



**ITB NO. 20-007
INVITATION TO BID
PS4021 REHABILITATION & UPGRADE PROJECT**

**For
BRUNSWICK-GLYNN COUNTY JOINT WATER AND SEWER COMMISSION
BRUNSWICK, GA**

Issued Tuesday, January 14, 2020

**MANDATORY Pre-bid meeting and site visit
Wednesday, January 29th 11:00 a.m. EST
Brunswick-Glynn County Joint Water and Sewer Commission Chambers
1703 Gloucester Street
Brunswick, Georgia 31520**

**Deadline for questions is Wednesday, February 5, 2020 at 5:00 p.m. EST
Please submit questions via e-mail to pcrosby@bgjwsc.org**

Bids Due by 12:00 NOON EST Tuesday, February 25, 2020 to:

**Purchasing Division
Pam Crosby, Director of Purchasing
Brunswick-Glynn County Joint Water and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520
(912) 261-7100**

**Bids should be clearly labeled as follows:
"ITB No. 20-007 PS4021 Rehabilitation & Upgrade Project"**

**Submit responses in hard copy only; electronic or fax responses will not be accepted.
Responses received after the deadline or at any other locations will not be accepted.**

FOR COMPLETE DETAILS OF THIS SOLICITATION, please visit the BGJWSC website, utilizing the following link:

<http://www.bgjwsc.org/departments/procurement/>

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BIDDING REQUIREMENTS

INVITATION FOR BIDS – 20-007

Sealed bids for **ITB No. 20-007 PS4021 REHABILITATION & UPGRADE PROJECT, BRUNSWICK, GEORGIA** will be received by the Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) at the JWSC's Office of the Director, 1703 Gloucester Street, Brunswick, Georgia 31520 until **12:00 NOON, EST, Tuesday, February 25, 2020** at which time and place they will be publically opened and read aloud.

Bidding documents are available, free of charge, on the JWSC website using the link below:

<https://www.bgjwsc.org/departments/procurement/>

All updates and relevant information for the solicitation may be found here.

The work to be performed under this contract consists of furnishing all labor, materials, tools, equipment and incidentals required to construct complete in place and ready to operate a new Wastewater Pumping Station and associated force main. More specifically the work includes, but is not limited to:

- Security fencing and related site work
- Erosion and sedimentation controls
- New precast concrete wetwell top with aluminum access covers
- New precast valve pit
- New electrical shed and equipment
- Pumping equipment and accessories
- Electrical work including controls and SCADA
- Discharge piping, valves, effluent flow meter, etc.
- Eighteen (18)-inch HDPE forcemain with associated fittings and appurtenances

The Bidder is ***encouraged*** to examine the location of the work and inform himself fully as to the conditions present at the site. A ***mandatory pre-bid meeting*** will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520 on **Wednesday, January 29, 2020 at 11:00 a.m. local time** followed by a site visit for anyone interested in attending. Questions regarding this solicitation shall be made in writing to the Purchasing Director, Pam Crosby, via email: pcrosby@bgjwsc.org. All responses to submitted questions will be issued via Addendum to pre-bid attendees and posted on the JWSC website for reference.

A bid guarantee in an amount not less than ten percent (10%) of the amount bid must accompany each bid. Acceptable forms of bid guarantees are: a bid bond, certified check or cashier's check made payable to the Brunswick-Glynn County Joint Water and Sewer Commission. Performance and Payment bonds, each in an amount equal to hundred percent (100%) of the contract amount will be required of the successful Bidder.

The Brunswick-Glynn County Joint Water and Sewer Commission provides equal opportunity for all businesses and does not discriminate against any person or business because of race, color, religion, sex, national origin, disability or veteran status. This policy ensures all segments of the business community have access to supplying the goods and services needed by the JWSC.

The JWSC reserves the right to reject any and all bids, waive technicalities and make an award in the best interest of the JWSC.

SECTION 00200
INSTRUCTIONS TO BIDDERS

1.0 Intent

It is intended that the Instructions to Bidders, General Conditions, Construction Plans and Technical Specifications shall define and describe the complete work to which they relate. Requests for clarification during the bidding period must be submitted to the Purchasing Director, Pam Crosby via email pcrosby@bgjwsc.org on or before **5:00 p.m. EST on Wednesday, February 5, 2020**. Requests for clarification received after this date will not be considered. Responses to requests for clarification will be issued by addendum to all pre-bid attendees and will also be posted on the JWSC website:

<https://www.bgjwsc.org/departments/procurement/>

2.0 Work to be Done

The work to be performed under this contract consists of furnishing all labor, materials, tools, equipment and incidentals required to construct complete in place and ready to operate a new Wastewater Pumping Station and associated force main. More specifically the work includes, but is not limited to:

- Security fencing and related site work
- Erosion and sedimentation controls
- New precast concrete wetwell top with aluminum access covers
- New Precast Valve pit
- New Electrical Shed
- Pumping equipment and accessories
- Electrical work including controls and SCADA
- Discharge piping, valves, effluent flow meter, etc.
- Eighteen (18) inch HDPE forcemain with associated fittings and appurtenances

3.0 Site Examination

The Bidder is **encouraged** to examine the location of the work and inform himself fully as to the conditions present at the site. A **mandatory pre-bid meeting** will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520 on **Wednesday, January 29, 2020, at 11:00 a.m. local time** followed by a site visit for anyone interested in attending.

4.0 Bid and Contract Security

A bid guarantee in an amount not less than ten percent (10%) of the amount bid must accompany each bid. Acceptable forms of bid guarantees are: a bid bond, certified check or cashier's check made payable to the Brunswick-Glynn County Joint Water and Sewer Commission. The JWSC will return bid guarantees, other than bid bonds, to unsuccessful bidders as soon as practicable, but not sooner than the execution of a contract with the successful bidder. If for any reason whatsoever the successful Bidder withdraws from the competition after opening the bids, or refuses to execute the Contract, the Owner

will proceed on the Bid Bond or deposit the certified check or cashier's check as damages for the Bidder's failure to enter into a contract for the work.

Performance and Payment bonds, each in an amount equal to one hundred percent (100%) of the contract amount will be required of the successful Bidder.

The Surety of the Bid Bond, Performance Bond, and Payment Bond shall be a surety company authorized to do business in the State of Georgia, shall be listed in the Department of the Treasury Circular 570, and shall have an underwriting limitation in excess of one hundred percent (100%) of the bid amount. The Bonds and Surety shall be subject to approval by the JWSC legal counsel.

Attorneys-in-fact who sign and seal Bid Bonds or Contract Bonds must file with each bond a certified and effectively dated copy of their power of attorney.

5.0 Determination of Successful Bidder

The contract, if awarded, will be awarded to the lowest responsive, responsible Bidder. The determination of the Bidder's **responsibility** will be made by the JWSC based on whether the Bidder:

- Maintains a permanent place of business,
- Has the appropriate technical experience,
- Has adequate plant and equipment to do the work properly and expeditiously,
- Has suitable financial means to meet obligations incidental to this work, and
- Is appropriately licensed for the described work in the State of Georgia
- Submitted the E-Verify Affidavits and Agreements with bid.

The Bidder shall furnish, to the JWSC, all such information and data for this purpose as the JWSC may request. The JWSC reserves the right to reject any bid if the evidence submitted by, or investigation of, the Bidder fails to satisfy the JWSC that he is properly qualified to carry out the obligations of the Contract.

The determination of **responsiveness** will be made by the JWSC based on a consideration of whether the Bidder has submitted a complete Bid Form without irregularities, excisions, special conditions, or alternative bids for any item unless specifically requested in the Bid Form.

The JWSC reserves the right to reject any and all bids including without limitation, the right to reject any or all nonconforming, nonresponsive, unbalanced or conditional bids; the right to award each of the contract components individually or to a single qualified Bidder; the right to waive technicalities and make an award in the best interest of the JWSC; the right to award any, all or none.

6.0 Bid Alternates

Bidders are requested to review bid alternates, if any, as outlined on the Bid Form.

7.0 Contract Time

Contract time shall consist of **one hundred twenty (120)** consecutive calendar days for the completion of

work, to be computed from the date of the Notice to Proceed. Time is of the essence and is an essential element of this Agreement, and the Contractor shall pay to the JWSC, not as a penalty, but as liquidated damages, the sum of **Two Thousand Dollars (\$2,000.00)** for each calendar day that he shall be in default of completing the work within the time limit named herein.

8.0 Bid Form

Bids shall be submitted on the Bid Form included. Bids shall be based upon unit or lump sum prices as indicated by the Bid Form. Where errors or omissions result in discrepancies in proposal totals, prices per unit as submitted will be binding. Final payment will be based upon completion and acceptance of the work by the JWSC.

9.0 Submission of Bids

Bidder shall submit ***an original and five (5) copies*** of its Bid in an opaque sealed envelope at the time and place indicated in the Invitation. On the outside of the envelope containing the Bid shall be noted the following:

"Sealed Bid – PS4021 REHABILITATION & UPGRADE PROJECT"

The outside of the envelope shall also bear the name, address and Utility Contractor's License Number of the Bidder.

All blanks in the Bid Form must be completed and written or printed in ink.

Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested to by the secretary or an assistant secretary of the corporation. The corporate address and state of incorporation must be shown on the Bid Form.

Bids by partnerships must be executed in the partnership name and signed by a partner, whose title must appear under the signature and the official address of the partnership must be shown on the Bid Form.

The address, telephone number, facsimile number and email address for communications regarding the Bid must be shown on the Bid Form.

All names and titles must be typed or printed in ink below the signature.

The Bid shall contain an acknowledgement of receipt of all Addenda, if any. The numbers of each Addendum must be filled in on the Bid Form.

The ***Oath, Bid Bond, Representation, Legal and Character Qualifications, Affidavit, and E-Verify Affidavit and Agreement*** forms in this IFB shall be submitted with the Bid, and be executed in proper form.

IN ACCORDANCE WITH O.C.G.A. § 13-10-91, NO PROPOSAL FOR THE PHYSICAL PERFORMANCE OF SERVICES WILL BE CONSIDERED UNLESS THE BID INCLUDES A SIGNED, NOTARIZED E-VERIFY AFFIDAVIT AS SET FORTH HEREIN.

The submission of a Bid will constitute an incontrovertible representation by the Bidder that the Bidder has complied with every requirement of the IFB, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions of performance of the Project and furnishing of the Work.

SECTION 00410

BID FORM

DATE SUBMITTED: _____

PROJECT NAME: PS4021 REHABILITATION & UPGRADE
PROJECT
Brunswick, Georgia

SUBMITTED TO: Brunswick – Glynn County Joint
Water and Sewer Commission
1703 Gloucester Street,
Brunswick, Georgia 31520

SUBMITTED BY:

Company Name: _____

Address: _____

Georgia Utility Contractor's License No. _____

Acknowledge Receipt of Addenda Numbers _____

The undersigned as BIDDER hereby declares that the only person or persons interested in the BID as principal or Principals is or are named herein and that no other person than herein mentioned has any interest in the BID or in the Contract to be entered into; that this BID is made without connection with any other person or parties making a BID, and that it is in all respects fair and in good faith without collusion or fraud.

The BIDDER declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the plans and

specifications for the work and the documents relative thereto; and has read all General and Special Conditions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The BIDDER proposes and agrees, if the BID is accepted, to contract with the Brunswick – Glynn County Joint Water and Sewer Commission to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor to complete the work in full and complete accordance with the shown, noted, described and reasonably intended requirements of the plans, specifications and contract documents to the full and entire satisfaction of the Brunswick – Glynn County Joint Water and Sewer Commission with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and contract documents for the prices set forth below.

ITEM 1 – WASTEWATER PUMPING STATION

For furnishing all labor materials and equipment (including the items of major mechanical equipment) necessary to rehab and upgrade existing wastewater pumping station including, but not limited to, mobilization; earthwork; concrete work; installation of precast concrete wet well top; valve pit; electrical shed; furnish and install new submersible pumps; furnish and install required station hardware; furnish and install new piping, effluent flow meter, valves and fittings; furnish and install new triplex control panel and SCADA system; electrical shed and concrete pad; security fencing and related site work; electrical work; erosion control and grassing; demobilization; complete surface restoration and all other work and appurtenances required, the lump sum price of:

<u>Item</u>	<u>Est. Qty.</u>	<u>Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
(1a)	1	LS	Mobilization, Demobilization, Insurance & Bonds		\$_____
(1b)	1	LS	Demolition		\$_____
(1c)	1	LS	Temporary Bypass Pumping		\$_____
(1d)	1	LS	Wet-well Cleaning & Coating		\$_____
(1e)	1	LS	Electrical		\$_____
(1f)	1	LS	Ga Power Pole(s) Relocation		\$_____
(1g)	1	LS	Pumps, Piping, Vaults, Misc. Valves and Appurtenances		\$_____
(1h)	1	LS	Fencing		\$_____

Sub-total Bid Item No. 1 (Items 1a through 1h) _____

_____ (\$_____).

ITEM 2 – FORCE MAIN

For furnishing all labor, materials and equipment necessary to install the 18-inch HDPE force main from the existing pumping station constructed under Bid Item No. 1 above to its connection to MH40060220 located along Altama Avenue including but not limited to mobilization; clearing and grubbing; trench excavation, bedding and backfill; dewatering; HDPE force mains; ductile iron fittings; pressure testing; erosion control and grassing; complete surface restoration and all other work and appurtenances required, the following unit prices:

<u>Item</u>	<u>Est. Qty.</u>	<u>Units</u>	<u>Description</u>	<u>Unit Price</u>	<u>Total Price</u>
(2a)	1	EA	Connect to SSMH40060220	\$_____	\$_____
(2b)	50	LF	18-inch SDR-21 Class 200 HDPE Force main	\$_____	\$_____
(2c)	1	LS	Fittings (Sewer Safe)		\$_____
(2d)	1	LS	Coating MH		\$_____
(2e)	1	LS	Frame & Cover		\$_____
(2f)	1	LS	Hydrostatic Pressure Testing		\$_____
(2g)	1	LS	Erosion Control and Grassing		\$_____

Sub-total Bid Item No. 2 (Items 2a through 2g) _____

_____ (\$_____).

Total Bid (Items 1 and 2) _____

_____ (\$_____).

The Bidder further agrees to accomplish all work and provide all material for the lump sum price submitted, and understands that the lump sum price is subject to adjustment by either increase or decrease, only through a properly executed change order.

The Bidder further proposes and agrees to commence work under this contract, with adequate force and equipment, on a date to be specified in a written order of the Owner and shall fully complete all work hereunder within **one hundred twenty (120)** consecutive calendar days from and including said date.

The undersigned further agrees that, in case of failure on his part to execute the said Contract and Bonds within thirty (30) consecutive calendar days after receipt of the conformed Contract Documents, the check or bid bond accompanying this Bid and the monies payable thereto, shall be paid into the

funds of the Owner as liquidated damages for such failure otherwise, the check or Bid Bond accompanying this Bid shall be returned to the undersigned.

I understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards. I agree to abide by all conditions of this Invitation for Bids and certify that I am authorized to sign this Bid for the Bidder.

This the _____ day of _____ 2020.

Company Name: (Please Type or Print)

Person Authorized to Sign:

Name: _____

Name: _____

Street: _____

Signature: _____

City: _____

Title: _____

State: _____ Zip: _____

Telephone Number: () _____

Fax Number: () _____

E-Mail: _____

EXPERIENCE AND REFERENCE FORM

The Bidder shall provide references relative to work it has done of a similar nature as solicited in this Invitation for Bids. Give references that will afford the JWSC opportunity to judge as to experience, skill, business standing and financial ability.

Project	Brief Scope of Project	Project Owner (Title)	Phone Number	Address	Email Address

This form will also be provided electronically as a separate attachment for ease of completion in the bid documents found on the JWSC website.

SECTION 00420

BID BOND

State of Georgia

City of Brunswick

County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we, _____

_____, as Principal, and

_____, as Surety, are held and firmly bound

unto the Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) in the not to

exceed sum of _____ Dollars

(\$ _____) lawful money of the United states, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, personal representatives, successors and assign, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted to the JWSC a Bid for:

**PS4021
REHABILITATION & UPGRADE PROJECT
BRUNSWICK, GEORGIA**

NOW THEREFORE, the conditions of this obligation are such that if the Bid be accepted, the Principal shall, within fifteen days (15) days after receipt of conformed Contract Documents, execute a contract in accordance with the Bid upon the terms, conditions and prices set forth therein, and in the form and manner required by the JWSC and execute a sufficient and satisfactory Performance Bond and Payment bond payable to the JWSC, each in an amount of one hundred percent (100%) of the total contract price,

in form and with security satisfactory to the JWSC, then this obligation shall be void; otherwise, it shall be and remain in full force and virtue in law; and the Surety shall, upon failure of the Principal to comply with any or all to the foregoing requirements within the time specified above, immediately pay to the aforesaid JWSC, upon demand, the amount hereof in good and lawful money of the United States of America, not as a penalty, but as liquidated damages.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. § 36-91-50 *et seq.*, as amended from time to time, and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted and these are hereby made a part hereof to the same extent as if set out herein in full.

(Continued on Next Page)

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on

This the _____ day of _____, 2020.

PRINCIPAL: _____

Signed and sealed in the
Presence of:

By: _____

Title: _____

1. _____

(Seal)

2. _____

SURETY: _____

Signed and sealed in the
Presence of:

By: _____

Title: _____

1. _____

(Seal)

2. _____

SECTION 00430

OATH

State of Georgia

City of Brunswick

County of Glynn

I _____ (Name of Individual) solemnly swear that in the procurement of the Contract for

**PS4021 REHABILITATION & UPGRADE PROJECT
BRUNSWICK – GLYNN COUNTY, GEORGIA**

That I or any other person associated with me or my business, corporation or partnership has prevented or attempted to prevent competition in the bidding of said project or from submitting a bid for this project by any means whatsoever.

Lastly, I swear that neither I, nor any other person associated with me or my business, Corporation or partnership has caused or induced any other bidder to withdraw his/her bid from consideration for this project. Said oath is filed in accordance with the requirements set forth in O.C.G.A. § 36-91-21 (e).

This _____ Day of _____, 2020

Name of Party: _____

Corporate or Partnership Name: _____

Sworn to and subscribed before me this _____ Day of _____, 2020

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(SEAL)

SECTION 00440

REPRESENTATION

EQUAL EMPLOYMENT OPPORTUNITY (EEO) PRACTICE:

EEO Plan: The successful Bidder will develop and implement an EEO policy that, as a minimum, will recruit, hire, train, and promote, at all levels, without regard to race, color, religion, national origin, sex, or age, except where sex or age is a bona fide occupational qualification.

EEO For Veterans/Handicapped: The successful Bidder will also provide equal employment opportunities for qualified disabled veterans, handicapped persons and veterans of the Vietnam Era.

EEO For Successful Bidder Programs: The successful Bidder, will ensure equal employment opportunity applies to all terms and conditions of employment, personnel actions, and successful Bidder-sponsored programs. Every effort shall be made to ensure that employment decisions, programs and personnel actions are non-discriminatory. That these decisions are administered on the basis of an evaluation of an employee's eligibility, performance, ability, skill and experience.

EEO Acquisitions: The successful Bidder will develop and implement a policy that will give equal opportunity to the purchase of various goods and services from small businesses and minority-owned businesses.

Does the Bidder have the above EEO policy in place?

Yes []

No []

If the answer to a. above is no, will the Bidder have such a policy in place for the project?

Yes []

No []

Statement of Assurance: The Bidder herein assures the JWSC that it is in compliance with Title VI & VII of the 1964 Civil Rights Act, as amended, in that it does not on the grounds of race, color, national origin, sex, age, disability, or veteran status, discriminate in any form or manner against employees or employers or applicants for employment and is in full compliance with A.D.A.

(Firm's Name)

(Authorized Signature)

(Title)

(Date)

SECTION 00450

LEGAL AND CHARACTER QUALIFICATIONS

Convictions: Has the Bidder (including parent corporation, if applicable) or any principal ever been convicted in a criminal proceeding (felonies or misdemeanors) in which any of the following offenses were charged?

	Yes	No		Yes	No
Fraud	[]	[]	Obstruction of justice (or any other misconduct affecting public or judicial officers' performance of their official Duties	[]	[]
Embezzlement	[]	[]		[]	[]
Tax Evasion	[]	[]			
Bribery	[]	[]	False/misleading advertising	[]	[]
Extortion	[]	[]	Perjury	[]	[]
Jury Tampering	[]	[]	Conspiracy to commit any of the Foregoing offenses	[]	[]
Anti-Trust Violations	[]	[]			

Civil Proceedings: Has the Bidder or any principal ever been a party, or is now a party, to a civil proceeding in which it was held liable for any of the following?

	Yes	No		Yes	No
Unfair/anti-competitive business practices	[]	[]	Violations of securities laws (state & federal)	[]	[]
Consumer fraud misrepresentation	[]	[]	False/misleading advertising	[]	[]
Violation of local government Ordinances	[]	[]			

Ordinances

License Revocation: Has the Bidder or any principal ever had a business license revoked, suspended, or the renewal thereof denied, or is a party to such a proceeding that may result in same?

Yes **No**
[] []

SECTION 00460

AFFIDAVIT

This Bid is submitted to Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) by the undersigned who is an authorized officer of the company and said company is licensed to do business in Georgia. Further, the undersigned is authorized to make these representations and certifies these representations are valid. The Bidder recognizes that all representations herein are binding on the Company and failure to adhere to any of these commitments, at the JWSC's option, may result in a revocation of the granted contract.

Consent is hereby given to the JWSC to contact any person or organization in order to make inquiries into legal, character, technical, financial, and other qualifications of the Bidder.

The Bidder understands that, at such time as the JWSC decides to review this Bid, additional information may be requested. Failure to supply any requested information within a reasonable time may result in the rejection of the Bid with no re-submittal rights.

The successful Bidder understands that the JWSC, after considering the legal, financial, technical, and character qualifications of the Bidder, as well as what in the JWSC's judgment may best serve the interest of its rate payers and employees, may grant a contract.

The successful Bidder understands that this bid is made without prior understanding, agreement, or connection with any corporation, firm or person submitting a bid for the same, and is in all respects fair and without collusion or fraud. I understand that collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards.

Any contract issued will be on the basis of the Bidder's service, financial plans and arrangements being feasible and adequate to fulfill the conditions set forth in this project and the successful Bidder's response.

Company Name: _____

Authorized Person: _____ Signature: _____
(Print/Type)

Title: _____ Date: _____

Address: _____

Telephone: _____ Fax: _____ Email: _____

SECTION 00470

E-VERIFY CONTRACTOR AFFIDAVIT AND AGREEMENT

Georgia Security Immigration and Compliance (GSIC) Act

The Brunswick - Glynn County Joint Water and Sewer Commission and Contractor agree that compliance with the requirements of O.C.G.A. § 13-10-91 and Rule 300-10-1-.02 of the Rules of the Georgia Department of Labor are conditions of this Agreement for the physical performance of services.

By executing this affidavit, the undersigned contractor verifies its compliance with O.C.G.A. § 13-10-91, *stating affirmatively that the individual, firm, or corporation which is contracting with the Brunswick - Glynn County Joint Water and Sewer Commission has registered with and is participating in the federal work authorization program known as: "E-Verify", web address <https://e-verify.uscis.gov/enroll/> operated by the United States Citizenship and Immigration Services Bureau of the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicable provisions and deadlines established in O.C.G.A. § 13-10-91.* The undersigned Contractor also verifies that he/she/it is using and will continue to use the federal work authorization program throughout the contract period.

The undersigned Contractor agrees that, should it employ or contract with any subcontractor(s) in connection with the physical performance of services pursuant to the contract with the Brunswick - Glynn County Joint Water and Sewer Commission, Contractor will secure from each subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Contractor further agrees the Contractor will advise the Brunswick - Glynn County Joint Water and Sewer Commission of the hiring of a new subcontractor and will provide the Brunswick - Glynn County Joint Water and Sewer Commission with a Subcontractor Affidavit attesting to the Subcontractor's name, address, user identification number, and date of authorization to use the Federal Work Authorization Program within five (5) days of the hiring before the Subcontractor begins working on the Project. Contractor also agrees to maintain all records of such compliance for inspection by the Brunswick - Glynn County Joint Water and Sewer Commission at any time and to provide a copy of each such verification to the Brunswick - Glynn County Joint Water and Sewer Commission at the time the subcontractor(s) is retained to perform such services.

(Continued on Next Page)

E-Verify Employment Eligibility Verification User I.D. Number

Date of Authorization To Use Federal Work Authorization Program

Name of Contractor

Title of Authorized Officer or Agent of Contractor

Signature and Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this the _____ day of _____, 2020.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

Authority O.C.G.A. § 13-10-91. **History.** Original Rule entitled "Contractor Affidavit and Agreement" adopted F. May 25, 2007; eff. June 18, 2007, as specified by the Agency.

SECTION 00480

E-VERIFY SUBCONTRACTOR AFFIDAVIT AND AGREEMENT

Georgia Security Immigration and Compliance (GSIC) Act

The Brunswick - Glynn County Joint Water and Sewer Commission and Subcontractor agree that compliance with the requirements of O.C.G.A. § 13-10-91 and Rule 300-10-1-.02 of the Rules of the Georgia Department of Labor are conditions of this Agreement for the physical performance of services.

By executing this affidavit, the undersigned subcontractor verifies its compliance with O.C.G.A. § 13-10-91, *stating affirmatively that the individual, firm, or corporation which is contracting with a Contractor contracting with the Brunswick - Glynn County Joint Water and Sewer Commission has registered with and is participating in the federal work authorization program known as: E-Verify”, web address <https://e-verify.uscis.gov/enroll/> operated by the United States Citizenship and Immigration Services Bureau of the United States Department of Homeland Security to verify information of newly hired employees, pursuant to the Immigration Reform and Control Act of 1986 (IRCA), P.L. 99-603], in accordance with the applicable provisions and deadlines established in O.C.G.A. §13-10-91. The undersigned Subcontractor also verifies that he/she/it is using and will continue to use the federal work authorization program throughout the contract period.*

The undersigned Subcontractor agrees that, should it employ or contract with any other subcontractor(s) in connection with the physical performance of services pursuant to the contract with the Brunswick - Glynn County Joint Water and Sewer Commission, Subcontractor will secure from such subcontractor(s) similar verification of compliance with O.C.G.A. § 13-10-91 on the Subcontractor Affidavit provided in Rule 300-10-01-.08 or a substantially similar form. Subcontractor further agrees the Subcontractor will advise the Brunswick - Glynn County Joint Water and Sewer Commission of the hiring of a new subcontractor and will provide the Brunswick - Glynn County Joint Water and Sewer Commission with a Subcontractor Affidavit attesting to the Subcontractor’s name, address, user identification number, and date of authorization to use the Federal Work Authorization Program within five (5) days of the hiring before the Subcontractor begins working on the Project. Subcontractor also agrees to maintain all records of such compliance for inspection by the Brunswick - Glynn County Joint Water and Sewer Commission at any time and to provide a copy of each such verification to the Brunswick - Glynn County Joint Water and Sewer Commission at the time the subcontractor(s) is retained to perform such services.

(Continued on Next Page)

E-Verify Employment Eligibility Verification User I.D. Number

Date of Authorization To Use Federal Work Authorization Program

Name of Subcontractor

Title of Authorized Officer or Agent of Subcontractor

Signature and Printed Name of Authorized Officer or Agent

Sworn to and subscribed before me this the _____ day of _____, 2020.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

As of the effective date of O.C.G.A. § 13-10-91, the applicable federal work authorization program is the "EEV/Basic Pilot Program" operated by the U.S. Citizenship and Immigration Services Bureau of the U.S. Department of Homeland Security, in conjunction with the Social Security Administration (SSA).

Authority O.C.G.A. § 13-10-91. **History.** Original Rule entitled "Contractor Affidavit and Agreement" adopted F. May 25, 2007; eff. June 18, 2007, as specified by the Agency.

CONTRACTING REQUIREMENTS

SECTION 00520

**PART A – CONTRACT FORM
CONTRACT FOR SERVICES BY AND BETWEEN
BRUNSWICK – GLYNN COUNTY JOINT WATER AND SEWER COMMISSION
AND
(COMPANY TO BE NAMED)**

This **AGREEMENT** made and entered into by and between the **BRUNSWICK – GLYNN COUNTY JOINT WATER AND SEWER COMMISSION**, a public corporation created by Local Act of the General Assembly of the State of Georgia, acting by and through its Commissioners (hereinafter referred to as the “JWSC”) and *Company to be Named*, a *State of Incorporation* licensed to do business in the State of Georgia (hereinafter referred to as the Contractor)

WITNESSETH

WHEREAS, the JWSC issued an Invitation for Bids on or about January____, 2020 (hereinafter referred to as the “Solicitation”) from qualified Contractors to provide for its

**PS4021 REHABILITATION & UPGRADE PROJECT
BRUNSWICK – GLYNN COUNTY, GEORGIA**

Hereinafter referred to as the “Project”; and

WHEREAS, the Contractor submitted a qualified bid in response to the Solicitation; and

WHEREAS, the JWSC, at a regular meeting held on _____, 2020, authorized the award of the project to the Contractor; and

WHEREAS, it is the intention of the parties hereto to enter into this contract (hereinafter referred to as the “Agreement”) in order to provide a statement of the respective covenants, conditions and agreements in connection with the performance of services by the Contractor to the JWSC;

NOW THEREFORE, FOR AND IN CONSIDERATION of the mutual covenants and conditions set forth herein, and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1.0 INDEPENDENT CONTRACTOR STATUS

In the performance of the Project services required under this Agreement, Contractor shall be an "independent contractor" with the authority and responsibility to control and direct the performance and details of the Project Work and services required under this Agreement; provided, however, JWSC shall have a right to inspect Work in progress to determine whether, in JWSC's opinion, the Project services are being performed by Contractor in accordance with the provisions of this Agreement.

ALL persons hired or used by Contractor shall be Contractor's employees and agents and Contractor

shall ensure that such persons are qualified to engage in the activity and services in which they participate. Contractor shall be responsible for the accuracy, completeness and adequacy of any and all work and services performed by Contractor's employees and agents and shall ensure that all applicable licensing and operating requirements of federal, state, county and municipal governments, and all applicable accreditation and other standards of quality generally accepted in the field of Contractor activities are complied with and satisfactorily met.

Contractor expressly agrees to assume the sole and entire liability (if any liability is determined to exist) to its employees, agents and other persons for all loss, damage or injury caused by Contractor's employees and agents in the course of their employment. The mere participation in the performance of Project services under this Agreement shall not constitute nor be construed as employment with JWSC and shall not entitle Contractor or Contractor's employees, agents or subcontractors to vacation, sick leave, retirement or other benefits afforded by employees of the JWSC. Contractor shall be responsible for payment of applicable income, social security and any other federal, state, and/or local taxes and fees.

Contractor assumes sole responsibility for completion of the Project undertaken pursuant to this Agreement. The JWSC shall consider Contractor the sole point of contact with regard to contractual matters. Subcontracting of any part of the Project Work or services contemplated by this Agreement may not be entered by Contractor without prior written approval by the JWSC.

2.0 CONTRACT DOCUMENTS

This Agreement consists of this document and other documents which are incorporated herein by reference as though set forth fully herein (hereinafter referred to in this Agreement as the Contract Documents), as follows:

- JWSC's Solicitation, dated _____, 2020 including Addendums, if any.
- Contractor's Bid dated _____, 2020 for

PS4021 REHABILITATION & UPGRADE PROJECT BRUNSWICK – GLYNN COUNTY, GEORGIA

- This Agreement which includes the following parts

Contract Form
Performance Bond
Payment Bond
Affidavit of Payment of Claims
Certificate of Insurance
Certificate of Drug Free Workplace
E-Verify Contractor Affidavit and Agreement
E-Verify Subcontractor Affidavit and Agreement

In case of any conflicts, the terms and conditions set forth in this Agreement shall control over the terms and conditions of the documents incorporated herein by this Section 2.0 Contract Documents.

3.0 SCOPE OF WORK

Contractor agrees to provide all the skill labor, materials and equipment necessary to carry out, in good faith, the complete requirements of the Project specified as

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in strict conformity with all sections of the Solicitation, whose program services together with the Contractor's Bid, the Invitation for Bids, Instructions to Bidders, General Conditions, Construction Plans, Standards for Water and Sewer Design and Construction, this Agreement and all addenda hereto annexed, and the Contract Documents shall form essential parts of this Agreement as if fully contained herein.

