two shall govern.

2.2 STANDARDS

- A. Environmental Protection Agency and U.S. Public Health Service:
 - 1. The governing standards of these agencies will be followed when applicable.
- B. Florida Department of Environmental Protection:
 - 1. The water distribution system shall conform to the applicable Florida Department of Environmental Protection laws, policies, standards, and rules and regulations for public water systems.
- C. Plumbing Codes
 - 1. The provisions of the Florida Building Code as it pertains to water supply and distribution, service line locations and materials, and backflow prevention devices, except as provided for elsewhere in these criteria, shall apply.
- D. COS

1. All water distribution systems that are to become a part of the COS water system shall be designed and constructed in accordance with these standards. Materials, installation, and construction methods and procedures shall be in accordance with Sections 4 and 5 of this manual.

2.3 LOCATION/FUTURE CONNECTION

- A. Water mains shall be located in dedicated right-of-ways or utility easements. When installed in right-of-ways, water mains shall, in general, maintain a consistent alignment with respect to the centerline of the road. All water mains located outside of dedicated right-of-ways shall require a minimum 20-foot easement with the water mains located at least three feet inside any edge not bounded by a right-of-way. Additional easement widths shall be provided when the pipe size or depth of cover so dictate. If a water main is located adjacent to a road right-of-way, a minimum 10-foot easement shall be provided. Additional easement widths shall be provided if the pipe size or depth of cover so dictate. Water mains shall not be placed under any structures. In general, water mains shall not be located along side or rear lot lines. Placement of a water main along side or rear lot line may be allowed on a case by case basis if such a water main configuration results in efficient placement and utilization of the water main network.
- B. Provisions for future connecting mains shall be made by extending construction of all water mains to the exterior boundaries of the subdivision wherever future connections to adjacent subdivisions or lots are anticipated or are required to form an interconnected grid system or reduce the number of dead ends.
- C. Easements shall be free of any restrictions regarding the maintenance, operation or existence of the water utility or any continuing obligation for the provision of any compensation for the existence of the easement.
- D. Utility mains located within existing right-of-ways shall be located a minimum of three feet within the right-of-way unless it is also bordered by a utility easement.
- E. Utility mains shall not be located under pavement to the largest extent practical.
- F. Evidence of satisfaction of these requirements shall be submitted to the COS at the time of FDEP permitting in the form of design drawings illustrating compliance.

2.4 DESIGN BASIS

- A. Pressures
 1. The system shall be designed to maintain a minimum pressure of 20 psi at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system should be approximately 60 psi but not less than 35 psi on the downstream side of a meter. Higher pressures may be required at commercial, industrial and high-density residential areas.
- B. Diameter of Mains

1. Only water mains of four (4) inch diameter and larger shall be permitted. As a minimum, six (6) inch looped systems shall be required in low density residential projects. In commercial, industrial, and high density residential areas, minimum eight (8) inch looped mains may be required. Larger size mains may be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure.

C. Fire Flow Requirements

1. Fire flow requirements shall be determined in accordance with state Insurance Services Office and/or Wakulla County Regulations.

D. Fire Hydrant Location and Spacing

1. Fire hydrants shall be located along public right-of-ways preferably at street intersections. A 6-inch gate valve shall be installed between the water main and each fire hydrant. Fire hydrants shall be the dry barrel, breakaway traffic type. Fire hydrants shall be spaced every 1000 ft. along right-of-ways and located throughout the distribution system so that not more than 500 ft. of hose, laid along public right-of-ways, will be required to reach from a fire hydrant to any proposed structure within the area served. Where dead ends occur, a fire hydrant shall be placed no more than 500 feet from the dead end point. Hydrant spacing in commercial areas shall be at 500-foot intervals.

E. Dead Ends

1. In order to provide increased reliability of service and reduce head loss, dead ends shall be minimized by making appropriate tie-ins by looping the network whenever practical, as determined by the COS.
2. Where dead-end mains occur, they shall be provided with a fire hydrant or with an approved flushing hydrant. Flushing devices shall be sized to provide flows which will give a velocity of at least 2.5 feet per second in the water main being flushed. No flushing device shall be directly connected to any sewer.

F. Valves

1. Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 foot intervals in commercial, industrial and high density residential areas and at not more than 800 foot intervals in all other areas. Appropriate valving shall also be provided at all areas where water mains intersect to ensure effective isolation of water lines for repair, maintenance or future extension.

G. Air Relief

1. At high points in water mains where air can accumulate, provisions shall be made to remove the air by means of hydrants or automatic air relief valves.

H. Water Services

1. Customer Service Lines

- a. Customer service lines shall be provided to all lots within a subdivision. Customer service connections to industrial or commercial lots may be omitted provided approval of the COS is obtained prior to approval of plans and specifications.
 - b. All meters shall be adjacent to the property line and readily accessible to the COS meter readers.
2. Master Metering
- a. In general individual water meters shall be installed for all users. Under certain conditions master metering may be allowed for shopping centers, malls and similar installations.
3. Meter Installations
- a. All meters 1-1/2" and less will be installed by the COS after payment of applicable fees and charges. All meters less than two inches in size will be installed underground in an approved meter box. Meters two inch and larger shall be installed above ground by the Contractor and shall be domestically manufactured and approved by the COS. In general, meters larger than two inches shall be located in a meter easement located adjacent to the public right-of-way.
 - b. Size of all meters shall be determined by the developer's engineer and approved by the COS. The developer's engineer shall provide sufficient information on estimated peak flows and low flows so that meter size can be verified. The developer's engineer shall include headlosses through metering device when designing the water system.
4. Cross Connection Control
- a. In accordance with the COS Cross Connection Control Program, backflow prevention devices shall be installed to protect public water supplies from contamination or pollution by isolating such contaminants or pollutants which could backflow into the public water system.
 - b. The selection of an appropriate protective device will be based on the degree of hazard involved and will normally be as described hereinafter. However, the COS shall retain the final decision in individual cases.
 - c. The backflow prevention device shall be provided, installed, and maintained by the customer for all commercial connections. The COS will provide and install a dual check valve assembly for single family residential connections.
 - d. Air-Gap Separation: An air gap separation is acceptable in all situations described in this section.
 - e. Reduced Pressure Principle Backflow Prevention Device: Will be used in any high risk connections.
 - f. Dual Check Valve Assembly: Will be all low-risk connections.

END OF SECTION 000002

SECTION 3
SPECIFICATIONS

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SECTION 000200 - SPECIAL CONDITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The following Special Conditions shall take precedence over and modify any parts of statements of the General Conditions of the Contract and shall be used in conjunction with them as part of the Contract Documents.
- B. All site work material and construction methods shall be in accordance with the COS standard specifications and details, FDEP requirements, and the latest edition of the Florida department of transportation standard specifications unless otherwise noted. In the event of conflicts or omissions from the construction documents, COS standards shall prevail.
- C. It is the contractor's responsibility to determine the exact location of existing utilities and to determine if other utilities will be encountered during the course of the work and take whatever steps necessary to provide for their protection.
- D. The contractor shall notify COS 48 hours prior to beginning construction.
- E. COS shall be notified a minimum of 48 hours in advance of the pressure and leakage test. The pressure test shall be performed in accordance with AWWA standards.
- F. No final testing or pressure testing will be accepted unless witnessed by COS's representative.
- G. No work shall be performed on Saturday or Sunday without written notification to COS and the engineer.
- H. In accordance with the Florida administrative code, water containing chlorine at levels greater than 0.1 mg/l may not be discharged to any existing water body. All discharges of chlorinated water shall be made at locations sufficiently away from existing water bodies such that no flow enters those water bodies. Discharge shall be directed and contained such that it percolates into the ground.
- I. Fire hydrants shall be located at 3' inside the right-of-way line or at the treeline, whichever is nearer. Hydrant valves shall be located within 3' of the main.
- J. The contractor is responsible for all costs associated with required sampling and testing and providing test results to the COS.
- K. The contractor is responsible for all costs associated with developing required As-Built Drawings and GIS Data and providing As-Built Drawings and GIS Data to the COS.

1.2 EXISTING UTILITIES

- A. Information shown on the drawings as to the location of existing utilities has been prepared from the most reliable data available to the Engineer. The Contractor shall be responsible for

requesting underground utility locates and shall assist the utility companies by every means possible to determine said locations and the locations of recent additions to the systems not shown. Extreme caution shall be exercised to eliminate any possibility of damage to utilities resulting from Contractor's activities. The locations of all overhead utilities shall also be verified by the Contractor. The Engineer shall be notified of any conflict that may occur. The Contractor shall be responsible for determining which poles will need shoring during excavation and shall provide such shoring and support as required.

1.3 PERMITS:

- A. COS will have construction plans approved by the County, and the Florida Department of Environmental Protection. The Contractor will be responsible for conforming with requirements of these approvals.
- B. The COS will notify all permitting agencies when construction commences.
- C. All permits required by the County relating to trades such as electrical, building, sitework, etc. are to be obtained by the Contractor.

1.4 SCHEDULE OF WORK:

- A. All work under this contract shall be arranged and be carried out in such a manner as to complete the work on or before the contract completion date.
- B. Should the Contractor(s) work, through no fault of the Engineer, the COS, or other contractors, fail to progress according to the schedule, and if, in the opinion of the Engineer, the work cannot be completed within the time stated in the contract, or if deemed necessary to protect this or adjoining work from damage, the Contractor shall work such additional time over the established hours of work, including Holidays as required to meet the schedule time without additional expense to the COS.
- C. The Contractor is required to furnish adequate manpower at the project to complete the work within the time allowed by the progress schedule. Should payment of premium time, bonuses, or the like be necessary to attract sufficient manpower for the project, such extra labor costs shall be borne by the Contractor without additional compensation from the COS.
- D. Inclement weather will be reason for granting extension in contract time if the number of delays of rain (trace not included) for the period of the Contract is in excess of the average for that period for the past five (5) years. The increase in time shall be one day for each day of inclement weather over the average.

1.5 USE OF SITE:

- A. The Contractor(s) shall confine their use of the site for storage or materials, erection of temporary facilities and parking of vehicles to areas within his Contract limits as directed by the Engineer. The Contractor shall not unnecessarily encumber the premises at any time. Portions of the site beyond areas on which work is indicated are not to be disturbed.

- B. Keep existing driveways and entrances clear and available at all times. Do not use these areas for parking or storage of materials.
- C. Lock automotive type vehicles such as passenger cars and trucks and other mechanized and motorized construction equipment, when parked and unattended, so as to prevent unauthorized use. Do not leave such vehicles or equipment unattended with the motor running or the ignition key in place.

1.6 TEMPORARY FACILITIES:

- A. The Contractor shall provide electric power and water as he may require for his construction purposes, and shall pay all costs incurred. At completion of the contract, all temporary facilities shall be removed from the site.
- B. The Contractor shall provide sanitary facilities for his workmen at all times. Sanitary facilities shall be of an approved chemical type with regular servicing, as approved by the Engineer and Health Authorities.

1.7 PRECAUTIONS:

- A. Attention is called to the fact that Contractor is responsible for contacting all utility companies to obtain locations of all existing utilities or obstructions which he may encounter during construction. After location of utilities by the appropriate utility company, it is the Contractor's liability to protect all such utility lines, including service lines and appurtenances, and to replace at his own expense any which may be damaged by the Contractor's equipment, or forces during construction of the project.
- B. Barricades, Guards and Safety Provisions: To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, red lanterns and guards shall be placed and maintained during progress of construction work and until it is safe for both pedestrians and vehicular traffic. Rules and regulations of local authorities regarding safety provisions shall be observed.
- C. Traffic Controls: Trenching and earthwork shall be conducted in a manner to cause the least interruption to traffic. Where traffic must cross open trenches, provide suitable bridges.
- D. Work in Progress: Protect completed work from damage by other work in progress. Maintain such protection as long as work is in progress.

1.8 JOBSITE SAFETY

- A. While on the jobsite, the Contractor shall at all times observe all Federal, State and local safety rules, regulations and laws. This includes, but not limited to, confined spaces and excavation protection systems as per O.S.H.A. standard.

1.9 SPECIAL PRECAUTIONS:

- A. The Contractor shall at all times during construction activity control turbidity caused by construction related acts, by the placement of containment curtains, hay bales or suitable temporary erosion control barriers. The pumping and discharge of trench water shall be in accordance with all local, State, and Federal agencies which control such activities. Any permits for such activities shall be obtained by the Contractor and the cost of same be included in the bid price submitted.

1.10 PROJECT LAYOUT AND CONTROL:

- A. The work shall be laid out and constructed by the Contractor in the general location and arrangement as illustrated in the plans. Adjustments to the design location shall be made by the Contractor with coordination through the Engineer's representative to avoid existing utilities and other conflicts while protecting the conformance of the installation with permit requirements.
- B. The Utility Contractor shall provide all surveys necessary for the layout and construction of the work of his contract.

1.11 TESTING:

- A. The Contractor will furnish and pay for the services of a qualified independent testing laboratory approved by the Engineer to provide project quality control if required. It is the Contractor's responsibility to notify the Engineer and testing laboratory as items become ready for tests. Retesting of all testing failures shall be at the Contractor's expense. Testing laboratory shall work under direction of the Engineer. Copies of reports of all tests shall be sent to Contractor, Engineer and COS.
- B. The Contractor will furnish and pay for the services of a qualified independent testing laboratory for sampling and testing of water samples.

1.12 DISPOSAL OF WASTE MATERIALS:

- A. No burial of waste materials will be permitted on the premises. The Contractor shall at all times keep the premises free from accumulations of waste material or debris caused by his employees or work and shall remove same when necessary or required by the Engineer.

1.13 WARRANTY OF TITLE AND WAIVER OF LIEN:

- A. No material, supplies or equipment for the work shall be purchased by the Contractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest therein or any part thereof is retained by the seller or supplier. The Contractor warrants good title to all materials, supplies and equipment installed or incorporated in the work and agrees upon completion of all work to deliver the premises, together with all improvements and appurtenances constructed or placed thereon by him, to the COS free from any claims, liens or charges and further agrees that neither he nor any person, firm, or corporation furnishing any material or labor for any work covered by this contract shall have any right to a lien upon the premises or any improvements or appurtenances thereon as a result of the Contractor's failing in

his commitment to the COS or any person, firm or corporation furnishing any material or labor for any work covered by this contract. The Contractor shall not at any time suffer or permit any lien, attachment, or other encumbrances under the law of Florida or otherwise by any person or persons whomsoever to remain on file with the COS against any money due or to become due for any work done or materials furnished under the contract or by reason of any other claim or demand against the Contractor. Such lien, attachment, or other encumbrance, until it is removed, shall preclude any and all claims or demands for any payment.