Contractor agrees to perform all Project services as contemplated herein in a manner that does not jeopardize the safety of Contractor's workers, JWSC personnel or any other person, including providing and maintaining all necessary precautions for the protection of the public. In addition, Contractor agrees to perform the Project contemplated herein in a manner that poses no threat to the environment or violates any federal, state or local statute, ordinance, rule or regulation regarding environmental concerns.

Contractor agrees to keep the rights-of-way, easement area and adjacent property free from accumulations of waste materials, rubbish and other debris resulting from the Work, and progressively as the Work is completed he shall remove all waste materials, rubbish and debris from and about the work areas and shall leave the site clean.

4.0 NOTICE TO PROCEED; LIQUATED DAMAGES

Notice to Proceed: The Contractor agrees to commence the Project included in this Agreement on a date to be specified in a written Notice to Proceed and shall fully complete the Project within a period of **one hundred twenty (120)** consecutive calendar days after the effective commencement date.

Liquidated Damages: Time is of the essence and is an essential element of this Agreement, and the Contractor shall pay to the JWSC, not as a penalty, but as liquidated damages, the sum of **Two Thousand Dollars (\$2,000.00)** for each calendar day that he shall be in default of completing the work within the time limit named herein. These fixed liquidated damages are not established as a penalty but are calculated and agreed upon in advance by the JWSC and the Contractor due to the uncertainty and impossibility of making a determination as to the actual and consequential damages incurred by the JWSC and its rate payers as a result of the failure on the part of the Contractor to complete the Work on time. Such liquidated damages referred to herein are intended to be and are cumulative and shall be in addition to every other remedy now or hereafter enforceable at law, in equity, by statute or under this Agreement.

5.0 COMPENSATION

The JWSC agrees to pay the Contractor, in current funds, for the performance of this Agreement based on the units and lump sum pricing for the Project and listed at Exhibit "A," which sums shall also

pay for all loss or damage arising out of the nature of the Project aforesaid, or in the performance of the Project and for all expenses incurred by, or in consequence of the Project, its suspension or discontinuance, and for well and faithful completion of the Project and the whole thereof, as herein provided.

The JWSC and Contractor agree that the Construction Plans, Standards for Water and Sewer Design and Construction, and all Addenda thereto together are as fully a part of the Contract as if attached or herein repeated. The Contractor, recognizing the particular requirements of the JWSC budgetary process, agrees to waive the terms of O.C.G.A. § 13-11-1 *et seq.*, known as the Georgia Prompt Pay Act. Contractor agrees that the Work and services required by this Agreement may require inspection and approval of the JWSC's engineers or consultants and that the time of repayment shall be tolled for a reasonable time as required for said inspection and approval.

Contractor further agrees to toll the time for payment herein under for an additional and reasonable period of time for the JWSC representative overseeing the Project or Work contemplated by this Agreement to approve the Work and/or services performed.

The JWSC shall have forty-five (45) days from approval by the JWSC representative in which to pay the Contractor; subject to any documentation requests by the JWSC as necessary to allow the JWSC to evaluate the completeness and accuracy of monies due.

6.0 TERM OF AGREEMENT

This Agreement shall be for a period of **one hundred twenty (120)** consecutive calendar days after the effective commencement date of the Work.

This Agreement is binding on the parties as of date last written below.

7.0 INSURANCE

Contractor shall not commence Work on the Project under this Agreement until all insurance set forth in the Solicitation, Section 7.0, Insurance (*see* General Conditions), has been obtained and such insurance certificates have been approved by the JWSC. The certificates of insurance shall indicate the JWSC as an additional named insured and that the coverages are primary and not contributory with any similar insurance purchased by the JWSC, and shall contain a provision that such coverage shall not be cancelled until at least thirty (30) days prior written notice has been given to the JWSC.

8.0 INDEMNIFICATION

To the fullest extent permitted by laws, statutes, rules and regulations, the Contractor shall indemnify and hold harmless the JWSC, its officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, damages, losses and expenses, including but not limited to all fees and charges of engineers, attorneys and other professionals and all court costs, arising out of or resulting from the performance of the Work, but only to the extent caused in whole or in part by acts or omission of the Contractor, its officers, directors, employees, agents, and anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, costs, damage, loss or expense is caused in part by a party indemnified hereunder. In any and

all claims against the JWSC or any of its agents or employees, the indemnification obligation shall not be limited in any way by the amount or type of damages. Contractor shall not indemnify JWSC, its agents or employees for their own, sole negligence.

9.0 ASSIGNMENT

Contractor shall not assign or transfer any part of or the entire Project to be performed under this Agreement, or any right accruing hereunder, without the express written consent of JWSC. The JWSC may condition any consent and approval upon such terms and provisions that JWSC may deem necessary. Further, no assignment of claims for money due or to become due to Contractor under this Agreement shall be effective unless the assignment of such claim is first approved, in writing, by the JWSC.

10.0 PROHIBITED DISCRIMINATION

Contractor shall comply with all applicable federal and state laws prohibiting discrimination against any person on the grounds of race, color, religion, sex, national origin, age, disability, veteran status or any other status protected by law, in employment or in any condition of employment with Contractor or in participation in the benefits of the Work provided by Contractor under this Agreement.

11.0 COMPLIANCE WITH ALL LAWS

Contractor shall observe and comply with the laws of the State of Georgia which require authorization or licensing to conduct business in the State. Notwithstanding statutory exemptions or exclusions, Contractor agrees to subject itself to the jurisdiction and process of the Courts of the State of Georgia as to all matters and disputes arising or to arise under this Agreement and the performance thereof, including all issues relating to liability for taxes, licenses or fees levied by the State.

12.0 REMEDIES; DISPUTE RESOLUTION

Contractor irrevocably consents that any legal action or proceeding arising out of or in any manner relating to this Agreement shall be brought in any court in Glynn County, Georgia. Contractor designates the Secretary of the State of Georgia as its agent for service of process, provided no such agent located in Georgia is on file with the said Secretary. Contractor, by the execution and delivery of this Agreement, expressly and irrevocably assents to and submits to the personal jurisdiction of any court in Glynn County, Georgia, and in any said action or proceeding. Contractor hereby expressly and irrevocably waives any claim or defense in any said action or proceeding based on any alleged lack of jurisdiction, improper venue or *forum non conveniens* or any similar basis.

A dispute between the parties arising out of or in any manner relating to this Agreement, or breach thereof, may be submitted to binding arbitration or resolved in a court of law having jurisdiction of such matters. Once a party elect's arbitration, such election is binding on both parties. An arbitrator selected from a panel in Glynn County, Georgia, provided by the American Arbitration Association shall resolve the dispute. The cost of arbitration shall be borne equally by the parties. The arbitration decision may be appealed in accordance with State law.

No provision set forth in this Section is to have the effect to abridge the right of any party to proceed in a court of law or equity.

13.0 MODIFICATION OF AGREEMENT

No modification, alteration or amendment to the terms of this Agreement shall be effective unless written and signed by the authorized representative of all parties hereto.

14.0 WAIVER

The failure of either party at any time to enforce or require performance of any provision hereof shall in no way operate as a waiver or affect the right of such party at a later time to enforce the same. No waiver by either party of any condition or the breach of any provision contained in this Agreement, whether by conduct or otherwise, in anyone or more instances, shall be deemed to be or construed as a further or continuing waiver of any such condition or breach, or a waiver of any other condition or of any breach of any other provision contained in this Agreement.

15.0 TERMINATION OF AGREEMENT

The JWSC may, at any time upon written notice to the Contractor, terminate this Agreement for convenience, without prejudice to any right or remedy of the JWSC, in whole or as to any portion of the Project, then existing or which may thereafter accrue. If the JWSC terminates this Agreement for convenience, then JWSC's only obligation to Contractor will be for payment of compensation earned up to the date of such termination and all outstanding costs including those materials in transit and un-cancellable.

When the Contractor's services have been terminated by the JWSC, the Contractor in calculating his termination application for payment, shall develop his outstanding costs, including those materials in transit and un-cancellable with the appropriate percentage markups; subcontractors shall follow the same procedures. All costs must be substantiated by adequate back-up documentation. Any retention or payment of moneys due to the Contractor by the JWSC will not release the Contractor from liability.

The Contractor may not terminate this Agreement without the JWSC's consent except for failure of the JWSC to pay sums due to the Contractor hereunder. Prior to termination, the Contractor must give written notice to the JWSC allowing thirty (30) days to investigate and remedy any failure or breach hereof. Should the JWSC fail to remedy the failure or breach hereof within such thirty (30) days, the Contractor shall give written notice, addressed to the JWSC Executive Director, sent by certified mail, return receipt requested, of its intention to cease providing services upon a day certain after delivery of such notice.

16.0 AGREEMENT SECURITY – BONDS

A bid guarantee in an amount not less than ten percent (10%) of the amount bid must accompany each bid. Acceptable forms of bid guarantees are: a bid bond, certified check or cashier's check made payable to the Brunswick- Glynn County Joint Water and Sewer Commission. The JWSC will return bid guarantees, other than bid bonds, to unsuccessful Bidders as soon as practicable, but not sooner than the execution of a contract with the successful Bidder. If for any reason whatsoever the successful

Bidder withdraws from the competition after opening the bids, or refuses to execute the Contract, the JWSC will proceed on the Bid Bond or deposit the certified check or cashier's check as damages for the Bidder's failure to enter into a contract for the work.

Performance and Payment bonds, each in an amount equal to one hundred percent (100%) of the contract amount will be required of the successful Bidder.

The Surety of the Bid Bond, Performance Bond, and Payment Bond shall be a surety company authorized to do business in the State of Georgia, shall be listed in the Department of the Treasury Circular 570, and shall have an underwriting limitation in excess of one hundred percent (100%) of the bid amount. The Bonds and Surety shall be subject to approval by the JWSC legal counsel.

Attorneys-in-fact who sign and seal Bid Bonds or Contract Bonds must file with each bond a certified and effectively dated copy of their Power of Attorney evidencing the authority of the individual signing the bond.

17.0 NOTICES

All notices, approvals, consents, requests, demands, claims or other communications shall be in writing (collectively referred to as Notice).

It shall be sufficient service of any Notice if the same shall be delivered or mailed by first class registered or certified mail, return receipt requested, postage prepaid and addressed as follows:

If to Contractor: **COMPANY TO BE NAMED**

If to JWSC: Andrew Burroughs, Executive Director
Brunswick – Glynn County Joint Water and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520

Copy to: Charles A. Dorminy, JWSC Attorney
Hall Booth Smith, P.C.
3528 Darien Highway Suite 300
Brunswick, Georgia 31525

Any Notice hereunder shall be deemed to have been given or made as of the time of actual delivery or in the case of mailing when the same should have been received in due course of post. Any notice by facsimile transmission shall be deemed to have been given or made upon receipt and if verified by the facsimile apparatus that the transmission was in fact delivered, including the number to which the facsimile was sent, and the time and date it was transmitted successfully.

The parties hereto may, by Notice given hereunder, designate any different address to which subsequent Notices shall be sent or the person to whose attention the same shall be directed.

18.0 WARRANT OF AUTHORITY

Each individual executing this Agreement on behalf of any party expressly represents and warrants that he/she has authority to do so, and thereby to bind the party on behalf of which he/she signs, to the terms of this Agreement.

19.0 ENTIRE AGREEMENT; BENEFIT TO PARTIES

This Agreement and any attached exhibit(s) constitute the final and entire agreement and understanding between the parties hereto regarding the subject matter hereof. No prior written promises, or contemporaneous or subsequent oral promises or representations, shall be binding and are to be without effect in the construction of any of the terms or conditions of this Agreement.

With the exception of rights expressly conferred herein, nothing expressed or mentioned in or to be implied here from is intended or shall be construed to give to any person other than the parties hereto, any legal or equitable right, remedy or claim under or in respect hereto or any agreement, condition or provision herein contained and no provision shall be construed as creating any debt as against Contractor or JWSC in favor of any such person; this Agreement and the covenants, conditions and provisions hereof being intended to be used for the sole and exclusive benefits of the parties hereto.

Contractor and JWSC, their successors, executors, administrators and assigns hereby agree to the full performance of the covenants herein contained.

20.0 GOVERNING LAW

This Agreement shall be governed by and construed in accordance with the laws of the State of Georgia.

21.0 TIME IS OF THE ESSENCE

Time is of the essence in fulfilling all terms and conditions of this Agreement.

22.0 EXECUTION IN COUNTERPARTS

This Agreement may be simultaneously executed in several counterparts, each of which shall be an original and all of which shall constitute but one and the same instrument.

23.0 MISCELLANEOUS PROVISIONS

Section captions herein are for convenience of reference only and neither limits nor amplifies the provisions of this Agreement.

Should any term, provision or other part of this Agreement be declared illegal or unenforceable, it shall be excised or modified to conform to the appropriate laws or regulations, and the remainder of the Agreement shall not be affected but shall remain in full force and effect.

The foregoing whereas clauses are hereby incorporated into this Agreement and made a part thereof.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement in their names under seal, all by their duly authorized officers, as of the date last written below, in two (2) counterparts, each of which shall without proof or accounting for the other counterparts, be deemed an original contract.

COMPANY TO BE NAMED

By: _____
Name and Title of corporate officer to be named

Date and Seal

Attest to:

By: _____
Name and Title of corporate officer to be named

Date and Seal

BRUNSWICK – GLYNN COUNTY JOINT WATER AND SEWER COMMISSION

By: _____
G. Ben Turnipseed, Sr., Commission Chairman

Attest to:

By: _____
Janice Meridith, Commission Clerk

Date and seal

PART A: CONTRACT FORM CONTINUED

Please be advised that the Contract Form, herein above, contemplates the Project Described and when the successful Bidder is selected and the Project awarded, then JWSC will provide the successful Bidder with a

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Agreement which will include the standard contract provisions as set forth in the Contract Form herein, as applicable.

SECTION 00610
PERFORMANCE BOND

State of Georgia
City of Brunswick
County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we _____

_____, as Principal, and _____

_____, as Surety, do hereby acknowledge ourselves indebted and firmly bound and held unto the Brunswick – Glynn County Joint Water and Sewer Commission, for the use and benefit of those entitled thereto in the not to exceed sum of _____

_____ \$ (_____)

for the payment of which will and truly to be made, in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:

WHEREAS, the Brunswick –Glynn County Joint Water and Sewer Commission has engaged the said Contractor for the not to exceed sum of _____

_____ \$ (_____)

for the Project entitled:

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as more fully appears in a written Agreement bearing the same project title, a copy of which Agreement is by reference hereby made a part thereof.

NOW, THEREFORE, if said Contractor shall fully and faithfully perform all the undertakings and obligations under the said agreement or contract herein before referred to and shall fully indemnify and save harmless the Brunswick-Glynn County Joint Water and Sewer Commission from all costs and damage whatsoever which it may suffer by reason of any failure on the part of said Contractor to do so, and shall fully reimburse and repay the Brunswick-Glynn County Joint Water and Sewer Commission such default, and shall guarantee all products and workmanship against defects for a period of one year, then this obligation or bond shall be null and void, otherwise, it shall remain in full force and effect.

And for value received it is hereby stipulated and agreed that no change, extension of time, alteration or addition to the terms of the said Agreement or Contract or in the work to be performed there under, or the Specifications accompanying the same shall in any way affect the obligations under this obligation or bond, and notice is hereby waived of any such damage, extension of time, alteration or addition to the terms of the

Agreement or Contract or to the work or to the Specifications.

This bond is given pursuant to and in accordance with the provisions of O.C.G.A. §§ 36-10-1 *et seq.* and 36-82-100 *et seq.* and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on

This the _____ day of _____, 2020, executed in three (3) counterparts.

PRINCIPAL: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SURETY: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SECTION 00620
PAYMENT BOND

State of Georgia
City of Brunswick
County of Glynn

KNOW ALL MEN BY THESE PRESENT, that we _____

_____, as Principal, and _____

_____, as Surety, do hereby acknowledge ourselves indebted and firmly bound and held unto the Brunswick – Glynn County Joint Water and Sewer Commission, for the use and benefit of those entitled thereto in the not to exceed penal sum of

_____ \$ (_____)

for the payment of which will and truly to be made, in lawful money of the United States, we do hereby bind ourselves, successors, assigns, heirs, and personal representatives.

BUT THE CONDITION OF THE FOREGOING OBLIGATION OR BOND IS THIS:

WHEREAS, the Brunswick – Glynn County Joint Water and Sewer Commission has engaged the said Contractor for the not to exceed sum of _____

_____ \$ (_____)

for the Project entitled:

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BRUNSWICK – GLYNN COUNTY, GEORGIA

as more fully appears in a written Agreement bearing the same project title, a copy of which Agreement is by reference hereby made a part thereof.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if said Contractor and all subcontractors to whom any portion of the work provided for in said Contract is sublet and all assignees of said Contract and of such subcontractors shall promptly make payments to all persons supplying him or them with labor, products, services, or supplies for or in the prosecution of the work provided for in such Contract, or in any amendment or extension of or addition to said Contract, and for the payment of reasonable attorney's fees, incurred by the claimants in suits on this bond, then the above obligation shall be void; otherwise, it shall remain in full force and effect.

HOWEVER, this bond is subject to the following conditions and limitations:

- (a) Any person, firm or corporation that has furnished labor, products, or supplies for or in the prosecution of the work provided for in said Contract shall have a direct right of action against the Contractor and Surety on this bond, which right of action shall be asserted in a proceeding, instituted in the county in which the work provided for in said Contract to be performed or in any county in which Contractor or Surety does business. Such right of action shall be asserted in proceedings instituted in the name of the claimant or claimants for his or their use and benefit against said Contractor and Surety or either of them (but not later than one year after the final settlement of said Contract) in which action such claim or claims shall be adjudicated and judgment rendered thereon.
- (b) The Principal and Surety hereby designate and appoint _____ as agent of each of them to receive and accept service of process or other pleading issue or filed in any proceeding instituted on this bond and hereby consent that such service shall be the same as personal service on the Contractor and/or Surety.
- (c) In no event shall the Surety be liable for a greater sum than the penalty of this bond, or subject to any suit, action or proceeding thereon that is instituted later than one year after the final settlement of said Contract.
- (d) This bond is given pursuant to and in accordance with the provisions of O.C.G.A. §§ 36-10-1 *et seq.* and 36-82-100 *et seq.* and all the provisions of the law referring to this character of bond as set forth in said sections or as may be hereinafter enacted, and these are hereby made a part hereof to the same extent as if set out herein in full.

(Signatures on Next Page)

IN WITNESS WHEREOF, the said Principal has hereunder affixed its signature and said Surety has hereunto caused to be affixed its corporate signature and seal, by its duly authorized officers, on

This the _____ day of _____, 2020, executed in two (2) counterparts.

PRINCIPAL: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SURETY: _____

By: _____

Title: _____

(SEAL)

Signed and Sealed in the Presence of:

1. _____

2. _____

SECTION 00630
PART D - AFFIDAVIT OF PAYMENT OF CLAIMS

_____ This the _____ day of _____, 2020

appeared before me, _____, a Notary Public, in and for

_____, and being by me first duly sworn states that all subcontractors and suppliers of labor and materials have been paid all sums due them to date for work performed or material furnished in the performance of the Contract between the Brunswick – Glynn County Joint Water and Sewer Commission (JWSC) and **Contractor to be Named** (Contractor) last signed on _____, for the

PS4021 REHABILITATION & UPGRADE PROJECT
BRUNSWICK – GLYNN COUNTY, GEORGIA

CONTRACTOR

Company: _____

By: _____

Title: _____

(SEAL)

Sworn to and subscribed before me this the _____ day of _____, 2020

NOTARY PUBLIC

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

SECTION 00640

PART E – CERTIFICATE OF INSURANCE

This is to certify that _____
(Insurance Company)

Of _____
(Insurance Company Address)

Has issued policies of insurance, as identified by a policy number to the insured named below, and that such policies are in full force and effect at this time. Furthermore, this is to certify that these policies meet the requirements described in the General Conditions of this project; and it's agreed that none of these policies will be canceled or changed so as to affect this Certificate until thirty (30) days after written notice of such cancellation or change has been delivered to:

**BRUNSWICK – GLYNN COUNTY JOINT WATER AND SEWER COMMISSION
EXECUTIVE DIRECTOR
1703 GLOUCESTER STREET
BRUNSWICK, GEORGIA 31520**

It is further agreed that the Brunswick – Glynn County Joint Water and Sewer Commission shall be named as an additional insured on the Contractor's policy.

Insured: _____

Project Name: **PS4021 REHABILITATION & UPGRADE PROJECT
BRUNSWICK – GLYNN COUNTY, GEORGIA**

Policy Number(s): _____

Date: _____
(Insurance Company)

Issued At: _____
(Authorized Representative)

Address: _____

Note: Please attach Certificate of Insurance form to this page.

SECTION 00650

PART E - CERTIFICATE OF DRUG FREE WORKPLACE

In order to have a drug- free workplace, a business shall:

Publish a statement notifying employees that the unlawful, manufacture, distribution, dispensing, possession, or use of controlled substances is prohibited in the workplace and specifying the actions that shall be taken against employees for violation of such prohibition.

Inform employees about the dangers of drug abuse in the workplace, the business's policy of maintaining a drug-free workplace, any available drug counseling, rehabilitation, and employee assistance programs, and the penalties that may be imposed upon employees for drug abuse violations.

As a condition of working on the commodities or contractual services then under bid, the employee shall notify the employer of any conviction of, or plea of guilty or nolo contendere to, any violation of any controlled substance law of the United States or any State, for a violation occurring in the workplace no later than five (5) days after such conviction.

Impose a sanction on, or require satisfactory participation in a drug abuse assistance or rehabilitation program if such in available in the employee's community, by any employee who is so convicted.

Make a good faith effort to continue to maintain a drug-free workplace through implementation of this section.

As the person authorized to sign this statement, I certify that this firm complies fully with the above requirements.

Company Name: _____

Authorized Signature: _____

Title: _____

Date: _____

SECTION 00700
GENERAL CONDITIONS

INDEX:

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2.0	Contract Project Representative	3.0	Notice of Award of Contract
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8.0	Quantities	9.0	Suspension or Termination of Services
10.0	Indemnification	11.0	Assignments
12.0	Laws and Regulations	13.0	Notice and Service Thereof
14.0	Schedule, Reports and Records	15.0	Changes in the Contract
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0.0 Definitions

Where used throughout these contract documents the following words and terms shall have the meanings indicated. The meanings shall be applicable to the singular, plural, masculine and feminine of the words and terms.

Acceptance. Formal action of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION in determining that the Contractor's work has been completed in accordance with the contract and in notifying the Contractor in writing of the acceptability of the work.

Act of God. A cataclysmic phenomenon of nature, such as a hurricane, earthquake or abnormal flood. Rain, wind, high water, or other natural phenomenon which might reasonably have been anticipated from historical records of the general locality of the work shall not be construed as acts of God.

Addenda. Supplemental written specifications or drawings issued prior to execution of the contract which modify or interpret the project manual by addition, deletion, clarification, or corrections.

Bid. Offer of a bidder submitted on the prescribed form setting forth the price or prices of the work to be performed.

Bidder. Individual, partnership, corporation, or a combination thereof, including joint ventures, offering a bid to perform the work.

Contract. The writings and drawings embodying the legally binding obligations between the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and the Contractor for completion of the work; Contract Documents attached to the Contract and made a part thereof as provided herein.

Contract Documents. The Advertisement for Bids, Addenda (which pertain to the Contract Documents), Contractor's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award), the Contract, the Notice to Proceed, the Bonds, these General Conditions, the Special Conditions, the Specifications and Drawings, together with all Written Amendments, Change Orders, Work Change directives, and Field Orders.

Contract Price. Amount payable to the Contractor under the terms and conditions of the contract. Based on the price given on the Bid schedule, with adjustments made in accordance with the contract. The base amount given in the Bid schedule shall be a lump sum Bid.

Contract Time. Number of consecutive calendar days stated in the contract for the completion of the work or portions thereof.

Contractor. The individual, partnership, corporation, or combination thereof, including joint ventures who enter into the contract with the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION for the performance of the work. The term covers subcontractors, equipment and material suppliers, and their employees.

Contractor's Plant and Equipment. Equipment, material, supplies, and all other items, except labor, brought onto the site by the Contractor to carry out the work, but not to be incorporated in the work.

Day. Calendar day.

Defective. An adjective which when modifying the word "work" refers to work, including but not limited to the furnishing of materials, that is unsatisfactory, faulty, deficient, or performed in an unworkmanlike manner, in that it does not conform to or meet the requirements of the Contract, any inspection, reference standard, test or approval referred to in the Contract, or has been damaged prior to a recommendation of final payment.

Direct. Action of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION by which the Contractor is ordered to perform or refrain from performing work under the contract.

Directive. Written documentation of the actions of the Engineer or the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION in directing the Contractor.

Engineer. Whenever the word "Engineer" is used in the contract, it shall be understood as referring to the Engineer of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, or such other Engineer, supervisor or inspector as may be authorized by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION to act in any particular area of the Contract.

Equipment. Mechanical, electrical, instrumentation or other device with one or more moving parts, or devices requiring an electrical, pneumatic, electronic, or hydraulic connection.

Furnish. To deliver to the job site or a specified location any item, equipment or material.

Holidays. Legal holidays designated by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION.

Install. Placing, erecting, or constructing in place any item, equipment, or material.

May. Refers to permissive actions.

Owner. The Brunswick - Glynn County Joint Water and Sewer Commission.

Owner's Representative. The person, firm or corporation designated by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION.

Paragraph. For reference or citation purposes, paragraph shall refer to the paragraph, or paragraphs, called out by section number and alphanumeric designator where applicable.

Person. The term, person, includes firms, companies, corporations, partnerships, and joint ventures.

Project. The undertaking to be performed under the provisions of the contract.

Punch List. List of incomplete items of work and of items of work which are not in conformance with the contract. The list will be prepared by the Owner's Representative when the Contractor (1) notifies the Owner's Representative in writing that the work has been completed in accordance with the contract and (2) requests in writing that the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION accept the work.

Shall. Refers to actions by either the Contractor or the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and means the Contractor or BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION has entered into a covenant with the other party to do or perform the action.

Specifications. That part of the contract documents consisting of written descriptions of the technical features of materials, equipment, construction system, standards, and workmanship.

Work. The labor, materials, equipment, supplies, services, and other items necessary for the execution, completion and fulfillment of the Contract.

(Continued on Next Page)

1.0 Contract Administration

The Contract Administrator for this Invitation shall be Mr. Andrew Burroughs Executive Director (912) 261-7108. The Contract Administrator shall act as the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION's Representative during the execution of any subsequent contract and related amendments. He will evaluate any contract disputes in a fair and unbiased manner. The decisions of the Contract Administrator shall be final and conclusive and binding upon all parties to the Contract. Any contractual questions arising during the Bid period or during the contract period(s) are to be addressed to the Contract Administrator at the following address:

Brunswick – Glynn County Joint Water and Sewer Commission
Attention: Mr. Andrew Burroughs, Executive Director
1703 Gloucester Street
Brunswick, Georgia 31520
Phone: (912) 261-7108
E-Mail: aburroughs@bgjwsc.org

2.0 Owner's Representative

The Owner's Representative is the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION's day-to-day manager of the contracted services. He shall provide the successful Bidder direction and monitor the results within the limits of the contract's terms and conditions. He will decide questions that may arise as to quality and acceptability of services performed. He shall judge as to the accuracy of quantities submitted by the successful Bidder in payment requests and the acceptability of the services that these quantities represent. He will be the point-of-contact for developing contract changes and amendments to be approved by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION. Any project questions arising, subsequent to contract award, are to be addressed to the Owner's Representative at the following address:

Brunswick – Glynn County Joint Water and Sewer Commission
Attention: Mr. W. Todd Kline, P.E., Director of Engineering
1703 Gloucester Street
Brunswick, Georgia 31520
Phone: (912) 261-7122
E-Mail: tkline@bgjwsc.org

3.0 Notice of Award of Contract

As soon as possible, and within sixty (60) days after receipt of bids, the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall notify the successful Bidder of its intent to enter into a contract agreement. Should the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION require additional time to award a contract, the time may be extended by mutual agreement between the parties. If an Award of Contract has not been made within sixty (60) days from the bid opening date or within the extension mutually agreed upon, the Bidder may withdraw the bid without further liability on the part of either party.

4.0 Execution of Contract Documents

- 4.1** Within fifteen (15) days subsequent to successful contract negotiations, the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall furnish the successful Bidder the conformed copies of Contract Documents for execution by him.
- 4.2** Within fifteen (15) days after receipt of the Contract Documents, the successful Bidder shall return all the documents properly executed by him. Attached to each document shall be the certificate of insurance and proper licenses required by Federal, State, or Local authorities.
- 4.3** Within thirty (30) days after receipt of the Contract Documents, executed by the successful Bidder certificates of insurances and licenses, the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.
- 4.4** Should either party require an extension of any of the time limits stated above, this shall be done only by mutual agreement between both parties.

5.0 Notice to Proceed

The Notice to Proceed shall be issued within ten (10) days of the execution of the Contract Agreement by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION. If there are reasons why the Notice to Proceed should not be issued within this period, the time may be extended by mutual agreement between the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and successful Bidder. If the Notice to Proceed has not been issued within the ten (10) day period or within the period mutually agreed upon, the successful Bidder may terminate the Contract Agreement without further liability on the part of either party.

6.0 Protest of Award

All protests of the award must be filed in writing with the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION within ten (10) days after the award of bid. The protest must describe in detail all alleged deficiencies. Any violations of law not specifically set forth in the protest are deemed waived. The validity of the protest shall be determined by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION Contract Administrator and the review shall be limited to any alleged violation of federal, state or local law.

7.0 Insurance

The successful Bidder shall not commence the Work under the Contract until all insurance described below has been obtained and such insurance has been approved by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, nor shall the successful Bidder allow any subcontractor to commence work on his subcontract until all similar insurance required of the subcontractor has been so obtained and approved by the successful Bidder.

The successful Bidder shall maintain insurance with companies reasonably acceptable to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, authorized to do

business in Georgia, and having a rating with A.M. Best & Co. of A-VII or better, unless otherwise approved in writing by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION. Such insurance as will protect the successful Bidder from claims set forth herein below which may arise out of or result from the operations of the successful Bidder under the contract, whether such operations be by the successful Bidder, by anyone directly or indirectly employed by the successful Bidder or by anyone for whose acts the successful Bidder may be liable including, but not limited to, the following:

- 7.1** Claims under workers' compensation, disability benefit, and other similar employee benefit acts;
- 7.2** Claims for damages because of bodily injury, occupational sickness, disease, or death of any employee of the successful Bidder;
- 7.3** Claims for damages because of bodily injury, sickness, disease, or death of any person other than an employee of the successful Bidder;
- 7.4** Claims for damages insured by usual personal injury liability coverage which are sustained by any other person;
- 7.5** Claims for damages because of injury to or destruction of tangible property, including loss of use resulting there from;
- 7.6** Claims for contractually assumed liability under the contract.

The aforesaid insurance required to be maintained by the successful Bidder may be written under an umbrella policy or policies, but shall not be written for less than the limits of liability specified herein below or less than any limits required by law, whichever is greater. The successful Bidder shall maintain during such time as the successful Bidder is performing hereunder the services, subject to a policy or policies having a deductible not greater than \$25,000 on account of any one occurrence, (i) workers' compensation insurance in an amount not less than the greater of that required by law or \$1,000,000 for injuries, including accidental death to any one person, (ii) commercial general liability insurance with a general aggregate of \$2,000,000 and not less than \$1,000,000 for each occurrence, (iii) automobile liability insurance in an amount not less than a combined single limit of \$1,000,000 for injuries, including accidental death, and (iv) property damage liability insurance in an amount not less than \$1,000,000 on account of any one occurrence with a \$2,000,000 aggregate.

Certificates of insurance indicating that the successful Bidder has obtained such coverage and a copy of the policies evidencing such coverage, if requested by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, shall be filed with the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION prior to the commencement by the successful Bidder of the contracted services. Such certificates shall be in form and substance reasonably acceptable to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, shall indicate that, except in respect to workers' compensation insurance coverage, BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION is an additional named insured with respect to such coverage, shall indicate that such coverage is primary and is not contributory with any similar insurance purchased by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER

COMMISSION, and shall contain a provision that such coverage shall not be canceled until at least thirty (30) days prior written notice has been given to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION.

8.0 Quantities

None of the various BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION departments, divisions, employees or agencies, individually or collectively, shall be required to purchase any minimum or maximum amount during the life of any contract, or extension thereof, as a result of this Advertisement for Bids.

9.0 Suspension or Termination of Services

The anticipated contract between the successful Bidder and the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may be terminated based on any one of the following:

- 9.1** Failure of the Bidder to perform based on the Bidder's bankruptcy, lack or loss of skilled personnel, or disregarding laws, ordinances, rules, regulations or orders of any public body having jurisdiction. Should any single, multiple or all of the above conditions occur the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall have the authority to terminate the contract with written notice to the successful Bidder. The successful Bidder shall be liable for any losses occurring as a result of not abiding by the terms of the contract.
- 9.2** The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may terminate the contract at will. All correspondence of this nature will be forwarded by certified or registered mail with return receipt requested.
- 9.3** Any termination of the successful Bidders services shall not affect any right of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION against the successful Bidder then existing or which may thereafter occur. Any retention of payment of monies by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION due the successful Bidder will not release the successful Bidder from compliance with the Contract Documents.

10.0 Indemnification

The successful Bidder will indemnify and hold harmless the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and their officers, employees, Engineers, and agents, each and any one of them, from and against all claims, damages, losses and expenses including attorneys' fees arising out of or resulting from the performance of the services, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the successful Bidder and anyone directly or indirectly employed by him or anyone for whose acts any of them may be liable. In any and all claims against the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION or any of their agents or employees, by any employee of the successful Bidder, directly or indirectly employed by him, or anyone for whose acts any of them may be liable, the

indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the successful Bidder or under federal and state workers' compensation and disability benefits statutes, and applicable laws relating thereto. No party shall indemnify any other party for their own sole negligence.

11.0 Assignments

The successful Bidder shall not assign the whole or any part of this Contract or any monies due or to become due hereunder without written consent of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION. In case the successful Bidder assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the successful Bidder shall be subject to prior liens of all persons, firms, and corporations for services rendered or materials supplied for the performance of the services set forth in this contract.

12.0 Laws and Regulations

The successful Bidder's attention is directed to the fact that all applicable Federal, State and Local laws and ordinances, including rules and regulations of all authorities having jurisdiction over the services, shall apply to the contract throughout. The successful Bidder shall keep himself fully informed of all laws, ordinances and regulations of the Federal, State, County and municipal governments or authorities in any manner affecting those engaged or employed in providing these services or in any way affecting the conduct of the services and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over same. If any discrepancy or inconsistency should be discovered in these Contract Documents or in the specifications herein referred to, in relation to any such law, ordinance, regulation, order or decree, he shall herewith report the same in writing to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION.

The successful Bidder shall at all times observe and comply with all such existing laws, ordinances and regulations, and shall protect and indemnify the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and its agents against the violation of any such law, ordinance, regulation, order or decree, whether by himself or by his employees. Licenses of a temporary nature, necessary for the prosecution of the services, shall be secured and paid for by the successful Bidder.

13.0 Notice and Service Thereof

13.1 All notices, demands, requests, instructions, approvals, and claims shall be in writing.

13.2 Any notice to or demand upon the Contractor shall be sufficiently given if delivered at the office of the Contractor specified in his Bid (or at such other office as the Contractor may from time to time designate to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION in writing), or if deposited in the United States Mail in a sealed, postage- prepaid envelope, or delivered, with charges prepaid, to any telegraph company for transmission, in each case addressed to such office.

13.3 All papers required to be delivered to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall, unless otherwise specified in writing to the Contractor, be delivered to the Contract Administrator. Any notice to or demand upon the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION will be sufficiently given if delivered to the Office of said Contract Administrator or if deposited in the United States Mail in a sealed, postage-prepaid envelope, or delivered with charges prepaid to any telegraph company for transmission, in each case addressed to said Contract Administrator or to such other representative of the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION or to such other address as the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may subsequently specify in writing to the Contractor.

14.0 Schedule, Reports and Records

The Contractor shall submit to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION schedules, reports, estimates, records and other data as the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may request concerning services performed or to be performed.

15.0 Changes in the Contract

15.1 Changes in the Service. The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may at any time, as the need arises, order changes within the scope of the services without invalidating the Contract Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the services, an equitable adjustment shall be negotiated culminated by the issuance of a Contract Amendment and signed and sealed by the parties. The Contractor shall proceed with the performance of any changes in the services so ordered by the Contract Administrator unless the Contractor believes that such order entitles him to a change in the fee or time or both, in which event he shall give the Contract Administrator written notice thereof within fifteen (15) days after the receipt of the Contract Amendment, and the Contractor shall not execute such amendments pending the receipt of an executed Notice to Proceed instruction from the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION.

The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION may, when changes are minor or when changes would result in relatively small changes in the Fee or Contract Time, elect to postpone the issuance of a Contract Amendment until such time that a single amendment of substantial importance can be issued incorporating several changes. In such cases, the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall indicate this intent in a written notice to the Contractor.

15.2 Changes in Contract Price. The contract price shall be changed only by a mutual agreement by the Contractor and the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION transmitted as a Contract Amendment. The Contractor shall, when required by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION, furnish to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER

COMMISSION the method and justification used in computing the change in price as related to the services ordered.

15.3 Changes in Contract Period. The Contract Period shall be changed only by a Contract Amendment. Changes in the services described in above and any other claim made by the Contractor for a change in the Contract Period shall be evaluated by the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION and if the conditions warrant, an appropriate adjustment of the Contract Periods will be made.

16.0 Payments and Completion

16.1 Application for Payment. The Contractor shall submit an application for payment (invoice) for services rendered during the preceding calendar month. This application shall be sent to the Owner's Representative listed in Paragraph 2.0.

16.2 Certificate for Payments. If the Contractor has made application for payment, as above, then the Owner's Representative will issue a Certificate for Payment to the Owner for such amount as is determined to be properly due, or state in writing the itemized and specific reasons for withholding a Certificate. After the Certificate for Payment has been issued, the Owner shall pay to the Contractor within thirty (30) days the amount covering services completed. No Certificate for Payment, nor any payment, shall constitute an acceptance of any services not in accordance with the Contract Documents.

16.3 Failure of Payment.

If the Owner's Representative fails to approve an application for payment, through no fault of the Contractor, within seven (7) working days after receipt from the Contractor, or if the Owner fails to pay the Contractor within thirty (30) days after receipt of a Certificate for Payment, then the Contractor shall receive interest on the balance due with the interest being one percent (1%) per month not to exceed three (3) months (3%). The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION reserves the right to reject the Owner's Representative's certification of any request for payment by the Contractor without the accrual of interest.

16.4 Governing Document. All parties expressly agree that the provisions of the Georgia Prompt Pay Act, Title 13, Chapter 11, of the Official Code of Georgia Annotated, are superseded by the terms and conditions of this agreement.

16.5 Final Payment. Upon receipt of written notice from the Contractor that all contracted services are complete, the Owner's Representative will, within a reasonable time, review all services and reports. If the Owner's Representative finds the services and reports of the Contractor complete and acceptable in accordance with the provisions of the Contract Documents, he shall, within a reasonable time, recommend to the Owner that final payment be made. The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and still unsettled.

17.0 Contractor's Claim

No claim for additional or other compensation beyond the contract price shall be allowable unless the Contractor makes **written demand therefore within thirty (30)** days of the occurrence of any event which gives rise to such claim.

18.0 Contract Agreement Jurisdiction

Contractor irrevocably consents that any legal action or proceeding against it under, arising out of, or in any manner relating to, this Agreement shall be brought in any court in Berrien County, Georgia. Contractor designates the Secretary of the State of Georgia as its agent for service of process, provided no such agent located in Georgia is on file with the said Secretary. Contractor, by the execution and delivery of this Agreement, expressly and irrevocably assents to and submits to the personal jurisdiction of any court in Berrien County, Georgia, and in any said action or proceeding. Contractor hereby expressly and irrevocably waives any claim or defense in any said action or proceeding based on any alleged lack of jurisdiction, improper venue or *forum non conveniens* or any similar basis.

19.0 Ownership of Data

All data and other records supplied to the Contractor for this project shall remain the sole property of the Engineer. The Contractor shall not, without written consent, copy or use such records, except to carry out contracted work, and will not transfer such records to any other party not involved in the performance of the Contract pursuant to this Advertisement for Bids, and will return submitted records to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION upon completion of the work hereunder. The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION shall have the right, without the consent of the Contractor, to extract such data in industry standard formats, using standard Contractor utilities and at no cost to the BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION. The BRUNSWICK - GLYNN COUNTY JOINT WATER AND SEWER COMMISSION acknowledges that the storage, compilation, format, and layout constitute proprietary and secret trade information of the Contractor, and are protected by Federal copyright law.

20.0 Contractor's Status

It is agreed that the Contractor shall occupy the status of an Independent Contractor and the Contractor's employees are not employees of the Owner.

DIVISION ONE

**SECTION 01100
SUMMARY OF WORK**

PART 1 GENERAL

1.1 DESCRIPTION

The work covered by this Contract includes furnishing all labor, equipment, materials and incidentals and performing all work required to rehab & upgrade PS4021 located at 4727 Altama Avenue and associated force main. The work includes, but is not limited to, excavation, dewatering, backfill and compaction, new precast concrete wet well top, valve pit, electrical shed pumps, controls, site work, fencing, discharge piping and valves, 50 LF new 18-inch PVC force main with associated fittings, electrical work, erosion control and grassing, complete surface restoration and all other work and appurtenances required.

1.2 PLANS AND SPECIFICATIONS

The completed work shall be in accordance with these specifications and the construction plans prepared by Roberts Civil Engineering entitled "***Site Construction Plans PS4021 REHABILITATION & UPGRADE***" last revised on January 08, 2020 as follows:

INDEX OF DRAWINGS		
Sheet	Title	Date
T-1	Title Sheet	01/09/20
G-1	General Construction Notes	01/07/20
P-1	Site Existing	11/07/19
P-2	Demolition Plan	01/07/20
P-3	Site Proposed	01/08/20
P-4	Proposed Plan	01/08/20
P-5	Erosion & Sedimentation Control Plan	01/09/20
P-6	Construction Details	01/08/20
P-7	JWSC Details	01/08/20
E-1	Electrical Plan	10/22/19
E-2	Electrical Plan Cont.	10/22/19
E-3	Electrical Plan Cont.	10/22/19
E-4	Electrical Plan Cont.	10/22/19
E-5	Electrical Plan Cont.	10/22/19
E-6	Electrical Plan Cont.	01/08/20

1.3 APPLICABLE STANDARDS

In general, all work is intended to conform to the JWSC's Standards for Water and Sewer Design and Construction, latest edition. In the event of a conflict between these project specifications, the aforementioned construction plans and the JWSC Standards, the project specifications and construction plans shall take precedence.

PART 2 (Not Used)

(END OF SECTION)

**SECTION 01110
MEASUREMENT AND PAYMENT**

PART 1 GENERAL

1.1 SCOPE

Under this section shall be included the methods of measurement and payment for items of work under this Contract.

1.2 ESTIMATED QUANTITIES

All estimated quantities for unit price items, stipulated in the Proposal, or other Contract Documents, are approximate and are to be used as a basis for estimating the probable cost of the Work and for comparing the bids submitted for the Project. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of the work done and material furnished as shown on the Plans. The Contractor agrees to make no claim for damages, anticipated profits or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts included in the Proposal. The Contractor will provide assistance to the Owner to check quantities and elevations when so requested.

1.3 LUMP SUM AND UNIT PRICE QUANTITIES

All quantities are for unit price or lump sum items stipulated in the Bid Form. The Contractor, having read and understood the Bidding Documents and examined the Project Site and adjoining areas and being familiar with the obstacles and conditions that will affect proposed work, hereby offers and agrees to furnish all labor, products, and services needed to provide work in accordance with the Bidding Documents and will provide a properly itemized listing for each bid item, supported by sufficiently substantially data, to permit evaluation of partial pay requests.

1.3 CONSTRUCTION ITEMS

Bid Item No. 1 – Wastewater Pumping Station

(1a) Mobilization, Demobilization, Insurance & Bonds

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. The lump sum price for this item shall not exceed 5% of the total of all bid items in the Base Bid.

Payment shall include all compensation for mobilization, demobilization, insurance requirements and bonds for the project. Payment for 75% of the item shall be made when the contractor completes project mobilization and satisfies the insurance and bonding requirements to the satisfaction of the Owner. Payment for the remaining 25%

of the item shall be after demobilization and completion of the work to the satisfaction of the Owner.

(1b) Demolition

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials necessary for demolition of the existing structures, foundations, and utilities as shown on the drawings.

(1c) Temporary Bypass Pumping

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for temporary bypass pumping operations with temporary bypass pumps, as necessary to complete the work as described in the bid documents.

(1d) Wet-well Cleaning & Coating

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for to complete the work as described in the bid documents.

(1e) Electrical

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for complete installation of all electrical components per plans and bid documents.

(1f) Ga Power Pole(s) Relocation

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment, materials and GA Power coordination required to relocate existing power poles in conflict with the proposed upgrades. Work to be coordinated with GA Power.

(1g) Pumps, Piping, Vaults, Misc. Valves and Appurtenances

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for installation of pumps, interior piping, valves, valve pit(s) per plans and bid documents.

(1h) Fencing

There will be no separate measurement of the items under this heading. Payment for this item will be on the basis of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for the installation of yard fencing and gates per plans and bid documents.

Bid Item No. 2 – Force main

(2a) Connect to Existing MH40060220

Connections to existing MH40060220 shall be made at the location noted on the drawings and in accordance with the details. Measurement and payment for connections to existing manhole shall be made based of the lump sum price in the Bid Form. Payment includes all labor, equipment and materials required for to complete the work as described in on the plans and Bid Documents.

(2b) Force main Pipe

Pipe, installed in accordance with the specifications and accepted by the Owner, will be measured along the pipe from center of structure to center of structure. Payment will be made based on the unit contract price per linear foot as shown in the Bid Form and includes, but is not limited to, mobilization; SDR-21 Class 200 pipe; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(2c; 2d) MJ Fittings

Mechanical joint ductile iron (sewer safe) fittings, installed in accordance with the specifications and accepted by the owner, will be measured on the basis of each unit installed. Payment will be made based on the unit contract price per fitting as shown in the Bid Form and includes, but is not limited to, mobilization; fittings and Mega-Lug joint restraints; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(2e) Harness Type Joint Restraints

Harness type joint restraints, installed in accordance with the specifications and accepted by the owner, will be measured on the basis of each unit installed. Payment will be made based on the unit contract price per restraint as shown in the Bid Form and includes, but is not limited to, mobilization; joint restraints and accessories; trenching and backfill; dewatering; demobilization; complete surface restoration; and all other work and appurtenances required.

(2f) *Hydrostatic Pressure Testing*

Hydrostatic pressure testing of new force mains will be measured on the basis of the completed item. Payment will be made in accordance with the lump sum price stated in the Bid Form and includes all pumps, piping, fittings, gauges and other equipment necessary to perform the test.

(2g) *Erosion Control and Grassing*

Erosion control and grassing will be measured on the basis of the completed item. Payment will be made in accordance with the lump sum price stated in the Bid Form and includes all structural practices and vegetative measures directed by the Engineer, required and/or as shown to ensure effective erosion control at the work site.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01120 FIELD ENGINEERING

PART 1 GENERAL

1.1 SCOPE

Field engineering shall include all surveying work required to layout the proposed facilities and control the location of the finished project. The Contractor shall be solely responsible for constructing the project to the correct horizontal and vertical alignment as shown on the drawings and as specified herein. The Contractor shall assume all costs associated with rectifying any work constructed in the wrong location.

The drawings provide the location and/or coordinates of principal components of the project.

1.2 JWSC'S RESPONSIBILITIES

The JWSC will provide the following:

One (1) vertical control point on the project site with its elevation (included on the drawings – Plan Sheet 3)

A topographic survey (included on the drawings)

The JWSC may, acting through the Engineer, order changes to the location of some of the components of the project or provide clarification to questions regarding the correct alignment.

1.3 CONTRACTOR'S RESPONSIBILITIES

The Contractor's responsibilities include but are not limited to the following:

Be responsible for setting reference points and/or offsets, establishment of baselines, and all other layout, staking and other surveying required for the construction of the project.

Safeguard all reference points, stakes, grade marks, horizontal and vertical control points, and bear the cost of re-establishing same if disturbed.

Stake out temporary and permanent easements or the limits of construction to ensure the work is not deviating from the indicated limits.

Record drawing surveys shall be performed in accordance with Section 01700 of these specifications. Baselines shall be defined as the line to which the location of the work is referenced, i.e. edge of pavement, road centerline, property line, right of way or survey line.

1.4 STAKING PRECISION

1.4.1 Site Work

The precision of construction staking shall match the precision of a component's location as indicated on the drawings. Staking of utilities shall be done in accordance with generally accepted practice for the type of utility.

1.4.2 Water Mains and Accessories

The precision of construction staking required shall be that which the correct location of the water main can be established for construction and verified by the Engineer of Record. Where the location of the components of the water main, such as valves, fittings, fire hydrants, etc. are not dimensioned on the drawings, they shall be located based upon scaling these locations from the drawings with relation to readily identifiable landmarks (survey reference points, power poles, manholes, etc.).

1.4.3 Sewer Mains, Manholes and Appurtenances

The precision of construction staking shall be no less than 1:10,000. Horizontal distances shall be measured with a precision no less than 0.01 feet and horizontal angles measured with a precision of no less than 10 seconds.

1.5 QUALITY ASSURANCE

The Contractor shall furnish documentation, prepared by a Registered Professional Surveyor currently licensed in the State of Georgia, confirming that staking is being done to the horizontal and vertical alignment shown in the Contract Documents. This requires that the Contractor hire at his own expense, a registered surveyor suitable to the JWSC to provide on-going construction staking and confirmation of such.

Any deviations from the drawings shall be confirmed by the Engineer of Record prior to construction of that portion of the project.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01340

SHOP DRAWINGS

PART 1 GENERAL

1.1 SCOPE

The work under this Section includes submittal to the JWSC of shop drawings, product data and samples required by the various Sections of these specifications. The submittal contents required are specified under each Section.

1.2 DEFINITIONS

1.2.1 Shop Drawings

Shop drawings include technical data, drawings, diagrams, procedures and methodology, performance curves, schedules, templates, patterns, test reports, calculations, instructions, measurements and similar information as applicable to the specific item for which the shop drawing is prepared.

1.2.2 Product Data

Product data includes standard printed information on materials, products and systems, not specifically prepared for this project other than the designation of selections from among available choices printed therein.

1.2.3 Samples

Samples include both fabricated and un-fabricated physical examples of materials, products and units of work, both as complete units and smaller portions of units of work, either for limited visual inspection or more detailed testing and analysis.

1.3 ROUTING OF SUBMITTALS

Submittals and routine correspondence shall be routed as follows:

Supplier to Contractor
Contractor to Engineer/JWSC
Engineer/JWSC to Contractor
Contractor to Supplier

1.4 SUBMITTAL LOG

At the discretion of the JWSC, a submittal log shall be created and issued to the Contractor as the complete listing of submittals required for the project.

PART 2 (Not Used)

PART 3 EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

The Contractor shall be responsible for the accuracy and completeness of the information contained in each submittal and shall ensure that the material or equipment shall be as described in the submittal. The Contractor shall verify in writing that all features of all products conform to the requirements of the drawings and specifications. Submittal documents shall be clearly edited to indicate only those items which are being submitted for review. All extraneous material shall be crossed out or otherwise obliterated. The Contractor shall ensure that there is no conflict with other submittals and shall notify the JWSC in each case where his submittal may affect the work of another contractor or the JWSC. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

Before each submittal, the Contractor shall have determined and verified all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto; all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the work; and all information relative to the Contractor's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

Submittal documents common to more than one piece of equipment shall be identified with the appropriate equipment numbers and specification section and paragraph. Each submittal shall bear a stamp or written indication that the Contractor's obligations under the contract with respect to the Contractor's review and approval of that submittal have been met. Any deviations from the requirements of the drawings and specifications shall be noted on the submittals. The Contractor shall submit six copies of all specified information. **Submittals which do not have all the information required to be submitted including deviations, are not acceptable and will be returned without review.**

In lieu of hard copies, submittals may be made electronically via email to kyoung@bgiwsc.org. The routing of submittals shall remain as specified in Paragraph 1.3 of this Section.

3.2 REVIEW PROCEDURES

The JWSC's review will not extend to means, methods, techniques, sequences or procedures of construction, or to verifying quantities, dimensions, weights, or fabrication processes, or to safety precautions or programs incident thereto. Unless otherwise specified, within fourteen days after receipt of a submittal, The JWSC will review the submittal and return three copies to the Contractor with comments. The returned submittals will indicate one of the following actions:

If the review indicates conformance with the drawings and specifications, submittal copies will be marked "**NO EXCEPTIONS TAKEN**". In this event, the Contractor may begin to implement the work or incorporate the material or equipment covered by this

submittal.

If the review indicates limited corrections are required, submittal copies will be marked **“MAKE CORRECTIONS NOTED”**. The Contractor may begin implementing the work or incorporate the materials or equipment covered by the submittal in accordance with the noted corrections. Where submittal information will be incorporated into Operation and Maintenance data, a corrected copy shall be provided.

If the review indicates that the submittal is insufficient or contains incorrect data, submittal copies will be marked **“AMEND AND RESUBMIT”**. Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted, and returned marked either **“NO EXCEPTION TAKEN”** or **“MAKE CORRECTIONS NOTED”**.

If the review indicates that the submittal does not comply with the drawings and specifications, submittal copies will be marked **“REJECTED - SEE REMARKS”**. Submittals with deviations that have not been clearly identified will be rejected. Except at his own risk, the Contractor shall not undertake work covered by this submittal until it has been revised, resubmitted, and returned marked either **“NO EXCEPTIONS TAKEN”** or **“MAKE CORRECTIONS NOTED”**.

Review of drawings, submittals, or information regarding materials or equipment the Contractor proposes to provide, shall not relieve the Contractor of his responsibility for errors and omissions therein and shall not be regarded as an assumption of risks or liability by the JWSC or the Engineer of Record or by any officer or employee thereof, and the Contractor shall have no claim under the contract on account of the failure or partial failure, or the method of work, material, or equipment so reviewed. A mark of **“NO EXCEPTION TAKEN”** or **“MAKE CORRECTIONS NOTED”** shall mean that the JWSC has no objection to the Contractor, upon his own responsibility, using or providing the materials or equipment proposed.

(END OF SECTION)

SECTION 01500 TEMPORARY FACILITIES

PART 1 GENERAL

1.1 SCOPE

Temporary facilities required for this work include, but are not necessarily limited to the following:

Temporary utilities such as water and electricity

First aid facilities

Sanitary facilities

Potable water

Temporary enclosures and construction facilities

1.2 GENERAL

First aid facilities, sanitary facilities and potable water shall be available on the project site on the first day that any activities are conducted on site. The other facilities shall be provided as the schedule of the project dictates.

Use all means necessary to maintain temporary facilities in proper and safe condition throughout the construction period. In the event of loss or damage, immediately make all repairs and replacements necessary at no additional cost to the JWSC.

Remove all temporary facilities as rapidly as the progress of the work will allow.

1.3 TEMPORARY UTILITIES

1.3.1 General

Provide and pay all costs for water, electricity and other utilities required for the performance of the work. Pay all costs for temporary utilities until project completion.

1.3.2 Temporary Water

Provide temporary piping and upon completion of the work remove all such temporary piping. Provide and remove water meters.

1.3.3 Temporary Electricity

Provide all necessary wiring for the Contractor's use. Furnish, locate and install area

distribution boxes such that the individual trades may use their own construction type extension cords to obtain adequate power and artificial lighting at all points where required.

1.4 FIRST AID FACILITIES

The Contractor shall provide a suitable first aid station, equipped with all facilities and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of any injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the JWSC and the Engineer's personnel.

1.5 SANITARY FACILITIES

The Contractor shall furnish, for use of the Contractor's personnel all necessary toilet facilities which shall be secluded from public observation. These facilities shall be chemical toilets. All facilities shall be kept in a clean and sanitary condition and shall comply with the requirements and regulations of the area in which the work is performed.

1.6 POTABLE WATER

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

1.7 ENCLOSURES AND CONSTRUCTION FACILITIES

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

1.8 PARKING FACILITIES

Parking facilities for the Contractor's employees and subcontractors shall be the Contractor's responsibility. The storage and work facilities provided by the JWSC, if any, shall not be used for parking by the Contractor.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

**SECTION 01510
JOB SITE SECURITY**

PART 1 GENERAL

1.1 BARRICADES, LIGHTS AND SIGNALS

The Contractor shall furnish and erect such barricades, fences, lights and danger signals and shall provide such other precautionary measures for the protection of persons or property and of the work as necessary. Barricades shall be painted in a color that will be visible at night. From sunset to sunrise, the Contractor shall furnish and maintain at least one light at each barricade and sufficient numbers of barricades shall be erected to keep vehicles from being driven on or into any work under construction.

The Contractor will be held responsible for any damage to the work due to failure of barricades, signs and lights. The Contractor's responsibility for the maintenance of barricades, signs and lights shall not cease until the project has been accepted by the JWSC.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01600 SUBSTITUTIONS

PART 1 GENERAL

1.1 SCOPE

This Section outlines the restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

1.2 DEFINITIONS

For the purposes of these Contract Documents, a “substitute item” shall be defined as one of the following:

A product or manufacturer offered as a replacement to a specified product or manufacturer.

A product or manufacturer offered in addition to a specified product or manufacturer.

A “substitute construction method” shall be defined as one of the following:

A mean, method, technique, sequence or procedure of construction offered as a replacement for a specified mean, method, technique, sequence or procedure of construction.

A mean, method, technique, sequence or procedure of construction offered in addition to a specified mean, method, technique, sequence or procedure of construction.

1.3 GENERAL

An item or construction method, which is offered where no specific product, manufacturer, mean, method, technique, sequence or procedure of construction is specified or shown on the drawings, shall not be considered a substitute and shall be at the option of the Contractor, subject to compliance with all provisions in the Contract Documents for that item or construction method.

For products specified only by a referenced standard, the Contractor may select any product by any manufacturer, which meets the requirements of the Specifications, unless otherwise indicated in the Contract Documents.

If the manufacturer is named on the drawings or in the Specifications as an acceptable manufacturer, products of that manufacturer meeting all requirements of the drawings and specifications are acceptable.

Whenever the JWSC’s or Engineer of Record’s design is based upon a specific product or process of a specific manufacturer, that manufacturer shall be so listed in the specifications and such product or process ***shall be used in the base bid.***

1.4 APPROVALS

Any **Contractor** proposing to furnish products or processes other than those listed in the specifications shall make a written application for approval of the proposed substitution to the JWSC or Engineer of Record at least 10 days prior to the date set for receipt of bids. The minimum information required in the application is listed below.

- A. Documentation demonstrating that the item being proposed as a substitute will fit in the space allowed, perform the same functions and have the same capabilities as the product or process specified.
- B. A letter signed by an officer of the company certifying compliance with the specifications without exception.
- C. Installation list with contacts and phone numbers for the same minimum number of installations and years of experience as the specified product or process.
- D. Complete descriptive and technical data addressing all specification requirements.
- E. Complete list of deviations from the specifications as written.
- F. Identification of accessory items required as a result of the proposed substitution.
- G. Identification of all architectural, structural, mechanical, piping, electrical or other modifications required as a result of the proposed substitution.

Whenever a product specification includes minimum experience requirements which the proposed substitution cannot meet, a condition of approval will require that the manufacturer furnish the JWSC with a cash deposit or bond acceptable to the JWSC in an amount equal to the cost of the product or process which shall remain in effect until the experience requirement has been met.

The burden of proving equivalency of a proposed substitute to an item designated by trade name or manufacturer's name referenced on the drawings or in the specifications rests on the party submitting the request for approval. The JWSC will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed product with previous users or any other written information that is reasonable under the circumstances. The degree of proof required for approval of a proposed substitute as equivalent to a named product is the amount of proof necessary to convince the JWSC beyond all doubt. To be acceptable, a proposed substitute must meet or exceed all requirements of the plans or specifications.

If the proposed substitution is approved, an addendum will be issued to all prospective bidders at least five days prior to the date set for the opening of bids listing any and all approved substitutions. If approved the bidder may offer a price for the substitution. The bid offered shall include the cost of all additional architectural, structural, mechanical, piping, electrical or other modifications, including engineering and design costs, required as a result of the proposed substitution. The JWSC shall be the final judge on questions of equivalence.

PART 2 (Not Used)

PART 3 (not Used)

(END OF SECTION)

SECTION 01700 RECORD DOCUMENTS

PART 1 GENERAL

1.1 SCOPE

The work under this Section includes but is not limited to the compiling, maintaining, recording and submitting of project record documents as herein specified.

Record documents include but are not limited to the following:

1. Drawings
2. Specifications
3. Change orders and other modifications to the Contract
4. JWSC field orders or written instructions, including requests for information (RFI) and clarification memos
5. Reviewed shop drawings, product data and samples
6. Test records

The Contractor shall maintain an up to date set of Record Drawings

1.2 SYSTEM SOURCE AND QUALITY ASSURANCE

1.2.1 STORAGE

Store documents and samples in the Contractor's office, apart from documents used for construction. File documents and samples in accordance with the format of these specifications

1.2.2 Maintenance

Maintain documents in a clean, dry legible condition and in good order. Do not use record documents for construction purposes. Record documents shall at all times be available for inspection by the JWSC. Failure to maintain record documents in a satisfactory manner may be cause for withholding of a certificate for payment.

Each document shall be labeled "PROJECT RECORD" in neat, large printed letters. All record information shall be kept concurrently with construction progress. Do not conceal any work until the project information is recorded.

1.3 RECORD DRAWINGS

Record drawings maintained by the Contractor shall provide dimensions, distances and coordinates to the nearest 0.1 foot. Elevations shall be provided to the nearest 0.01 foot.

Final record drawings shall be prepared by a professional surveyor licensed in the State of Georgia from a post construction field run survey. The Contractor shall pay all surveying and preparation costs associated with the final record drawings. The final record drawings shall provide elevations to the nearest 0.01 foot for the invert of all precast structures, access covers, and all other pertinent items constructed by the Contractor. The final record drawings shall provide dimensions, distances and coordinates to the nearest 0.01 foot and angles to the nearest 10 seconds.

Final Record Drawing shall be labeled "FINAL RECORD DRAWINGS" and shall include the name of the surveyor who prepared the drawings as well as the date the drawings were prepared.

Record drawings shall include the following:

Horizontal and vertical location of all exposed and underground piping systems including manholes, services, cleanouts, valves, hydrants and fittings

Location and dimensions of roadways and parking areas

Location of structures including finish floor elevations

1.4 SPECIFICATIONS

Legibly mark each section to record the manufacturer, trade name, catalog number and supplier of each product and item of equipment actually furnished. Also record all changes made by Requests for Information (RFI), field order, clarification memorandums of Contract change order.

1.5 SUBMITTAL

At the completion of the project, deliver Record Documents to the JWSC. Include a signed transmittal letter which lists the title and number of each record document.

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

SECTION 01710
OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 SCOPE

The Contractor shall provide five copies of complete Operation and Maintenance manuals for each item of equipment installed containing sufficient information to enable system operators to correctly operate service and maintain all equipment and accessories provided under the Contract. The data contained in the manual shall explain and illustrate clearly and simply all principles and theory of operation, operating instructions, maintenance and calibration procedures and safety precautions and procedures for the equipment involved.

1.2 SUBMITTAL FORMAT

Each copy of the manual shall be assembled in one or more 3-ring hardback loose leaf binders, each with a title page, table of contents and lists of tables and figures. The cover and binding edge of each manual shall have the project name, specification number and title and manual title printed thereon.

1.3 CONTENTS

Each manual shall the following items:

Title page which includes the equipment name and model number as well as the name, address and contact information of the Manufacturer, Supplier and Contractor.

Detailed Table of Contents

Equipment function, normal operating characteristics, performance data and limiting conditions

Detailed disassembly, overhaul and reassembly, installation, alignment, adjustment and testing procedures

Operating checklists

Detailed operating instructions for startup, calibration, routine and normal operation, regulation and control, safety procedures, shut down and emergency conditions

Detailed list of settings for relays, pressure switches, temperature switches, level switches, thermostats, alarms, relief valves, rupture discs, etc.