1.14 SUBMITTAL DATA

- A. COS SHOP DRAWING AND SUBMITTAL PROCESS. A signed acknowledgement that all materials will be in accordance with COS's specifications, COS's details and COS's Approved Materials Manual, is the only submittal COS will require unless use of an alternate material is requested. Correction of all non-compliant items (materials and workmanship) shall be the Contractor's responsibility and at the Contractor's expense.
- B. The Contractor shall be required to submit five (5) copies of pertinent information, shop drawings and literature on all materials and items of equipment to be installed in conjunction with these specifications. Before ordering or installing any of the equipment or materials, the Contractor shall have one copy of submittal data on each item approved by the Engineer in writing and returned to him.

1.15 INSPECTIONS REQUIRED BY CONTRACTOR

- A. The following is a list of items for which the Contractor is to give the Engineer a minimum of 48 hours notice prior to performing the work:
 - 1. Any major tie-ins or valve placements prior to backfill.
 - 2. Hydrostatic tests of pressure pipework.
 - 3. Disinfection of Mains.
 - 4. Final clean-up of sites.
- B. The Contractor shall verify that the hereinbefore mentioned items are ready to be inspected and/or tested prior to notifying the Engineer. Following notification, the engineer will then make the necessary trip to witness the test or inspection. If the inspection is not ready to be made or the required testing fails to meet specifications, then the Contractor shall pay all costs associated with that inspection trip. These costs shall include time spent by the Engineer and/or inspector and the direct expenses (i.e. mileage, etc.) associated with the failing inspection. Only the test in which the system passes will be included in the general inspection of the job for the COS.

1.16 ESTIMATES AND PAYMENTS:

- A. The Contractor shall submit to the Engineer at time of signing his Contract a schedule of values (if not already given in the Bid Schedule) of the various parts of the work aggregating the total sum of the Contract, divided so as to facilitate payments, and made out in such forms as the Engineer may direct, and if required, supported by the evidence of the correctness. The schedule, upon approval by the Engineer, shall be used as a basis of payment.

- B. On or about the 25th of each month, the Contractor shall submit an estimate of the amount of materials and work in place. The Engineer shall thereupon check such estimate, and if found correct, certify to its correctness. Ninety percent (90%) of the value of all work in place shall be paid for on or before the 30th day after receipt of the Request for Payment. Payments shall be made within forty-five (45) days after the completion and acceptance by the Engineer of the work included on the estimate.
- C. No error or oversight in the making of estimates or certificates shall relieve the Contractor from his obligation to do and complete the work according to the true intent of the specifications and drawings.
- D. In case labor or materials not in strict accordance with the drawings and specifications are furnished, no certificates will be issued until the defective work shall have been removed and replaced to the satisfaction of the Engineer.
- E. In case the Contractor shall fail to complete his Contract or before the time stated in the Contract, no further estimates or payments shall be made until the entire completion of the Contract.

1.17 OWNERSHIP OF HIDDEN VALUABLE MATERIALS:

- A. A.If the excavation of this project uncovers treasure or valuable materials of any kind buried or hidden within the work, it shall remain the property of the COS, other provisions in the documents to the contrary notwithstanding. Guard same until it is turned over to the COS.

1.18 AS-BUILT PLANS:

- A. A complete set of as-built records shall be kept by the Contractor. These records shall show all items of construction and equipment which differ in size, shape or location from those shown on the contract drawings. All new valve installations shall be referenced to three (3) permanent points. These records shall be kept up-to-date daily. They may be kept on a market set of contract drawings for this purpose, or in any other form which is approved prior to the beginning of the work. Before final inspection the Contractor shall turn over to the Engineer a set of marked up drawings showing field changes and actual installed conditions.
- B. AS-BUILT DRAWINGS AND ASSOCIATED COSTS. Prior to acceptance of any work performed for the Utility that is completed, the Utility will require that the Contractor provide the Utility, to retain for its permanent records, all field as-built data which shall be provided in accordance with the Utility's As-Built Specifications Standards Manual, which can be obtained from the Utility's website. All costs pertaining to such records and submissions to the Utility shall be provided by the Contractor.
- C. Contractor shall provide GIS Location Data in accordance with and as specified in Section 001620 - Geographic Information System (GIS) for all items described in Paragraph 1.8.E.6.

1.19 CLEAN UP:

- A. Before final inspection and acceptance of the work, clean ditches, shape shoulders and restore all disturbed areas, including street crossings, grass plots, regrassing if necessary, to as good condition as existed before work started.
- B. Under no circumstance shall any trees be planted within a COS utility easement without:
 - 1. COS approving landscape and irrigation plans
 - 2. COS being notified prior to the planting of trees and giving approval
 - 3. COS inspecting the installation of root barrier material (required at all trees which are closer than 7.5' to any COS utility line) as shown in COS Approved Material Manual and COS roadway cross-section details, whether or not shown on the plans.
- C. CLEAN-UP. All surplus materials of construction shall be removed from the site and disposed of by the Contractor as part of his contract with the COS.
- D. RESTORATION. New Water Main Construction in earthen areas shall be seeded and mulched in accordance with Section 570 of Standard Specifications of the Florida Dept. of Transportation (latest edition). In locations where existing grassed (sodded) areas are disturbed, sod shall be replaced to preconstruction condition and to limits of construction or where directed by the Engineer.

1.20 FINAL ACCEPTANCE:

- A. As soon as work is substantially complete, the Contractor will request a final inspection. This inspection will be made by the COS's Representative, the Engineer, and the Contractor. Any work remaining to be completed or any defective work will be listed on a punch list and delivered to the Contractor. This punch list may be updated as work items are completed or if other defects are discovered.
- B. Final acceptance of any portion of the project will occur after all punch list items are completed and the work is in accordance with the plans and specifications.
 - 1. PRIOR TO FINAL INSPECTION, THE Contractor SHALL PROVIDE THE FOLLOWING:
 - a. Locate wire report.
 - b. The pressure test and bacteriological clearance analysis report.
 - c. The engineer of record certification to D.E.P. This can be done with preliminary as-builts.
 - d. Preliminary as-builts showing at least the following: a.) Location of valves, mains, services.
 - e. All services and valves to be plainly marked with a treated fence post.
- C. All facilities will be subject to inspection and acceptance by any Governmental and State Agency having jurisdiction prior to acceptance by the COS.
 - 1. PRIOR TO FINAL ACCEPTANCE FOR OWNERSHIP, THE FOLLOWING MUST BE COMPLETED:

- a. Water services must be lowered and meter boxes installed, valve boxes must be set on all gate valves.
- b. All valves, locate wire boxes, water and reclaimed services shall be scribed in curb and painted the Correct color.
- c. As-builts must be accepted by the COS.
- d. GIS Location Data in accordance with and as specified in Section 001620 - Geographic Information System (GIS).

D. CLOSE OUT / COMPLETION. Minimum items required for Close Out / Completion for submittal to the COS will include:

1. Construction Warranty from Contractor in the form of a Bond, Letter of Credit or Cashier's Check for a two-year period.
2. Schedule of Values
3. Bacteriological Test(s)
4. Pressure Test(s)
5. Television Reports and Recorded DVDs
6. Density Reports
7. Final As-Built Drawings and disks
8. Locate Wire test.
9. GIS Location Data in accordance with and as specified in Section 001620 - Geographic Information System (GIS).

1.21 SILENCE OF SPECIFICATIONS:

- A. The apparent silence of these specifications and supplemental specifications as to any details or the omission from it of a detailed description concerning any point shall be regarded as meaning that all work shall be performed in accordance with the Florida DOT Standard Specifications for Road and Bridge Construction, Latest Edition.

1.22 SUBCONTRACTORS AND SUPPLIERS:

- A. The Contractor shall supply the names and addresses of subcontractors and material suppliers when requested to do so by the COS.
- B. The Contractor shall not use a subcontractor or material supplier against whom the COS has a reasonable objection.

END OF SECTION 000200

SECTION 001620 - GEOGRAPHIC INFORMATION SYSTEM (GIS)

PART 1 - GENERAL

1.1 PURPOSE

- A. The COS Geographic Information System (GIS) specifications and standards manual establish the minimum requirements for as-built submittals.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONFIGURATION STANDARDS

- A. All electronic as-built utility information in the as-built survey collected data must reference the State Plane Coordinate System, Florida North Zone (WKID 2238), NAD 83 2011 (horizontal) and NAVD 88 (vertical) utilizing GEOID12A or GEOID12B (or newer); the units must be in feet and be properly projected into its correct spatial location prior to submitting to the COS. The COS will not re-project or manipulate the submittals in an attempt to correct improperly spatially referenced information. It is the certifying Surveyor or Engineer's and their staff's responsibility to ensure all submitted information adheres to the specifications and adheres to the Florida Standards of Practice for licensed Surveyors and Mappers.
 - 1. The Surveyor or their staff performing the data collection will independently verify the positional accuracy relative to the referenced horizontal and vertical datum. Local, State, or federal agencies vertical and horizontal control points will be used and are independent of checks to local project controls.
 - 2. The positional accuracy relative to the referenced published control points used shall not exceed 0.5' horizontally and 0.1' vertically for water utilities.
 - 3. Coordinates on the utility mains will be required at all pipe dead ends, size changes, points of connection to existing system, fittings (bends, valves, tees, plugs, etc.), at intersections of pipe, at 100' intervals for water mains and 500' intervals for reclaimed and force mains, or to the nearest fitting/structure whichever is less.
 - 4. Intended Display Scale: All maps or reports of surveys produced and delivered with digital coordinate files must contain a statement to the effect of: "Map is intended to be displayed at a scale of 1"=60"
- B. File submittals shall be an ArcGIS Pro map document and corresponding database (version 2.x or newer)
 - 1. The COS will provide base templates for submittal use
- C. All polylines (water utility mains, etc.) shall be connected with no broken segments; unless noted in item a) below.

1. Polylines shall be broken at each of the following points (fittings / blocks in AutoCAD) Valves (does NOT include Air Release Valves)
 - a. Reducers
 - b. Tees, Taps and Crosses (including Fire Hydrant Tees)
 - c. Caps (Tapped Caps)
 - d. Clean-outs
 - e. R.P.Z. B.F.P. (Back-flow Preventer)
 - f. In-line Ball Valve
 - g. Point of service
 - h. Double Detector Check Valves & Check Valves
 - i. Adapters Couplings (including HDPE-to-PVC, HYMAX and Type of Material Transition Points, etc...)

D. ****DO NOT BREAK** at any fittings not listed above. ******

E. All water mains and fittings shall have designated field attributes completed at the time of data collection and entry

F. The Surveyor or Engineer shall provide a Boundary Survey as defined in 5J-17.052(2) of the Standards of Practice of the site showing above and below ground improvements impacted by construction within lift station, treatment plant and well sites. All infrastructure, equipment and lines that are necessary for full operation of the site shall be included. Elevations shall be indicated at the finished floor and top of structures and at pipe inverts, wet well tops (rim elevation), wet well sumps and at ground level adjacent to wet wells.

3.2 COST

- A. The GIS submittals shall be prepared at the Contractor's, or Developer's (applicant) expense.
- B. The applicant's Contractor shall be responsible for paying in advance to the COS, the cost for reviewing the final GIS data for each extension of the COS's utility system.
- C. Extra time required to review the as-built GIS data, due to failure of meeting the specifications or for other inadequate or inaccurate information required of applicant's Surveyor or Contractor to complete COS's as-built GIS drawings/data or by any combination of such factors shall be charged to and paid by the applicant as an additional cost, based on a rate of \$35.00 per hour.

3.3 SUBMISSION OF ELECTRONIC AS-BUILTS

- A. As-builts submittals shall be submitted using the COS's Esri ArcGIS Pro template files. Electronic files can be provided via e-mail, FTP, or delivered via USB (if necessary).