Preventative maintenance procedures and schedules including detailed lubrication instructions, identification of required lubricants and operating fluids and diagrams illustrating lubrication points

Detailed troubleshooting guide

Detailed parts list with name and part number

Recommended spare parts list

Electrical and instrumentation schematics including motor control centers, control panels, instrument panels and analyzer panels

List of special tools required

Name, address and contact information of nearest service center for parts, overhaul and service

Procedures for storing, handling and disposing of any chemicals or products used with the equipment or system

PART 2 (Not Used)

PART 3 (Not Used)

(END OF SECTION)

DIVISION TWO

SECTION 02110 DEMOLITION

PART 1 GENERAL

1.1 SCOPE

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

Demolition includes:

- a. Demolition, partial removal and cutting of existing masonry and metals as required for the new construction.
- b. Distribution of salvageable and excess unacceptable material and equipment as specified below.
- c. Off-site disposal of excess and unacceptable materials and equipment.

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

1.2 PERMITS AND NOTICES

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

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

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

1.3 CONDITIONS OF STRUCTURES

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

1.4 REMOVAL OF EXISTING EQUIPMENT

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

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

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

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

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

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

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

1.5 TRAFFIC AND ACCESS

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

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

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

1.6 DAMAGE

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

1.7 UTILITIES

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

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

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

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

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

1.8 POLLUTION CONTROL

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

1.9 QUALITY CONTROL

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

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

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

PART 2 – MATERIALS (NOT USED)

PART 3 – EXECUTION (NOT USED)

(END OF SECTION)

SECTION 02120
EROSION, SEDIMENTATION AND POLLUTION CONTROL

PART 1 GENERAL

The requirements of this Section apply only to those projects for which the Contractor is under direct contract to the JWSC.

1.1 SCOPE

The work of this section includes implementation of the Erosion, Sedimentation and Pollution Control plan including but not limited to the installation and maintenance of all structural and vegetative Best Management Practices (BMP's), and all other work and appurtenances required.

1.2 RELATED WORK SPECIFIED ELSEWHERE

SECTION 02220	Trenching Excavation, Bedding and Backfill
SECTION 02555	Water Distribution System
SECTION 02650	Sanitary Sewer System

1.3 APPLICABLE STANDARDS

The following standards and/or publications are made a part of this specification by reference. The Contractor shall obtain copies all referenced standards or publications and keep available on the jobsite at all times during the construction period. In the event of conflicts among the various sources cited below, the most stringent criteria shall take precedence.

"Manual for Erosion and Sediment Control in Georgia", latest edition copies of which are available from the State Soil and Water Conservation Commission.

1.4 QUALIFICATIONS

1.4.1 Installers

Installation of BMP's must be performed by an installer who has completed Erosion, Sedimentation and Pollution Control Plans similar in material, design and extent to that indicated for this project and whose work has resulted in construction with a record of successful in-service performance.

The Contractor must disclose to the JWSC/ENGINEER prior to project award all violations and citations received in the last five (5) years from the Georgia Environmental Protection Division, Army Corps of Engineers, and other City/County/State agencies dealing with erosion and sediment control deficiencies or wetlands deficiencies.

1.4.2 Inspectors

Contractor shall have a Qualified Personnel, as defined by the NPDES Permit on site whenever construction activity occurs. "Qualified Personnel" means a person who has successfully completed an erosion and sediment control short course eligible for continuing education units, or an equivalent course approved by the Georgia Environmental Protection Division and the State Soil and Water Conservation Commission.

1.5 SUBMITTALS

The following information shall be submitted to the JWSC prior to commencement of the work.

Copy of Certification with GSWCC number of Qualified Person(s)

Technical Product Data for

Sediment barriers
Inlet protection materials

NPDES Forms

A Notice of Intent (NOI) with the JWSC's and Operator's signatures is **required** for this project.

Notice of Implementation immediately after completing the installation of the initial BMP's

PART 2 MATERIALS

2.1 MATERIALS

All materials shall conform to these specifications and to the applicable standards listed in Paragraph 1.3 of this Section. BMP's required but not specified below shall be in accordance with the "Manual for Erosion and Sediment Control in Georgia" latest edition.

2.1.1 Ds1 - Disturbed Area Stabilization (Mulching Only)

Ds1 is a temporary cover of plant residues applied to the soil surface for a period of six (6) months or less when seeding is not practical. Materials shall consist of the following.

Compressed and compacted bound bundles of wheat, oat, rye or other local hays free of weeds

Wood waste consisting of chips, sawdust or bark

Polyethylene film

Hydro-mulch

Composed of wood cellulose fiber containing no germination or growth inhibiting factors

Colored green to allow visual metering in application and properties evenly dispersed and suspended when agitated in water

Add hydro-mulch water slurry in hydraulic seeder after proportionate quantities of seed, fertilizer and other materials have been introduced

Moisture Content	9.9% (+ or -) 3.0%
Organic Matter	99.2% (+ or -) 0.8%
Ash Content	0.8% (+ or -) 0.2%
Water Holding Capacity (min)	1150 grams water per 100 grams fiber

2.1.2 Ds2 - Disturbed Area Stabilization (Temporary Seeding)

Ds2 is a temporary vegetative cover with fast growing seedings for up to a twelve (12) month period or until permanent vegetated is established. Materials shall consist of the following.

Lime

Lime shall be natural limestone containing minimum 85% total carbonates.

- 95% or more pass 20 mesh sieve
- 55% pass 60 mesh sieve
- 40% pass 100 mesh sieve

Fertilizer

Fertilizer shall be as follows.

Dry or hydro

Commercial grade manufactured in accordance with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia

Grade containing plant food elements determined by laboratory analysis

Grass Seed

Grass Seed must be planted according to recommendations contained the "Manual for Erosion and Sediment Control in Georgia" or as approved by a

Landscape Architect.

Ryegrass, annual (*Lolium Multiflorum*) containing minimum 98% pure seed with 90% minimum germination and maximum 0.5% weed seed

Bermuda 100% hulled common Bermuda grass (*Cynodun Dactylon*) containing minimum 87% pure Bermuda with 85% minimum germination and maximum 1% weed seed

All seed types listed in the "Manual for Erosion and Sediment Control in Georgia".

Hydro-seed shall be applied at the following rates.

Ryegrass	250	Lbs/Acre
Bermuda	175	Lbs/Acre

2.1.3 Ds3 - Disturbed Area Stabilization (Permanent Vegetation)

Ds3 is permanent vegetative cover using grasses, trees, shrubs or legumes on highly erodible or critically eroded lands. Materials shall consist of the following.

Lime

Lime shall be natural limestone containing minimum 85% total carbonates. Dolomitic limestone shall be used in sandy plains and coastal soils. Conventional equipment shall be use to ground limestone.

95% or more pass 20 mesh sieve
55% pass 60 mesh sieve
25% pass 100 mesh sieve

For hydraulic seeding use finely ground limestone.

98% or more pass 20 mesh sieve
70% pass 100 mesh sieve

Fertilizer

Fertilizer shall be as follows.

Dry or hydro

Commercial grade manufactured in accordance with Georgia Department of Agriculture Specifications and bearing approval label of State of Georgia

Grade containing plant food elements determined by laboratory analysis

Grass Seed

Grass Seed must be planted according to recommendations contained the "Manual for Erosion and Sediment Control in Georgia" or as approved by a Landscape Architect.

Ryegrass, annual (*Lolium Multiflorum*) containing minimum 98% pure seed with 90% minimum germination and maximum 0.5% weed seed

Bermuda 100% hulled common Bermuda grass (*Cynodun Dactylon*) containing minimum 87% pure Bermuda with 85% minimum germination and maximum 1% weed seed

Hydro-seed shall be applied at the following rates.

Ryegrass	250	Lbs/Acre
Bermuda	175	Lbs/Acre

2.1.4 Cd - Check Dam

Check dam (Cd) is a small temporary barrier consisting of stone or hay bales constructed across a swale, drainage ditch or area of concentrated flow.

Hay Bale Check Dams

Compressed and compacted bound bundles of wheat, oat, rye or other local hays free of weeds

2.1.5 Co - Construction Exit

Construction Exit (Co) is a stone stabilized pad located at any point where traffic will be leaving a construction site to a public right of way, street, alley, sidewalk or parking area.

Aggregate size shall be National Stone Association R-2 (1 1/2-inch to 3 1/2-inch stone)

Approved Geo-textiles

- Amoco CEF-1199, 2019
- Carthage 6%
- Contech C70/06
- GT-400E
- Geotex 104 F
- Filterweave 403, 700
- TNS Advanced Technologies M706
- US Fabrics 670

Terratex EP

2.1.6 Sd1-Sediment Barrier

A temporary structure made of silt fence supported by steel or wooden posts, sandbags, straw bales or other filtering material.

Sediment Barrier Type 'A' (Sd1-A)

Fabric height	36-inches
Trench Depth	6-inches

Fence Posts	48-inches long 1 1/2-inch by 1 1/2-inch Oak 3-inch diameter or 2-inch by 4-inch softwood Steel 1.3 Lbs/Ft Minimum
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Approved silt fence fabrics

Amoco CEF 2019
Beltech 755 & 890
Cady bag Company 20-CSF 350/26
LINQ Industrial Fabrics, Inc. GTF-200S
Geotex 914SC, 915SC
TNS Advanced Technologies TNSW101
Terratex GASF
Willacoochee Industrial Fabrics, Inc. 1215 Silt Fence

PART 3 EXECUTION

3.1 PERFORMANCE REQUIREMENTS

Erosion control devices shall be installed as shown on the plans (and elsewhere as deemed necessary) and are required for all earth areas disturbed by grading and construction operations. The extent of disturbed areas is shown on the construction plans. Erosion control activities include but are not limited to:

- Initial installation of erosion control devices
- Implementation of Best management Practices (BMP's)
- Application of temporary ground cover
- Maintenance of erosion control devices for the duration of the construction period.
- Application of permanent ground cover
- Removal of erosion control devices

3.1.1 Non-Compliance

Upon notification by the JWSC/ENGINEER of non-compliance with this specification, the Contractor has seven (7) days to address and install additional erosion control devices or otherwise correct the deficiencies noted.

3.1.2 Temporary Erosion Control Measures

Contractor shall install, maintain, repair and/or replace all temporary erosion control measures including, but not limited to, the following:

- Silt fences
- Construction exits
- Check Dams

The Contractor shall be responsible for providing additional erosion control measures as needed to prevent sediment from leaving the site. Contractor shall be responsible for all additional costs associated with additional erosion control measures.

3.1.3 Maintenance of Erosion Control Measures

The Contractor is responsible for maintenance, repair and/or replacement of erosion control measures throughout the construction period due to any of the following causes:

- Downed silt fences
- Washed out silt fences and rock
- Vandalism
- When silt overburdens structure
- Erosion of earth or dam
- Damage due to abnormal weather conditions

3.2 SEQUENCE OF EVENTS

Best Management Practices (BMP's) shall be implemented during construction activities from commencement of construction to completion. Schedule grading operations so as to minimize the time that denuded soils are exposed. Any exposed area left undisturbed for a period of 14 days or longer shall be stabilized with mulch or temporary seeding.

3.3 INSTALLATION AND MAINTENANCE

3.3.1 Ds1 - Disturbed Area Stabilization (Mulching Only)

Install mulch on all building pad area left for more than seven (7) days. Mulch shall re-applied whenever ground cover is less than 90%.

Dry straw or hay shall be applied uniformly at a depth of 2-inches to 4-inches by hand or by mechanical equipment. Straw or hay mulch shall be anchored immediately after application. Mulch can be pressed into the soil with a disk harrow using packer disk. Mulch spread with special blower-type equipment may be anchored with emulsified asphalt, tackifiers and/or binders.

Wood waste shall be applied at a depth of 2-inches to 3-inches.

Cut back asphalt shall be applied at the rate of 1200 gallons per acre.

Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection.

3.3.2 Ds2 - Disturbed Area Stabilization (Temporary Seeding)

All disturbed areas shall be seeded within seven (7) days of the completion of land disturbing activities or when land disturbing activities are to be discontinued for longer than two weeks. Seed areas outside buildings, walks and paving not to immediately receive permanent grass or landscaping with temporary seed producing fast growing cover resistant to erosion.

Maintenance of seeded areas shall include but not be limited to watering, re-fertilization, weeding, mowing and repairing washouts and gullies.

3.3.3 Ds3 - Disturbed Area Stabilization (Permanent Vegetation)

Permanent vegetation and structural control measures must be installed as soon as practicable.

3.3.4 Cd - Check Dams

Construct temporary ditch checks of stone, sand or cement bagged, rip-rap, or treated timber post in all ditches and drainage areas on or adjacent to the work area and/or as shown on the plans. The toe of the upstream dam shall be at the same elevation as the top of the downstream dam. The height of check dams shall be 24-inches maximum at center. Check dams shall be 9-inches lower at the center than the outer edges. Side slopes shall be 2:1 or flatter.

3.3.5 Co - Construction Exit

Contractor shall provide temporary construction exits at all locations where vehicles exit the construction site. The stone pad thickness shall be at least 6-inches and shall cover the full width of the entrance. In no case shall the pad width be less than 20 feet. The length of the stone pad shall be at least 50 feet. A layer of geo-textile fabric shall be placed between the stone pad and the soil surface as specified in paragraph 2.1.6 above. Periodically add a 2-inch thick top dressing to maintain pad effectiveness and sprinkle regularly to settle accumulated sediment.

3.3.6 Sd1 - Sediment Barriers

Construct silt fences in accordance with applicable regulations and details. Sediment barriers shall be installed at the toe of all embankments or at the perimeter of all disturbed areas and shall be located to interrupt silt transport conveyed by surface runoff.

Remove, re-distribute and compact sediments which accumulate behind silt fences when such accumulations reach one-half the original height of the barrier and immediately before beginning temporary grassing operations.

Replace fabric whenever it has deteriorated to such extent that the effectiveness of the barrier is compromised or every six months, whichever comes first.

3.4 CONCRETE WASHOUT AREAS

Contractor shall provide at least one 10' by 10' washout area for the disposal of excess concrete, mortar and similar products. Washout areas shall be cleaned as needed. Washout areas shall be completely removed after construction has been completed. Remove all concrete and silt and dispose of materials in an approved landfill. Backfill, grade and stabilize area.

3.5 REMOVAL OF TEMPORARY DEVICES

Temporary erosion control devices shall remain in place and be properly maintained until one of the following has occurred:

A permanent device has been installed to replace the function of the temporary device.

The Contractor has achieved 95% stabilization of disturbed areas and a Notice of Termination has been submitted.

Remove erosion control devices installed under this contract and any erosion control devices left from previous phases of work.

(END OF SECTION)

**SECTION 02220
TRENCHING EXCAVATION, BEDDING AND BACKFILL**

PART 1 GENERAL

1.1 SCOPE

The work of this section includes trench excavation, dewatering, bedding, backfilling and all other work required for the installation of underground water, and sewer systems as shown on the drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

02120	Erosion, Sedimentation and Pollution Control
02555	Water Distribution System
02650	Sanitary Sewer System

1.3 APPLICABLE STANDARDS

All work to be performed in accordance with applicable provisions of the Southern Standard Building Code, OSHA Safety Requirement, State and Local Ordinances and other authorities having jurisdiction.

All construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, subpart P, revised July 1, 1995.

If local authorities have standard specifications for pavement removal and replacement, work shall be done in accordance with such standards.

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

1.4 PROTECTION

1.4.1 Existing Utilities

Contractor shall contact the Utilities Protection Center at 1-800-282-7411 at least 72 hours in advance of trenching operations. The location of existing underground utilities shown on the plans is based upon the best information available and may not accurate or complete. The Contractor shall verify the location of all underground utilities prior to commencing work and shall be responsible for the protection of same. Any damage to existing utilities shall be promptly repaired at the Contractor's expense to the full and complete satisfaction of the utility owner.

1.4.2 Existing Structures

Contractor shall protect from damage all existing structures, roads, sidewalks, curbing, etc. against damage from foot or vehicular traffic. Install and maintain adequate barricades, planking, bridging as necessary. Underpin or otherwise support adjacent structures, including service lines and pipe chases, to prevent damage by excavation work.

1.4.3 Excavations

Protect excavations by shoring, sheeting, bracing or other means as required to prevent cave-ins or loose dirt from falling into excavated trenches. Methods and procedures utilized shall conform to, as a minimum, the requirements of OSHA and other governing authorities having jurisdiction.

1.5 QUALITY ASSURANCE

Tests for compaction and density, where required, shall be conducted by an independent testing laboratory selected by the JWSC and paid for by the Contractor. The Contractor shall make all necessary excavations and provide access to the work by the testing laboratory. The cost of all retests made necessary by the failure of materials to conform to the requirements of these specifications shall be paid for the Contractor.

PART 2 MATERIALS

2.1 BEDDING AND BACKFILL MATERIALS

Pipe bedding and backfill materials shall be as follows:

Class I:

This Class includes angular, 1/4-inch to 1-1/2-inch graded stone including a number of fill materials including coral, slag, crushed stone and crushed shells.

Class II:

This Class includes coarse sands and gravels with maximum particle size of 1-1/2-inches including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this Class.

Class III:

This Class includes fine sand with clayey gravels including fine sands, clay-sand mixtures, and gravel-clay mixtures. Soil types GM, GC, SM and SC are included in this Class.

Class IV:

This Class includes silt, silty clays and clays including organic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH and CL are included in this Class.

Class IV materials may only be used with the approval of the Engineer.

Class V:

This Class includes the organic soils OL, OH and PT as well as soil containing frozen earth, debris, rocks larger than 1-1/2-inches in diameter and other foreign materials. **Class V materials shall not be used.**

PART 3 EXECUTION

3.1 EXCAVATION

The contractor shall examine the work site and inform himself fully as to the nature of all materials to be encountered during excavation for the construction of the various facilities and related appurtenances. The contractor shall perform excavation of all substances encountered to the depth shown on the drawings.

During excavation, pile excavated materials that are suitable for backfilling in an orderly manner and at a sufficient distance from the trench banks to avoid overloading and prevent slides or cave-ins. Remove and dispose of unsuitable material in a manner acceptable to the JWSC.

Grade work site as necessary to prevent surface water from flowing into trenches or other excavations and remove any water accumulating therein by pumping or other approved methods.

Excavation shall not be carried below the required level. Where excavation is carried below the grade indicated through error, the contractor shall refill to the proper grade with Class I or Class II material as directed by the JWSC to obtain a suitable pipe support.

Where wet or otherwise unsuitable material incapable of properly supporting the pipe, as determined by the JWSC/Engineer, is encountered in the trench bottom, the Contractor shall remove such soil or unsuitable material, dewater to the depth required and backfill trench to proper grade with a foundation of Class I or Class II material as directed by the JWSC to obtain a suitable pipe support.

3.2 DEWATERING

The contractor shall keep all excavations clear of water while pipe and appurtenances are being installed. All water pumped or bailed from trenches and other excavated areas shall be conveyed to a point of discharge where it will cause no hazard to the safety and protection of the public, to private property or to other work in progress.

Provide all necessary equipment including well points, pumps, piping and temporary drains sufficient to handle both surface and subsurface water. Maintain equipment for the duration of trench exposure to the elements.

3.3 PIPE BEDDING

Pipe bedding shall be Class A, B, C or D as specified below or as shown on the construction plans.

Rigid pipe includes ductile iron (DIP), reinforced concrete (RCP), or steel pipes with or without coatings. Flexible pipe includes PVC and HDPE.

3.3.1 Bedding Classifications

The following bedding classifications shall be used as specified below or where shown on the drawings.

Class A:

This bedding class shall consist of a continuous concrete cradle or a concrete arch with granular bedding. Locations shall be as shown on the drawings.

Class B:

Class B Standard - shall consist of granular Class I material placed a minimum of 4-inches below the pipe and continuing to the spring line of the pipe.

Class B Modified - shall consist of granular Class I material placed a minimum of 4-inches below the pipe and continuing to 6-inches above the top of the pipe.

Class C:

This bedding class shall consist of granular Class I material placed a minimum of 4-inches below the pipe with Class II or Class III material continuing to the spring line of the pipe.

Class D:

This bedding class shall consist of a native undisturbed earth trench bottom with an area excavated for the pipe bell. This bedding class may only be used for dry trench conditions. If the trench becomes wet, Class B bedding shall be used.

3.3.2 Bedding Requirements

Bedding requirements for the various piping systems shall be as shown in the following table.

PIPE SYSTEM	BEDDING CLASS
Sanitary & Storm Sewers (Gravity)	
Rigid Pipe	Class C
Flexible Pipe	Class B Modified
Watermains & Force mains	
Rigid Pipe	Class C
Flexible Pipe	Class B Standard

Bedding material under and around the pipe shall be placed in 6-inch layers and compacted by rodding, spading or with approved vibratory equipment to obtain not less than 98% standard proctor as determined by ASTM Method D698.

3.4 BACKFILLING

If unsuitable materials are encountered, such materials may not be used for backfilling operations and shall be removed from the site. Unsuitable material includes but is not limited to debris, muck, clay, large clods, stones, wood, stumps, and roots. Prior to backfilling, piping and appurtenances shall be observed by the JWSC's Inspector.

Contractor shall carefully backfill trenches with approved materials. Only Class III (or Class IV if approved by the JWSC/Engineer) materials shall be used. Backfill materials shall be free from large clods of earth or stone and shall be deposited in 6-inch layers and carefully compacted until the following densities are obtained:

Areas under structures	100% Standard Proctor (ASTM D698)
Areas under walks and pavements	98% Standard Proctor (ASTM D698)
Areas under lawns and landscaping	95% Standard Proctor (ASTM D698)

Re-open improperly backfilled trenches (trenches where settlement occurs, or where tests indicate non-compliance with the densities specified above) to depth required for proper compaction. Then refill and compact with surface restored to required grade.

3.5 PAVEMENT REMOVAL AND REPLACEMENT

3.5.1 Removal

Where necessary to cut existing pavements, curbs and gutters, walks, driveways, etc. make cut with neat parallel straight lines at least 12" wider than the required trench width on each side.

3.5.2 Replacement

Replace pavements, curbs and gutters, walks and driveways with the same materials and cross section as the original except when otherwise detailed on the construction plans.

Backfill open trenches across roadways, or other areas to be paved as specified in Paragraph 3.4 above except backfill entire trench depth in 6-inch layers, moisten and compact each layer to density of 100% of standard proctor test, so that paving of area can proceed immediately after backfilling is complete.

3.5.2 Temporary Surfaces

Use temporary road surface of gravel or crushed stone as approved. Maintain one-way traffic at all times and street must be fully opened to traffic as quickly as possible. Completely remove temporary materials and dispose of when permanent pavement is placed.

(End of Section)

SECTION 02555
WATER DISTRIBUTION SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary to install, test, disinfect (where required) and place into operation the water distribution system as shown on the drawings, as specified herein and as required for a complete and operational system.

1.2 SUBMITTALS

Complete shop drawings and product data on all piping and fittings shall be submitted to the Engineer in accordance with the requirements of Section 01340 of these specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340 Shop Drawings
02220 Trench Excavation, Bedding and Backfill

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

The contractor shall furnish and install water distribution systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise. All materials shall be new.

2.2 PIPING

Pipe sizes and applications shall be as indicated on the plans and shall conform to the following table.

Pipe Size and Application Table

Pipe Material	Pipe Size	Joint Types	Applications
PVC (ASTM D2241 SDR-21)	2-inch	Push-on Joint – Below Ground	Potable Water
Polyethylene Tubing	≤2-inch	See Specifications Below	Water Services

2.2.1 PVC Pressure Pipe

Pipe shall be virgin polyvinyl chloride (PVC) pressure pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Provisions must be made for expansion and contraction at each joint with flexible ring gaskets made of rubber or other suitable material. Elastomeric seals shall meet ASTM F477.

PVC pressure pipe two (2) inches in diameter and smaller shall conform to ASTM D2241, Class 200 SDR-21 with push-on type jointing. Glued or Solvent weld joints shall not be used. PVC 1120, SDR-21 fittings shall be injection molded push-on bell type with elastomeric rubber seals in accordance with ASTM D3139. Seals shall conform to ASTM F477. Pipe for domestic potable water mains shall be **blue** in color with each length marked with name of the manufacturer, pressure rating, nominal pipe diameter and the seal of the National Sanitation Foundation (NSF).

2.2.2 Polyethylene Tubing

All water services two (2) inches in diameter and smaller shall be manufactured of PE 3408, high density polyethylene in accordance with AWWA C901, ASTM D1248, ASTM D2239, ASTM D2737 and ASTM D3350. Tubing shall have a minimum working pressure of 200 PSI, shall be copper tube size SDR-9 and shall be blue in color. Couplings shall be made of bronze with compression fittings on both ends suitable for connection to polyethylene tubing with inserts.

Tubing shall be approved for use with potable water by the National Sanitation Foundation and shall be continuously marked at intervals of not more than four (4) feet with the nominal size, pressure rating, NSF seal, manufacturer's name, standard dimension ratio and ASTM specification.

2.3 WATER VALVES AND APPURTENANCES

Water valves shall be of the size and type shown on the approved construction plans. All valves shall open by turning left or "counter-clockwise". Extension stems on buried valves will be used only at the direction of the Engineer.

2.3.1 Gate Valves (<4-inch)

Gate valves two (2) inches to three (3) inches in diameter shall be non-rising stem, resilient seat wedge type with epoxy coated iron body and two (2) inch square operating nut. Valve shall conform to the applicable requirements of AWWA C509 and ASTM A126 Class B with threaded ends and designed for 200 PSI working pressure.

2.3.2 Valve Boxes

Valve boxes shall be cast iron, heavy duty roadway, screw type adjustable to six (6) inches up and down from the nominal required cover over the pipe. Six (6) inch PVC C900 Pipe shall be used to extend valve boxes to grade. Cast iron castings shall be manufactured of

clean, even grain, gray cast iron conforming to ASTM A48, Class 20B. Valve boxes shall have cast iron drop covers with the word "WATER" stamped on it.

2.3.3 Yard Hydrants

Yard hydrant shall be high capacity freeze proof type hydrants as Merrill Manufacturing C-1000 Series or approved equal with the following features:

- Inlet – 1" NPT in no lead brass casting
- Outlet – ¾" no-lead hose thread & outside of nozzle has 1" pipe thread
- Stainless steel operating rod
- Teflon packing
- Stainless steel and molded rubber plunger made of self-lubricating material
- 1" no-lead galvanized pipe

2.4 WATER SERVICES AND APPURTENANCES

2.4.1 Corporation Stops

Corporation stops are required on all water services. Corporation stops shall be made of brass conforming to AWWA C800, ASTM B62 and/or ASTM B584 and shall accommodate the full working pressure of the system. The inlet connection shall be AWWA standard iron pipe (IPT) thread. The outlet connection shall be compression type for polyethylene tubing.

2.4.2 Curb Stops

Curb stops shall be ball valve type conforming to AWWA C800. Curb stops shall be made of brass conforming to AWWA C800, ASTM B62 and/or ASTM B584 and shall accommodate the full working pressure of the system. Service line connections shall be compression type for polyethylene tubing.

2.4.3 Double Strap Tapping Saddles

Double strapped tapping saddles shall be epoxy coated ductile iron body type with NPT service outlet. The saddles shall have a self-energizing, o-ring rubber gasket, two alloy steel straps, and a female iron pipe tap conforming to AWWA C800.

2.5 BACKFLOW PREVENTION DEVICES

Provide reduced pressure zone backflow preventers where shown on the drawings. Backflow preventers shall be rated for operation with inlet water pressures up to 175 psig and water temperatures up to 140°F. Backflow preventers shall be tested and certified in accordance with ASSE 1013, AWWA C506, and USC-FCCCHR.

Provide with bronze body construction, rubber check valve and relief valve assemblies, and Clecon check seats.

Provide isolation valves on the inlet and outlet of each backflow preventer. These valves shall be ¼ turn, full port, resilient seated, bronze ball valves.

Provide bronze body ball valve test cocks.

Provide bronze body strainer on the inlet.

Acceptable manufacturers: Watts Series 909, Wilkins, Hersey.

2.6 MISCELLANEOUS ITEMS

2.6.1 Detection Tape

Detection tape shall be composed of a solid aluminum foil encased in a protective plastic jacket. The tape shall be safety blue in color, shall be at least two and half (2-1/2) inches wide and will bear the printed identification "CAUTION: BURIED WATER LINE BELOW".

2.6.2 Tracer Wire

Water pipe tracer wire shall be AWG 12/1, single conductor solid copper with blue jacket, UL rated suitable for direct burial, temperature range -20° C to 60° C, 600 Volts RMS.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground and the interior of pipe and fittings shall be kept free of dirt and debris. Store non-metallic piping and rubber gaskets under cover and protect from exposure to sunlight.

Valves, hydrants, and other appurtenances shall be handled to ensure delivery at the point of installation in sound, undamaged condition. If coating or linings of pipe or fittings are damaged, such pipe and fittings shall be removed from the site and new materials furnished. Pipe shall not be dragged.

3.2 INSTALLATION

The contractor shall install all pipe, valves, hydrants and other appurtenances in accordance with the specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise.

3.2.1 Pipe and Fittings

3.2.1.1 General Requirements

Excavation, cleaning, laying, jointing and backfilling shall follow as closely as possible during prosecution of the work. In no case shall pipe be left in the trench overnight without completing the jointing. All precautions shall be taken to

prevent sand, dirt and debris from entering the pipe during installation. Any time that pipe installation is not in progress, open pipe ends shall be closed by a watertight plug or other method approved by the JWSC/Engineer.

Plugs shall remain in pipe ends until all water has been removed from the trench and any foreign material that enters the pipe shall be removed immediately. No pipe shall be installed when trench or weather conditions are unsuitable for such work.

Water lines shall not be laid closer than ten (10) feet horizontally from a sanitary sewer main unless otherwise indicated on the drawings or directed by the JWSC/Engineer. Sanitary sewer lines shall pass beneath water lines with the top of the sewer being at least eighteen (18) inches below the bottom of the water line, Where sewer lines cross water lines, no joints in the sewer line shall be located closer than ten (10) feet horizontal distance from the water line.

3.2.1.2 Pressure Pipe

All PVC C900 pipe shall be laid in accordance with AWWA C605. All ductile iron pipe and fittings shall be laid in accordance with the manufacturer's recommendations and AWWA C600. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints.

Pipe alignment and gradient shall be straight or shall follow true curves as near as practicable. Curvature in pipe lines, where required, shall be well within (no more than 80% of) the manufacturer's allowable joint deflection or laying radius for the pipe supplied. Otherwise fittings shall be required.

Pipe shall be laid with a minimum cover of forty two (42) inches in paved areas and thirty six (36) inches in unpaved areas with an allowable maximum of sixty (60) inches. Cover in paved areas shall be measured from crown of pipe to finish grade. Greater depths are permissible when required to clear obstructions, conflicts, etc.

Contractor shall furnish and install locate wiring on all non-metallic pressure mains. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy five (475) foot intervals (maximum). In addition, all pressure mains shall have detection tape installed two (2) feet above the pipe.

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

3.2.2 Valves

All buried valves shall be carefully mounted in their respective positions free from distortion and strain. Valves shall be placed as shown on the drawings. Gate valves shall be installed as near as possible to tee and cross fittings. The contractor shall check all exposed bolts on all valves to ensure that they are tight prior to installation. Where required, extension stems shall be furnished and located as directed by the Engineer.

Adjustable valve boxes shall be installed with each buried valve, placed vertically and concentric with the valve stem. Any valve box which has been moved from its original position by trench settlement or other causes, and which prevents the use of a valve wrench for opening and closing of the valve, shall be reset by the Contractor prior to final acceptance. The entire assembly shall be plumb.

In unpaved areas, a poured in place reinforced concrete valve pad shall be installed around all valve boxes. The concrete thickness shall be four (4) inches for poured in place collars. The top of poured in place collar shall be level with the top of the cast iron valve box and level with the *final grade*.

3.2.3 Backflow Prevention Devices

Backflow prevention devices shall be installed in accordance with the manufacturer's instructions and AWWA M14.

3.3 DISINFECTION

Upon satisfactory completion of the hydrostatic test (where applicable), all new potable water lines and other pipe related installations which may have been contaminated by the work shall be disinfected in accordance with AWWA C651, the Rules for Safe Drinking Water as published by the Georgia Environmental Protection Division, and as outlined below. The contractor shall disinfect all new water lines in the presence of the Engineer.