3.4 DESCRIPTION OF GIS SCHEMA CONFIGURATION (appendix item)

A. Feature Classes:

CurbStop	Fitting	FlowValve
AssetID	assettype	assettype
Diameter	assetid	assetid
ValveType	installdate	diameter
TypeofJoin	lifecyclestatus	installdate
ValveStatus	notes	lifecyclestatus
TurnstoClose	diameter	notes
DirectiontoClose	inservicedate	lastmaint
Operable	retireddate	inservicedate
HasBypass	ownedby	retireddate
Manufactur	maintby	ownedby
ModelNumber	spatialsource	maintby
SurveyElev	spatialconfidence	spatialsource
InstallDate	globalid	spatialconfidence
LastMainte	creationdate	symbolrotation
InServiceDate	creator	globalid
RetireDate	lastupdate	creationdate
LifeCycleStatus	updatedby	creator
OwnedBy	ESRIGNSS_POSITIONSOURCETYPE	lastupdate
Notes	ESRIGNSS_RECEIVER	updatedby
Image	ESRIGNSS_LATITUDE	ESRIGNSS_POSITIONSOURCETYPE
UniqueID	ESRIGNSS_LONGITUDE	ESRIGNSS_RECEIVER
Collector	ESRIGNSS_ALTITUDE	ESRIGNSS_LATITUDE
Updated	ESRIGNSS_H_RMS	ESRIGNSS_LONGITUDE
Createdon	ESRIGNSS_V_RMS	ESRIGNSS_ALTITUDE
ESRIGNSS_H_RMS	ESRIGNSS_PDOP	ESRIGNSS_H_RMS
ESRIGNSS_V_RMS	ESRIGNSS_HDOP	ESRIGNSS_V_RMS
Device	MaterialType	ESRIGNSS_FIXDATETIME
DeviceID	TypeofJointFitting	ESRIGNSS_FIXTYPE
Capturemet	MaterialTransition	ESRIGNSS_CORRECTIONAGE
ESRIGNSS_PDOP		ESRIGNSS_STATIONID
ESRIGNSS_HDOP		ESRIGNSS_NUMSATS
Location		ESRIGNSS_PDOP
Latitude		ESRIGNSS_HDOP
Longitude		ESRIGNSS_VDOP
		ESRIGNSS_DIRECTION
		ESRIGNSS_SPEED
		ESRIGNSSR_AZIMUTH
		ESRIGNSS_AVG_H_RMS

ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV

ServiceConnection	PressureValve	FireHydrant
assettype	assettype	assettype
assetid	assetid	assetid
accountid	diameter	diameter
additionaldetails	pressure	secondarydiameter
additionaldevice	installdate	manufacturer
installdate	lifecyclestatus	installdate
lifecyclestatus	notes	lifecyclestatus
inservicedate	lastmaint	inservicedate
retireddate	inservicedate	retireddate
notes	retireddate	notes
lastmaint	ownedby	lastmaint
ownedby	maintby	ownedby
maintby	spatialsource	maintby
spatialsource	spatialconfidence	spatialsource
spatialconfidence	symbolrotation	spatialconfidence
symbolrotation	globalid	symbolrotation
globalid	creationdate	globalid
creationdate	creator	creationdate
creator	lastupdate	creator
lastupdate	updatedby	lastupdate
updatedby	ESRIGNSS_POSITIONSOURCETYPE	updatedby
ESRIGNSS_POSITIONSOURCETYPE	ESRIGNSS_RECEIVER	ESRIGNSS_POSITIONSOURCETYPE
ESRIGNSS_RECEIVER	ESRIGNSS_LATITUDE	ESRIGNSS_RECEIVER
ESRIGNSS_LATITUDE	ESRIGNSS_LONGITUDE	ESRIGNSS_LATITUDE
ESRIGNSS_LONGITUDE	ESRIGNSS_ALTITUDE	ESRIGNSS_LONGITUDE
ESRIGNSS_ALTITUDE	ESRIGNSS_H_RMS	ESRIGNSS_ALTITUDE
ESRIGNSS_H_RMS	ESRIGNSS_V_RMS	ESRIGNSS_H_RMS
ESRIGNSS_V_RMS	ESRIGNSS_FIXDATETIME	ESRIGNSS_V_RMS
ESRIGNSS_FIXDATETIME	ESRIGNSS_FIXTYPE	ESRIGNSS_FIXDATETIME
ESRIGNSS_FIXTYPE	ESRIGNSS_CORRECTIONAGE	ESRIGNSS_FIXTYPE
ESRIGNSS_CORRECTIONAGE	ESRIGNSS_STATIONID	ESRIGNSS_CORRECTIONAGE
ESRIGNSS_STATIONID	ESRIGNSS_NUMSATS	ESRIGNSS_STATIONID
ESRIGNSS_NUMSATS	ESRIGNSS_PDOP	ESRIGNSS_NUMSATS
ESRIGNSS_PDOP	ESRIGNSS_HDOP	ESRIGNSS_PDOP
ESRIGNSS_HDOP	ESRIGNSS_VDOP	ESRIGNSS_HDOP
ESRIGNSS_VDOP	ESRIGNSS_DIRECTION	ESRIGNSS_VDOP
ESRIGNSS_DIRECTION	ESRIGNSS_SPEED	ESRIGNSS_DIRECTION

ESRIGNSS_SPEED
 ESRISNSR_AZIMUTH
 ESRIGNSS_AVG_H_RMS
 ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV

ESRISNSR_AZIMUTH
 ESRIGNSS_AVG_H_RMS
 ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV

ESRIGNSS_SPEED
 ESRISNSR_AZIMUTH
 ESRIGNSS_AVG_H_RMS
 ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV
 Collector

FlushingAndBlowoff

Service

WaterMain

FlushingAndBlowoff	Service	WaterMain
assettype	assettype	assettype
assetid	assetid	assetid
name	diameter	diameter
installdate	material	material
lifecyclestatus	designtype	designtype
notes	installdate	installdate
lastmaint	lifecyclestatus	lifecyclestatus
inservicedate	inservicedate	notes
retireddate	retireddate	measuredlength
ownedby	notes	adddetails
maintby	measuredlength	inservicedate
spatialsouce	addetails	retireddate
spatialconfidence	ownedby	ownedby
symbolrotation	maintby	maintby
globalid	spatialsouce	spatialsouce
creationdate	spatialconfidence	spatialconfidence
creator	globalid	globalid
lastupdate	creationdate	creationdate
updatedby	creator	creator
ESRIGNSS_POSITIONSOURCETYPE	lastupdate	lastupdate
ESRIGNSS_RECEIVER	updatedby	updatedby
ESRIGNSS_LATITUDE		Collector
ESRIGNSS_LONGITUDE		CollectionDate
ESRIGNSS_ALTITUDE		
ESRIGNSS_H_RMS		
ESRIGNSS_V_RMS		
ESRIGNSS_FIXDATETIME		
ESRIGNSS_FIXTYPE		
ESRIGNSS_CORRECTIONAGE		
ESRIGNSS_STATIONID		
ESRIGNSS_NUMSATS		
ESRIGNSS_PDOP		
ESRIGNSS_HDOP		

ESRIGNSS_VDOP
 ESRIGNSS_DIRECTION
 ESRIGNSS_SPEED
 ESRISNR_AZIMUTH
 ESRIGNSS_AVG_H_RMS
 ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV

ServiceLinePoint	SystemValve	WaterMainPoint
assettype	assettype	AssetType
assetid	assetid	AssetID
diameter	diameter	diameter
material	designtype	material
designtype	installdate	designtype
installdate	lifecyclestatus	installdate
lifecyclestatus	presentstatus	lifecyclestatus
inservicedate	inservicedate	inservicedate
retireddatate	retireddate	retireddate
ownedby	additionaldetails	ownedby
maintby	designinfo	maintby
notes	operable	notes
measuredlength	name	measuredlength
adddetails	additionaldevice	adddetails
spatialaou	notes	spatialsource
spatialconfidence	lastmaint	spatialconfidence
Collector	ownedby	globalid
Shape_leng	maintby	creationdate
HDOP	spatialsource	Creator
PDOP	spatialconfidence	lastupdate
HorizontalAcc	symbolrotation	updatedby
VerticalAcc	globalid	collector
Latitude	creationdate	Collection
Longitude	creator	HDOP
	lastupdate	PDOP
	updatedby	HorizontalAcc
	ESRIGNSS_POSITIONSOURCETYPE	VerticalAcc
	ESRIGNSS_RECEIVER	Latitude
	ESRIGNSS_LATITUDE	Longitude
	ESRIGNSS_LONGITUDE	
	ESRIGNSS_ALTITUDE	
	ESRIGNSS_H_RMS	

ESRIGNSS_V_RMS
 ESRIGNSS_FIXDATETIME
 ESRIGNSS_FIXTYPE
 ESRIGNSS_CORRECTIONAGE
 ESRIGNSS_STATIONID
 ESRIGNSS_NUMSATS
 ESRIGNSS_PDOP
 ESRIGNSS_HDOP
 ESRIGNSS_VDOP
 ESRIGNSS_DIRECTION
 ESRIGNSS_SPEED
 ESRIGNSS_AZIMUTH
 ESRIGNSS_AVG_H_RMS
 ESRIGNSS_AVG_V_RMS
 ESRIGNSS_AVG_POSITIONS
 ESRIGNSS_H_STDDEV

ServiceValve	ServiceMeter
assettype	assettype
assetid	assetid
diameter	accountid
designtype	diameter
presentstatus	installdate
additionaldetails	lifecyclestatus
designinfo	inservicedate
operable	retiredate
operator	notes
name	lastmaint
installdate	ownedby
ownedby	maintby
maintby	spatialsource
notes	spatialconfidence
lastmaint	symbolrotation
lifecyclestatus	globalid
inservicedate	creationdate
retiredate	creator
spatialsource	lastupdate
spatialconfidence	updatedby
symbolrotation	ESRIGNSS_POSITIONSOURCETYPE
globalid	ESRIGNSS_RECEIVER
creationdate	ESRIGNSS_LATITUDE
creator	ESRIGNSS_LONGITUDE

lastupdate	ESRIGNSS_ALTITUDE
updatedby	ESRIGNSS_H_RMS
ESRIGNSS_POSITIONSOURCETYPE	ESRIGNSS_V_RMS
ESRIGNSS_RECEIVER	ESRIGNSS_FIXDATETIME
ESRIGNSS_LATITUDE	ESRIGNSS_FIXTYPE
ESRIGNSS_LONGITUDE	ESRIGNSS_CORRECTIONAGE
ESRIGNSS_ALTITUDE	ESRIGNSS_STATIONID
ESRIGNSS_H_RMS	ESRIGNSS_NUMSATS
ESRIGNSS_V_RMS	ESRIGNSS_PDOP
ESRIGNSS_FIXDATETIME	ESRIGNSS_HDOP
ESRIGNSS_FIXTYPE	ESRIGNSS_VDOP
ESRIGNSS_CORRECTIONAGE	ESRIGNSS_DIRECTION
ESRIGNSS_STATIONID	ESRIGNSS_SPEED
ESRIGNSS_NUMSATS	ESRIGNSS_AZIMUTH
ESRIGNSS_PDOP	ESRIGNSS_AVG_H_RMS
ESRIGNSS_HDOP	ESRIGNSS_AVG_V_RMS
ESRIGNSS_VDOP	ESRIGNSS_AVG_POSITIONS
ESRIGNSS_DIRECTION	ESRIGNSS_H_STDDEV
ESRIGNSS_SPEED	
ESRIGNSS_AZIMUTH	
ESRIGNSS_AVG_H_RMS	
ESRIGNSS_AVG_V_RMS	
ESRIGNSS_AVG_POSITIONS	
ESRIGNSS_H_STDDEV	
Collector	
CollectionDate	

3.5 REVISION HISTORY

Revision	Date	Party	Description
1			

END OF SECTION 001620

SECTION 002210 - GRASSING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of grassing work is as specified or shown on the construction plans. Sodded areas disturbed during construction shall be re-sodded to match existing. All other areas disturbed during construction operations shall be seeded and mulched.

1.2 QUALITY ASSURANCE:

- A. All seed used shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act in effect on the date of Invitation for Bids. All seed shall be furnished in sealed standard containers, unless exception is granted in writing by the COS. Seed which has become wet, moldy, or otherwise damaged in transit or in storage shall not be used. Fertilizer 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 used. Seed, fertilizer and other grassing materials shall be stored under cover and protected from damage which would make them unacceptable for use.

1.3 SUBMITTALS:

- A. Approvals, except those required for field installations, field applications, and field tests shall be obtained before delivery of materials or equipment to the project. The results of laboratory tests performed on the topsoil material shall be submitted. The reports shall include the pH level, the amount of organic matter, and available phosphoric acid and potash of the soil intended for use in the work. Certificate of conformance will be required for the following:
 - 1. Grass seed shall be certified by registered, certified seed association or a registered testing laboratory not more than ten months prior to seeding.
 - 2. Fertilizer
 - 3. Topsoil
 - 4. Lime

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. If the quantity of existing stored or excavated topsoil is inadequate for planting, sufficient additional topsoil shall be furnished. Topsoil furnished shall be a natural, fertile, friable soil, possessing characteristics of representative productive soils in the vicinity. It shall be obtained from naturally well-drained areas. Topsoil shall be without admixture of subsoil and free from

Johnson grass (*Sorghum halepense*), nut grass (*Cyperus rotundus*) and objectionable weeds and toxic substances.

2.2 SOIL AMENDMENTS

- A. Lime: Ground limestone (Dolomite) containing not less than 85 percent of total carbonates, and shall be ground to such a fineness that 50 percent will pass a 100-mesh sieve and 90 percent will pass a 20-mesh sieve.
- B. Fertilizer: 16-16-16 formulation of which 60 percent of the nitrogen is in the urea-formaldehyde form and shall conform to the applicable State Fertilizer laws. It shall be granulated so that 80 percent is held on a 16-mesh screen, uniform in composition, dry and free-flowing.
- C. Mulch: Clean hay, fresh straw mulch or wood chips.

2.3 GRASS MATERIALS

- A. Grass Seed:

Federal Specifications JJJ-S-181 and shall satisfy the following requirements:

Max. %	Min. %	Germination		
		Min. % <u>Pure Seed</u>	<u>and Hard Seed</u>	<u>Weed Seed</u>
Argentine Bahia (<i>Paspalum notatum</i>)	80%	65%	15%	.25%

- B. Seed failing to meet the purity or germination requirements by no more than twenty-five percent may be used, but the quantity shall be increased to yield the required rate of pure live seed. Seed failing to meet the weed seed requirements shall not be used.

PART 3 - EXECUTION

3.1 GRADING

- A. Areas to be grassed shall be graded to remove depressions, undulations, and irregularities in the surface before grassing.

3.2 PLACING TOPSOIL

- A. Areas to be grassed shall have a minimum topsoil cover of two inches. Topsoil shall not be placed when the subgrade is excessively wet, extremely dry or in a condition

otherwise detrimental to the proposed planting or proper grading.

3.3 TILLAGE

- A. The area to be grassed shall be thoroughly tilled to a depth of four inches using a plow and disc harrow or rotary tilling machinery until a suitable bed has been prepared and no clods or clumps remain larger than 1-1/2 inches in diameter.

3.4 APPLICATION OF FERTILIZER

- A. Fertilizer shall be applied at the rate of 6 pounds per 1,000 square feet and shall be thoroughly incorporated into the top three to four inches of soil.

3.5 PLANTING SEEDS

- A. All areas disturbed during construction shall be seeded as specified herein. Immediately before seeds are sown and after fertilizer and lime are applied, the ground shall be scarified as necessary and shall be raked until the surface is smooth, friable, and of uniformly fine texture. Areas to be grassed shall be seeded evenly with a mechanical spreader, raked lightly, rolled with a 200-pound roller, and watered with a fine spray.

- 1. Seed shall be applied at the following rate:

<u>Seed</u>	<u>Rate of Application</u>
Argentine Bahia Grass (Paspalum notatum)	6 lbs./1000 sq. ft. 260 lbs./acre

- 2. Seeded areas shall be mulched at the rate of not less than 1-1/2" loose measurement over all seeded areas. Spread by hand, blower, or other suitable equipment. Mulch shall be cut into the soil with equipment capable of cutting the mulch uniformly into the soil. Mulching shall be done within 24 hours of the time seeding is completed.