Prior to disinfection, water lines shall be thoroughly flushed to remove contaminated materials from the line. The contractor is referred to AWWA C651 for precautions during construction and procedures for flushing.

Disinfection shall be accomplished by introducing chlorine into the main to be disinfected. The disinfection procedure used may be any of the methods or procedures outlined in AWWA C651. A chlorine residual of at least 25 milligrams per liter (mg/l) shall be maintained for 24 hours in the water line to be disinfected. After the 24 hour holding or contact period, the heavily chlorinated water shall be flushed from the main until the chlorine residual within the main reaches the level of chlorine normally carried in the distribution system (1.0 mg/l). De-chlorination of the flushing water may be required if the highly chlorinated water is to be discharged directly to a surface water stream or storm drain system. If the water can be sheet-flowed over a large area or discharged to a holding pond, de-chlorination may be avoided.

SECTION 02555
WATER DISTRIBUTION SYSTEM

After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24-hours apart, shall be collected from the new main.

At least one set of samples shall be collected from every twelve-hundred (1200) linear feet of new water main, plus one set from the end of each line and at least one set from each branch. The JWSC/Engineer will determine the number and location of the required sampling points to meet the current standards. All required sampling taps shall be installed by the contractor, at his expense, prior to disinfection.

The collection of samples and bacteriological testing will be performed by the JWSC at the Contractor's expense unless noted otherwise on the construction plans. If the bacteriological tests are unsatisfactory, disinfection procedure shall be repeated until satisfactory results are obtained.

(END OF SECTION)

**SECTION 02650
SANITARY SEWER SYSTEM**

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary to install, test, and place into operation the precast concrete wetwell top, valve pit, gravity sewer mains, pump station discharge piping and valves, effluent flow meter, HDPE forcemain with related fittings and appurtenances as shown on the drawings, as specified herein and as required for a complete and operational system.

1.2 SUBMITTALS

Complete shop drawings and product data in accordance with the requirements of Section 01340 of these specifications shall be submitted on all the following items:

1. Round precast manhole and wetwell bottoms, riser sections and top
2. Complete product data on wetwell and influent manhole coating system
3. Square and rectangular precast structures (Flow Meter Vault)
4. Complete product data on all piping, valves, flow meter and appurtenances

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340 Shop Drawings
02220 Trench Excavation, Bedding and Backfill
11210 Submersible Sewage Pumps

PART 2 PRODUCTS

2.1 PIPING

The contractor shall furnish piping systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise. All materials shall be new. Pipe sizes and applications shall be as indicated on the plans and shall conform to the following table.

Pipe Size and Application Table

Pipe Material	Pipe Size	Joint Types	Applications
Ductile Iron	≥ 4-inch	Mech. Joint – Below Ground Flanged Joint – Above Ground Flanged Joint – Inside Structures	Sewage Forcemains
PVC (AWWA C900 DR-18)	4 to 12-inch	Push-on Joint – Below Ground	Sewage Forcemains
PVC (ASTM D2241 SDR-21)	3/4 to 8-inch	Push-on Joint – Below Ground	Sewage Forcemains
PVC (ASTM D3034 SDR-26)	4 to 15-inch	Push-on Joint – Below Ground	Gravity Sewer Mains
HDPE (DR-11)	≥2-inch	Fused – Below Ground Flanged – Inside Structures	Sewage Forcemains

2.1.1 Polyvinyl Chloride (PVC) Pipe and Fittings

Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. All PVC sanitary sewer pipe shall be green in color. Storage and handling of PVC pipe shall be in accordance with Chapter 6 of AWWA Manual M23.

2.1.1.1 PVC Gravity Sewer Pipe

Gravity sewer pipe shall be PVC 1120, Class 160, SDR-26 and shall conform to ASTM D3034 for size 4-inch through 15-inch and ASTM F679 for 18-inch through 36-inch.

The pipe material shall be clean, virgin, National Sanitation Foundation approves, Class 12454-B PVC compound conforming to ASTM resin specification D1784 with wall thickness T-1. Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3212. Elastomeric seals shall meet ASTM F477 or ASTM F913. The pipe shall be designed to pass without failure a sustained pressure test of 340 PSI in conformance with ASTM D1598 and a quick burst test of 400 PSI in conformance with ASTM D1784.

2.1.1.2 PVC Fittings

Fittings shall meet the requirements of ASTM D3034 and ASTM F1336 for sizes 4-inch through 15-inch in diameter and ASTM F679 and ASTM F1336 for sizes 18-inch through 36-inch in diameter with minimum wall thickness of SDR-26. Fittings shall be gasket joint type meeting the requirements of ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 or ASTM F913. PVC material shall have a cell classification of 12454-B in accordance with ASTM D1784.

2.1.1.3 PVC Pressure Pipe

PVC force main piping shall be green in color and shall be either SDR-21 Class 200 meeting the requirements of ASTM D2241 with elastomeric integral bell gasketed joints meeting the requirements of ASTM D3036; or AWWA C900 and C905 DR-18. Fittings on PVC force mains shall be ductile iron as specified under Section 2.1.2 below.

2.1.2 Ductile Iron Pipe and Fittings

All buried ductile iron pipe shall have mechanical joints or push-on type pipe joints. Buried fittings shall be mechanical joint with mega-lug type joint restraints. Exposed or above ground ductile iron pipe and fittings shall have flanged joints.

2.1.2.1 Pipe

Ductile iron pipe wall thickness and pressure class shall conform to ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151) with pressure class 350 as a minimum. Pipe shall be clearly marked with the name of the manufacturer, location of the foundry, pressure rating, thickness or pressure class, nominal pipe diameter, weight of pipe without lining, maximum depth of bury and length. All pipe furnished by the approved manufacturer shall be cast and machined at one foundry location to ensure quality control and provide satisfactory test data. All ductile iron pipe for sewer service shall be color coded green by field painting green stripe, three (3) inches wide along the crown of the pipe barrel.

2.1.2.2 Fittings

Ductile iron fittings shall have a minimum working pressure of 350 PSI. Fittings shall conform to ANSI A21.10 (AWWA C110), ANSI A21.11 (AWWA C111), ANSI A21.15 (AWWA C115) and/or ANSI A21.53 (AWWA C153). Compact fittings shall normally be installed. Long body fittings shall be used where shown on the drawings, where compact fittings are not available, or at the option of the Contractor when the laying length is not controlled by compact fitting patterns. All fittings shall be UL/FM approved and shall conform to NSF Standard 61 as applicable. All fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to ensure quality control and provide satisfactory test data. Fittings shall have cast on them the pressure rating, nominal diameter, manufacturer's name, foundry location, plant code and degrees or fraction of a circle. Cast letters and figures shall be on the outside body of the fitting.

2.1.2.3 Coatings

All buried ductile iron pipe and fittings shall be externally coated with a bituminous coating as specified in ANSI A21.51 and be continuous, smooth, neither brittle when cold or sticky when exposed to the sun, and be strongly adherent to the fitting. If pipe is installed in a corrosive soil, all nuts, bolts, studs and other uncoated parts of joints for underground installation shall be coated with asphalt or coal tar prior to backfilling. All exposed or above ground ductile iron pipe and fittings shall be painted in accordance with Section 09900 of these specifications.

All ductile iron pipes and fittings for sewer service applications shall be Sewer Safe internally lined with an approved amine cured novalac epoxy coating containing at least 20% by volume of ceramic quartz pigment.

2.1.3 High Density Polyethylene (HDPE) Pipe and Fittings

All interior wetwell discharge piping shall be IPS DR-11 (160 PSI) flange by flange high density polyethylene (HDPE) pipe with 316 stainless steel backup rings, nuts, bolts and washers. Each discharge leg shall be one continuous pipe joint.

2.1.4 Joint Restraints

Force mains shall have mechanically restrained joints at changes in direction. The restrainer shall be manufactured of ductile iron and shall meet or exceed the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shall provide anchoring of ductile iron pipe or fittings or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance.

2.2 PRECAST CONCRETE STRUCTURES

2.2.1 Wetwell

Precast wet well base, sections and related structures shall be of the size indicated on the drawings and shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall be minimum 4,000 psi concrete meeting the requirements of ASTM C150 (specification for Portland cement, type II). Precast sections shall be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches. Lifting devices for handling precast section components shall comply with OSHA Standard 1926.704. Wetwell coatings shall be in accordance with Section 09900 of these specifications.

Wall thickness shall be determined by the precast manufacturer and shall **be not less than** 1/12th the inside diameter in inches plus one (1) inch. Ring reinforcement shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. Bases for wet wells shall be cast integrally with the bottom section.

A Flexible Neoprene-EPDM pipe connector, conforming to ASTM C443 shall be used to connect the sewer influent pipe to the precast concrete wet well. The connector shall be a minimum of three-eighths (3/8) inches thick or greater and resistant to ozone, weathering, aging, chemicals and petroleum products. The securing bands shall be stainless steel and screw assembly and totally non-magnetic Series 304 stainless steel. The connector shall be of a size specifically designed for the specified pipe material and size. The interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout. The exterior (below grade) of precast concrete wet wells shall be given two coats of an approved bituminous water proofing materials.

2.2.2 Round Precast Concrete Manholes

Precast concrete manholes or calcium aluminate cement concrete manholes used shall conform to all requirements of ASTM Designation C478 at minimum and be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches. Lifting devices for handling precast manhole section components shall comply with OSHA Standard 1926.704. Manhole coatings shall be in accordance with Section 09900 of these specifications.

2.2.2.1 Top Section

Top Section shall be cast monolithically and shaped as an eccentric cone except that a concentric cone shall be used for manhole depths 5-feet or less. Joint systems must match associated riser or base sections. The clear opening for the manhole frame and cover shall not be less than 24-inches for main sewers 6-inches 18-inches in diameter, and not less than 32-inches for main sewers greater than 18-inches in diameter.

Where manhole depth will not permit a diameter transition or cone section, a precast flat slab top section shall be provided with a 24-inch or 32-inch diameter hole (as required above) for the manhole frame and cover opening.

2.2.2.2 Riser Section

Riser sections shall be cast monolithically and have a minimum length of 16-inches. Joint systems must match associated riser, cone or base sections.

2.2.2.3 Base Section

Base sections shall be cast monolithically and have a minimum length of 16-inches. Joint systems must match associated riser sections.

2.2.2.4 Manhole Inverts

Manhole inverts shall be precast and provide clearance for pipe projecting a minimum of 2-inches inside the manhole wall. For straight through flow manholes, troughs shall be formed and finished to the same slope as the incoming and outgoing sewer mains. Manholes placed at changes in grade or direction shall be formed and finished to provide a minimum drop of 0.10-feet between the inlet and outlet pipes.

The minimum thickness of precast inverts from the bottom of the lowest invert to the bottom of the base shall not be less than 8- inches. Benches shall have a uniform 2:1 slope from the high point at the manhole wall to the lip of the invert trough. The invert trough shall have a minimum depth of ½ of the main pipe

diameter. Precast inverts shall be free from depressions, high points, voids, chips or fractures over ¼-inch in diameter or depth.

Hand-formed inverts, when approved for use, shall meet or exceed the durability, strength, configuration and hydraulic "smoothness" required for precast inverts. Filler for hand formed inverts shall be holed burned brick.

2.2.2.5 Manhole Steps

Manhole steps shall be provided on the vertical or straight wall of 4-foot and 5-foot diameter manholes and shall be aligned vertically on 16-inch centers. Steps shall be secured to the manhole wall with a compression fit in tapered holes or cast in place. Steps shall be coated with a copolymer polypropylene plastic coating, reinforced with a ½-inch diameter grade 60 bar, and be provided with serrated treads and tall end lugs. Step pullout strength shall be 2000 lbs. minimum when tested according to ASTM C497. Steps shall begin no less than 18-inches from the manhole rim and end no closer than 16-inches above the manhole bench.

Manhole steps shall not be used on manholes greater than 5-feet in diameter or where a concentric cone or flat-slab top is the final section.

2.2.2.6 Pipe Connections

Provide preformed rubber boots at all pipe connections to manholes. Rubber boots, with stainless steel fasteners shall be equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation.

2.2.3 Square and Rectangular Precast Structures and Vaults

Precast concrete sections shall meet the requirements of ASTM C 913. The minimum 28-day compressive strength of the concrete in precast sections shall be 4,000 PSI.

The design of each structure shall be the responsibility of the manufacturer and shall conform to ACI 318 and the minimum structural design loading requirements as defined in ASTM C 890. The minimum design dead load shall be based on the depth shown on the drawings.

Precast sections shall be manufactured such that the spigot end is at the top of each section. Dimensions for square and rectangular precast sections, where required, are shown on the drawings.

2.3 MANHOLE FRAMES AND COVERS

Manhole frames and covers shall be Gray Cast iron conforming to specification ASTM-A48 Class 35B. Castings shall be of uniform quality, and free from blowholes, porosity, hard spots, shrinkage distortion and other defects. Frames and covers shall be smooth, well-cleaned by shot blasting and shall remain unpainted. All castings shall be manufactured true to pattern, and component parts shall fit together in a satisfactory manner. The frame and cover shall be designed to withstand an AASHTO H-20 wheel loading. The frame and cover shall have an "O" Ring type rubber seal or neoprene gasket designed to eliminate or significantly reduce surface water infiltration, have two non-penetrating pick-holes in the cover and four one (1) inch diameter anchor holes in the frame flange. The cover shall read "Sanitary Sewer".

Manhole frames and covers on 4-foot diameter manholes shall have a minimum inside opening diameter of not less than 23-inches and no more than 24-inches. Manhole frames and covers on 5-foot diameter manholes and greater shall have a minimum inside opening diameter of not less 30-inches and not more than of 31-inches.

Manhole frames and covers within easements or in areas where security is an issue shall be equipped with manhole locking devices or bolt down covers.

2.4 VALVES

All lift stations shall be equipped with an isolation valve, check valve and gauge fitting on its discharge header. The common manifold header for the pumps shall be equipped with a combination air/vacuum release valve and isolation valve to isolate the entire pumping system from the serving force main.

2.4.1 Plug Valves

Lift station isolation valves shall be plug valves mounted horizontally on the discharge header. All plug valves shall be non-lubricated eccentric plug type with Buna "N" neoprene, epoxy or fusion bonded, nylon faced plugs. Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be of stainless steel. The interior of all plug valves shall be epoxy coated. Plug valves shall be rated for a minimum of 150 PSI and shall provide drip tight shut off with this pressure in either direction.

Port areas of four (4) inch through twelve (12) inch valves shall be 100% of full pipe area. Valve seat shall consist of either a welded 1/8-inch overlay of pure nickel, or shall be 316 stainless steel screwed into the cast iron body.

Upper and lower plug stem bearings shall be sleeve type of a stainless steel or other non-corrosive bearing material. The packing shall be adjustable and the bonnet shall be bolted. All bolts, nuts and washers shall be 316 stainless steel.

Plug valves up to six (6) inches in size shall be lever operated. All plug valves eight (8) inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel

with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each gear actuated valve.

Plug valves shall be as manufactured by Dezurik

2.4.2 Check Valves

Lift station check valves shall be swing check valves mounted horizontally on the discharge header upstream of the isolation plug valve. Swing check valves shall conform to the requirements of AWWA C508. All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.

Swing check valves larger than two (2) inches in diameter shall be rated for a working pressure of 150 PSI. Valves shall have a cast iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to steel outside lever and stainless steel spring, swing type with straight away passageway of full pipe area. The valve shall have a renewable bronze seat ring and rubber faced disk.

Swing check valves two (2) inches in diameter and smaller shall be all brass swing check valves with a 200 PSI working pressure.

Check valves shall be as manufactured by Clow.

2.4.3 Air Release Valves

Lift station air release valves shall be combination air and vacuum release valves placed on the discharge header manifold piping upstream of the manifold's station isolation valve on the common header.

Combination air release valves shall have a minimum inlet size of two (2) inches, stainless steel internal trim (including float, lever arm, linkage, etc.), stainless steel assembly bolts, and stainless steel ball valves. The body of the air valve shall be of composite material, stainless steel (SAE 316) or ductile iron.

Air release valves shall be Model D-025 as manufactured by A.R.I. optimal Flow Solutions.

2.5 DISCHARGE GAUGE FITTINGS

A discharge gauge fitting shall be installed on the discharge header of each submersible pump a minimum of six (6) inches upstream from the discharge valve. Gauges shall be 4-1/2 inch diameter glycerin filled Wika discharge gauge, graduated in one (1) PSI increments (0 to 60 PSI) and one (1) foot increments of water (0 to 140 feet) scale range. Gauges shall be provided in plastic protective cases and equipped with quick disconnects. Complete assembly to include gauge, 316 stainless steel nipple approximately two (2) inches in length, 1/4 inch stainless steel ball valve and a 1/4 inch NPT quick connect coupler.

2.6 MAGNETIC FLOW METER

Furnish, install and test electromagnetic flowmeters and all necessary appurtenances on lift station discharge piping at the locations indicated. The function of the flowmeter shall be to measure, indicate and transmit the flow of a conductive process liquid in a full pipe.

2.6.1 Type

Electromagnetic flowmeter with operation based on Faraday’s Law utilizing pulsed dc coil excitation. The meter shall utilize a full bore flow tube with magnetic field traversing the entire cross-section. Insertion style, multiple point probes inserted into a spool piece, or “liner less” spool piece designs with modular sensors inserted into standpipes are not acceptable. The unit shall be suitable for raw wastewater or liquids with a minimum conductivity of 5 microS/cm. Meter shall be Emerson Process Management – Rosemount Division model 8750WA Magmeter. See Specification Section 01600 for restrictions and requirements for substitutions, product and manufacturer options, and construction method options.

2.6.2 Operating Temperature

Flow Tube:	Ambient Process	5°F to 150°F 0°F to 140°F for polyurethane
Transmitter:	Ambient Storage	-20°F to 140° (For surface mount w/integral display) -22°F to 175°F (For surface mount)

2.6.3 Performance

Flow Ranges:	Site specific - to suit pumping requirements						
	<table border="0" style="width: 100%;"> <tr> <td style="width: 60%;">Minimum flow</td> <td style="width: 20%; text-align: center;">0</td> <td style="width: 20%; text-align: right;">GPM</td> </tr> <tr> <td>Maximum flow</td> <td style="text-align: center;">600</td> <td style="text-align: right;">GPM</td> </tr> </table>	Minimum flow	0	GPM	Maximum flow	600	GPM
Minimum flow	0	GPM					
Maximum flow	600	GPM					
Accuracy:	Plus or minus 0.5% of rate for all flows resulting from pipe velocities of one (1) to thirty (30) FPS, with option for 0.25% of rate						
Turndown ratio:	Minimum of 30 to 1 when flow velocity at minimum flow is at least one (1) FPS						
Repeatability:	Plus or minus 0.1% of reading						
Response Time:	0.2 seconds maximum response to step change in output						
Stability:	Plus or minus 0.1% of rate over six (6) months						

Ambient Temperature Effect: 0.25% over operating temperature range

2.6.4 Features

The flowmeter shall be equipped with the following features:

- Ability to check zero alignment without stopping flow
- Capable of measuring bi-directional flow
- Low flow adjustable between 0.01 FPS and 1 FPS. Below selected value, output is driven to the zero flow rate signal level
- Non-volatile totalizer
- Forward, reverse and net totals
- 75 process updates per second

2.6.5 Process Connection

Meter size:	(Site specific)	6	inches
Connection Type:	150-pound ANSI raised-face flanges		
Flange Material:	Carbon steel		

2.6.6 Materials of Construction

Power Transmitter:	120V ac, 60 Hz		
Flow Tube:	Meter Tube	316 SS	
	Liner Material	Polyurethane	
	Coil Drive Power	Not less than 0.5 Amps	
	Electrode Type	Flush	
	Electrode Material	316 SS or Hastelloy-C	
	Grounding Rings	316 SS	
	Enclosure	NEMA 4X 316 SS	

2.6.7 Transmitter

Transmitter shall be field mounted with digital LCD display indicating flow rate and total. Parameter adjustments shall be by keypad or non-intrusive means. Enclosure shall be NEMA 4X 316 SS dual compartment housing with the terminal block isolated from the electronics compartment.

Empty Pipe Detection:	Drives display and outputs to zero when empty pipe is detected
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4 to 20 mA Output Signal:	Isolated 4 to 20 mA, jumper selectable as internally or externally powered 5 to 24 volt dc, 0 to 1000 ohm load
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	Supports superimposed digital HART protocol for reading totalized flow values
Frequency Adjustment:	0 to 10,000 Hz, externally powered at 5 to 24 volt dc Transistor switch closure supports power loads up to 2W for frequencies up to 4,000 Hz and 5 volt dc at 0.1W at maximum frequency of 10,000 Hz Pulse can be set to equal desired velocity or volume in user selectable engineering units Pulse width adjustable from 1.5 to 500 msec, below 1.5 msec pulse width automatically switches to 50% duty cycle
Discrete Outputs:	Two discrete outputs rated for up to 30 volts typical Programmable for the following typical parameters: <ul style="list-style-type: none">• High/low flow rates• Percent of range• Empty pipe zero• Fault conditions
Discrete Inputs:	Configured for the following typical parameters: <ul style="list-style-type: none">• Reset totalizer• Change rate• Hold output constant• Drive output to zero• Low flow cutoff
Output Testing:	Analog output test – transmitter may be commanded to supply a specific current between 3.75 and 23.25 mA Pulse output test – transmitter may be commanded to supply a specified frequency between 1 pulse/day and 10,000 Hz
Damping:	Adjustable between 0.0 and 256 seconds
Cables:	Cables used to interconnect the flow tube and transmitter for remote operation shall be standard Belden or Alpha equivalent, lengths as required to accommodate device locations

Built-in Diagnostics:

Features:

- Field programmable electronics
- Self-diagnostics with troubleshooting codes

Meter verification capability

- Coil resistance
- Coil signature value
- Electrode resistance
- High process noise detection
- Electronics temperature monitoring
- Wiring and grounding verification
- Coil fault detection
- Empty pipe detection

Fully functional diagnostics in AMS Device manager including help screens with troubleshooting guidance

Transmitter shall be capable of interoperability with flow tubes from all manufacturers. This includes the ability to drive the flow tubes at different coil currents and provide meter verification diagnostics for the magmeter system.

The flow meter system will be verifiable without an external device.

Factory Calibration:

Shall be calibrated in an ISO 9001 and NIST certified facility

Factory flow calibration system must be certified by volume or weight certified calibration devices

2.7 MISCELLANEOUS ITEMS

2.7.1 Detection Tape

Detection tape shall be provided on all gravity sewer and force mains. Detection tape shall be at least two inches wide mylar encased metal marking tape and will bear the printed identification "CAUTION: SEWAGE FORCE MAIN BELOW" or "CAUTION: GRAVITY SEWER MAIN BELOW". Detection tape shall be buried eight to twelve inches below plan finished grades.

2.7.2 Tracer Wire

Tracer wire shall be installed on all buried PVC force mains. Tracer wire shall be continuous or properly spliced single strand No. 10 solid plastic coated (30 mil) copper wire from iron fitting to iron fitting.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground and the interior of pipe and fittings shall be kept free of dirt and debris. Store non-metallic piping and rubber gaskets under cover and protect from exposure to sunlight.

Precast concrete manholes and other appurtenances shall be handled to ensure delivery at the point of installation in sound, undamaged condition. If coating or linings of pipe or fittings are damaged, such pipe and fittings shall be removed from the site and new materials furnished. Pipe shall not be dragged.

3.2 INSTALLATION

The contractor shall install all pipe, fittings, valves, wetwells, manholes and appurtenances in accordance with the specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise.

3.2.1 Pipe and Fittings

The type, class, grade, and alignment of sewer pipe may be changed only at manholes. Sanitary sewer mains crossing under storm drains shall be installed in a casing pipes centered under the storm drain.

3.2.1.1 General

Excavation, cleaning, laying, jointing and backfilling shall follow as closely as possible during prosecution of the work. In no case shall pipe be left in the trench overnight without completing the jointing. All precautions shall be taken to prevent sand, dirt and debris from entering the pipe during installation. Any time that pipe installation is not in progress, open pipe ends shall be closed by a watertight plug or other method approved by the Engineer.

Plugs shall remain in pipe ends until all water has been removed from the trench and any foreign material that enters the pipe shall be removed immediately. No pipe shall be installed when trench or weather conditions are unsuitable for such work.

Sewer mains shall not be laid closer than ten (10) feet horizontally from a water line unless otherwise indicated on the drawings or directed by the Engineer. Sanitary sewer lines shall pass beneath water lines with the top of the sewer being at least eighteen (18) inches below the bottom of the water line. Where sewer lines cross water lines, no joints in the sewer line shall be located closer than ten (10) feet horizontal distance from the water line.

Trench excavation, bedding, backfill and compactions shall be in accordance with Section 02220 of these specifications.

3.2.1.2 Pressure Pipe

All PVC C900/C905 pipe shall be laid in accordance with AWWA C605. All ductile iron pipe and fittings shall be laid in accordance with the manufacturer's recommendations and AWWA C600. Each section of pipe shall rest upon the pipe bed for the full length of its barrel, with recesses excavated to accommodate bells and joints.

Pipe alignment and gradient shall be straight or shall follow true curves as near as practicable. Curvature in pipe lines, where required, shall be well within (no more than 80% of) the manufacturer's allowable joint deflection or laying radius for the pipe supplied. Otherwise fittings shall be required.

Forcemain pipe shall be laid with a minimum cover of forty two (42) inches in paved areas and thirty six (36) inches in unpaved areas with an allowable maximum of sixty (60) inches. Cover in paved areas shall be measured from crown of pipe to finish grade. Greater depths are permissible when required to clear obstructions, conflicts, etc.

Contractor shall furnish and install locate wiring on all non-metallic pressure mains. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy five (475) foot intervals (maximum). In addition, all pressure mains shall have detection tape installed two (2) feet above the pipe. Tracer wire and detection tape shall be as specified in Paragraph 2.7 of this Section.

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

3.2.1.3 Non-Pressure Pipe

Plastic piping installation shall be in accordance with ASTM D2321. Pipe laying shall proceed upgrade with pipe bells on the upper end. Pipe to be laid with joints close and even, butting all around. Sagging joints will not be tolerated. Pipe shall be straight and of uniform grade between manholes, laid to line and grade. Bell holes shall be dug so that the pipe barrel will carry the load of the pipe.

Where sewers or force mains, are to be connected to existing manholes or other structures, and where no stub or opening has been provided for the connection, the Contractor shall core drill an opening of minimum diameter through the side wall of the existing structure for inserting the sewer pipe. A flexible rubber boot shall then be installed to seal around the new pipe for a watertight connection.

The Contractor shall install a continuous run of plasticized metallic detection tape above the top of the sewer main at 12" to 18" below finished grade. Detection tape shall be as specified in Paragraph 2.6 of this Section.

3.2.2 Wet Wells and Manholes

Wet wells and manholes shall be installed at the locations and elevations shown on the plans. Standard details for the installation of precast concrete wet wells manholes are provided on the construction plans. Outside drop connections shall be installed where indicated.

Wet well and manhole coatings shall be in accordance with Section 09900 of these specifications.

3.2.3 Manhole Frame and Covers

The top rim of manhole frames and covers shall be set to conform to grades and transverse slopes. Manhole rim elevations are indicated on the plans but shall be adjusted as required to meet these specifications. Generally along outfall lines, the manhole frame and covers shall extend approximately 6" above finish grade or to a designated elevation for flood protection. Generally along paved streets and parking areas, and other unpaved areas subject to vehicular traffic the manhole frames and covers shall be set flush with the surface.

Grade rings, where necessary to serve as spacers between the top cone of the manholes and the base of the manhole cover frame to bring the manhole to design or finish grade, shall be hard rubber in paved areas and high density polyethylene or cement rings in off road applications. Adjustments using clay or cement brick are not acceptable. On new construction, an adjustment using metal riser rings to extend the manhole cover frame to grade is not permitted. No adjustment using grade rings between the top cone section and the manhole cover frame shall exceed 12-inches.

3.2.4 Valves

All valves and appurtenances shall be installed in the locations shown on the drawings, true to alignment and properly supported. Any damaged items shall be repaired to the satisfaction of the JWSC/Engineer before they are installed.

Install all valve boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the drawings. Flanged or buried mechanical joints shall be made with cadmium plated bolts. All exposed bolts shall be cadmium plated bolts. All exposed bolts and nuts and all above ground valves shall be painted in accordance with Section 09900 of these specifications

3.2.5 Discharge Gauge Fittings

The gauge fittings shall be installed on discharge header piping a minimum of six (6) inches upstream from each pumps check valve. The gauge fitting shall be installed by drilling and tapping a ¼-inch NPT hole, installing a 316 stainless steel nipple, a ¼-inch stainless steel ball valve, another 316 stainless steel nipple to the ball valve and attaching a ¼-inch NPT quick connect coupler to the nipple.

3.3 FORCE MAIN TESTING

Force mains shall be hydrostatically tested to 1.5 times the working pressure of the associated lift station or 100 PSI whichever is greater in accordance with the procedures of AWWA C600. Testing shall be observed by the JWSC inspector.

All installed isolation, air release and check valves shall be tested for proper operation. Force main tracer wire shall be checked for continuity along the pipe run and checked at terminus points for proper connection.

(END OF SECTION)

**SECTION 02820
CHAIN LINK FENCES AND GATES**

PART 1 GENERAL

1.1 WORK INCLUDED

Provide all labor, materials and equipment necessary for the installation of a complete fence system to the limits and at the locations shown on the construction plans.

1.2 SUBMITTALS

Complete shop drawings and product data shall be submitted in accordance with the requirements of Section 01340 of these specifications.

1.3 RELATED WORK SPECIFIED ELSEWHERE

01340 Shop Drawings

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

Overall height for new fencing shall be 8-feet including three strands of barbed wire. Posts shall be set at no more than 10-foot centers and anchored a full three feet deep in concrete footings poured to the limits of the excavation. Corner posts shall have the necessary strut and tie bracing. Provide gates of the sizes and at the locations indicated.

2.2 MATERIALS

2.2.1 Fence Posts, Rails and Appurtenances

All fence posts, rails and appurtenances shall be hot dipped galvanized with a minimum of 0.9 ounces per square foot of surface area. Dimensions of the various members shall be as follows:

Member	Dimension
Corner Posts	3.0-inch O.D. (5.79 #/Ft)
Intermediate Posts	2.5-inch O.D. (3.65 #/Ft)
Gate Posts	4.0-inch O.D. (9.11 #/Ft)
Gate Frames	2.0-inch O.D. (2.72 #/Ft)
Braces	1.625-inch O.D. (2.27 #/Ft)
Top Rails	1.625-inch O.D. (2.27 #/Ft)

2.2.2 Fence Fabric

Fence fabric shall be steel chain link fabric of No. 9 gauge aluminum coated steel fabric

woven into a 2" mesh with black PVC coating. Fabric shall be 72" wide. Fence fabric shall conform to the requirements of ASTM A491. Continuous tension wire shall be provided at the lower edge of the mesh.

2.2.3 Barbed Wire

Barbed wire shall consist of three strands of 12-1/2 gauge galvanized wire with 14 gauge 4 point round barbs spaced not more than 5" apart.

2.2.4 Concrete

Concrete for fence posts shall be 3,000 PSI.

2.2.5 Gates

Gates shall be complete with latches, stops and hinges. Gate frames shall be as specified in Paragraph 2.2.1 above. Welds shall be painted with aluminum or zinc based paint. Fabric shall be as specified for the fence material. Provisions for padlocking shall be provided.

2.2.7 Miscellaneous Hardware

All miscellaneous hardware shall conform to the Chain Link Fence Manufacturer's Institute standards. All parts shall be galvanized.

PART 3 EXECUTION

3.1 PRODUCT DELIVERY, STORAGE AND HANDLING

The contractor shall inspect all materials delivered to the job site for damage. Materials shall be unloaded and stored with a minimum of handling. Materials shall be stored above ground.

3.2 INSTALLATION

Fence posts shall be uniformly spaced and shall not exceed 10 on centers. Line posts shall be set in 16" diameter holes, 36" deep with a 33" post embedment. Corner posts shall be set in 24" diameter holes, 36" deep with a 33" post embedment. Post holes shall be filled with concrete.

Terminal and gate posts shall be set as specified above and braced to the nearest post. Intermediate posts shall have waterproof tops with cast openings through which the tops rails pass.

Tension wire shall be stretched taut between terminal posts and securely fastened to intermediate posts 6" above finished grade line. Fabric shall not be stretched until concrete footings have cured for a minimum of 3 days.

(END OF SECTION)

SECTION 02960 TEMPORARY SEWER BYPASS SYSTEM

PART 1 GENERAL

1.1 WORK INCLUDED

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

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

1.2 SUBMITTALS

Bypass Systems Plan: The Contractor shall submit to the JWSC/Engineer detailed Drawings and shop drawings outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing sewer flows. The Bypass Systems Plan shall be specific and complete, including such items as schedules, locations, capacities of equipment, materials, connections, fuel storage, and all other incidental items necessary to provide satisfactory bypassing operations and backups for each of the proposed activities identified in paragraph 1.1

The Bypass Systems Plan shall provide sufficient detail to ensure proper protection of the existing forcemains and gravity sewer, and other relevant JWSC facilities, including protection of the access and bypass pumping locations. **No bypassing activities or construction shall begin until all provisions and requirements have been reviewed and approved by the JWSC and Engineer.** The Bypass Systems Plan shall include, but is not limited to, the following details for each of the proposed activities identified in paragraph 1.1:

1. Detailed drawings showing all required equipment and staging areas for pumps, tanks, fuel storage, and piping within the project site at PS4021 and/or Glynn County right-of-way areas;

2. Plugging methods and types of plugs;
3. Number, size, material, location and method of installation of suction piping;
4. Number, size, material, method of installation and location of installation of discharge piping;
5. Bypass pump sizes, capacity, number of each size to be on site and fuel requirements;
6. Pump curves showing pump operating range are to be submitted;
7. Fuel storage information and tank size;
8. Thrust and restraint block sizes and locations as necessary in accordance with manufacturer/supplier of LineStops, Insert Valves, and other equipment to be installed within piping;
9. Sections showing suction and discharge bypass piping depth, embedment, select fill and special backfill, and any equipment necessary to maintain vehicular and construction equipment in driveways and parking areas; modification of existing structures including manholes to allow for efficient installation of bypass pumping equipment and operation.
10. Method of noise control for each bypass pump. Dunbar Creek WPCP is located within a residential area.
11. Any temporary pipe supports and anchoring required;
12. Design for access to bypass system operation locations indicated on the Drawings and specified herein;
13. Calculations and selection of bypass pump pipe size(s);
14. Schedule for installation of and maintenance of bypass pumping lines.
15. Emergency plan for adverse weather and flooding for various phases of the Work and bypass system operation locations.
16. Contractors plan for providing continuous monitoring of the bypass pumping operations including qualifications of any onsite monitoring persons and specifications of any electronic monitoring operations.
17. Necessary restoration including repairs to existing structures which were modified to install and operate bypass pumping equipment.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

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

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

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

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

The pumps shall be diesel/fuel powered, unless otherwise approved.

All pumps shall be sound attenuated and equipped with quiet packs.

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

All pumps shall be High Pressure Solids Handling Self-Priming Pumps as manufactured by Thompson Pump & Manufacturing Co., Inc. in state of Georgia, Godwin Pumps by Xylem, or JWSC/Engineer approved equal.

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

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

2.2 COORDINATION

The Contractor shall submit a Sequence of Bypass Operations in accordance with 2.1 which details the interruptions to be made which the Contractor shall be fully responsible for. One week prior to connections being made to existing structures or pipes, a coordination meeting shall be held between the Contractor, Engineer, and JWSC to discuss the approved construction plan.

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

PART 3 EXECUTION

3.1 PREPARATION

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

The Contractor shall be responsible for all physical damage to existing infrastructure caused by human or mechanical failure.

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

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

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

3.2 INSTALLATION AND REMOVAL

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

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

When the bypass pipelines cross driveways or local streets, the Contractor must place the bypass pipelines in trenches and cover with traffic rated plates or temporary pavement.

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

(END OF SECTION)

DIVISION 03

SECTION 03000 CONCRETE WORK

PART 1 GENERAL

1.1 SUMMARY

Furnish and install cast-in-place concrete as shown and indicated on the Drawings and as specified in this Section, complete.

All formwork, reinforcing, sleeves, inserts, piping, hangers, anchors frames, and other items to be built into the concrete work shall be correctly positioned, secured and inspected by the Engineer prior to placing concrete.

1.2 SUBMITTALS

Submit concrete design mix and shop drawings on reinforcing, admixtures, waterstops and curing compound for the Engineer's review prior to any work.

1.3 STORAGE AND PROTECTION

All materials shall be stored and protected in accordance with the requirements of these Specifications.

1.4 QUALITY ASSURANCE

All concrete work shall be in accordance with the provisions of the American Concrete Institute's Building Code Requirements for Reinforced Concrete, Latest Edition (ACI 318), unless specified or noted otherwise.

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

Materials for use in concrete work including admixtures, aggregates, cement, form material, reinforcing and water shall be in accordance with the following:

1. Cement: All cement shall be Type I and meet the requirements of ASTM C 150.
2. Aggregates: Aggregates shall conform to requirements of ASTM C 33.
3. Water: Mixing water for concrete shall be fresh, clean and potable.
4. Admixtures: For each 100 pounds of cement the following amount of admixture shall be provided in accordance with the manufacturer's recommendations:

- a. For air temperatures below 70 degrees F, provide 3 to 6 ounces of Master Builder's Pozzoloth 344-N (or 122-N) or 2 ounces of Sika Chemical Company's Plastocrete-A.
- b. For air temperature above 70 degrees F, provide 3 ounces of Master Builder's Pozzoloth 300-R or 3 ounces of Sika Chemical Company's Plastocrete-A.
- c. An air-entraining admixture conforming to the requirements of ASTM c 260, equal to Master Builder's MB-AE 10, shall be used in all concrete exposed to freezing temperatures. The air content of freshly mixed airetrained concrete, as determined by the method of ASTM C 233, shall be not less than three percent not more than six percent. The air-entrained admixture is in addition to the admixture specified in a. or b. above.

5. Formwork

- a. Form Material: Forms shall be of plywood or architectural type steel panel forms.
- b. Form Oil: Form oil shall be non-staining, paraffin base type oil equal to Chevron K Pale40 as manufactured by Standard Oil Company.
- c. Form Ties: Form ties shall have a minimum working strength of at least 3,000 pounds when fully assembled and shall be of the snap or break type with a water stop in the center. Ties shall be free of cones, washers or other devices which will leave a hole larger than 7/8-inch diameter in the exposed surface of the concrete. Ties shall be such that when forms are removed no metal shall be within 1-1/2 inches of the finished surface.
- d. Chamfer Strips: Chamfer strips shall be placed in forms for exposed corners of columns and exposed edges of beams, slabs an curbs. Chamfer Strips shall have a minimum dimension of 1-inch.

6. Reinforcing Steel: Reinforcing steel shall be properly supported and secured in position before concrete is placed.

- a. Reinforcement Bars. Bar reinforcing steel shall conform to the requirements of ASTM A 615 Grade 60. The reinforcement shall be bent cold to the shapes indicated on the Drawings. This shall be done in the shop, before shipment, and not in the field, unless otherwise noted on the Drawings or directed by the Engineer
- b. Wire Fabric: Wire fabric for concrete reinforcement, shall conform to the requirements of ASTM A 185.
- c. Bending: Hooks of 90 degrees shall have a radius bend of the axis of the bar of not less than six bar diameters plus an extension of 12 bar diameters at the free end.

7. Waterstops: In expansion joints and in construction joints not shown as expansion joints, waterstops shall be polyvinyl chloride (PVC) and shall incorporate a galvanized steel wire along both edges which shall be used to secure the waterstop in position during concrete placement. Waterstop shall be Wirestop Type No. CR-9380, Vinylex Waterstop Type No. RB-38r or approved equal. The waterstop shall extend the entire length of the joint and all splices shall be heat welded and tested in accordance with the manufacturer's instructions.

8. Non-Shrink Grout

a. All grout shall be non-metallic, non-shrink type. Cement shall be Type III Grout shall meet the following requirements:

Criteria	Test Method	Result
Workability	ASTM C 191	Initial set time not less than 60 minutes
Compressive Strength	ASTM C 109 (restrained condition)	One day - 3,000 psi
Shrinkage	ASTM C 827 and CRD 621	No shrinkage after placement or shrinkage after set

b. The contractor shall furnish independent laboratory test results as evidence of full compliance with these requirements.

9. Standard Grout: Grout which is required by the Drawings or Specifications and is not otherwise specified, shall be composed of one part of cement and three parts of sand. Grout shall have a maximum water/cement ratio of 5.0 U.S. gallons per 94 pound bag of cement.

10. Epoxy Bonding Compound: Epoxy bonding shall be 100 percent solids with a minimum bond strength of 2,100 psi at 14 days. Epoxy bonding compound shall be equal to Sikadur Hi-Mod.

11. Expansion Joint Filler: Joint filler shall be a preformed type meeting the requirements of ASTM D 1751.

12. Curing Compound: Curing compound shall be an all resin-cure (not acrylic) based compound conforming to ASTM C309, Type I, Class B. The curing compound shall form a moisture impermeable film which retains a minimum of 95 percent of the mixing water beyond the required curing time. Curing compound shall be equal to Meadows Sealtight CS-309.

PART 3 EXECUTION

3.1 PLACING AND FASTENING AND REINFORCING

Unless otherwise called for, provisions of the American Concrete Institute's Building Code Requirements for Reinforced Concrete (ACT 318), shall be strictly followed.

All reinforcement shall be furnished in full length as indicated on the Drawings. No splicing of bars, except where shown on the Drawing, will be permitted.

Splices which are permitted, shall have a lap of not less than forty times the diameter of the bar, unless otherwise shown. Splices shall be well distributed or otherwise located at points of low tensile stress.

3.2 CONCRETE COMPOSITION AND MIXING

Concrete shall be proportioned by weight to give an ultimate compressive strength of 4,000 psi at 28 days when sampled and tested in accordance with ASTM C 31 and C 39. Concrete shall contain not less than 517 pounds of cement per cubic yard of concrete. The mix design shall provide for a slump of 3-inches minimum, 5-inches maximum.

Ready-Mix: All reinforced structures shall be constructed using ready-mix concrete. Ready-mix concrete shall be mixed and transported in accordance with ASTM C 94.

Batch Mixing on Site: Non-reinforced concrete may be batch mixed. The concrete shall be mixed in a batch mixer conforming to the requirements of the Mixer Manufacturers Bureau of the Associated General Contractors of America. The mixer shall bear a manufacturers rating plate indicating rated capacity and the recommended revolutions per minute, and shall be operated in accordance with these recommendations. It shall be equipped with a suitable charging hopper, water storage tank and a water-measuring device, and shall be capable of thoroughly mixing the aggregates, cement and water into a uniform mass within the specified mixing time, and of discharging the mix without segregation.

The batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to insure that the batch cannot be discharged until the required mixing time has elapsed. When concrete of normal weight is specified, controls shall be provided to insure that no additional water may be added during mixing. The entire batch shall be discharged before mixer is recharged.

Each batch of two cubic yards or less shall be mixed for not less than 1-1/2 minutes. The mixing time shall be increased by 15 seconds for each additional cubic yard or fraction thereof.

The mixer shall be clean and the pickup and throw over blades in the drum shall be replaced when they have lost 10 percent of their original depth.

Admixtures

1. Air-entraining and chemical admixtures shall be charged into the mixer as a solution and shall be dispensed by an automatic dispenser or similar metering device. Powdered admixtures shall be weighed or measured by volume as recommended by the manufacturer. The accuracy of any admixture shall be within \pm three percent.
2. Addition of retarding admixtures shall not be significantly delayed after the addition of the cement

3.3 PLACING

Before concrete is placed, steel forms shall be uniformly coated with form oil and wood forms shall be thoroughly wetted.

Concrete shall be placed to avoid the segregation or separation of aggregates, and displacement of reinforcing. Concrete shall not be allowed to drop freely more than four feet.

All concrete shall be placed in daylight, the placing of concrete in any portion of the work shall not be begun if such work cannot be completed by daylight.

Concrete shall not be placed when the atmospheric temperature is below 40 degrees F. If after placing concrete the temperature drops below 40 degrees F, the Contractor shall cover, heat and protect the work in a manner to keep the air surrounding the fresh concrete at a temperature not less than 45 degrees F for period of five days after concrete is placed.

Concrete shall be compacted by the use of mechanical internal vibrating equipment supplemented by hand spading. Vibrating shall not be used to transport concrete within forms. Internal vibrators shall maintain a speed of at least 5,000 impulses per minute when submerged in concrete.

Keys shall be formed in all construction joints.

Waterstops shall be used where shown on the Drawings and as directed by the Engineer.

3.4 FINISHING

All exterior concrete surfaces shall be finished to minimum 12-inches below finish grade. Interior concrete surfaces within buildings, and other surfaces shall be finished to 12 inches below finish grade. Interior concrete surfaces within buildings, and other such surfaces exposed to view shall be finished.

The interior of basins shall be finished to a level not less than 12-inches below overflow level. Concrete not exposed to view, therefore not specified to be finished, shall have rough edges tooled off and shall be pointed and spot finished to fill irregularities.

1. Vertical Surfaces

- a. When concrete has set sufficiently to permit, forms and form ties shall be carefully removed. All depressions resulting from removal of form ties and all other holes and rough places shall be thoroughly wetted with water and pointed with sand cement grout.
- b. After pointed surfaces have set sufficiently to permit, all surfaces specified to be finished shall be kept wetted with water and rubbed with a carborundum stone of medium fineness or other equally good abrasive, to bring the surface to a smooth texture and to remove all form and tie marks.

2. Slabs

- a. After concrete has been placed, struck off, consolidated and leveled, it shall not be worked further until ready for floating. Floating shall begin when the WATER sheen has disappeared and the mix has hardened sufficiently that the weight of a man standing on it leaves only a slight imprint on the surface. The surface shall then be consolidated by hand floating with wood floats.
- b. After floating, interior surfaces shall be steel troweled until the surface is free from trowel marks or other imperfections, uniform in texture and appearance and true to plane.
- c. Immediately after the floating has been completed, exterior surfaces shall be given a coarse transverse scored texture by drawing a broom or burlap belt across the surface.

3.5 CURING

A curing compound as previously specified shall be applied to all concrete surfaces except those which are to receive future concrete or mortar. The compound shall be applied in accordance with the manufacturer's recommendations.

3.6 TESTING

All testing shall be performed by an independent laboratory and paid for by the Owner.

Required Tests: The following tests of materials and concrete are required to be conducted in accordance with the current ASTM Standards.

1. Test Cylinders: Cylinders shall be made and cured in accordance with ASTM C 31. One set of five cylinders from the same batch of concrete shall be made for each day's placing of concrete.

2. Two cylinders from each set shall be broken at seven days and two and 28 days in accordance with ASTM C 39. The test results shall be the average of the strengths of the cylinders tested at 28 days. One cylinder shall be held as a spare to be broken at 56 days in the event that cylinders broken at 28 days do not meet specified values.
3. All sampling, molding, transporting, storing, curing, preparation for breaking and testing of cylinders shall be the responsibility of the laboratory and shall be performed by qualified laboratory personnel. The Contractor shall supply wheelbarrows, shovels mixing boards and shaded area for molding cylinders, and similar equipment required by the laboratory representative for molding test cylinders.
4. Slump Tests: At least two slump tests shall be made on each day that concrete is placed. One slump test shall be made at the time cylinders are made for compression tests. Tests shall meet ASTM C 143.
5. Test Results: The laboratory shall send one copy of all reports to the Engineer, one copy to the Contractor and one to the ready mix plant. Concrete test reports shall include slump tests and state where concrete was used in the structure.

3.7 IMPERFECT OR DAMAGED WORK

Defective or damaged work, or any work damaged before final acceptance, shall be satisfactorily removed and replaced in accordance with the requirements of the Drawings and Specifications. Removal and replacement of concrete work shall be done in such a manner that the strength of the structure will not be impaired. All testing required to verify compliance with the Specifications and ACI Code shall be paid for by the Engineer.

3.8 CLEANING

Upon completion of the work, all forms, equipment, protective coverings and rubbish resulting therefrom shall be removed from the premises. Finished surfaces shall be left in a condition satisfactory to the Engineer.

(END OF SECTION)

DIVISION 09

SECTION 09900 PAINTING

PART 1 GENERAL

1.1 WORK INCLUDED

The work of this section includes furnishing all labor, materials and equipment required to clean and paint exposed ductile iron piping systems and equipment as described herein and as shown on the drawings.

1.2 SUBSTITUTIONS

To the maximum extent possible, all coatings shall be the products of a single manufacturer. Guidelines for determining acceptability of substitutions are given in Section 01600 of these specifications. Contractors intending to furnish substitute materials or equipment are cautioned to read and strictly comply with these guidelines

1.3 SUBMITTALS

Complete manufacturer's literature in accordance with the requirements of Section 01340 of these specifications shall be submitted.

The Contractor shall submit to the Engineer the following information:

1. A list of all components (paints or other materials) to be used in each painting system required herein.
2. A complete descriptive specification, including manufacturer's data sheet, of each component.
3. Prior to completing the purchase and delivery of the coating material selected by the Contractor, the Contractor shall obtain a letter from the material supplier stating that the selected material is suitable and compatible for application and use as directed under these Specifications, and that if properly applied will provide metal protection and a pleasing appearance for five years or longer.
4. A color chart for each product to be applied.

1.4 PAINTING REQUIREMENTS

Finish paint all new and exposed ductile iron piping (interior and exterior) systems including steel straps at pipe supports. Exposures and surfaces are defined in Part 3 of this Section, Paragraph 3.6. Items to be left unfinished or to receive other types of finishes are specifically shown on the drawings or specified. Properly protect existing finish painted items and surfaces from damage throughout the project. Repair any damage to existing coatings in accordance with the requirements of this Section, at no expense to the Owner.

1.5 QUALITY ASSURANCE

The following information shall be included on the label of all containers of materials supplied under this Section:

1. Manufacturer's Name
2. Type of paint or other generic identification
3. Manufacturer's stock number
4. Color (if any)
5. Instructions for mixing, thinning or reducing (as applicable)
6. Manufacturer's application recommendations
7. Safety and storage information

All coating material used on this project shall be purchased specifically for this project and furnished in new, unopened containers.

1.6 PRODUCT HANDLING

Deliver materials in original, sealed containers of the manufacturer with labels legible and intact. Each container shall be clearly marked or labeled to show paint identification, date of manufacture, batch number, analysis or contents, and special instructions. At all times a copy of every component's MSDS shall be available.

1.7 MATERIAL SCHEDULES

Material schedules included in Part 2, Paragraph 2.2 of this Section list prime coats, intermediate coats, finish coats and cover coats that comprise a complete and compatible system of surface protection for a particular substrate. Maintain the unity of these systems, making sure all coats applied to any surface are from the same system and same manufacturer. Verify with the manufacturer the compatibility of the materials used.

PART 2 PRODUCTS

2.1 COATING MATERIALS

The only acceptable manufacturers and products shall be those listed in the material schedules below. All applicable data currently published by the paint manufacturer relating to surface preparation, coverage, film thickness, application technique, drying and over coating times is included by reference as a part of this section. It is the responsibility of the Contractor to obtain and fully understand the appropriate data sheets for the coatings specified.

Paints shall be factory mixed and delivered to the site in unbroken original packages bearing the manufacturer's name and brand designation and shall be applied in strict accordance with the manufacturer's printed instructions. Two component coatings shall be mixed in accordance with the manufacturer's instructions. All two component coatings, once mixed, shall be applied within the pot-life recommended by the manufacturer. Paints, thinners, driers, varnish, etc., shall be of the best grade and shall be furnished by the coating manufacturer for use with the specified

paints.

The Owner will select the colors to be used on the various portions of the work. Provide color cards for the coatings proposed. Where more than one coat of paint is required, job tint off-shade the paint for each undercoat to show complete coverage.

Material Schedules

SYSTEM: 247						
TYPE: POLYURETHANE						
USE: EXTERIOR FERROUS METALS						
SURFACE PREPARATION: SP-6						
Coat	Minimum Dry Film Thickness (Mils)	Ameron	Carboline	Induron	Sherwin Williams	Tnemec
1 st	3.0	Amercoat 370 or 385	Carboguard 893 SG	Amourguard P-14 Primer	Macropoxy 646 FC Epoxy	Series 66-1211 Epoxoline
2 nd	4.0 – 6.0	Amercoat 370 or 385	Carboguard 893 SG	Amourguard Epoxy	Macropoxy 646 FC Epoxy	Series 66-Color Epoxoline
3 rd	2.0 – 3.0	Amercoat 450 Series	Carbothane 134 HG	Indurethane 5500 Enamel	Sherthane 2K Urethane	Series 1074-Color Endura-Shield IV
System	11.0					

2.3 MIXING AND TINTING

When possible, all paints and other materials shall be mixed and tinted by the paint manufacturer prior to delivery to the job site. When job site mixing and/or tinting is required, the manufacturer’s recommendations shall be strictly adhered to. The Contractor shall be solely responsible for the proper conduct of all on-site mixing and/or tinting.

2.4 PIPE AND EQUIPMENT IDENTIFICATION

Different colors will be used on pumps, motors, valves, piping systems and other surfaces as shown in the Table below.

Pipe Identification and Color Coding

Pipe System	Paint Colors		Stencil Text
	Pipe	Letters and Arrows	
Raw Sewage	To Be Selected by Owner	White	Raw Sewage

PART 3 EXECUTION

3.1 GENERAL

Protect other surfaces from paint and damage. Furnish sufficient shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted. Repair damage as a result of inadequate or unsuitable protection.

No coat of paint shall be applied until the surface has been inspected and accepted by the

Engineer. The Contractor shall give at least 24 hour notice to the Engineer when cleaning is to be performed to prevent inspection delays. The Contractor shall provide the necessary access for inspection by the Engineer.

Shop applied prime coatings which are damaged during transportation, construction or installation shall be thoroughly cleaned and touched up in the field as directed by the Engineer. The Contractor shall use repair procedures which ensure the complete protection of all adjacent primer. The specified repair method and equipment may include wire brushing, hand or power tool cleaning, or dry air blast cleaning. In order to prevent injury to surrounding painted areas, blast cleaning may require use of lower air pressure, small nozzle and abrasive particle sizes, short blast nozzle, distance from surface, shielding and masking. If damage is too extensive or uneconomical to touch up, then the item shall be re-cleaned and coated or painted as directed by the Engineer.

3.2 ENVIRONMENTAL CONDITIONS

Environmental conditions which affect coating application include, but are not necessarily limited to, ambient air temperature, surface temperature, humidity, dew point and environmental cleanliness. Comply with the manufacturer's recommendations regarding environmental conditions under which coatings may be applied.

Surface preparation and cleaning of the exterior surfaces must be performed during periods of still air or only a slight breeze so that fall out of the dust produced does not drift onto adjacent property. The Owner reserves the right to temporarily stop the Contractor from exterior blasting (or painting) when by observation it is apparent that the wind direction or velocity prevents compliance with this requirement. Any cleanup of fall out on adjacent property shall be the responsibility of the Contractor. All blast residue shall be properly disposed of off-site by the Contractor.

No paint shall be applied on damp or frosty surfaces, or in wet or foggy weather. No paint shall be applied in temperatures below 40°F, when freezing is predicted within 24 hours of application, or under temperature or humidity conditions not recommended by the manufacturer. However, in no case shall coatings be applied when the surface temperature is within 5°F of dew point, and in no cases shall coating be applied over a damp surface.

3.3 SAFETY

The Contractor is responsible for the safety of all workers and subcontractors and suppliers performing work on this project. The Contractor shall protect the Owner, their agents, and the general public from harm attributable to the Contractor's performance, or non-performance, of work on this project. The protection shall include, but not be limited to, providing the necessary safety equipment and instructions for its use by the Owner, and their agents.

The interior of tanks, vaults and manholes may be considered a confined space hazard. The Contractor shall confirm to the Owner, in writing, prior to the start of the project that the Contractor has training programs, trained personnel, and is otherwise in compliance with CFR 1910.146.

3.4 SURFACE PREPARATION

All surfaces shall be thoroughly clean, dry and free from oil, grease, or dust. The Engineer will inspect the surface preparation prior to the application of coatings. Standards for the surface preparation of ferrous metals required in the Material Schedules are the Standards of the SSPC – Society for Protective Coatings (SSPC, SP-1 through SP-10).

3.5 APPLICATION

After specified surface preparation, all surfaces shall be brushed free of dust or foreign matter. Surfaces shall be completely dry before any paint is applied. Paint shall be evenly spread in the proper thickness, so that there shall be no drops, or runs of the coating. Where runs and drops do occur, they shall be removed and the surface re-coated to the satisfaction of the Engineer. Sufficient time, as directed by the manufacturer, shall be allowed for the paint to dry before the application of succeeding coats.

Use drop cloths or other suitable means to protect other surfaces of the structure or equipment in place. Upon completion of the work, remove all paint spots from surfaces as directed by the Engineer. The Engineer will inspect each coat prior to the application of subsequent coats. Remove and replace any painting work found to be defective or applied under adverse conditions.

3.6 PAINTING SCHEDULE

The painting schedule below summarizes the painting systems to be applied to the various surfaces. Items which appear in the painting schedule are defined in subsequent paragraphs.

Painting Schedule

Exposures	Surfaces	System Schedules				
		Concrete & Concrete Block Substrate	Non-Ferrous Metals Substrate	Ferrous Metals Substrate	Wood Substrate	Drywall Substrate
Exterior	Ductile Iron Piping	NA	NA	247	NA	NA

Painting Schedule Numbering Guide

First Number - Exposure		Second Number - Substrate		Third Number – Coating Type	
1	Interior and Weather Protected	1	Non-Ferrous Metals	1	Alkyd
2	Exterior Weather Exposure	2	Wood	2	Asphaltic
3	Submerged in Potable Water but Protected from Sunlight	3	Concrete, Concrete Block, Masonry	3	Calcium Aluminate
4	Submerged in Potable Water and Exposed to Sunlight	4	Ferrous Metals	4	Epoxy
5	Submerged in Wastewater	5	Galvanized Ferrous Metals	5	Vinyl
6	Submerged in Wastewater and Exposed to Sunlight	6	Drywall	6	Coal Tar
7	Submerged in Wastewater and Exposed to Hydrogen Sulfide Gas	7	PVC Pipe	7	Polyurethane

			8	Acrylic
			9	Zinc

Exposure terms refer to the environmental conditions to which different surfaces may be exposed.

1. Interior: All surfaces within the confines of a building or other enclosure not constantly exposed to weather, including concealed surfaces subject to trapped moisture, heat or other deteriorating conditions and all surfaces exposed to view.
2. Exterior: All surfaces above finished grade and exposed to weather.

Surfaces include the following.

1. Piping: All plumbing and process piping and accessories including valves, fittings, pipe supports, electrical conduit and similar related items.

3.7 MAINTENANCE MATERIALS

Furnish the Owner at least one gallon of each type and color of paint used for finish coats and one gallon of each type of thinner required. Containers shall be tightly sealed and clearly labeled.

3.8 COATING REPAIR

Where coatings have been damaged, the surfaces shall be cleaned and re-painted. Surface preparation shall conform to SSPC-SP 11, and feathered into undamaged areas. Painting shall be performed as specified for the damaged surface.

(END OF SECTION)

DIVISION 11

SECTION 11210 SUBMERSIBLE SEWAGE PUMPS

PART 1 GENERAL

1.1 WORK INCLUDED

The work covered by this Section includes furnishing all labor, equipment and materials required to install and place into operation submersible sewage pumping equipment, controls and accessories as shown on the drawings and specified herein.

The pumping units shall be designed and furnished in accordance with the latest hydraulic institute specifications for submersible sewage pumps. The pump and motor units shall be designed and constructed to operate continuously at full nameplate load while the motor is completely submerged, partially submerged, or totally non-submerged.

1.2 SYSTEM SOURCE AND QUALITY ASSURANCE

All pumps, controls and accessories shall be furnished by a single manufacturer who shall assume complete system responsibility for the pumping system as specified or shown on the construction plans.

1.3 SUBMITTALS

Complete manufacturer's literature in accordance with the requirements of Section 01340 of these specifications shall be submitted. Information to be submitted includes:

1. Manufacturer's data and bulletins
2. Performance curves for all pumps showing capacity, head, horsepower, efficiency, and NPSH requirements over the manufacturer's recommended range of operation
3. Motor data
4. Dimensional drawings of all pumps, access covers and related equipment
5. Complete electrical diagrams for control panels
6. Control panel layout drawings
7. Catalog data on all ancillary electrical components

1.4 PERFORMANCE REQUIREMENTS

Submersible sewage pumps shall be suitable for pumping raw sewage under the operating conditions specified in the following table:

Pump	Capacity (GPM)	TDH (FT)	HP	Discharge Size (Inches)	Electrical	RPM	Shut-off Head (FT)	KSB Model No.
P-1	2250	45.0	40	10"	460V, 3Ph	1186	71.6	KSB K200-402XNG-6
P-2	2250	45.0	40	10"	460V, 3Ph	1186	71.6	KSB K200-402XNG-6
P-3	2250	45.0	40	10"	460V, 3Ph	1186	71.6	KSB K200-402XNG-6

1.5 WARRANTY

In addition to the general guarantee required elsewhere in these specifications, the pump manufacturer shall furnish the Owner with a written warranty to cover the pumps, motors and controls against defects in workmanship and material for a period of 5 years under normal use and service.

1.7 ACCEPTABLE MANUFACTURERS

These specifications and accompanying drawings are based upon the use KSB Pumps and Controls and only such manufacturer shall be included in the Base Bid. Other manufacturers of submersible pumping equipment and controls will be considered in accordance with the provisions of Section 01600 of these specifications.

1.8 RELATED WORK SPECIFIED ELSEWHERE

- Section 01340 Shop Drawings
- Section 01600 Substitutions
- Section 02650 Sanitary Sewer System

PART 2 PRODUCTS

2.1 PUMP DESIGN

The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two stainless steel guide bars extending from the top of the station to the discharge connection. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal contact with no portion of the pumping unit bearing directly on the wet well floor. Pumps shall be manufactured by KSB (Model numbers as specified in Paragraph 1.4 above). Pumps shall also be provided with stainless steel lifting cables or chains. All pump accessories inside the wet well, including but not limited to, cable holder, guide bars, guide bar brackets, lifting chains or cables and all other metal accessories shall be 316 stainless steel.

2.2 PUMP CONSTRUCTION

Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts and bolts shall be AISI Type 304 stainless steel. All metal surfaces coming into contact with the pumped liquid, other than stainless steel or brass shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal to metal contact between machined surfaces. Critical mating surfaces where water tight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings.

The cable entry seal design shall preclude specific torque requirements to ensure a water tight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled water tight chamber, NEMA B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155 degrees C. Thermal switches set to open at 125 degrees C shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The combined service factor of the motor shall be a minimum of 1.15. Leakage sensors shall be provided to detect water in the stator chamber. The thermal switches and the leakage sensors shall be connected to a control and status monitoring unit mounted in the control panel.

The power cable shall be sized according to NEC and ICEA standards and shall be of sufficient length to reach from the pump to the control panel without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.

The pump system including the pump, motor and power cable shall be approved for use in areas classified as hazardous locations in accordance with the NEC Class 1 Division 1, Groups C and D service as determined and approved by a nationally recognized testing laboratory (UL, FM, CSA).

The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single roller bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces.

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower primary seal unit located between the pump and the lubricant chamber shall contain one stationary and one positively driven rotating tungsten carbide ring. The upper secondary seal unit located between

the lubricant chamber and the motor housing shall contain one stationary and one positively driven rotating tungsten carbide ring. Each seal interface shall be held in contact by its own spring system.

The pump and motor shaft shall be the same unit and shall be AISI 431 stainless steel.

The impeller shall be of grey cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design capable of handling solids, fibrous material, heavy sludge and other matter normally found in wastewater. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

The pump volute shall be a single piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

2.3 ACCESS HATCHES

Access hatches in the top slab of wet well structures shall have clear opening dimensions in accordance with the recommendations of the pump manufacturer and shall have a minimum load capacity of 300 psf.

Access hatches shall be Aluminum Alloy 6063-T5 and T6, minimum ¼" thick plate, flush type lock with inside spoon handle. The frame shall be complete with hinged and hasp-equipped cover, upper guide holders, chain holders and cable holder. Chain and cable holder shall be stainless steel. Frame shall be securely mounted above the pumps. Hatch covers shall be torsion bar loaded for ease of lifting and shall have a safety locking handle in the open position and a safety grate.