3.6 ROLLING

- A. After seeding and mulching, a cultipacker, traffic roller, or other suitable equipment shall be used for rolling the grassed areas. Areas shall then be watered with a fine spray.

3.7 WINTER COVER

- A. All areas to be grassed shall be protected against erosion at all times. For protection during Winter months (November 1st through March 31st) Italian rye grass shall be planted at the rate of four pounds per 1,000 square feet on all areas which are not

protected by permanent grass.

3.8 CLEAN-UP

- A. All excess soil, excess grass materials, stones, and other waste shall be removed from the site daily and not allowed to accumulate.

3.9 MAINTENANCE

- A. Maintenance shall begin immediately following the last operation of grassing and continue until final acceptance. Maintenance shall include watering, mowing, replanting, and all other work necessary to produce a uniform stand of grass. Grassing will be considered for final acceptance when the permanent grass is healthy and growing on 97 percent of the area with no bare areas wider than 12 inches.

3.10 ACCEPTANCE

- A. The Contractor shall submit to the COS two copies of a written request for final acceptance of the grassing work. The request shall be submitted at least ten days prior to the anticipated date of acceptance. The condition of the grass will be noted, the Contractor will be notified if maintenance is to continue.

END OF SECTION 002210

SECTION 002222 - TRENCHING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Extent of work includes excavation for trenches, earthwork for backfilling and compacting trenches necessary for the construction of the Water System.

PART 2 - PRODUCTS – (NOT USED)

PART 3 - EXECUTION

3.1 CLEARING THE SITE

- A. The site of the work shall be cleared of all trees, shrubs, paving and objectionable material which interfere with the prosecution of the proposed work. Trees and shrubs which will not interfere with construction shall be protected from damage. Clearing shall be considered as an incidental item of excavation.

3.2 EXCAVATION

- A. General: Perform excavation described of whatever substance encountered to the dimensions and depths specified or shown on the drawings. Undercutting will not be permitted, except when ordered by the Engineer. Material suitable for backfill shall be stockpiled near the site. Rock or other material undesirable for backfill shall be spoiled outside the area in a neat manner, as directed by the Engineer. Where it is necessary to cut roots projecting into an excavation or where it is necessary to trim branches for equipment clearance, all severed root ends or cuts to branches over 1/2-inch diameter shall be treated with an asphalt base pruning paint. Backfill over exposed roots as soon as possible.
- B. Rock: Where encountered in the trench bed, rock shall be excavated to a depth of 1/4 of the pipe diameter below the bottom of the pipe but in no case less than 4-inches. All undercut trench excavation shall be backfilled and tamped with materials as specified in the following paragraphs under Unstable Subgrade.
- C. Unstable Subgrade:
 - 1. In the event that unsuitable material is encountered at or below the excavation depth specified or shown on the drawings, the Engineer shall be notified. Such material shall be removed and replaced with suitable material. Methods and materials used for replacement shall be one of the following as directed by the Engineer in writing.
 - a. Suitable earth or sand, compacted in the trench. Materials shall be furnished as a part of the Bid Proposal item covering excavation and backfill.

- b. Gravel or crushed limerock, compacted in the trench and paid for under the appropriate item.
 - c. Existing materials, stabilized after removal and then replaced and compacted in the trench at no additional cost to the COS.
2. The Engineer shall determine the methods and materials to be used, based upon the condition of the excavation, the pipe structure to be supported, and the availability and character of stabilizing materials.

D. Trenches:

1. Keep pipe laying operation as close to the excavation operation as possible during the prosecution of the work. The Engineer reserves the right to stop the excavation at any time when, in his opinion, the excavation is opened too far in advance of the pipe laying.
2. Pipe trenches shall be excavated to a depth that will insure a minimum of 36-inches of cover for ductile iron and PVC pipe and 54-inches of cover for polyethylene pipe, except service laterals. Trenches shall be only of sufficient width to provide a free working space on each side of the pipe. To prevent excess pressure on the pipe, the maximum width of trench at the top of the pipe and at the bottom of the trench shall not be greater than 2-feet more than the greatest exterior diameter of the pipe. If this maximum width is exceeded, it shall be the Contractor's responsibility to provide, at no additional cost to the COS, such additional bedding or select backfill materials as the Engineer may require. The excavation below the spring line shall be made to conform as near as possible to the shape of the lower third of the pipe. To protect the pipe lines from unusual stresses, all work shall be done in open trenches. Excavation shall be made for bells of all pipes and of sufficient depth to permit access to the joint for construction and inspections. In no case will the bells be used to support the body of the pipe.
3. In order to avoid existing utilities, at times it may be necessary for the pipe to be laid deeper than the minimum cover specified in the preceding paragraph. At such time the Contractor will not be allowed extra compensation for additional excavation involved.
4. In case excavation has been made deeper than necessary, a layer of concrete, fine gravel or other material satisfactory to the Engineer shall be placed, at no extra cost, to secure a firm foundation for the lower third of each pipe. Where possible, excavated material shall be placed so as not to interfere with public travel. Bridging shall be provided to afford necessary access to public or private premises. Bridging shall be considered as part of the excavation operation and shall be supplied at no additional cost to the COS.

E. Structural: (For valve pits and similar structures)

1. Remove sufficient material to allow proper space for erecting and removing forms. The elevations of the bottoms of footings, if shown on the drawings, shall be considered as approximate only, and the Engineer may order, in writing, such changes in dimensions or elevations of footings as may be deemed necessary to secure a satisfactory foundation. Excavation for structures shall be sufficient to leave at least 12-inches in the clear between their outer surfaces and the embankment of timber that may be used to protect them. Backfill of earth under structures will not be permitted. Excess excavation for structures shall be filled with thoroughly compacted sand, gravel, or concrete at the expense of the Contractor.
2. After excavation for a structure is completed, the Contractor shall notify the Engineer to that effect. No concrete or reinforcing steel shall be placed until the Engineer has approved the depth of the excavation and the character of the foundation material.

F. Sheeting and Shoring:

1. The Contractor shall provide all trench and structural bracing, sheeting or shoring necessary to construct and protect the excavation, existing utilities, structures and private property of all types and as required for the safety of the employees. Sheeting shall be removed or cut off by the Contractor during backfilling operations as directed by the Engineer. Sheeting which is left in place by order of the Engineer will be paid for under the item, Lumber left in Place. Removal of shoring for structures shall be done in such a manner as not to disturb or mar finished masonry or concrete surfaces.

3.3 DRAINAGE

- A. Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water which accumulates in the excavations shall be removed promptly by well point or by other means satisfactory to the Engineer in such a manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid. Bridging of dewatering pipe shall be provided where necessary. Pumps and engines for well point systems shall be operated with mufflers, and at a minimum noise level suitable to a residential area. The Contractor will not be allowed to discharge water into the Wakulla County's storm drainage system without the written approval of Wakulla County. Approval will be subject to the condition that the storm sewer be returned to its original condition.
- B. The Contractor is responsible for carrying the water to the nearest ditch or body of water and for obtaining the necessary permission to use same. The Contractor shall be financially responsible for any nuisance created due to carrying off water from his drainage system.

3.4 BACKFILL

A. Trenches:

1. Trenches shall be backfilled immediately after the pipe is laid unless other protection for the pipeline is provided. Clean earth, sand, crushed limerock or other material approved by the Engineer shall be used for backfill. Backfill material shall be selected, deposited and compacted (simultaneously on both sides of the pipe) so as to eliminate the possibility of lateral displacement of the pipe. Backfill material shall solidly tamped around the pipes in layers to a level at least 1-foot above the top of the pipe. Each layer shall be compacted to a maximum thickness of 6-inches.
2. In unpaved areas, the remainder of the backfill shall be deposited and then compacted by puddling, water flooding or mechanical tampers. Mechanical tamping of layers in unpaved areas shall be to a maximum thickness of 12-inches. In areas to be paved or repaved, the entire depth of backfill shall be deposited in layers and compacted by hand or mechanical tampers to a maximum thickness of 6-inches. Compaction shall be carried out to achieve a density of at least 98% of the maximum density as determined by AASHTO, Method T-180. Under areas to be paved, puddling may be used for backfill consolidation after tamping to 1-foot over the pipe, as specified, provided the method is first approved by the Engineer and the density requirements are met.
3. In areas to be paved, density tests for determination of the specified compaction shall be made by a testing laboratory and spaced one in every 300-feet of trench cut. It is the

intent of this specification to secure a condition where no further settlement of trenches will occur. When backfilling is completed, the roadway base for pavement replacement may be placed immediately. It will be the responsibility of the Contractor to restore the surface to the original grade wherever settlement occurs.

B. Wet Trenches (Contractor's Option):

1. Backfill for the pipe bed in wet trenches shall be crushed, graded limerock, compacted in the trench. After the pipe is laid, a graded limerock backfill shall be placed and worked in around the haunches to a point 6-inches above the pipe. The width of the limerock material around the pipe shall not be less than the outside diameter of the pipe plus 6-inches on each side of the pipe. Material shall be carefully distributed along the pipe so as to provide full and uniform support under and around the pipe. Six inches above the top of the pipe and up to the water level, material from the excavations with no rock or earth exceeding 4-inches in any one dimension shall then be lifted to the trench and released at the water level. Material shall be uniformly distributed for the full width of the trench. Backfill and compaction above the water level in the trench shall be as specified above. All costs for graded limerock placed in wet trenches shall be included in the cost of stage excavation and backfill for the various sizes of pipe.

C. Bedding and Backfill - Flexible Pipe:

1. For polyvinyl chloride pipe, the bedding and backfill materials shall be such as to limit the vertical ring deflection to 5% of the inside pipe diameter. A deflection greater than 5% of the inside diameter shall be cause for rejection of the pipe.
2. Class IV or Class V materials as defined in ASTM D2321-74 shall not be used for bedding, haunching or initial backfill for flexible pipes.
3. For polyvinyl chloride plastic pipe, bedding shall be in accordance with ASTM D2321-74, using Class I, II or III materials, except under wet conditions. In any area where the pipe will be installed below existing or future groundwater levels or where the trench could be subject to inundation, Class I material shall be placed to the springline of the pipe.
4. A minimum of effort is needed to compact the material. However, in the initial stage of placing this type of material, take care to ensure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. Take precautions to prevent movement of the pipe during placing of the material under the pipe haunch. Except for the protection of the pipe from large particles of backfill material, little care need be taken and no compaction is necessary in placing backfill material in the balance of the initial backfill area above the pipe. Where unstable trench wall exist because of migratory materials, such as water-bearing silts or fine sand, take care to prevent the loss of side support through the migratory action.
5. All bedding requirements for flexible pipe specified in the preceding paragraphs shall be included in the price bid for the applicable pipe material and no additional compensation for bedding material will be allowed.

D. Structural:

1. After completion of foundation footings and walls and other construction below the elevation of the final grades, and prior to backfilling, forms shall be removed and the excavation shall be cleared of all trash and debris. Material for backfilling shall consist of the excavation, borrow sand or other approved materials, and shall be free of trash,

lumber or other debris. Backfill shall be placed in horizontal layers not in excess of 9-inches in thickness, and have a moisture content such that a density may be obtained to prevent excessive settlement or shrinkage. Each layer shall be compacted by hand or approved machine tampers with extreme care being exerted not to damage pipe or structures. Backfill shall be placed and compacted evenly against the exposed surfaces to prevent undue stress on any surface.

3.5 RESTORATION OF SURFACE IMPROVEMENTS

- A. Roadways, including shoulders, alleys and driveways of shell, limerock, stabilized soil or gravel, grass plots, sod, shrubbery, ornamental trees, signs, fences, or other surface improvements on public or private property which have been damaged or removed in excavation, shall be restored to conditions equal to or better than conditions existing prior to beginning work. Restoration of shoulders shall consist of seeding and mulching or stabilizing with limerock as selected by the Engineer. The cost of doing this work shall be included in the cost of the various applicable items. Photographs as specified in Section 01380 – Construction Photographs will be used as an aid in determining conditions prior to construction.
- B. Materials for unpaved roadways, road shoulders, alleys, or driveways, shall be compacted to a minimum of 95% of the maximum density as determined by AASHTO, Method T-180. The cost of this work and furnishing new materials shall be included in the cost of the applicable items of work as no separate payment will be made, unless a separate bid item is provided.

3.6 FINE GRADING

- A. Finished areas around structures shall be graded smooth and hand raked and shall meet the elevations and contours shown on the drawings. Lumber, earth clods, rocks and other undesirable materials shall be removed from the site.

3.7 DISPOSAL OF MATERIALS

- A. Such portions of the excavated materials as needed and as suitable, shall be used for backfilling and grading about the completed work to the elevations as shown of the drawings or as directed. Excavated material in excess of the quantity required for this purpose shall be disposed of by the Contractor in those areas designated by the COS and as shown on the drawings. The Contractor shall leave the earth over the trenches or other excavations in a neat and uniform condition acceptable to the COS.

3.8 PAVEMENT REPLACEMENT

- A. Asphalt pavement shall be removed by saw cutting on a straight line with edges as vertical as possible. Concrete pavement or asphalt surfaced concrete shall be removed by cutting with a concrete saw in as straight a line and vertically as possible. Materials to replace State Highway paving shall conform to the specifications required by the Florida Department of Transportation Specifications for Type S-I asphaltic concrete surface course.

- B. Prior to replacing concrete or asphalt pavement replacement, a limerock base shall be laid. The base for concrete pavement shall be 6-inches of compacted thickness, and that for asphalt pavement shall be 8-inches of compacted thickness. The base course for each shall be compacted to a minimum of 98% of the maximum density as determined by AASHTO, Method T-180. The COS will have tests made by an independent testing laboratory to verify compaction results. One test will be made for each block of continuous trench cut.
- C. Non-asphalt pavement replacement shall be replaced of like material and thickness. Asphalt or built-up asphalt pavement shall be replaced with like material or concrete as directed by the Engineer. Where asphalt or built-up asphalt pavement is replaced by concrete, the concrete shall have a minimum of 6-inches in thickness and be reinforced with 6 by 6 no. 6 gage welded wire fabric. Concrete for paving shall be 3,000 psi design strength. Where the pavement replacement is of like material, it shall be replaced in thickness equal to or better than that existing at the time of removal.
- D. Unless the base is sealed or other temporary paving applied over areas to be repaved, pavement shall be replaced not later than 3-weeks after completion of backfill.

3.9 TESTS

- A. A.The Contractor shall furnish facilities for making all density tests and make such restorations as may be necessary due to test operations. All density tests on backfill or base replacement will be made by a commercial testing laboratory employed by the COS and at such locations as may be recommended by the Engineer. If the densities as determined by the specified tests fall below the required minimums, the Contractor shall pay for all retests.

3.10 SIDEWALK, CURB AND GUTTER REMOVAL AND REPLACEMENT

- A. Sidewalk, curb and gutter removal and replacement required in the construction of this work shall be done by the Contractor. Reasonable care shall be exercised in removing sidewalk and curb and gutter, and the Contractor shall either stockpile or dispose of this material as directed by the Engineer. Brick, concrete or built-up asphalt sidewalk replacement and curb and gutter replacement shall be replaced of like material in a manner and condition equal to or better than that existing at the time of removal. Materials and methods of replacing State Highway sidewalks or curbs shall conform to the Department of Transportation specifications.

END OF SECTION 002222

SECTION 002224 - PIPE BORING, DRILLING AND JACKING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This work shall consist of boring, drilling or jacking operations related to the installation of water pipe, in areas where trenching is not feasible or permitted, or as designated on the plans.
- B. The pipe casing shall be clean and free of all dirt, and shall be cleaned with a Vac-Con if necessary. A COS inspector shall be present at all time during this work. Contractor shall be responsible to establish the correct elevation of the Jack and Bore carrier pipe and pipe casing. Contractor shall compact the bottom of the excavation to assure the density of earth is adequate to prevent any settlement of equipment used to perform the Jack and Bore operation. Contractor shall, at all Jack and Bore pits, provide and utilize the necessary de-watering equipment to keep the excavation dry and free from water in accordance with Paragraph 7 of the General Notes. Contractor shall, at all Jack and Bore excavations, provide a rock bed of #57 stone (a minimum of 8-inches thick) to support the track and rail system of the Jack and Bore equipment. This shall be inspected by a COS inspector and approved by the inspector prior to beginning the placement of the pipe casing. Contractor shall replace, at his/her expense, any Jack and Bore installed which COS refuses to accept for ownership and which does not meet the requirements of COS, due to incorrect grading, damaged or faulty materials, poor workmanship, or anything that COS deems as inadequate to perform its intended use.

PART 2 - PRODUCTS

2.1 STEEL CASING

- A. The steel casing shall be seamless or electric resistance-welded tubing for sizes under 24-inch O.D. and standard double-submerged arc-weld for sizes over 24".
- B. Steel pipe shall be A-139, Grade B with one beveled end (to 37 degrees) and other end square cut.

- C. The following table shall be used for determining minimum casing size.

CASING SIZE VERSUS CARRIER SIZE				
Steel Casing Diameter	MINIMUM WALL THICKNESS		Carrier Pipe I.D.	
	Highway	Railroad	Gravity	Pressure
10"	.188"	.188"	NA	4"
12"	.188"	.188"	4"	6"
14"	.250"	.250"	6"	8"
16"	.250"	.250"	8"	10"
18"	.250"	.250"	10"	10"
20"	.250"	.250"	12"	12"
24"	.250"	.281"	14"	14"
24"	.250"	.281"	16"	16"
30"	.250"	.312"	18"	18"
30"	.312"	.344"	20"	20"
36"	.312"	.406"	24"	24"
42"	.375"	.469"	30"	30"
48"	.500"	.532"	36"	36"
60"	.500"	.563"	42"	42"
72"	.625"	.625"	48"	48"

PART 3 - EXECUTION

3.1 BORING and JACKING

- A. Boring shall be performed to alignment and grade as shown on the construction drawings.
- B. The earth and/or rock augers shall not exceed the O.D. (outside diameter) of the steel casing by more than ¼ of an inch. The boring and insertion of the steel casing shall be performed with equipment capable of simultaneous operations.
- C. The feed rate of augers and hydraulic pushing of the casing shall be the same. Under no circumstances will boring be allowed unless operations are simultaneous.
- D. Every effort shall be made to avoid loss of earth.
- E. Excavated material shall be removed from the casing as excavation progresses and no accumulation of such material within the casing shall be permitted.
- F. Upon completion of the boring operations, all voids around the outside face of the casing shall be filled by grouting. Grouting equipment and material shall be on the job site before boring

operations are started in order that grouting around the bored casing may be started immediately after the boring operations have finished.

- G. The allowable tolerance as to grade and alignment of the installed casing shall not exceed 1/10 of a foot per hundred feet of casing length.
- H. The Contractor shall be responsible for protecting any underground utilities and for any damage resulting to locate utilities.
- I. The contractor shall be fully responsible for producing a sound, tight installation, true to line and grade. Gravity pipe shall be skidded through the casing on redwood or pressure treated, stainless-steel tied skids. Ductile iron pipe may be used instead of skids.

3.2 INSTALLATION DETAILS

- A. Prior to the start of the boring operations, the Contractor shall submit the following details to the Engineer when requested.
 - 1. Boring pit bracing.
 - 2. Casing boring head.
- B. Only workmen experienced in boring operation shall perform the work.

3.3 DRILLING AND JACKING FOR CONDUIT

- A. Metallic conduit shall be installed under existing pavement by approved jacking or drilling methods.
- B. Nonmetallic conduit shall not be installed by jacking. Nonmetallic conduit may be installed by drilling if a hole larger than the conduit is pre-drilled and the conduit is hand-installed.
- C. Jacking or drilling pits shall be at least 2 feet from the edge of any type of any pavement, measured from the side of the pit nearest to the pavement.

3.4 JACKING

- A. If the grade of the pipe at the jacking end is below the ground surface, suitable pits or trenches shall be excavated for the purpose of conducting the jacking operations and for placing end joints of the pipe. Such work shall be sheeted securely and braced in a manner to prevent earth cavings and to provide a safe, stable work area.
- B. Heavy duty jacks suitable for forcing the pipe through the embankment shall be provided. In operating jacks, even pressure shall be applied to all jacks used so that pressure will be applied to the pipe uniformly around the ring of the pipe.
- C. A suitable jacking frame or backstop shall be provided. The pipe to be jacked shall be set on guides properly braced together, to support the section of the pipe and to direct it in the proper line and grade.

- D. The whole jacking assembly shall be placed so as to line up with the direction and grade of the pipe. In general, embankment material shall be excavated just ahead of the pipe and material removed through the pipe and the pipe forced through the embankment with jacks, into the space thus provided.
- E. The excavation for the underside of the pipe, for at least 1/3 of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe. This clearance is to be tapered off to zero at the point where the excavation conforms to the contour of the pipe.
- F. The distance that the excavation shall extend beyond the end of the pipe depends on the character of the material, but it shall not exceed 2 feet in any case. This distance shall be decreased if the character of the material being excavated makes it desirable to keep the advance closer to the end of the pipe.
- G. The pipe, preferably, shall be jacked from the low or downstream end. Lateral or vertical variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extent of 1 inch in 10 feet, provided that such variation shall be regular and only in one direction and that the final grade or flow line shall be in the direction indicated.
- H. If the Contractor desires, he may use a cutting edge of steel plate around the head end of the pipe extending a short distance beyond the end of the pipe with inside angles or lugs to keep the cutting edge from slipping onto the pipe.
- I. When jacking of pipe is once begun, the operation shall be carried on without interruption, insofar as practical, to prevent the pipe from becoming firmly set in the embankment.
- J. Any pipe damaged in jacking operations shall be removed and replaced by the Contractor at his entire expense.
- K. Immediately after jacking is complete and the carrier or encasement pipe is accurately positioned and approved for line and grade, the clearance space between the pipe and soil shall be completely filled by pressure grouting for the entire length of the installation.
- L. The pits or trenches excavated to facilitate jacking operations shall be backfilled immediately after the jacking of the pipe has been completed.

END OF SECTION 002224

SECTION 002270 - SEDEMENTATION AND EROSION CONTROL

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary to perform all installation, maintenance, removal, and area cleanup related to sedimentation control work as shown on the Drawings and as specified herein or as required to prevent the transport of silt or sediment outside the limits of construction. The work shall include, but not necessarily be limited to, installation of temporary access ways and staging areas, silt fences, temporary seeding, turbidity barriers, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, and final cleanup.
- B. The CONTRACTOR shall prepare a Sedimentation and Erosion Control Plan. This plan shall be used as a minimum in developing the Pollution Prevention Plan for the NPDES permit application (notification) to be filed by the CONTRACTOR.

1.2 SUBMITTALS

- A. Within 10 days after award of Contract, the CONTRACTOR shall submit to the ENGINEER for approval, technical product literature for all commercial products to be used for sedimentation and erosion control.

1.3 QUALITY ASSURANCE

- A. The CONTRACTOR shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off-site areas, via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment outside the limits of construction shall be installed, maintained, removed, and cleaned up at the expense of the CONTRACTOR. No additional charges to the COS will be considered.
- B. Sedimentation and erosion control measures shall conform to the Best Management Practices outlined in the Drawings and in the Florida Development Manual.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Silt Fence
 - 1. Steel posts shall be a minimum of 5 feet in length, 2-1/2-in by 2-1/2-in by 1/4 in angle post with self fastening tabs and a 5 in by 4 in (nominal) steel anchor plate at bottom.
 - 2. Welded wire fabric shall be 4 in by 4 in mesh of 12 gauge by 12 gauge steel wire.

3. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, NC or equal.
4. Tie wires for securing silt fence fabric to wire mesh shall be light gauge metal clips (hog rings), or 1/32 in diameter soft aluminum wire.
5. Prefabricated commercial silt fence may be substituted for built in field fence. Pre fabricated silt fence shall be "Envirofence" as manufactured by Mirafi Inc., Charlotte, NC or equal.

PART 3 - EXECUTION

3.1 LOCATION OF SEDIMENT/EROSION CONTROL AND TURBIDITY BARRIERS

- A. At a minimum, sediment/erosion control devices shall be installed at all locations shown on the plans and specified herein.
- B. Sediment/erosion control devices shall be installed at 500 feet intervals along all swales and ditches constructed and around all installed drainage structures prior to placement of sod.
- C. Sediment/erosion control shall be installed along all downhill limits of construction.
- D. CONTRACTOR shall provide additional sediment/erosion control and turbidity barriers as needed to control the transport of silt and sediments outside of the limits of construction.
- E. Sediment/erosion control devices shall be installed along the perimeter of all staging areas and all soil stockpile areas.

3.2 INSTALLATION

A. Silt Fence Installation

1. Silt fences shall be positioned as specified indicated on the Drawings and as necessary to prevent movement of sediment produced by construction activities outside of the limits of construction or as approved.
2. Silt fences shall be installed as indicated in the plans.

3.3 MAINTENANCE AND INSPECTIONS

A. Inspections

1. CONTRACTOR shall make a visual inspection of all sedimentation and erosion control devices (including turbidity barriers) once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to areas outside the limits of construction, CONTRACTOR shall promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.
2. CONTRACTOR shall keep a log of all inspections indicating the following:
 - a. Date and time of inspection

- b. Inspector
- c. Amount of rainfall
- d. Erosion and sediment control devices inspected
- e. Condition of sediment and erosion control devices
- f. Repairs needed
- g. Date repair is completed

B. Device Maintenance

1. Silt Fences

- a. Remove accumulated sediment once it builds up to one half of the height of the fabric.
- b. Replace damaged fabric, or patch with a 2 ft minimum overlap.
- c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

3.4 SEDIMENT BASINS

- A. The stormwater ponds may serve as sediment traps during the term of construction. The CONTRACTOR shall monitor the depth of sediment in each stormwater pond on a monthly basis and after each storm which produced greater than one (1) inch of rainfall. Sediments shall be removed from the stormwater ponds when they constitute one-half of the volume below the normal pool elevation. CONTRACTOR shall reexcavate all stormwater ponds to their original design depths after all areas served by the pond have reached substantial completion and all soil has been stabilized.

3.5 REMOVAL AND FINAL CLEANUP

- A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings or specified herein.

END OF SECTION 002270

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SECTION 002300 - DIRECTIONAL BORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Division 2 Section 002665 apply to this Section.

1.2 DESCRIPTION OF WORK

- A. The extent of directional boring is shown on the drawings.
- B. The work included in this section covers the installation of carrier pipe by the directional boring (trenchless installation) method as described herein, within the limits indicated on the drawings. In general, include bore pit, pilot hole (as required), drilling fluids, carrier pipe, removal and disposal of drilling fluids and soil cuttings, soil reports as required by jurisdictional agencies, siltation and sediment control, and all other work required to install the carrier pipe as specified herein and as shown on the drawings.
- C. The Contractor will furnish all labor, equipment, materials and supplies and will perform all work necessary to provide COS with a complete, finished water main crossing via horizontal directional drilling.
- D. The proposed alignment length, profile and grade to which the water main shall be installed are noted on the applicable drawings. This profile indicates the minimum grade to which the pipe will be installed.

1.3 DESIGN/PERFORMANCE REQUIREMENTS

- A. Provide design engineering for the work as described in paragraph 1.2 and as described herein and on the contract drawings, including, but not limited to, the following elements:
 - 1. Bore hole diameter and length,
 - 2. Location of borehole entry and exit points,
 - 3. Drilling procedures,
 - 4. Pipeline pulling operations,
 - 5. Method of drilling fluid disposal,
 - 6. Area required for drilling operations and storage of pipe,
 - 7. Drilling fluids management plan, and
 - 8. Review of plan and profile drawings and proposed horizontal and vertical alignment of the pipeline, with written certification of agreement with them, or recommended departure from them.
- B. The Contractor's submitted design shall be signed and sealed by a Professional Engineer whose specialty includes design of horizontal drilling operations.

- C. The Contractor shall be responsible for conducting the job in accordance with all applicable federal, state and local permits, codes and statutes.