Aluminum surfaces to be embedded in concrete shall be coated with bitumastic paint.

2.4 GUIDE BARS

Contractor shall furnish and install 316 stainless steel guide bars for each submersible pump. Guide bars shall be of adequate length and strength to extend from the lower guide holders on the pump discharge connection to the upper guide holder mounted on the access cover frame. Intermediate guide supports of stainless steel shall be provided as necessary.

2.5 TRIPLEX CONTROLS

The control system shall be designed to operate the pumps in response to liquid level variations in the wet well as sensed by a system of float switches located in the wet well as shown on the drawings. The control function shall provide for the operation of the pumps under normal conditions and shall alternate the pumps on each pump draw down cycle to equalize pump run time.

Control panel shall be UL 508A certified and listed, completely assembled, wired, tested and properly labeled prior to shipment. Control panel to be supplied by pump manufacturer to ensure compatibility between pumps and controls.

The pump controls shall be housed in a NEMA 4X stainless steel enclosure with 3PT pad lockable latch and aluminum inner door. The inner door shall be 12 gauge with a 0.75-inch 90° break on all four sides. Wiring shall have not less than 600 volt insulation with a 75° Celsius rating. The enclosure shall be adequately sized to provide proper spacing of the equipment and have a properly sized cooling system if required.

Pumps shall be controlled by JWSC's standard SCADA pump controller as manufactured by Data Flow System's Inc.

The panel shall consist of the following components:

- Hand-Off-Automatic (H-O-A) switch for each pump
- Overload and short circuit protection for each pump
- Control power breaker
- GFCI outlet on dead front
- GFCI breaker
- 120 volt controls
- Red strobe high level alarm light
- Motor protection circuits for over and under current/voltage and phase change
- Circuit breaker for each pump with inner door lock when in "ON" position
- Field wiring connection using terminal strips with separate blocks for pump, SCADA control and SCADA alarms
- Pump starting shall use NEMA rated contactors
- Pump ambient compensated overload with reset on dead front
- Pump seal leak detection and motor thermal monitor relay by pump manufacturer
- Pump seal failure amber warning pilot light
- Pump thermal fail red warning pilot light
- Green pump running pilot lights
- Pilot lights shall be LED for long life
- Breakers, pilot lights and switches shall be oil tight mounted on inner door for operator access
- Run time hour meters
- Lightning arrestor
- Alarm horn with silence button
- All mounting screws shall be stainless machine with back plate holes drilled and tapped

All control switches, indicator pilot lights, elapsed time meters, duplex receptacle and other operational devices shall be mounted on the external surface of the dead front.

The back plate shall be manufactured of 12 gauge sheet steel and be finished with a primer coat and two coats of baked on white enamel.

PART 3 EXECUTION

3.1 INSTALLATION

All equipment of this section shall be installed in accordance with approved shop drawings, the manufacturer's recommendations and these Specifications.

Stainless steel anchor bolts, nuts and washers, as well as any templates necessary for setting the anchorage, shall be furnished by the equipment manufacturer. Placement of the anchor bolts shall be done by the Contractor from certified dimension drawings supplied by the equipment manufacturer.

Level and align pump and motor in accordance with the manufacturer's published data. Grout pump and discharge base with non-shrink grout in accordance with the ACI and the equipment manufacturer and grout manufacturer's published specifications.

3.2 SHOP PAINTING AND PRIMING

All surfaces shall be prepared, shop primed and painted as part of the work of this Section. Surface preparation, shop priming and painting shall be in accordance with the manufacturer's standard specifications and be compatible with field painting as specified in Section 09900.

3.3 START UP SERVICE AND TESTING

The pump manufacturer shall furnish the services of a qualified factory trained field service engineer to inspect the installation and instruct the Owners personnel in the proper operation and maintenance of the pumps and controls. All hydraulic, mechanical and electrical tests shall be run to ensure proper operation of the equipment. As a minimum, the site tests include but are not limited to checks for:

1. Compliance with operating requirements
2. Correct rotation before mounting to the discharge connection
3. Balanced voltage and current
4. Proper seating of the pumps to the discharge connection

(END OF SECTION)

DIVISION 15

SECTION 15000 MECHANICAL

PART 1 GENERAL

1.1 WORK INCLUDED

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

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

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

1.2 QUALITY ASSURANCE

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

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

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

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

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

Testing:

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

Pressure Test:

1. After installation, all of the pressurized piping shall be pressure tested. Piping shall be tested in accordance with Section 15044: Pressure Testing of Piping.
2. All tests shall be made in the presence of and to the satisfaction of the Owner's Representative and Engineer and also, to the satisfaction of any local or state inspector having jurisdiction.
 - a. Unless otherwise indicated in the Special Conditions or specific technical specifications, provide not less than three days' notice to the Owner's Representative, Engineer and the authority having jurisdiction when it is proposed to make the tests.

- b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Engineer shall be retested in part or in whole as directed by the Engineer.
 - c. The piping systems may be tested in sections as the work progresses but no joint or portion of the system shall be left untested.
3. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.
4. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.
5. Repair all damage done to existing or adjacent work or materials due to or on account of the tests at no cost to Owner.
6. Provide test pumps, gauges, or other instruments and equipment required for the performance of all tests. Provide all temporary bracing, test plugs, additional restraint, and thrust blocking which may be required for test pressures above normal working pressures.
7. All tests shall be maintained for as long a time as required to detect all defects and leaks but not outside of the minimum/maximum durations specified for each type of pipe or piping system.

Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture for such equipment, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.
2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him to deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment provided, however that the equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising

out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or other charge until the other equipment is obtained.

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

Acceptance of Materials:

1. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Owner. No material shall be delivered to the work without prior submittal approval of the Engineer.
2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.
3. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit samples of materials for such special test as may be necessary to demonstrate that they conform to the specification. Such sample shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for tests.
4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation in the work.

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

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

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

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

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

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

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

Responsibility:

1. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the site under this Contract until final inspection of the work and acceptance thereof by the Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.
2. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven (7) days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

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

1. The Contractor shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
2. Immediately on delivery, the Contractor shall inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

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

Storage and Protection of Products: The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with the "Instructions for Storage" of each equipment supplier and manufacturer including connection of space heaters, and placing of storage lubricants in equipment. Corroded, damaged, or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.

1. The Contractor shall store products subject to damage by the elements in weather-tight enclosures.
2. The Contractor shall maintain temperature and humidity within the ranges required by manufacturer's instructions.
3. The Contractor shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. The Contractor shall cover products which are subject to deterioration with impervious sheet coverings and provide adequate ventilation to avoid condensation.
4. The Contractor shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

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

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

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

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

Protection After Installation: The Contractor shall provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. The Contractor shall remove covering when no longer needed.

1.4 WARRANTY AND GUARANTEES

The manufacturer's warranty period shall be concurrent with the Contractor's correction period for one (1) year (unless otherwise indicated in the technical specifications or other Contract Documents) after the time of final completion and acceptance.

1.5 MAINTENANCE MATERIALS

All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.

PART 2 PRODUCTS

2.1 FABRICATION AND MANUFACTURE

Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials shall be suitable for service conditions.
2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.
3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least ¼-inch thick.

Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.
2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.
3. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or ½-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

Equipment Foundation Supports:

1. All foundations, platforms and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.
2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.
3. The Contractor shall furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for

the installation of equipment. These shall be of ample size and strength for the purpose intended.

4. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.
5. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Section shall be provided and installed by Contractor.
6. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as required for loads imposed on them.
7. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs and structural steel supports.

Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd enamel. Coatings shall be suitable for the environment where the equipment is installed.
2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer. Unless otherwise specified, the shop primer for steel and iron surfaces shall be Cook "391-N-167 Barrier Coat", Koppers "No. 10 Inhibitive Primer", or equal.
3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or equal.

Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Unless otherwise indicated, nameplates shall be 1/8inch Type 304 stainless steel and

shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by 3/8-inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primer and black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include equipment manufacturers name, year of manufacture, serial number and principal rating data.

Pipe Identification: Underground pipe: All non-metallic water and force main piping has have locate wire systems installed in accordance with Owner's standards and technical specifications. Detection tape shall be installed for all water and force main piping in accordance with Owner's standards.

2.3 ACCESSORIES

Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

PART 3 EXECUTION

3.1 INSTALLATION AND OPERATION

Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.

1. The Contractor shall have on site sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.
2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.
3. All equipment shall be installed in such a manner as to provide access for routine maintenance including lubrication.
4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized

representative, to align the pump and motor prior to making piping connections or anchoring the pump base.

5. Equipment of a portable nature which require no installation shall be delivered to a location designated by the Owner.

Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be ½-inch to 30 ft. horizontal and vertically. All valves and operators shall be installed in the position shown on the Contract Drawings or as directed by the Engineer, if not shown.

Alignment and Level: The equipment shall be brought to proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims.

Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise or otherwise displace the plate.

Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shall be separated using not less than one coat of zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.

Cutting and Patching: All cutting and patching necessary for the work shall be performed by the Contractor.

Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.2 OBSERVATION OF PERFORMANCE TESTS

Where the specifications require observation of performance tests by the Owner's Representative or Engineer such tests shall comply with the quality assurance paragraph in this section.

3.3 MANUFACTURER'S FIELD SERVICES

Services Furnished Under This Contract:

1. An experienced, competent, and authorized representative of the manufacturer of each item of equipment shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall re-visit the job site as often

as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer/Owner's Representative at no additional cost to Owner. The authorized representative shall also utilize the site visit to instruct the Owner's staff in the proper operation of the equipment.

2. Each manufacturer's representative shall furnish to Owner and Engineer, a letter of certification stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.
3. All costs for field services shall be included in the contract amount for such item.

(END OF SECTION)

**SECTION 15044
PRESSURE TESTING OF PIPING**

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: Hydrostatic testing shall be conducted for all pressurized piping systems. Pressure and leakage testing shall be performed in accordance with the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications.

PART 2 PRODUCTS

2.1 GENERAL

Testing fluid shall be potable water.

2.2 MATERIALS AND EQUIPMENT

Unless otherwise indicated, Contractor shall provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 EXECUTION

3.1 TESTING

All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications as noted below.

1. Reference Section 2.5.3.8 of the JWSC Standards for hydrostatic testing of water mains.
2. Reference Section 4.7.7 of the JWSC Standards for hydrostatic testing of force mains.

(END OF SECTION)

SECTION 15062 DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: The work under this section includes the furnishing, installation, and testing of all Ductile Iron pipe and fittings and appurtenant materials and equipment as indicated on the Construction Drawings and/or as specified herein. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.2 QUALITY ASSURANCE

Reference Standards

1. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A21.51.
2. Ductile iron pipe thickness: ANSI A21.50.
3. Cement mortar lining for water: ANSI21.4.
4. Cast and ductile iron fittings: ANSI A21.10.
5. C.I. pipe flanges and fittings: ANSI B16.1.
6. Threaded flanges: CIPRA standard.

Qualifications: All ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

Manufacturer: Pipe and fittings shall be as manufactured by the American Cast Iron Pipe Company, U.S. Pipe and Foundry Company, Star Pipe Products, or Engineer approved equal.

1.3 SUBMITTALS

1. Shop Drawings, including layouts within, and under buildings and structures shall be submitted to the Engineer for approval in accordance with Special Conditions. Shop Drawings shall be prepared by the pipe manufacturer.
2. Tabulated layout schedule, as appropriate for project.

3. Details of special elbows and fittings.
4. Calculations and/or test data demonstrating that the proposed restrained joint arrangement can transmit the required forces.
5. Copy of the manufacturer's quality control check of pipe material and production.
6. Provide an affidavit of compliance with AWWA standards referenced in this specification.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. All pipe shall be shipped and stored at the jobsite with wood lagging between pipes such that pipes do not make contact with one another.
- B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

PART 2 PRODUCTS

2.1 MATERIALS

Pipe - Ductile Iron Pipe Conforming to ANSI A21.51 and AWWA C151:

1. Unless otherwise shown on the Construction Drawings or Contract Documents, the minimum thickness of ductile iron pipe shall be Pressure Class 350 for piping 3 in. through 12. in., and Pressure Class 250 for piping 14 in. and larger.
2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.
3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the coupling manufacturer.
4. Pipe shall be supplied in lengths not in excess of 20 feet having rubber-ring type push-on joints, standard mechanical joints or restrained joints where required for underground piping and flanged joint piping, for all above ground piping as shown on the Drawings.

Coatings and Linings:

Interior Coatings and Linings:

1. Pipe for finished potable water and reclaimed water use shall be cement-mortar lined and seal coated, conforming to ANSI A21.4 and AWWA C104.
 - a. Pipe and fittings for non-potable use, except as otherwise noted, shall have a ceramic epoxy coating installed on the interior of the pipe. The coating shall be Tnemec Series 431 Perma-Shield PL. Coating thickness shall be 40 mils minimum dry film thickness.
2. Exterior Coating: All ductile iron pipe and fittings shall be externally coated with a bituminous coating per ANSI A21.51.

Fittings:

1. All ductile iron pipe fittings shall match the pressure class rating of the adjacent piping.
2. Grooved-end fittings shall conform to AWWA C110 and ANSI B16.1 with grooved ends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A 48, Class 30, or ASTM A 126, Class B.

Joints (as shown on the Construction Drawing and/or specified):

1. General: Joints in "runs" of aboveground piping or piping located in vaults and structures shall be rigid radius grooved end or flanged. Joints in "runs" of buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.
2. Grooved-End Couplings:
 - a. Grooved-end couplings shall be malleable iron, ASTM A 47 (Grade 32510), or ductile iron, ASTM A 536 (Grade 65-45-12).
 - b. Bolts: ASTM A 183, 110,000 psi tensile strength.
 - c. Gaskets: Halogenated butyl rubber or EPDM for water service and Buna-N for sewage service, conforming to ASTM D 2000
 - d. Couplings: AWWA C606 for rigid radius ductile-iron pipe. Couplings shall be Victaulic Style 31, Gustin-Bacon No. 500, or equal.

- e. Grooved-end adapter flanges for piping having an operating pressure of 150 psi and less shall be Victaulic Style 341, or equal. Flange dimensions shall conform to ANSI B16.1 Class 125.
3. Flanges:
- a. Flanges shall be Class 125 per ANSI B16.1 unless otherwise specifically noted. Determine the pressure rating of the fittings based on the test pressures shown in Section 15044: Pressure Testing of Piping.
 - b. Gaskets: Fullface, 1/8 inch thick, neoprene: Johns-Manville, John Crane Co., or Engineer approved equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180 degrees Fahrenheit (°F). Gaskets shall comply with Appendix A of AWWA C110.
 - c. Bolts and Nuts for Flanges
 - 1) Bolts and nuts for flanges located indoors, in enclosed vaults and structures, buried and submerged and located outdoors above ground or in open vaults in structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B&M for bolts, and ASTM A 194, Grade M for nuts. Bolts shall comply with Appendix A of AWWA C110.
 - 2) Provide washers for each nut. Washers shall be of the same material as the nuts.
 - d. Provide specially drilled flanges when required for connection to existing piping or special equipment.
 - e. Factory assemble screwed on flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange faces shall be coated with a rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.
4. Push-on and mechanical joint (ANSI A21.11):
- a. The plain ends of push-on pipe shall be factory, machined to a true circle and chamfered to facilitate fitting the gasket.
 - b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.
 - c. Each joint shall be complete with rubber gasket, cast iron gland and all required bolts and nuts.

Thrust Restraint:

1. Thrust blocks: Shall not be permitted unless specifically indicated on the Drawings.
2. Restrained joints:
 - a. Pipe joints shall be mechanically restrained type as accepted by the Engineer. Restrained joints that require field welding or requiring set screws will not be acceptable, except restrained joints for mechanical joints shall be Megalug by Ebba Iron, or Engineer approved equal. Standard retainer glands are not considered equal
 - b. Pipe joints shall be restrained on each side of the fitting for a continuous distance in accordance with DIPRA "Thrust Restraint Design for Ductile Iron Pipe". Distance restrained shall be based on sand-silt soil type, 3.0 feet of cover and Type 5 laying condition.
 - c. Bolts and nuts for restrained joints shall be Corten, low alloy, high strength steel.

PART 3 EXECUTION

3.1 INSPECTION AND TESTING

All pipe shall be inspected and tested at the foundry.

The Owner shall have the right to have any or all piping, fittings or special castings Inspected and tested by an independent testing agency at the foundry or elsewhere. Such inspection and testing will be at the Owner's expense.

Mark as rejected and immediately remove from the job site, all pipe lengths showing a crack, damaged lining, or receiving a severe blow that may cause an incipient fracture, even though no such fractures can be seen.

Removal of cracked portions:

1. Any pipe showing a distinct crack, but no incipient fracture beyond the limits of the visible crack, may be cut off and the sound portion installed. Cut the pipe at least 12 inches from the visible limits of the crack. Cutting of pipe shall be done by skilled workmen, and in such a manner as to not damage the pipe. Every cut shall be square and smooth, with no damage to the pipe lining. Cut surfaces, shall be recoated as specified for the pipe.
2. Cutting and installing cracked pipe shall only be performed when approved by the Engineer, and shall be at the expense of the Contractor.

Carefully inspect and hammer test all pipe and fittings prior to installation.

3.2 INSTALLATION

Assembling joints:

1. Push-on joints:
 - a. Insert the gasket into the groove of the ball.
 - b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.
 - c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.
2. Bolted joints:
 - a. Remove rust preventative coatings from machined surfaces prior to assembly.
 - b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.
3. Grooved end joints:
 - a. Install grooved end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.
 - b. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior, including lips, pipe ends, and housing interiors.
 - c. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.
4. Flanged Joints:
 - a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate bolts with oil and graphite.

- b. Insert the nuts and bolts (or studs) finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.
- c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.
- d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

5. Mechanical Joints:

- a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
- b. Lubricate the gasket, bell and spigot by washing with soapy water.
- c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly sealed.
- d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
- e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joints to the proper tension with a torque wrench.

6. Bell and spigot joints:

- a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.
- b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

Fabrication:

1 Tapped connections:

- a. Make all tapped connections as shown on the Drawings or as directed by the Engineer.
- b. Make all connections watertight and of adequate strength to prevent pullout.

- c. Drill and tap normal to the longitudinal axis of the pipe.
2. Cutting:
 - a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut ductile iron. The use of a hammer and chisel to cut pipe is prohibited.
 - b. After cutting, examine all cut ends for possible cracks.
 - c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

Installing Buried Piping:

1. Inspect each pipe and fitting before lowering the buried pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
2. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.
3. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
4. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.
5. At the location of each joint, dig bell (joint) holes of dimensions in the bottom of the trench and at the sides to permit visual inspection of the entire project.
6. Keep the trench in a dewatered condition during pipe laying in accordance with Section 02200: Earthwork, and Section 02220; Excavating, Backfilling and Compacting.
7. When the pipe laying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.

Installing Interior Piping:

1. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before erection.
2. Sleeves shall be installed of proper size for all pipes passing through floors or walls as shown on the Drawings. Where indicated on the Drawings, or required for liquid or gas-tightness, the pipe shall be sealed with mechanical seal equal to Link-Seal as manufactured by GPT Industries., or Engineer approved equal.
3. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be, in accordance with the requirements of the piping layout and jointing method and their locations shall be verified from approved piping layout drawings and the structural drawings.
4. Except as otherwise shown on the Construction Drawings either split type couplings or flange joints may be used. Prior to approval of jointing, method layouts for hanger and supports shall be submitted to the Engineer for approval.
5. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped.
6. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

Pipe deflection:

1. Push-on and mechanical joints:
 - a. The maximum permissible deflection of alignment at joints shall be 80% of the manufacturer's allowable deflection.

Flexible joints: The maximum deflection in any direction shall not exceed 80% of the manufacturer's instructions and recommendations.

Hydrostatic Testing: Test in accordance with Section 15044: Pressure Testing of Pipe.

(END OF SECTION)

SECTION 15100 VALVES AND SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDED

Scope of Work: Furnish, install, support, and test valves, gates, hydrants, cocks, stops, and faucets, when applicable, (hereinafter referred to as "valves") in the location(s) and of the size(s) and quantities shown on the Drawings and/or as directed by the JWSC. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.2 QUALITY ASSURANCE

Qualifications:

1. All equipment furnished under this Specification shall be new and unused and shall be a standard product which has a successful record of reliable service in similar installations for a minimum of five (5) years.
2. All valves of same type and duty shall be furnished by a single manufacturer.

Standards:

1. ANSI.
2. AISI.
3. SSPC.
4. AWWA.

1.3 SUBMITTALS

Materials and Shop Drawings: Copies of all materials required to establish compliance with the Specification shall be submitted in accordance with the Special Conditions. Submittals shall include at least the following:

1. Certified shop drawings showing all important details of construction, dimensions (including laying length), and weight.
2. Descriptive literature, bulletins, and/or catalogs showing all valve parts, valve operator, and describing material of construction by material and specification (e.g., AISI).

3. Valve coatings and linings, as required.
4. A complete total bill of materials for all equipment.

Operating Instructions: Copies of operating and maintenance instructions shall be furnished in accordance with Section 01710 Operation and Maintenance Data. These shall include equipment lists, descriptions, and information necessary to instruct operating and maintenance personnel unfamiliar with the valves.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

Shipping:

1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed.
2. Factory assembled parts and components shall not be dismantled for shipment unless permission is received in writing from the JWSC.
3. Finished surfaces of all exposed openings shall be protected by wooden blanks, strongly built and securely bolted thereto.
4. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.
5. After hydrostatic or other tests, all entrapped water shall be drained prior to shipment, and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.
6. Each box or package shall be properly marked to show its net weight in addition to its contents.

Storage:

1. Store valves and accessories in an area on the construction site protected from weather, moisture, or possible damage.
2. Do not store valves or accessories directly on the ground.

Handling:

1. Handle valves and accessories to prevent damage of any nature.
2. Carefully inspect all materials for:

- a. Defects in workmanship and materials.
- b. Removal of debris and foreign material in valve openings and seats.
- c. Proper functioning of all operating mechanisms.
- d. Tightness of all nuts and bolts.

PART 2 PRODUCTS

2.1 GENERAL

Materials shall be as indicated in JWSC Standards for Water and Sewer Design and Constructions, specific sections, or on the Drawings, and compatible with intended use.

Valves shall have the name of the manufacturer and the size of the valve cast or molded onto the valve body or bonnet or shown on a permanently attached stainless steel plate.

Bolts, washers, nuts, and gaskets for flanged valves shall be as described in the JWSC Standards for Water and Sewer Design and Construction or the specific piping sections.

Coat metal valves located above ground or in vaults and structures the same as the adjacent piping. Apply the specified prime coat at the place of manufacture. Apply finish coat in field. Finish coat shall match color of the adjacent piping.

2.2 PLUG VALVES – FORCEMAIN ISOLATION

All plug valves, unless specifically shown otherwise on the drawings, shall be of non-lubricated, eccentric plug type with resilient faced plugs and shall be furnished with end connections as shown on the Contract Drawings, unless otherwise approved. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical joint ends shall meet AWWA C111, Class B.

Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be stainless steel. Valve shall have Buna “N” neoprene, epoxy, or fusion bonded, nylon faced plug. The interior of all plug valves shall be epoxy coated.

Port areas shall be 100% of full pipe area. The valve seat material shall consist of either a welded in 1/8 inch overlay of 90% pure nickel, or 316 stainless steel screwed into the cast iron body. Upper and lower plug stem bearings shall be sleeve-type of a stainless steel or other non-corrosive bearing material. The packing shall be adjustable and the bonnet shall be bolted. All bolts, nuts and washers shall be 316 stainless steel for buried, non-buried, and pit installed service. All buried valves on push-on joint pipe shall have mechanical joint ends and meet the requirements of ANSI A21.11. All exposed (non-buried) valves shall have flanged ends in accordance with American Standard B16.1, Class 125. The valves shall be rated for a minimum of 150 psi, non-shock cold W.O.G. and shall provide drip-tight shut off with this pressure in either direction. The operating nut or hand wheel shall have an arrow cast in the metal indicating direction of opening. The valve

manufacturer shall furnish certified copies of performance, leakage and hydrostatic testing as outlined in AWWA C504.

All plug valves 8-inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each non-buried, gear-actuated valve. Buried valves shall have seals on all shafts and gaskets on valve covers. Buried valves shall be provided with 2-inch square operating nut with extension stem with operating nut no more than 8-inches below finish grade.

Plug valves shall be as manufactured by DeZurik PEF Eccentric Plug Valves, Pratt Ballcentric Full Port Eccentric Plug Valve, or JWSC approved equal.

2.3 CHECK VALVES

Check valve shall be mounted horizontally unless approved otherwise by JWSC. Check valves shall conform to the requirements of AWWA C508.

All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.

Check valves shall be swing check type. Swing check valves larger than two (2) inch nominal size shall be cast iron body with stainless steel bolts and nuts, flanged ends, 316 stainless steel shaft connected to a steel outside lever and weight, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc.

Check valves larger than two (2) inch shall be 150 psi working pressure.

Check valves two (2) inch and smaller nominal size shall be all brass swing check valves, 200 psi working pressure.

Swing check valves larger than two (2) inch nominal size shall be Clow Valve Company Style 1106LW or Style 159-02 or JWSC approved equal.

2.4 VALVE BOXES

All buried valves shall have cast-iron three-piece adjustable valve boxes. Valve boxes shall be provided with suitable heavy bonnets and shall extend to such elevation at or slightly above the finished grade surface as directed by the JWSC. The barrel shall be two-piece, sliding type, having 5-1/4-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling and shall be complete with a cast iron cover. Covers shall have "WATER" or "SEWER" cast into the top for all such mains, as appropriate. The actuating nuts for deeper valves shall be extended to come up to within four (4) feet of the finished grade.

Care shall be taken installing valve boxes to ensure that valve stems are vertical and the cast iron box has been placed over the stem with base bearing on compacted fill and top flush with final grade. Boxes shall have sufficient bracing to maintain alignment during backfilling. Contractor shall remove any sand or undesirable fill from valve box prior to final inspection. Any valve box which has been moved from its original position by trench settlement or other causes, and which prevents the use of a valve wrench for opening and closing of the valve, shall be reset by the Contractor prior to final acceptance. The entire assembly shall be plumb.

In unpaved areas, a poured in place reinforced concrete valve pad shall be installed around all valve boxes. The concrete thickness shall be four (4) inches for poured in place collars. The top of the poured in place collar shall be level with the top of the cast iron valve box and **level with the final grade.**

PART 3 EXECUTION

3.1 PREPARATION

Apply coatings to valves and miscellaneous piping appurtenances as per JWSC Standards for Water and Sewer Design and Construction.

Apply coats of paint filler and enamel to parts customarily finished at the shop.

Apply a shop coat of grease or other suitable rust resistant coating to ferrous surfaces obviously not to be painted.

3.2 INSTALLATION

Install valves and accessories in strict accordance with manufacturer's instructions and recommendations, as shown on the Drawings and/or as directed by the JWSC.

Carefully erect all valves and support them in their respective positions free from distortion and strain.

Bolt holes of flanged valves shall straddle the horizontal and vertical centerlines of the pipe run to which the valves are attached. Clean flanges by wire brushing before installing flanged valves. Clean flange bolts and nuts by wire brushing, lubricate threads with oil and graphite, and tighten nuts uniformly and progressively. Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to pipe threads before installing threaded valves. Joints shall be watertight.

Support all valves connected to pumps and equipment, and in piping systems that cannot support valves.

Repair any scratches, marks and other types of surface damage, etc., with original coating as supplied by the factory.

3.3 INSPECTION AND TESTING

Check and adjust all valves and accessories for smooth operation.

Test valves for leakage at the same time that connecting pipelines are tested. See Section 15044: Pressure Testing of Piping for pressure testing requirements. Protect or isolate any parts of valves, operators, or control and instrument systems whose pressure rating is less than the pressure tests.

If flanges leak under pressure testing, loosen or remove the nuts and bolts, reseal or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints.

(END OF SECTION)

DIVISION 16

SECTION 3 GRAVITY SEWER SYSTEMS

3.1 GENERAL

This section provides the minimum guidelines for the design of gravity sanitary sewer collection systems. The method of design and/or construction shall be according to these Design and Construction Standards and Specifications and the following:

Recommended Standards for Sewage Works (Ten State Standards) Latest Edition

Georgia Environmental Protection Division State of Georgia Regulations for Water and Sewerage Works, Latest Edition

Applicable Federal, State and Local Requirements

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

3.2 DESIGN FLOWS

Each system component shall be designed to meet certain flow requirements. The various flow requirements are described below.

3.2.1 Daily Average Dry Weather Flow (ADWF)

Daily Average Dry Weather Flow (ADWF) shall be 300 gallons per day per Residential Equivalent Unit (REU) or 115 gallons per day per capita. The basis for one (REU) shall be a single-family unit occupied by an average of 2.6 persons. Where sewer service beyond the basis of the established REU is required, the Sewage Flow Table shown below (adapted from the Georgia Environmental Division Large Community Design Guidance Document, Pages 8 & 9, Appendix A) shall be used.

**Figure GS-1
Sewage Flow Table**

FACILITY	Gallons/Day (GPD)
Assembly Hall	5 per seat
Barber Shop/Beauty Parlor	125 per chair + 20/employee
Boarding House*	100 per room
Bowling Alley	75 per lane + 20/employee
Church w/o Day Care or Kindergarten	5 per sanctuary seat
Correctional Institution/Prison	250 per inmate
Country Club, Recreation Facilities Only	25 per member
Day Care Center, No Meals	15 per person
Dental Office	100 per chair + 20/employee
Department Store	10 per 100 SF
Factory	
Without Showers	25 per employee
With Showers	35 per employee
Food Service Establishments*	
Restaurants (Up to 12 hours per day)	35 per seat + 20/employee
Restaurants (12 hours per day to 18 hours per day)	50 per seat + 20/employee
Restaurants (Above 18 hours per day)	75 per seat + 20/employee
Bar and Cocktail Lounge	30 per seat + 20/employee
Drive-in Restaurant	50 per space + 20/employee
Carry-out Only	50 per 100 SF + 20/employee
Funeral Home	10 per 100 SF
Hospital	
Inpatient	300 per bed
Outpatient	275 per bed
Hotel*	100 per room
Kindergarten, No Meals	15 per person
Laundry, Commercial	1,000 per machine
Laundry, Coin	150 per machine
Lodges*	100 per room
Mobile Home Park	300 per site
Motel*	100 per room
Nursing Home*	150 per bed
Office	10 per 100 SF
Physician's Office	200 per exam room
Schools*	
Boarding	100 per person
Day, Restrooms Only	12 per person
Day, Restrooms and Cafeteria	16 per person
Day, Restrooms, Gym and Cafeteria	20 per person
Service Stations, Interstate Locations	425 + 150 per pump
Service Stations, Other Locations	300 + 100 per pump
Service Station Car Wash	500 per stall
Shopping Center (Not including food service or laundry)	10 per 100 SF
Stadium	5 per seat
Supermarket/Grocery Store	20 per 100 SF
Theater	5 per seat

FACILITY	Gallons/Day (GPD)
Travel Trailer Park*	
With Independent Water & Sewer Connection	175 per site
Without Independent Water & Sewer Connection	35 per site
Warehouse	10 per 100 SF
*Add 300 gallons per machine to amount indicated if laundry or dish washing machines are installed	

Note: Where historical data is available from flow monitoring or other approved devices as in the case of existing systems, ADWF shall be as averaged from seven (7) days within the monitoring period of flow with no rainfall event greater than .5 (5/10ths) inches of rain in any of the seven 24-hour periods being averaged.