1.4 SUBMITTALS

- A. Drawings: Submit working drawings showing in detail the size and location of boring pits together with all sheeting and shoring to be used in supporting embankments and trench walls, and any other details of the proposed methods of installation required to allow adequate review by the engineer. The Contractor shall prepare a drilling plan indicating equipment proposed for each location, pull-back forces anticipated and shall verify that the DR of the pipe specified is adequate to withstand the anticipated pull-back forces in addition to the earth, line and groundwater loads.
- B. Shop Drawings: Submit complete layout and details for fabrication and installation of pipeline; including design data and calculations. Submittal shall include, but not be limited to, elements listed in paragraph 1.2 A.
- C. Task Schedule: Submit a detailed schedule of tasks for each stage or operation involved in the work of this section. Include as a minimum the following major tasks:
 - 1. Preparatory earthwork operations,
 - 2. Drilling rig mobilization and set-up,
 - 3. Pipe delivery and on-site pipe joining operations,
 - 4. Pilot hole drilling and reaming operations,
 - 5. Pipeline pulling operations,
 - 6. Pipeline hydrostatic testing,
 - 7. Drilling fluid disposal, and
 - 8. Restoration and demobilization.
- D. On completion of pilot hole phase of each drill site, a complete set of “as-built” records shall be submitted in duplicate to the Engineer. These records shall include copies of the plan and profile drawing, as well as directional survey reports as recorded during the drilling operation. Upon completion of directional boring and pipe installation, a complete set of final record shall be submitted in duplicate to the Engineer
- E. Submit MSDS (Material Safety Data Sheets) information for the drilling slurry compounds.
- F. Disposal Plan: Submit a plan describing the Contractor’s plans for disposal of the drilling fluid and the names, addresses and telephone numbers of any and all subcontractors who will be performing any portion of the disposal activities. At a minimum the plan shall include:
 - 1. Disposal method,
 - 2. Disposal hauler(s),
 - 3. Disposal locations,
 - 4. Estimated quantity to be disposed,
 - 5. Type of vehicle hauling drilling fluids,
 - 6. Signed statement that all hauling equipment (i.e., vehicle, tanker, dump truck, trailer, etc.) meets all requirements of state agencies, and
 - 7. Letter from proposed disposal site(s) accepting material.

- G. Erosion Control Plan: An erosion control plan shall be submitted prior to the preconstruction conference. It shall be a written, detailed plan for the accomplishment of acceptable erosion control of the bore sites. The plan shall describe all necessary temporary measures to be implemented for preventing soil erosion from the bore sites until permanent erosion control and finished surfaces are installed. The plan shall comply with all state and local requirements.
- H. Pipe Connection Procedures: The Contractor shall submit pipe connection procedures to the Engineer prior to connecting any pipe. For HDPE pipe, the Contractor shall submit the pipe manufacturer's representative's written approval of the proposed procedures.

1.5 PERMITS

- A. The COS shall obtain necessary FDEP environmental permits. Copies of the permits shall be kept on-site during construction operations.

1.6 QUALITY ASSURANCE

- A. Crossings must conform to applicable requirements of all utility companies affected, State Highway Department, and environmental agencies.
- B. Qualifications: The Contractor shall be thoroughly experienced in the type construction contemplated herein.
- C. The Contractor must demonstrate expertise in trenchless methods by providing a list of five references for whom similar work has been performed with the last two years. Two of the references shall be from projects where the SAME SIZE OR LARGER pipe than the largest carrier pipe specified in the contract documents was successfully installed at a linear distance greater than or equal to the longest bore required by the contract documents. The references shall include a name and telephone number where contact can be made to verify capability. The subcontractor must provide documentation showing successful completion of the projects used for reference. Conventional trenching experience will not be considered applicable.
- D. Upon completion of carrier pipe installation, Contractor shall pass a mandrel through the entire length of the bore in the presence of the COS's representative and COS's representative to inspect for roughness and necking. Mandrel shall not be more than two-inches in diameter smaller than the ID of the carrier pipe installed. Mandrel and towrope shall be constructed of materials that will not scar or harm the carrier pipe in any manner.
- E. Pipe Manufacturer's Quality Control: The pipe manufacturer shall have an on going Quality Control program for incoming and outgoing materials. High-density polyethylene (HDPE) resins for manufacturing of pipe shall be checked for density, melt flow rate, and contamination. These incoming resins shall be approved by NSF before being converted to pipe. Pipe shall be checked for outside diameter, wall thickness, length, roundness, and surface finish on the inside and outside and end cut.
- F. Fittings Manufacturer's Quality Control: The fitting manufacturer shall have an on-going quality control program for incoming and outgoing materials. Molded fittings shall be inspected for voids and knit lines. All fabricated fittings shall be inspected for joint quality and alignment.

All fabricated fitting welds shall be made using a Data Logger. A record of the temperature, pressure and graph of the fusion cycle shall be maintained by the fitting manufacturer.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. The pipe and fitting manufacturer shall package products for shipment in a manner suitable for safe transport on commercial carriers. When delivered, a receiving inspection shall be performed, and any shipping damage reported to the pipe and fittings manufacturer. Pipe and fittings shall be handled, installed, and tested in accordance with manufacturer's recommendations and the requirements of this specification.
- B. Deliver and store materials within limits of rights-of-way and/or property lines as shown on the drawings as directed by the COS.
- C. The Contractor shall be responsible for securing all project materials and shall bear the cost of replacing any materials which may become misplaced or stolen.

1.8 JOB CONDITIONS

- A. The Contractor shall be held fully responsible for protecting against surface subsidence, damage, or disturbance of adjacent property and facilities from his construction methods.
- B. Each directional boring crew shall have a reasonable proportion of experienced men. A superintendent and/or engineer experienced in directional boring methods and techniques, and who represents the boring contractor, shall be present at all times while work is proceeding. He shall also be responsible for the frequent checking of line and grade, if needed. Tolerances should be agreed to in the light gradient and easement requirements.
- C. Contractor shall be held responsible for the coordination and scheduling of all construction work.

1.9 SAFETY

- A. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
- B. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.
- C. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Drilling fluid shall be a gel-forming colloidal fluid consisting of at least 10% of high-grade bentonite, which is totally inert and contains no environmental risk, or equal.
- B. Carrier Pipe:
1. Pipe and fittings shall be high-density polyethylene manufactured from NSF approved PLEXCO P34CH compound, PE 3408, or equal.
 2. Pipe shall meet AWWA C-906, PE Pressure Pipe and Fittings 4" – 53" for Distribution and be marked with the NSF-pw logo.
 3. Hydrostatic design stress (HDS) shall be 800 psi at 73.4°F with a minimum pipe DR of 9 and operating pressure of 200 psi at 73.4°F.
 4. Pipe and fittings shall be produced by the same manufacturer from identical materials meeting the requirements of this specification.
 5. Molded fittings shall meet the requirements of ASTM D-3261 and this specification. At the point of fusion, the outside diameter and minimum wall thickness of fitting butt fusion outlets shall meet the outside diameter and minimum wall thickness specifications of ASTM F-714 for the same size of pipe.
 6. Pipe shall be manufactured in accordance with ASTM F-714, ASTM D-3035, or the applicable dedicated service specification. Print line markings shall include a production code from which the location and date of manufacture can be identified. Upon request, the manufacturer shall provide an explanation of his production code.
 7. Pipe Marking: HDPE color coding shall be in accordance with the marking requirements specified herein.
- C. Acceptable Pipe Manufacturer: Performance Pipe, Driscoplex 4000, PE3408, AWWA C-906, DIPS sizing, Richardson, TX, (800) 527-0662; Supplier: ISCO Industries, Grand Bay, AL, 1-800-345-4726, or approved equal.
- D. Butt fusion Fittings: HDPE fittings shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99, and approved for AWWA use. Butt fusion fittings shall have a manufacturing standard of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers. Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the Quality Control records. All fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the working pressure rating of the fitting.
- E. Transition Fittings: Terminate all HDPE pipe with fusion welded flanges (125 lb. bolt pattern). See paragraph above for alternate fusion procedures.
- F. Because I.D. sizing is different than that of PVC, the following sizes will be used:

Size Indicated on Drawings	HDPE Size to be Used
3"	4"
6"	8"
8"	10"

- G. Tracer wire (Number 8 or larger) shall be strapped or taped on HDPE pipe every 3 feet.

2.2 EQUIPMENT

A. Directional Drilling Equipment

1. General: The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pull back the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk over system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
2. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations. There shall be a system to detect electrical current from the drill string and an audible alarm, which automatically sounds when an electrical current is detected.
3. Drill Head: The drill head shall be steerable by changing it's rotation and shall provide necessary cutting surfaces and drilling fluid jets.

B. Guidance System

1. General: An electronic walkover tracking system or a Magnetic Guidance System (MGS) probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to fifty feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate and calibrated to the manufacturer's specifications for the vertical depth of the borehole at sensing position at depths up to fifty feet and accurate to 2-feet horizontally.
2. Components: The Contractor shall supply all components and materials to install, operate, and maintain the guidance system.
3. The guidance System shall be of a proven type, and shall be set up and operated by personnel trained and experienced with the system. The operator shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation of the guidance system.

2.3 JOINING METHODS

- A. Butt fusion joining: Plain end pipe and fittings shall be made using butt fusion. The butt fusion procedures shall be in accordance with the manufacturer or the PPI. The fusion equipment operator shall receive training using the recommended procedure. The Contractor shall be responsible to verify that the fusion equipment is in good operating condition and that the operator has been trained within the past twelve months. The fusion equipment shall be

equipped with a Data Logger. Records of the welds (heater temperature, fusion pressure, and a graph of the fusion cycle) shall be maintained for five (5) years. Fusion beads shall not be removed.

- B. Mechanical Joining: Polyethylene pipe and fittings may be joined together using flanges or mechanical joint adapters. These fittings shall be made from PE 3048 HDPE, with a Cell Classification of 345464C as determined by ASTM D3350-99. Flanged and MJ adapters shall have a manufacturing standard of ASTM D3261. They shall have a pressure rating equal to the pipe unless otherwise specified on the plans.
- C. Electrofusion couplings: Polyethylene pipe and fittings may be joined using approved electrofusion couplings. Fittings shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits, and per AWWA C906, have nominal burst values of three and one-half times the working pressure rating of the fitting.
- D. Dissimilar Pipe Joining: Joining of HDPE with PVC or DIP shall be flanged for sizes up through 4" and mechanical joint for larger sizes.

PART 3 - EXECUTION

3.1 SUMMARY

- A. The Contractor shall be responsible for setting all grade stakes, lines, and levels.
- B. Coordinate the locations of underground utilities with appropriate companies. Advise Engineer immediately if conflict exists.
- C. Contractor shall operate and maintain all equipment as required to keep the work free from excessive spoil and environmental risks.
- D. Install siltation fences, sediment barriers, etc., as required and as included in the Contractors erosion control plan
- E. The Contractor shall perform the necessary general earthwork operations as required for the directional drilling and pipe pulling operations.
- F. The Contractor shall be responsible for restoring all areas impacted by contractors work effort to pre-work conditions. The Contractor shall be responsible for constructing all means of temporary access to the designated work sites and shall be liable for all damages caused as a result of the work.

3.2 INSTALLATION

- A. Installation shall be in a trenchless manner producing continuous bores. The entry point shall be where shown on the plan submitted as required in 1.2 above. The exit point for the drilled

hole shall be within 3 feet laterally and within 5 feet longitudinally of where shown on the plan submitted as required in 1.2 above. No exception to this requirement will be allowed.

- B. The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel depth and location.
- C. Tunneling must be performed by a fluid-cutting process (high pressure-low volume) utilizing a liquid clay, i.e., bentonite. The clay lining will maintain tunnel stability and provide lubrication in order to reduce frictional drag while the pipe is being installed. In addition, the clay fluid must be totally inert and contain no environmental risk.
- D. The Contractor must also have a mobile vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits. The spoils must then be transported from the job site and be properly disposed of. Under no circumstances will the drilling spoils be permitted to be disposed of into sanitary, storm, or other public or private drainage systems.
- E. Mechanical, pneumatic, or water-jetting methods will be considered unacceptable due to the possibility of surface subsidence.
- F. After an initial bore has been completed, a reamer will be installed at the termination pit and the pipe will be pulled back to the starting pit. The reamer must also be capable of discharging liquid clay to facilitate the installation of the pipe into a stabilized and lubricated tunnel.
- G. The Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits.
- H. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geo-magnetic variations or anomalies.
- I. Contractor shall place silt fence between all drilling operations and any drainage, well-fields, wetland, waterway or other area designated for such protection necessary by documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Fuel may not be stored in bulk containers within 200 feet of any water body or wetland.
- J. Readings shall be recorded after advancement of each successive drill pipe, (no more than 15') and the readings plotted on a scaled drawing of 1" = 5', both vertical and horizontal. Access to all recorded readings and plan and profile information shall be made available to the Engineer, or his representative, at all times. At no time shall the deflection radius of the drill pipe exceed the deflection limits of the carrier pipe as specified herein.
- K. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to the Engineer, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon

completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the Contractor at an approved dumpsite.

- L. The pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100-feet. In the event that pilot does deviate from the bore path more than 5-feet of depth in 100-feet, Contractor will notify Engineer and Engineer may require Contractor to pullback and re-drill from the location along bore path before the deviation. In the event that a drilling fluid fractures, inadvertent returns or returns loss occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a Marsh funnel and wait another 30 minutes. If mud fracture or returns loss continues, Contractor will discuss additional options with the Engineer and work will then proceed accordingly.
- M. Flange/MJ Adapter Installation: Flanges/MJ Adapters shall be attached to pipe and fittings using butt fusion. The flanges/MJ adapters shall be aligned and centered relative to the pipe. Flanges/MJ adapters should be square with the valve or other flange before tightening of bolts. Bolts should not be used to draw flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be used under flange nuts. Bolts shall be tightened using a “star tightening pattern”. See manufactures recommendations. Twenty-four hours after first tightening the flange bolts, they must be re-tightened using the same “star tightening patter” used above. The final tightening torque shall be as indicated by the manufacturer.
- N. On each day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12" or 30 times the wall thickness in length (minimum) and 1" or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
- O. Socket and saddle fusions shall be tested by a bent strap test as described by the pipe manufacturer. The pipe manufacturer shall provide visual guidelines for inspecting the butt, saddle and socket fusions joints.
- P. The Contractor shall be liable for retrieving or sealing any pipe that becomes lodged in the drill hole.

3.3 PIPE PULLING OPERATIONS

- A. The full length of the pipe to be installed shall be laid out, welded and tested in one complete unit before being pulled back through the drilled hole. Once started, pipeline pullback shall be continuous unless approved otherwise in writing by the COS or COS's designated representative.
- B. The pulling head shall be designed by the Contractor to withstand the continuous tensile pull stresses with intermittent sudden occasional surges. The Contractor shall be responsible for determining the pulling loads.
- C. The pipe shall be continuously lubricated with a bentonite slurry and the assembled pipeline shall be laid on rollers, or other apparatus, to facilitate pullback and prevent damage to pipe.

- D. The Contractor shall continue pull back until 10 linear feet (minimum) of pipe is above ground for the purpose of pipe inspection.
- E. After inspection, a blind flange shall be temporarily bolted to the fusion welded flange and the pipe shall be marked and buried with a minimum cover of 36-inches. Connections, which will be made under this contract, will require the removal of the blind flange and a flanged ductile iron adapter shall be bolted to the fusion welded flange suitable for the transitional material.

3.4 TESTING

- A. In addition to the water system testing requirements specified for the entire system, the Contractor shall conduct a low pressure air test of the HDPE water main above ground prior to pullback as follows:

1. Secure and brace ends of pipe to be tested.
2. Provide calibrated low range air pressure gauge on high end of pipe.
3. Fill pipe to maximum pressure of 5.0 psig. Add air as necessary to compensate for internal/external pipe temperature and initial pipe expansion. Check all pipe joints and test fittings with mild soap solution. Repair or replace all leaking joints, pipe and/or fittings.
4. Once air pressure has stabilized, pipe should hold constant air pressure for two hours. If pipe does not hold pressure, check all joints and test fittings with soap solution.
5. Repair or replace sources of leakage and completely retest entire section.

- B. In addition to the water system testing requirements specified for the entire system, the Contractor shall conduct a hydrostatic test of the HDPE water main in-ground after pullback as follows:

1. Flush the HDPE water main with potable water to remove any sediment, solids and/or foreign material prior to any in place testing. Then, fill the pipe with potable water and after all free air is removed from the test section, raise the pressure at a steady rate to the required pressure. The pressure in the section shall be measured with calibrated pressure gauges at each end of the pipe section.
2. Test pressure shall be 150 psi. The initial pressure test shall be applied and allowed to stand without makeup water for a sufficient time to allow for diametric expansion or pipe stretching to stabilize. This usually occurs within 2-3 hours. After this equilibrium period, the test section can be returned to 150 psi operating pressure, the pump turned off, and a final test pressure held for three hours.
3. Immediately following the pressure test, the results shall be furnished to the Engineer or Inspector. Leaking pipes that cannot be repaired to meet pressure test must be removed, filled with concrete, or otherwise placed out of service.

3.5 DAMAGED OR IMPROPERLY INSTALLED PIPE

- A. If the pipe is damaged before installation, or does not meet the specifications, it shall be replaced at no expense to the COS. If the pipe is damaged during installation by the Contractor's operations, placed at the improper grade or line, or cannot be advanced because of an unseen obstruction or any other reason, it shall, at the discretion of the Engineer, be retrieved or abandoned in place and the void filled with concrete by pressure grouting as soon as possible.

If it becomes necessary to drill another hole, an alternate installation shall be made as directed by the Engineer. The Contractor shall re-drill the hole and furnish all additional labor and materials required to complete the job as indicated on the plans and specifications at no additional cost to the COS. The cost for retrieval or abandonment of pipe shall be at the expense of the Contractor. No additional payment shall be made for pipe which is retrieved, abandoned, or damaged beyond use, including dewatering, excavation, drilling, backfilling, etc.

- B. Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using one of the joining methods allowed in this section.

3.6 CONNECTION TO DISSIMILAR PIPE

- A. The HDPE shall be connected to HDPE or PVC distribution piping either side of the directionally drilled section utilizing a flanged joint for sizes up through 4" and mechanical joint for larger sizes.
- B. The first three joints of pipe either side of the directionally drilled section shall include restrained joints

END OF SECTION 002300

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SECTION 002514 - BASE REPLACEMENT AND RESURFACING FOR TRENCHES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of work includes base course replacement and temporary and permanent resurfacing for trenches associated with installation of the Water System.

1.2 QUALITY ASSURANCE:

- A. Where the pipelines lie within the right-of-way of a state highway, all resurfacing shall be done in strict accordance with the specifications, general and special provisions of the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, 2000. Highway permits will be obtained by the COS.
- B. At the completion of construction, the Contractor shall obtain a written release from the County Engineer and/or the State DOT authority (as applicable) on all rights-of-way that were impacted. Provide copies to the Engineer and the COS.

PART 2 - PRODUCTS

2.1 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements.
 - 1. Subbase and Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

PART 3 - EXECUTION

3.1 BASE REPLACEMENT

- A. Immediately after trenches have been backfilled as specified in these specifications, to a depth consistent with the bottom of the existing base but in no case less than eight inches below the bottom of the proposed surface of the street, the Contractor shall complete filling and compacting the trench with an approved base material unless otherwise specified.
- B. Unless otherwise directed by the COS, the Contractor shall maintain base replacement for the period during construction and replace any settlement of the trench with additional base replacement material as specified. The surface of the base replacement over the trench shall be maintained in a condition satisfactory for use by normal traffic. The Contractor shall pay all

claims for damages arising from his neglect to properly maintain the base replacement. No base replacement shall be required on sand or unimproved streets.

3.2 TEMPORARY RESURFACING

- A. Where paved streets are cut, undermined, or otherwise disturbed as a result of the construction, shell or gravel cover shall immediately be provided to temporarily restore the area until repaving occurs. This material shall be maintained until repaved.

3.3 PERMANENT RESURFACING

- A. Surface Courses: The Contractor shall properly prepare the previously placed base replacement by compacting, shaping and priming and place a permanent surface course conforming to the existing wearing surface in type, depth, crown and grade. All resurfacing shall conform to the pertinent sections of the Florida Department of Transportation Standard Specifications for Highway Construction.

3.4 ASPHALT RESURFACING

- A. Asphalt paving shall be replaced by first compacting fill in accordance with the applicable section of these specifications, then placing six-inch sand clay or crushed base to within one and one-half inches of grade. Care must be taken to make the saw cut in a straight line so the patch will be neat.

END OF SECTION 002514

SECTION 002665 - WATER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes furnishing and installing all potable water pipework and appurtenances necessary for a fully operable water system.

1.2 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data, including pressure rating, rated capacity, and settings of selected models for the following:
 - 1. Piping.
 - 2. Pipe fittings.
 - 3. Valves.
 - 4. Fire hydrants.
 - 5. All service materials
 - 6. Casing
 - 7. Backflow Preventer
 - 8. Water Meters
- C. Test reports specified in "Field Quality Control" Article in Part 3.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All material shall be free from defects impairing strength and durability and be of the best commercial quality for the purpose specified. It shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.
- B. Certified records of material tests made by the manufacturer or by a reliable commercial laboratory shall be submitted when requested by the Engineer.
- C. All pipework will be inspected upon delivery and such as does not conform to the requirements of these specifications shall be rejected and must be immediately removed from the site by the Contractor. The Contractor shall furnish and provide all labor necessary to assist the Engineer in inspecting the material. The basis of rejection shall be as specified in applicable ASTM Specifications.

2.2 PIPES AND TUBES

- A. Ductile iron pipe shall be as specified in Approved Material Page ML-1, or approved equal.
- B. PVC pipe, shall be as specified in Approved Material Pages ML-8 and ML-9, or approved equal.
- C. Service tubing shall be as specified in Approved Material Page ML-10, or approved equal.
- D. High Density Polyethylene (HDPE) Plastic Pipe shall be in compliance with ASTM F-714 and ASTM D3261. Fittings shall be in compliance with AWWA C-901. All pipe in sizes 3" through 8" shall have an SDR of 11.0 and be rated for 160 psi operating pressure. Pipe shall be blue or blue striped.
- E. Because of I.D., sizing is different then that of PVC, the following sizes will be used:

<u>Size Indicated on Drawings</u>	<u>HDPE Size to be Used</u>
3"	4"
6"	8"
8"	10"

- F. Transition from the larger HDPE sizes to the PVC sizes shall be made at the point where the flanged connection is to be made.

2.3 PIPE AND TUBE FITTINGS

- A. All fittings for PVC pressure pipe shall be as specified in Approved Material Page ML-5, or approved equal.
- B. Joint Restraining Devices for PVC Pipe shall be as specified in Approved Material Page ML-7, or approved equal.
- C. Mechanical Joint Retainers shall be as specified in Approved Material Page ML-2, or approved equal.
- D. Mechanical Joint Accessory Packs shall be as specified in Approved Material Page ML-3, or approved equal.
- E. Mechanical Joint Fasteners shall be as specified in Approved Material Page ML-4, or approved equal.
- F. Mechanical Joint Restrainer Glands shall be as specified in Approved Material Page ML-6, or approved equal.
- G. Polyvinyl Chloride (PVC) Pipe and Fittings: No PVC fittings will be allowed for pipe sizes 3" and larger.
- H. Fittings for PVC Schedule 80 pipe shall be socket type pipe fittings meeting the requirements of ASTM D 2467.

- I. PVC Joining Materials: Primers for PVC piping solvent cement joints shall meet the requirements of ASTM F 656. Solvent cement for PVC piping solvent cement joints shall meet the requirements of ASTM D 2564.

2.4 VALVES

- A. Gate Valves 4" and Larger: Gate valves 4" and larger shall be as specified in Approved Material Page ML-11, or approved equal.
- B. Gate Valves 2" and Smaller: Gate valves 2" and smaller shall be as specified in Approved Material Page ML-12, or approved equal.
- C. Check Valves: Provide check valves meeting the following requirements:
 - 1. Check Valves Sizes 4" through 12": Check Valves Sizes 4" through 12" shall be as specified in Approved Material Page ML-35, or approved equal.
 - 2. Under Three-Inches: Check valves under three-inches (3") shall be as specified in Approved Material Page ML-22, or approved equal.
- D. Valve boxes shall be as specified in Approved Material Page ML-13, or approved equal.
- E. Curb stops shall be as specified in Approved Material Page ML-20, or approved equal.
- F. Tapping Sleeve and Tapping Valve: Tapping sleeve and tapping valve shall be furnished and installed as a complete assembly, including tapping sleeve, tapping valve, and bolts and nuts. Use sleeve and valve compatible with tapping machine.
 - 1. Tapping Sleeve: Tapping sleeve shall be stainless steel 2 piece bolted sleeve with flanged outlet for new branch connection. Sleeve may have mechanical joint ends with rubber gaskets or sealing rings in sleeve body. Use sleeve that mates with size and type pipe material being tapped. Outlet flange shall be size required for branch connection.
- G. Tapping Sleeve (Sleeve Only): Tapping sleeves shall be as specified in Approved Material Page ML-14 or ML-17, or approved equal.
- H. Service Clamps and Corporation Stops: Service clamps and corporation stops shall be furnished and installed as a complete assembly, including service clamp, corporation stop, and bolts and nuts. Use service clamp and stop compatible with drilling machine.
 - 1. Service Clamp: Service Clamp shall be as specified in Approved Material Page ML-15 or ML-16, or approved equal.
 - 2. Corporation Stops: Corporation stops shall be as specified in Approved Material Page ML-21, or approved equal.
- I. Backflow Preventer: Double check valve assembly shall be a complete assembly including two positive seating check valves, tight closing shut-off valves located upstream and downstream of the check valves, and four suitably placed ball-type test cocks. The device shall be bronze construction. The first and second check valves shall be of modular design and they shall be identical, completely removable and interchangeable.

- J. The backflow preventer shall be in full conformance with the American Society of Sanitary Engineering Standard for Double Check Valve Assemblies, ASSE Standard 1015 and with the requirements of the U.S.C. Foundation for Cross-Connection Control. Double-check valve assemblies shall be manufactured domestically and approved by the COS.
- K. Backflow preventers shall be in-line check valves as specified in Approved Material Page ML-22, or approved equal.
- L. Hose Bibs: Hose bibs shall be manufactured domestically and approved by the COS.

2.5 HYDRANTS

- A. Fire Hydrants:
 - 1. All fire hydrants shall be as specified in Approved Material Page ML-27, or approved equal.

2.6 ANCHORAGES

- A. The following miscellaneous items shall meet the requirements of the listed standard:
 - 1. Clamps, Straps, and Washers: ASTM A 506, steel.
 - 2. Rods: ASTM A 575, steel.
 - 3. Rod Couplings: ASTM A 197, malleable iron.
 - 4. Bolts: ASTM A 307, steel.
 - 5. Cast Iron Washers: ASTM A 126, gray iron.
 - 6. Concrete Reaction Backing: Portland cement concrete mix, 3000 psi (20.7 MPa).
 - a. Cement: ASTM C 150, Type I.
 - b. Fine Aggregate: ASTM C 33, sand.
 - c. Coarse Aggregate: ASTM C 33, crushed gravel.
 - d. Water: Potable.

2.7 CASING (UNDER ROADWAYS)

- A. Casing under all State and Federal highways shall meet, at a minimum, the following:
 - 1. Wall Thickness: (Steel Casing) All casings shall be 0.188", ASTM A139, Grade B.
 - 2. Steel casing shall be coated inside and out with approved primer plus one coat of asphaltum paint on outside.
 - 3. All casing as a minimum shall extend 3 feet beyond the edge of roadway surfaces, as indicated on the Drawings.
 - 4. Casing shall be as specified in Approved Material Page ML-37, or approved equal.

2.8 CASING/PIPE SPACERS

- A. The Contractor shall provide casing spacers for all piping routed through steel casing. The spacers shall be as specified in Approved Material Page ML-36, or approved equal.

- B. The Contractor shall provide casing end seals on all casings. The end seals shall wrap around the casing and carrier pipes after installation to provide a barrier to backfill debris and seepage. Stainless steel bands shall be used to secure the end seals. The casing end seals shall be Model CCES by Cascade Waterworks Mfg. Company, Advance Products and Systems or equal.

2.9 WATER SERVICES

- A. Water services shall include the following components inclusive of the service line previously specified:
 - 1. Water Meters: Meters shall be in accordance with 2.4.H in Section 000002 - Design Standards.
 - 2. Meter Couplings: Meter couplings shall be as specified in Approved Material Page ML-23, or approved equal.
 - 3. Wye Branches: Wye branches for double services are to be pack joint wye branches, Ford Model Number Y44-243 or approved equivalent.
 - 4. Meter Boxes: Meter boxes shall be furnished and installed by the Contractor and shall be as specified in Approved Material Page ML-24, or approved equal.

2.10 METALLIC TRACER WIRE AND BOX

- A. Tracer wire shall be as specified in Approved Material Page ML-25, or approved equal. Tracer wire box shall be as specified in Approved Material Page ML-26, or approved equal.

2.11 AIR RELEASE AND VACUUM VALVE

- A. The combination air release and vacuum valve shall be furnished with both a large and small orifice. The valve shall automatically function to release to atmosphere both large and small amounts of air that accumulate in this pipeline. Once the air has been exhausted both the large and small valves shall seat tightly to prevent water leakage. The valve shall also function to admit air into a line, tank, or chamber under emergency conditions or when it is being drained. The valve body and cover shall be of semi-steel; floats of stainless steel; levers of bronze and resilient seats. The air and vacuum valve shall be manufactured by G-A Industries, Inc., Type 1-AV or approved equivalent.

2.12 AIR RELEASE VALVE

- A. Air release valves shall be as specified in Approved Material Page ML-33, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

- A. This section covers installation of pressure pipework. Excavation and backfilling shall be in accordance with the preceding, applicable sections of these specifications.

- B. All pipe, fittings, and valves shall be carefully handled at all times to prevent damage to the pipe or other installations on the job site.
- C. At times when pipe installation is not in progress, the open ends of the pipe shall be closed by approved means and shall remain closed until construction on that particular section is resumed, eliminating the possibility of any flow obstructions getting into the pipe.
- D. All joints shall be wiped free of all dirt, sand and foreign material and the pipe shall be carefully examined for defects before installation.
- E. Cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe.
- F. Deviations from the piping location, line and grade indicated on the construction plans shall not be made without the prior approval of the Engineer.
- G. Install piping free of sags and bends.

3.2 PIPING INSTALLATION

- A. Pressure piping shall be installed in strict accordance with the manufacturer's printed instructions. Before lowering the pipe into the trench the bottom of the trench shall be graded so that when the pipe rests on the trench bottom it will have a uniform bearing for its entire length. The pipe shall be carefully examined for defects and the inside cleaned. After placing the pipe in the trench, the ends shall be wiped free from all dirt, sand and foreign material. The joints shall be made in accordance with the recommendations of the pipe manufacturer.
- B. Suitable concrete reaction or thrust blocks shall be applied on all lines (except those having screwed or flanged joints), at all tees, plugs, caps, and bends deflecting 22 1/2 degrees or more, or movement shall be prevented by attaching metal rods or straps approved by the Engineer. Unless otherwise directed, the pipe shall be laid with bell ends facing in the direction of laying. Whenever it is necessary to deflect the pipe from a straight line, either in the vertical or horizontal plane, to avoid obstruction, to plumb stems, or where long radius curves are permitted, the degree at deflection shall be as recommended by the manufacturer of the pipe.
- C. The minimum cover for pipe will be 30 inches unless otherwise indicated on the plans. The depth of cover shall be measured from the established street grades or the surface of the permanent improvement to the top of the barrel of the pipe. At street intersections or where the new pipe lines cross existing underground lines at the approximate same depth as the new line, the cover shall be increased and the new line laid below existing lines or structures. Where the existing lines or structures are of sufficient depth that the new lines when laid will have 6 inches of separating earth between them and other pipe or structure and 30 inches cover, the new lines may be laid above the existing lines.
- D. Sub Surface Explorations: Whenever necessary to determine the location of existing pipes, valves, or other underground structures, the Contractor shall examine all available records and shall make all explorations and excavations for such purpose. The location of existing utilities shown on the drawings should be considered approximate only. The Contractor is responsible for locating and protecting all existing utilities whether shown on the drawings or not shown.

- E. Protecting Underground and Surface Structures: Temporary support, adequate protection and maintenance of all underground and surface utility structures, drains, sewers, and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his own expense under the direction of the Engineer.
- F. Construction Equipment: Mechanical equipment may be used for trenching and excavating. However in places where the operation of same will cause damage to trees, shrubbery, pavements or existing structures, above or below ground, hand methods shall be employed. Where a main is installed along paved streets only rubber tired equipment will be allowed for excavation and backfilling; the use of bulldozers or equipment on tracks will not be permitted. The Contractor will be responsible for any damage done to paved streets or lawns. Either air hammers or concrete saws should be used for cutting concrete pavement.
- G. Unsuitable Conditions: No pipe shall be laid in water or unsuitable soils conditions. Unsuitable soil, as determined by the Inspector, shall be removed or replaced with an approved material.
- H. Dewatering: The Contractor shall provide all necessary pumps to dewater the site properly, shall provide all labor and materials required to keep any open excavation dewatered during construction; and shall provide all necessary sheeting, bulkheads, drains, etc., so that construction operations may be performed under dry conditions. If approved prior by Walkulla County, discharge from pumps must be led to natural drainage channels, to drains, or to sewer.
- I. Trench Water: At times when pipe laying is not in progress, the open ends of pipe shall be closed by approved means, and no trench water shall be permitted to enter the pipe.
- J. Cutting Pipe: Cutting of pipe for inserting fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe.
- K. Plugging Dead Ends: Standard plugs shall be inserted into the bells of all dead ends of pipes, tees, or crosses, and spigot ends shall be capped. Plugs or caps shall be jointed to the pipe or fittings in the appropriate manner.
- L. Concrete Encasement and Specials: Provide concrete pipe encasements or special pipe supports as shown on the drawings or directed by the Engineer. Various pipe supports shall be as worked out in the field to suit local conditions and emergencies. Where, in the opinion of Engineer, pipe covering is inadequate, concrete encasement for protection shall be provided in accordance with the details on the drawings. Concrete encasements shall be to the dimensions indicated on the construction plans and as required by the applicable Department of Transportation or Public Health regulations. All other concrete needed to build and protect the pipe work shall be used at the direction of the Engineer.
- M. Backfilling: Backfill material shall be free from rocks or boulders or any other objectionable material and shall be placed in the trench and compacted simultaneously on both sides of the pipe for the full width of the trench, and to an elevation level with ground on either side to the densities indicated in the applicable sections of the specifications.
- N. Repaving: Pavement removal where required in the construction of this project shall be done by the Contractor in a workmanlike manner. Care must be taken to make the saw cut in a straight line so the patch will be neat. Asphalt paving shall be replaced as described in the applicable sections of the specifications. Concrete driveways and pavement shall be finished to conform with existing pavement.

- O. Clean Up: Before final inspection and acceptance, the Contractor shall clean ditches, shape shoulders, and restore all disturbed areas, including street crossing, grass plots, to as good a condition as existed before work started. All trenches shall be leveled, and loose material removed from pavement gutters and sidewalks, employing hand labor, if necessary.
- P. Service Pipe: Service pipe shall have a minimum depth of 30 inches at all highway crossings and 18 inches elsewhere. The requirements for trenching and backfilling shall apply. Removal of pavement or sidewalk will not be permitted for water service lines. They may be installed by jacking, boring, or pushing under sidewalks.
- Q. Separation of Water Mains and Sewers: Water mains or sewer mains that are laid in the vicinity of each other shall meet the horizontal and vertical separations specified and shown in the Standard Drawings sections.

3.3 ANCHORAGE INSTALLATION

- A. Thrust Block Placement: Reaction or thrust blocks shall be placed on all pipe lines two inches in diameter or larger at all tees, plugs, caps and at bends deflecting 22 1/2 degrees or more, or movement shall be prevented by attaching metal rods or straps as approved by the Engineer.
- B. Materials for Thrust Blocks: Reaction, or thrust blocks shall be of concrete that has a 28 day compressive strength of not less than 3000 psi. Reaction blocks will be placed in accordance with the details on the construction plans.
- C. Blocks shall be placed between solid ground and the fitting to be anchored. The blocks shall, unless otherwise directed, be so placed that the pipe and fitting joints will be accessible for repairs. No extra payment will be made for this material but shall be included in the unit price bid for the various sizes of pipe.
- D. In some cases, the Engineer may direct the Contractor to provide blocks using cables and "deadman" anchors where the soil conditions will not support the normal concrete type as described above.

3.4 VALVE INSTALLATION

- A. Valves and Fittings: Gate valves and pipe fittings shall be set and jointed to new pipe in the manner heretofore specified for cleaning, laying and restrained in accordance with Paragraph 2.3 in Specification Section 002665 - Water Systems.
- B. Valve Boxes: Cast iron valve boxes shall be firmly supported, and maintained centered and plumb over the wrench nut of the gate valve, and box cover flush with the surface of the finished pavement or at such other level as may be directed.

3.5 FIRE HYDRANT INSTALLATION

- A. Install fire hydrants and flushing hydrants with gate valves and provision for drainage as indicated in the plans.

3.6 DIRECTIONAL DRILLING

- A. Where indicated on the drawings, the Contractor shall use directional drilling or boring (trenchless excavation) in accordance with the requirements of the Directional Boring section of these specifications.
- B. The actual drilling process shall be one of displacement and compaction. The drill head shall cut its own hole and then compact the displaced material against the walls of the drilled hole. Bentonite shall be used to help hold the walls of the hole in place and ultimately fill the voids between the pipe and the walls of the hole. The pipe to be installed in all directional drilling shall be high-density polyethylene, as detailed in above.
- C. All normal precautions shall be utilized to protect any existing utilities within the drilling area.
- D. The directional drilling company shall be a member in good standing of the National Society for Trenchless Technology.
- E. The Contractor will contain all drilling and pipe lubricating mud by taking special measures to prevent runoff into adjacent properties and/or waterways. All surplus drilling and pipe lubricating mud will be removed from the site and properly disposed of by the Contractor

3.7 FIELD QUALITY CONTROL

- A. General: During construction and at the completion of the work, the Contractor shall make such tests as required in these specifications or as may be directed by the Engineer. The Engineer or assigned agent will observe the tests, but the Contractor shall furnish all apparatus required and shall pay all costs connected therewith unless otherwise stated in these specifications. Defective work shall be repaired immediately at the Contractor's expense.
- B. In general, tests shall conform to usually accepted testing practices for the specific type and class of test. All data, observations and results will be carefully recorded, and the Engineer will be furnished two signed copies of all data and reports. Project acceptance may be held contingent on receipt of satisfactory test reports.
- C. Piping Tests: After the pipe has been laid and backfilled as specified, each valved section of newly laid pipe shall, unless otherwise specified, be subjected to a hydrostatic pressure equal to the pressure rating of the pipe being tested. The Contractor shall record the testing by the use of a pressure recording gauge and after all testing is complete, the recordings shall be turned over to the Engineer for his files.
- D. Hydrostatic Tests: Test at the pressure rating of the pipe being tested for a period of 2 hours. The Contractor shall develop a "Hydrostatic Pressure Testing Schedule". The Engineer shall approve this schedule prior to testing. The tests shall also include all service taps (up to the curb stop).
- E. Testing equipment shall consist of a water source, pressure pump, a water meter to measure loss, check valve, 250 psi pressure gauge, and associated piping, valves, and fittings. The Contractor shall also provide a pressure recorder to record the pressures during testing. The recorder shall be equipped with a 24-hour chart and shall record pressures up to 250 psi.

- F. Procedure: Each section of pipe shall be slowly filled with water and the specified test pressure, measured at the lowest point of elevation, shall be applied. The test shall be applied to each valved section in order to check the leakage through all valves
- G. Expelling Air Before Test: Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points of highest elevation, and afterwards tightly plugged.
- H. Permissible Leakage: the Contractor shall provide Suitable means for determining the quantity of water lost by leakage under normal operating pressure. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No pipe installation will be accepted until or unless this leakage (evaluated at specified pressure) is less than the figures stated below:

I. Permissible Leakage:

Line diameter	gal's/1000'/24 hrs	gal's/1000'/1 hr
2"	3.6 gal.	0.15 gal.
3"	5.4 gal.	0.23 gal.
4"	7.2 gal.	0.30 gal.
6"	10.8 gal.	0.45 gal.
8"	14.4 gal.	0.60 gal.
10"	18.0 gal.	1.75 gal.
12"	21.6 gal.	0.90 gal.

- J. Repair piping system sections, which fail required piping test, by disassembly and re-installation, using new materials to the extent required to overcome leakage. **Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.**
- K. Should any test of combined sections of pipe laid disclose leakage greater than the specified limit, the Contract shall, at his own expense, locate and repair the defective joints until the leakage is within the specified allowance.
- L. Water for flushing and testing shall be provided by the Contractor. No cost for the water will be imposed, however, the water will be metered.
- M. Pipe may be subjected to hydrostatic pressure, inspected and tested for leakage at any convenient time after partial completion of backfill. The Contractor may test the system with joints exposed or backfilling complete at his option. The Engineer shall be notified at least forty-eight hours before beginning testing.
- N. Drain test water from piping systems after testing and repair work has been completed.

3.8 CHLORINATION FLUSHING & BACTERIOLOGICAL TESTING

- A. Upon completion of hydrostatic testing, repairs, and acceptance by the Engineer, the Contractor shall disinfect the accepted water mains and water service piping in accordance with AWWA C601. This shall include the injection of a 50 ppm solution of chlorine to remain for twenty four hours, with a measured chlorine residual of at least 10 ppm at the end of the disinfection period.

- B. Chlorinating Valves and Flushing Hydrants: In the process of chlorinating the water pipe, all valves or other appurtenances shall be operated while the pipe line is filled with the chlorinating agent.
- C. Final Flushing and Test: Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe line at its extremities and at each service line until the line and services are filled with replacement water throughout their full length.
- D. Test bacteriological quality by submitting to a certified bacteriological laboratory. Two (2) samples from each dead-end or every 1,200 feet of water main installed, whichever is greater and repeat this procedure as necessary until bacteriological results are negative for coliform bacteria.
- E. Should the initial treatment, in the opinion of the Engineer, prove ineffective, the chlorination procedure shall be repeated until confirmed tests show that the water sampled conforms to the requirements stated above. The contractor shall be responsible for all costs associated with sampling and testing, regardless of the number of repetitions of each.
- F. Prior to placing the water mains into service, approval from the Florida Department of Environmental Protection will be required.

END OF SECTION 002665

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