3.2.2 Calculation of Peak Flow (PF)

For gravity systems, the Daily Average Dry Weather Flow (ADWF) to be conveyed must be adjusted to allow for the maximum diurnal or peak flow that is expected to occur as follows:

$$\text{Peak Flow} = \text{PF} \times \text{Average Dry Weather Flow (ADWF)}$$

Where:

Peaking Factor = PF = $5 / P^{0.1667}$ as referenced in ASCE Manual and Reports of Engineering Practice #60 and WPCF Manual of Practice #FD-5, (Babbitt Equation);

Population = P = used as P/1,000 in the equation with each 300 GPD (REU) considered as serving 2.6 persons as follows:

For residential use, (i.e. 5 single family residences times 2.6 persons/residence = 13 and 13/1,000 = P = 0.013);

For Commercial Use, by dividing the total calculated GPD from the EPD Sewage Flow Table (Figure GS-1) by 300 GPD/REU and multiplying the REU's by 2.6, (i.e. 4,000 GPD/300 GPD = 13.3 REU's X 2.6 persons/REU = 35 and 35/1,000 = P = 0.035);

For Industrial Use, by employee count GPD from EPD Sewage Flow Table (Figure GS-1) divided by 300 GPD/REU and then multiplying the REU's by 2.6 persons/REU to approximate employee population, plus the maximum gallon per minute wastewater discharge capability, (as provided by the process design engineer), multiplied by 1,440 minutes/day and divided by 300 GPD to obtain REU's then multiplying the REU's by 2.6 to obtain an approximate equivalent population for process flow, (i.e. 25 factory employee @ 30 GPD = 900 GPD/300 GPD = 3 REU's X 2.6 persons/REU = 8 and peak process water discharge @ 150 GPM X 1,440min/day = 216,000 GPD/300 GPD per REU = 720 REU's X 2.6 persons/REU = 1,872, then 1,872 for process water population approximation + 8 factory employee population approximation = 1,880 and 1,880/1,000 = P = 1.88).

3.3 SIZING OF GRAVITY SEWER MAINS

3.3.1 *Major Outfalls*

The size of major outfall sewers or extensions to such mains, throughout the system shall be in accordance with JWSC Water and Sewer Master Plan, latest revision. Contact the Planning and Construction Division for additional information and guidance with regard to this requirement.

3.3.2 *Collector Sewers*

All gravity sewer mains shall be designed to convey the Design Peak Flow at a flow depth not to exceed 94% of the pipe inside diameter or less than 0.6 inches, and at a self-cleansing velocity of between 1.99 FPS and 2.01 FPS. Gravity sewer mains intended for public use and JWSC operation and maintenance shall be sized to meet these hydraulic guidelines with the minimum pipe size being 8-inches in diameter, unless specifically allowed subject to the 6-inch pipe diameter exceptions cited in paragraph 3.4.2 below.

3.4 GRAVITY SEWER MAIN PIPE SLOPE REQUIREMENTS

3.4.1 *Discussion*

The major items for consideration in the regulation of gravity sewer pipe slopes are carrying capacity at peak flow and self-cleansing velocity. The inability to convey peak flow results in system surcharging and potential sanitary sewer overflows. The lack in the development of self-cleansing velocity, at least during the flows diurnal peak, results in solids deposition, system odors, and the eventual reduction in pipe capacity leading to blockages and overflows.

An additional consideration in the JWSC jurisdictional area, and numerous other coastal areas, is wastewater piping system detention time. Lengthy wastewater detention or travel time through gravity piping systems encourages the development of corrosive and odorous gases that damage piping infrastructure, cause odor complaints and increase the cost of system operation by requiring the addition of chemicals to inhibit or mitigate the effects of aging wastewater. Therefore, design of gravity sewer systems in this standard shall stress the development of self-cleansing velocities as the most practical and effective method of minimizing wastewater detention times in sewer mains.

Standardized slopes, as recommended by Ten States Standards in concert with the minimum pipe diameters and minimum flow depths suggested in these guidelines, often forces the designer to hold to a pipe grade that does not provide adequate velocities at "projected" flow rates and/or forces a pipe grade that shortens the potential reach of a proposed sewer main when projected flow rates would develop self-cleansing velocity at a lesser grade.

In an effort to address these aforementioned issues, the JWSC's pipe slope design requirements are developed to provide a range of acceptable pipe slopes based on good hydraulic engineering practice using "projected" pipe flow rates based on REU's and peaking factors as defined by appropriate engineering literature, organizational experience, policy and regulatory guidelines.

3.4.2 Gravity Sewer Main Grades

Gravity sewer mains intended for public use and O&M by the JWSC or extensions to public systems which are to remain private shall be in accordance with the preferred slopes shown in Figure GS-2 for minimum pipe diameters. Where adherence to the minimum eight (8) inch pipe diameter will not develop self-cleansing velocities at "projected" ultimate contributory flows, six (6) inch diameter pipe may be used, if approved as an exception, defined as follows.

A six (6) inch diameter pipe exception shall only apply for limited reaches of gravity sewer where self-cleansing velocities can not be developed in eight (8) inch pipes by "projected" flow peaks during the 24-hour diurnal cycle; and when such gravity mains are strategically located such that system expansion from those lines is highly improbable, as in the case of limited boundary development subdivisions.

The use of the Manning Equation indicates that flows in excess of 12,000 gpd and peak flows of 61 gpm, using the Babbitt Peaking Equation, are needed to develop self-cleaning velocities at the diurnal peak in an eight (8) inch line on a grade of 0.40%. This equates to 39 single family residences or REU's. The six (6) inch pipe diameter exception shall be considered valid when this quantity of "projected" contributory flow for any gravity sewer reach is not available.

Grades for pipe diameters greater than the cited six (6) inch and eight (8) inch minimums shall be based on the same design criteria as stated above in article 3.3.2, and in consideration of "projected" flows. Alternatives to the six (6) inch exception include low pressure systems, step systems, vacuum systems or on-site treatment systems.

The maximum slope for all pipe diameters shall be such that the velocity in the pipes does not exceed 5 fps at 94% of the pipe inside diameter when calculated using Manning's Equation and projected flow peaks.

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Figure GS-2
Gravity Sewer Main Pipe Slope Table for six (6) inch and eight (8) inch Pipes
Using Manning Flow and Babbitt PF Equations

Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Population	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
6	PVC HDPE	4	10.4	10.7	1,200	9	1.75	0.61	467
6	PVC HDPE	5	13.0	10.3	1,500	11	1.53	0.68	437
6	PVC HDPE	6	15.6	10.0	1,800	13	1.35	0.75	410
6	PVC HDPE	7	18.2	9.7	2,100	14	1.25	0.80	395
6	PVC HDPE	8	20.8	9.5	2,400	16	1.11	0.88	372
6	PVC HDPE	9	23.4	9.3	2,700	18	1.02	0.94	357
6	PVC HDPE	10	26.0	9.2	3,000	19	0.95	1.00	344
6	PVC HDPE	11	28.6	9.0	3,300	21	0.89	1.05	333
6	PVC HDPE	12	31.2	8.9	3,600	22	0.86	1.09	328
6	PVC HDPE	13	33.8	8.8	3,900	24	0.80	1.15	316
6	PVC HDPE	14	36.4	8.7	4,200	25	0.76	1.20	308
6	PVC HDPE	15	39.0	8.6	4,500	27	0.72	1.26	300
6	PVC HDPE	16	41.6	8.5	4,800	28	0.69	1.30	293
6	PVC HDPE	17	44.2	8.4	5,100	30	0.66	1.35	287
6	PVC HDPE	18	46.8	8.3	5,400	31	0.64	1.39	283
Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Population	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
6	PVC HDPE	19	49.4	8.3	5,700	33	0.62	1.44	278
6	PVC HDPE	20	52.0	8.2	6,000	34	0.59	1.49	271
6	PVC HDPE	21	54.6	8.1	6,300	36	0.57	1.54	267
6	PVC HDPE	22	57.2	8.1	6,600	37	0.55	1.59	262
6	PVC HDPE	23	59.8	8.0	6,900	38	0.54	1.62	260
6	PVC HDPE	24	62.4	7.9	7,200	40	0.52	1.67	255
6	PVC HDPE	25	65.0	7.9	7,500	41	0.51	1.70	252
6	PVC HDPE	26	67.6	7.8	7,800	42	0.50	1.73	250
6	PVC HDPE	27	70.2	7.8	8,100	44	0.48	1.79	245

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6	PVC HDPE	28	72.8	7.7	8,400	45	0.48	1.80	245
6	PVC HDPE	29	75.4	7.7	8,700	46	0.47	1.83	242
6	PVC HDPE	30	78.0	7.6	9,000	48	0.45	1.90	237
6	PVC HDPE	31	80.6	7.6	9,300	49	0.44	1.94	234
6	PVC HDPE	32	73.2	7.6	9,600	50	0.44	1.96	234
6	PVC HDPE	33	85.8	7.5	9,900	52	0.42	2.03	229
6	PVC HDPE	34	88.4	7.5	10,200	53	0.42	2.04	229
6	PVC HDPE	35	91.0	7.5	10,500	54	0.41	2.07	226
6	PVC HDPE	36	93.6	7.4	10,800	56	0.40	2.12	223
6	PVC HDPE	37	96.2	7.4	11,100	57	0.39	2.17	221
6	PVC HDPE	38	98.8	7.4	11,400	58	0.39	2.19	221
6	PVC HDPE	39	101.4	7.3	11,700	59	0.38	2.22	218
6	PVC HDPE	40	104.0	7.3	12,000	61	0.38	2.25	218
8	PVC HDPE	40	104.0	7.3	12,000	61	0.40	2.00	481
8	PVC HDPE	41	106.6	7.3	12,300	62	0.40	2.01	481
8	PVC HDPE	42	109.2	7.2	12,600	63	0.39	2.04	475
8	PVC HDPE	43	111.8	7.2	12,900	65	0.39	2.07	475
8	PVC HDPE	44	114.4	7.2	13,200	66	0.38	2.10	469
8	PVC HDPE	45	117.0	7.1	13,500	67	0.38	2.12	469
8	PVC HDPE	46	119.6	7.1	13,800	68	0.37	2.15	463
8	PVC HDPE	47	122.2	7.1	14,100	69	0.37	2.17	463
8	PVC HDPE	48	124.8	7.1	14,400	71	0.36	2.21	456
Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Population	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
8	PVC HDPE	49	127.4	7.0	14,700	72	0.35	2.25	450
8	PVC HDPE	50	130.0	7.0	15,000	73	0.34	2.28	444
8	PVC HDPE	51	132.6	7.0	15,300	74	0.34	2.30	444
8	PVC HDPE	52	135.2	7.0	15,600	76	0.34	2.32	444
8	PVC HDPE	53	137.8	7.0	15,900	77	0.34	2.34	444
8	PVC HDPE	54	140.4	6.9	16,200	78	0.33	2.38	437
8	PVC HDPE	55	143.0	6.9	16,500	79	0.33	2.39	437
8	PVC HDPE	56	145.6	6.9	16,800	80	0.32	2.43	430
8	PVC	57	148.2	6.9	17,100	82	0.32	2.45	430

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8	PVC HDPE	58	150.8	6.9	17,400	83	0.32	2.47	430
8	PVC HDPE	59	153.4	6.8	17,700	84	0.31	2.51	424
8	PVC HDPE	60	156.0	6.8	18,000	85	0.31	2.52	424
8	PVC HDPE	61	158.6	6.8	18,300	86	0.31	2.54	424
8	PVC HDPE	62	161.2	6.8	18,600	88	0.30	2.60	417
8	PVC HDPE	63	163.8	6.8	18,900	89	0.30	2.61	417
8	PVC HDPE	64	166.4	6.7	19,200	90	0.30	2.62	417
8	PVC HDPE	65	169.0	6.7	19,500	91	0.29	2.66	410
8	PVC HDPE	66	171.6	6.7	19,800	92	0.29	2.68	410
8	PVC HDPE	67	174.2	6.7	20,100	93	0.29	2.69	410
8	PVC HDPE	68	176.8	6.7	20,400	95	0.28	2.75	403
8	PVC HDPE	69	179.4	6.7	20,700	96	0.28	2.76	403
8	PVC HDPE	70	182.0	6.6	21,000	97	0.28	2.78	403
8	PVC HDPE	71	184.6	6.6	21,300	98	0.28	2.79	403
8	PVC HDPE	72	187.2	6.6	21,600	99	0.27	2.83	395
8	PVC HDPE	73	189.8	6.6	21,900	100	0.27	2.85	395
8	PVC HDPE	74	192.4	6.6	22,200	101	0.27	2.86	395
8	PVC HDPE	75	195.0	6.6	22,500	103	0.27	2.89	395
8	PVC HDPE	76	197.6	6.6	22,800	104	0.26	2.94	388
8	PVC HDPE	77	200.2	6.5	23,100	105	0.26	2.96	388
8	PVC HDPE	78	202.8	6.5	23,400	106	0.26	2.97	388
8	PVC HDPE	79	205.4	6.5	23,700	107	0.26	2.98	388
Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Population	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
8	PVC HDPE	80	208.0	6.5	24,000	108	0.26	3.00	388
8	PVC HDPE	81	210.6	6.5	24,300	109	0.26	3.01	388
8	PVC HDPE	82	213.2	6.5	24,600	111	0.25	3.08	380
8	PVC HDPE	83	215.8	6.5	24,900	112	0.25	3.10	380
8	PVC HDPE	84	218.4	6.4	25,200	113	0.25	3.11	380
8	PVC HDPE	85	221.0	6.4	25,500	114	0.25	3.13	380
8	PVC HDPE	86	223.6	6.4	25,800	115	0.24	3.18	373
8	PVC HDPE	87	226.2	6.4	26,100	116	0.24	3.19	373

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8	PVC HDPE	88	228.8	6.4	26,400	117	0.24	3.21	373
8	PVC HDPE	89	231.4	6.4	26,700	118	0.24	3.22	373
8	PVC HDPE	90	234.0	6.4	27,000	119	0.24	3.23	373
8	PVC HDPE	91	236.6	6.4	27,300	121	0.24	3.26	373
8	PVC HDPE	92	239.2	6.3	27,600	122	0.23	3.32	365
8	PVC HDPE	93	241.8	6.3	27,900	123	0.23	3.33	365
8	PVC HDPE	94	244.4	6.3	28,200	124	0.23	3.35	365
8	PVC HDPE	95	247.0	6.3	28,500	125	0.23	3.36	365
8	PVC HDPE	96	249.6	6.3	28,800	126	0.23	3.37	365
8	PVC HDPE	97	252.2	6.3	29,100	127	0.23	3.39	365
8	PVC HDPE	98	254.8	6.3	29,400	128	0.23	3.40	365
8	PVC HDPE	99	257.4	6.3	29,700	129	0.22	3.47	357
8	PVC HDPE	100	260.0	6.3	30,000	130	0.22	3.48	357
8	PVC HDPE	101	262.6	6.2	30,300	131	0.22	3.49	357
8	PVC HDPE	102	265.2	6.2	30,600	133	0.22	3.52	357
8	PVC HDPE	103	267.8	6.2	30,900	134	0.22	3.54	357
8	PVC HDPE	104	270.4	6.2	31,200	135	0.22	3.56	357
8	PVC HDPE	105	273.0	6.2	31,500	136	0.22	3.57	357
8	PVC HDPE	106	275.6	6.2	31,800	137	0.22	3.58	357
8	PVC HDPE	107	278.2	6.2	32,100	138	0.21	3.65	349
8	PVC HDPE	108	280.8	6.2	32,400	139	0.21	3.66	349
8	PVC HDPE	109	283.4	6.2	32,700	140	0.21	3.68	349
8	PVC HDPE	110	286.0	6.2	33,000	141	0.21	3.68	349
Nominal Diameter	Pipe Material	Projected Flow (REU's)	Projected Population	Calculated Peaking Factor	Projected ADWF (GPD)	Projected Peak Flow (GPM)	Self Cleansing Minimum Slope (%)	Flow Depth (Inches)	Maximum Capacity @ Minimum Slope (GPM)
8	PVC HDPE	111	288.6	6.2	33,300	142	0.21	3.70	349
8	PVC HDPE	112	291.2	6.1	33,600	143	0.21	3.72	349
8	PVC HDPE	113	293.8	6.1	33,900	144	0.21	3.73	349
8	PVC HDPE	114	296.4	6.1	34,200	145	0.21	3.75	349
8	PVC HDPE	115	299.0	6.1	34,500	146	0.21	3.76	349
8	PVC HDPE	116	301.6	6.1	34,800	148	0.20	3.85	340
8	PVC HDPE	117	304.2	6.1	35,100	149	0.20	3.87	340
8	PVC	118	306.8	6.1	35,400	150	0.20	3.88	340

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	HDPE								
8	PVC HDPE	119	309.4	6.1	35,700	151	0.20	3.90	340
8	PVC HDPE	120	312.0	6.1	36,000	152	0.20	3.91	340
8	PVC HDPE	121	314.6	6.1	36,300	153	0.20	3.92	340
8	PVC HDPE	122	317.2	6.1	36,600	154	0.20	3.94	340
8	PVC HDPE	123	319.8	6.0	36,900	155	0.20	3.95	340
8	PVC HDPE	124	322.4	6.0	37,200	156	0.20	3.97	340
8	PVC HDPE	125	325.0	6.0	37,500	157	0.20	3.98	340
8	PVC HDPE	126	327.6	6.0	37,800	158	0.20	4.00	340
8	PVC HDPE	127	330.2	6.0	38,100	159	0.20	4.01	340
8	PVC HDPE	128	332.8	6.0	38,400	160	0.19	4.09	332

Notes For Table GS-2:

1. REU (GPD) = 300
2. Plastic Pipe Manning "n" = 0.010 (For clean pipe with little deposits/debris)
3. Metal Pipe Manning "n" = 0.013 (For clean pipe with little deposits/debris)
4. Required Self-Cleansing Velocity = 1.99 to 2.01 feet per second
5. Minimum Pipe Flow Depth = 0.6 inches

3.5 MATERIAL SPECIFICATIONS

The contractor shall furnish gravity sewer piping systems in accordance with the material specifications detailed below. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise. All materials shall be new. These material specifications include a list of acceptable manufacturers for the various water system components. The contractor may choose freely from the manufacturers list and **material submittals for such items are not required**. Only products and materials from the acceptable manufacturer's lists herein may be used in the work.

Any item required but not specified herein, or any product or manufacturer other than those listed will be considered a substitution. **Material submittals are required for such items**. Substitutions will not be allowed without the prior written approval of the JWSC Planning and Construction Division. Substitutions, if allowed, shall meet all criteria of the detailed specifications. The burden of proof of compliance for any proposed substitution rests with the Contractor/Developer/Owner. The JWSC Planning and Construction Division will be the sole judge as to the acceptance of a proposed substitution and such decisions will be final.

3.5.1 General Considerations

The type, class, grade, and alignment of sewer pipe may be changed only at manholes. The only exception to this being where a gravity sewer main crosses under a storm drain and the invert of the storm drain is less than 3 feet above the crown of the sewer main. In such cases, a full twenty (20) foot joint of ductile iron pipe shall be centered under the

storm drain and joined to PVC or HDPE pipe with a mechanical joint or stress resistant coupling.

Gravity sewer mains shall be ASTM 3034, SDR-26 heavy wall sewer pipe or DR-17 HDPE. Gravity sewer mains within steel casings or PVC DR18 casing pipes shall be ASTM 3034, SDR 26 heavy wall sewer pipe and shall be installed with approved skids or spacers to hold grade and prevent flotation in accordance with these specifications.

Ductile iron pipe is only permitted for gravity sewer use where the mains or laterals are above ground as in ditch crossings. The only exception being storm drain crossings as cited above.

All material shall be free from defects impairing strength and durability, shall be of the best commercial quality for the purpose specified, shall have structural properties sufficient to safely sustain or withstand strains and stresses to which it is normally subjected and be true to detail.

Pipe to be installed underground using open-cut methods shall be PVC push-on joint type as described in these specifications, or as accepted within these specifications for storm drain crossings. Pipe installed above ground shall be Sewer-Safe restrained joint ductile iron pipe or flanged ductile iron pipe as described in these specifications.

For pipe bursting or horizontal boring construction, the pipe shall be high density polyethylene (HDPE) or Fusible PVC of a suitable ASTM Standard, classification and pressure rating as described in these specifications. The "depth of cut" shall be defined as the vertical distance from pipe invert to finish grade.

3.5.2 Polyvinyl Chloride (PVC) Pipe and Fittings

Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter and length. All PVC sanitary sewer pipe shall be green. Storage and handling of PVC pipe shall be in accordance with Chapter 6 of AWWA Manual M23.

PVC 1120, Class 160, SDR 26 Pipe shall conform to ASTM D3034 for sizes four (4) inch thru fifteen (15) inch diameter pipe and ASTM F679 for 18 inch through 36 inch diameter pipe.

The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784 with wall thickness T-1. Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3212. Elastomeric seals shall meet ASTM F477 or ASTM F913. The pipe shall be designed to pass without failure a sustained pressure test of 340 psi in conformance with ASTM D1598 and a quick burst test of 400 psi in conformance with ASTM D1599.

Fittings shall meet the requirements of ASTM D3034 and ASTM F1336 for sizes four (4) inch through fifteen (15) inch in diameter and ASTM F679 and ASTM F1336 for eighteen

(18) inch through thirty six (36) inch in diameter with minimum wall thickness of SDR 26. Fittings shall be gasket joint type meeting the requirements of ASTM D3212. Elastomeric gaskets shall conform to ASTM F477 or ASTM F913. PVC material shall have a cell classification of 12454-B in accordance with ASTM D1784.

PVC 1120, Pressure Class (PC) 235 of DR-18 for twenty-four (24) inch diameter or less and DR-21 for greater than twenty-four (24) inch diameter pipe (used as casing pipe for easements and allowed rights-of-way) shall conform to AWWA Standard C900 or C905, as appropriate for pipe diameter. All pipes shall be hydrostatically proof tested at the factory in conformance with UNI-B-11 standards. In case of conflict between standards specified herein, the requirements of AWWA Standard C900 and C905 shall prevail. Pipe is to be manufactured to ductile iron pipe equivalent outside diameters. The pipe material shall be clean, virgin, National Sanitation Foundation approved, Class 12454-B PVC compound conforming to ASTM resin specification D1784.

Pipe shall have a bell type coupling with a thickened wall section integral with the pipe barrel in accordance with ASTM D3139. Elastomeric seals shall meet ASTM F477. The pipe shall be designed to pass without failure a sustained pressure test of 500 psi in conformance with ASTM D1598 and a quick burst test of 755 psi in conformance with ASTM D1599. Where PVC Casing Pipes can be installed using horizontal directional drilling techniques, equivalently rated fusible PVC pipe may be approved.

PVC Fittings six (6) inches through twelve (12) inches may be used with PVC C900 pipe. Fittings shall be PVC injection molded, made from materials meeting or exceeding the requirements of cell class 12454-B material as defined in ASTM D1784. All PVC fittings must comply with or exceed, AWA C907. All fittings must be designed to the pressure class of the pipe used, with a pressure rating of 150 psi and a 2.5 to 1 factor of safety. Virgin materials only shall be used in the manufacture of PVC pressure fittings. These fittings must have UL-FM approval and shall comply with or exceed all ASTM Standards for PVC fittings. All fittings must have NSF-61 approval. The elastomeric gasket shall comply with the requirements specified in ASTM F477.

3.5.3 Ductile Iron (D.I.P.) Pipe and Fittings

D.I.P. wall thickness and pressure class shall conform to ANSI Specification A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151) with pressure class 350 as a minimum. Pipe shall also be certified by ISO 9000 by an accredited registrar.

Pipe shall be clearly marked with the name of the manufacturer, location of the foundry, pressure rating, thickness or pressure class, nominal pipe diameter, weight of pipe without lining, maximum depth of bury and length.

All pipe furnished by the manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. All ductile iron pipe shall be color coded green by field painting a green stripe, three (3) inches wide, along the crown of the pipe barrel.

All ductile iron pipes and fittings shall be externally coated with a bituminous coating as specified in ANSI A21.51 and be continuous smooth, neither brittle when cold or sticky when exposed to the sun, and be strongly adherent to the fitting. If the pipe is installed in a corrosive soil, then all bolts, nuts, studs and other uncoated parts of joints for underground installation shall be coated with asphalt or coal-tar prior to backfilling.

All ductile iron pipes and fittings shall be Sewer Safe internally lined with an approved amine cured novalac epoxy coating containing at least 20% by volume of ceramic quartz pigment. Ductile iron fittings shall have a minimum working pressure of 350 psi. Fittings shall conform to ANSI Specifications A21.10 (AWWA C110), A21.11 (AWWA C111), A21.15 (AWWA C115) and/or A21.53 (AWWA C153). Fittings shall also be certified by ISO 9000 by an accredited registrar. Compact fittings shall normally be installed. Long body fittings shall be used where the drawings specifically call for long body fittings, where compact fittings are not available, or at the option of the contractor when the laying length is not controlled by compact fittings patterns. All fittings shall be UL/FM approved and shall conform to NSF Standard 61, as applicable. All fittings furnished by the approved manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. Fittings shall have cast on them the pressure rating, nominal diameter of openings, manufacturer's name, foundry location, plant code and degrees or fraction of the circle. Cast letters and figures shall be on the outside body of the fitting. All ductile iron fittings shall be externally coated and internally lined as specified in this specification.

3.5.4 High Density Polyethylene (HDPE) Pipe and Service Connections

For Horizontal Directional Drilling or Pipe Bursting, HDPE Pipe shall be ductile iron pipe size outside diameter, SDR 11 high performance, high molecular weight, high density polyethylene pipe, and shall conform to ASTM D 1248 (Type III C, Category 5, P34).

Minimum cell classification values shall be 345434C as referenced in ASTM D 3350. All pipe resin shall be manufactured by the same company that manufactures the pipe itself in accordance with these specifications to insure complete resin compatibility and total product accountability.

Fittings for service connections shall be Inserta-Tee or electro-fusion type fittings only.

3.5.5 Fusible Polyvinyl Chloride (FPVC) Pipe and Service Connections

For Horizontal Directional Drilling or Pipe Bursting, Fusible C-900, C-905, DR-18 FPVC and 1120, SDR-26 FPVC pipe shall be cast iron pipe size outside diameter, conforming to ASTM D3034. All piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784. Pipe shall be extruded with plain ends which shall be square to the pipe and free of any bevel or chamfer.

There shall be no bell or spigot gasket of any kind incorporated into the pipe. Pipe shall be manufactured in standard 40 foot nominal lengths, with other lengths available upon request. For gravity sewer use, pipe shall be green in color. The pipe shall be marked per

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industry standards. The pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

Fittings for service connections shall be Inserta-Tee or watertight stainless steel saddle type fittings suitable for use on C-900 pipe.

3.5.6 Manholes

3.5.6.1 Manhole Diameter

The minimum manhole inside diameters for gravity sewer lines six (6) inch through sixteen (16) inch shall be four (4) feet; for lines eighteen (18) inches through thirty (30) inches – five (5) feet; for lines thirty six (36) inch through forty eight (48) inch – six (6) feet; and for lines greater than forty eight (48) inches – eight (8) feet. Where the depth of a manhole, (from finished grade to lowest pipe invert), is fifteen (15) feet or greater, the minimum manhole diameter shall be five (5) feet.

3.5.6.2 Precast Concrete Manholes

Precast concrete manholes or calcium aluminate cement concrete manholes used shall conform to all requirements of ASTM Designation C478 at minimum and be provided with "O" ring gasket type joints, conforming to ASTM Designation C443-77, or flexible joint sealant roping of butyl rubber conforming to Federal Specification SS-S-210A, AASHTO M-198, Type B-Butyl Rubber with a minimum cross section of 1 ¼ inches, and shall be:

- (a) constructed using a top section cast monolithically and shaped as an eccentric cone, or for manhole depths five (5) feet or less be a concentric cone, joint systems must match associated riser or base sections; the clear opening for the manhole frame & cover shall not be less than twenty four (24) inches for main sewers six (6) inches through eighteen (18) inches in diameter, and not less than thirty two (32) for main sewers greater than eighteen (18) inches in diameter;
- (b) constructed using riser sections cast monolithically having a minimum lay length of sixteen (16) inches and of joint systems matching associated base and cone sections;
- (c) constructed using a base section cast monolithically having a minimum lay length of sixteen (16) inches and a joint system matching associated riser and cone sections;
- (d) constructed, where depth permits, using a precast eccentric transition section to reduce base section diameters of six (6) foot or greater, to five (5) foot diameter at finish grade. Such transitions shall not be made less than four (4) vertical feet above the invert bench;

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- (e) constructed, where manhole depth will not permit a diameter transition section, using a precast flat slab top section with centered thirty two (32) diameter hole for the manhole frame & cover opening;
- (f) constructed using precast inverts providing clearance for pipe projecting a minimum of two (2) inch inside the manhole wall, troughs formed and finished to provide a minimum slope of 1.25% from the pipe outlet to the inlets, minimum concrete thickness from the bottom of the lowest invert to the bottom of the base not less than eight (8) inches, invert benches with a uniform 2:1 slope from the high point at the manhole wall to the lip of the invert trough; trough depth from the lip of the invert trough to the invert of the pipe to be 50% of the main pipe diameter; inverts shall be free from depressions, high spots, voids, chips or fractures over one fourth ($\frac{1}{4}$) inch in diameter or depth;
- (g) hand-formed inverts, when approved for use, shall meet or exceed the durability, strength, configuration and hydraulic "smoothness" as required for precast inverts. Filler for inverts shall be holed burned brick;
- (h) steps, on the vertical or straight wall of four (4) foot and five (5) foot diameter manholes shall be aligned vertically on sixteen (16) inch centers, secured to the wall with a compression fit in tapered holes or cast in place, coated with a copolymer polypropylene plastic coating, reinforced with one-half ($\frac{1}{2}$) inch diameter grade 60 bar with serrated treads and tall end lugs; step pullout strength shall be 2000 lbs. minimum when tested according to ASTM C497; steps shall begin no less than eighteen (18) inches from the manhole rim and end no closer than sixteen (16) inches above the manhole bench;
- (i) steps shall not be used on manholes greater than five (5) foot in diameter or where a concentric cone or flat-slab top is the final section;
- (j) lifting, devices for handling precast manhole section components shall comply with OSHA Standard 1926.704;
- (k) manhole entrance couplings with the entry pipes greater than eighteen (18) inch in diameter shall be fitted with pipe entrance connectors conforming to ASTM C923, and for eighteen (18) inch pipes and smaller to ASTM C-425 using neoprene boot inserts tightened to the pipe using a stainless steel adjustable band, ("A-Loc" or approved equal), rigid cement or synthetic type grout collars are not acceptable as a seal between the manhole and entry pipe in new construction.

3.5.6.3 Fiberglass Manholes

Water tight fiberglass manholes shall be reinforced polyester manufactured from commercial grade polyester resin or other suitable polyester or vinyl ester resins with

fiberglass reinforcements. Manhole shall be a one piece unit manufactured to meet or exceed all specifications of A.S.T.M. D-3753 latest edition or approved equal.

Fiberglass manholes shall be bedded and fully encased in a Class I gravel envelope from the base to the top of the fiberglass structure to insure lateral support; the thickness of the gravel envelope shall be no less than six (6) inches around the entire circumference of the structure.

- (a)** Resin: The resins used shall be a commercial grade unsaturated polyester resin or other suitable polyester or vinyl ester resin.
- (b)** Reinforcing Materials: The reinforcing materials shall be commercial Grade "E" type glass in the form of continuous roving and chop roving, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.
- (c)** Interior Surfacing Material: The inner surface exposed to the chemical environment shall be a resin-rich layer of 0.010 to 0.020 inch thick. The inner surface layer exposed to the corrosive environment shall be followed with a minimum of two passes of chopped roving of minimum length 0.5 inch (13 mm) to maximum length of 2.0 inch (50.8 mm) and shall be applied uniformly to an equivalent weight of 3 oz/ft. Each pass of chopped roving shall be well rolled prior to the application of additional reinforcement. The combined thickness of the inner surface and interior layer shall not be less than 0.10 inch (2.5 mm).
- (d)** Wall Construction Procedure: After the inner layer has been applied the manhole wall shall be constructed with chop and continuous strand filament wound manufacturing process, which insures continuous reinforcement and uniform strength and composition. The cone section, if produced separately, shall be affixed to the barrel section at the factory with resin-glass reinforced joint resulting in a one-piece unit. Seams shall be fiber-glassed on the inside and the outside using the same glass-resin jointing procedure. Field joints shall not be acceptable by anyone other than the manufacturer or approved equal.
- (e)** Exterior Surface: For a UV inhibitor the resin on the exterior surface of the manhole shall have gray pigment added to a minimum thickness 0.125 inches.
- (f)** Stub-outs and Connections: Upon request stub-outs may be installed. Installation of SDR, PVC, or sewer pipe must be performed by sanding, priming, and using resin fiber-reinforce hand lay-up. The resin and fiberglass shall be the same type and grade as used in the fabrication of the fiberglass manhole. Inserta-Tee fittings may be requested and installed per manufacturer's instructions. Kor-N-Seal boots may be

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installed by the manhole manufacturer using fiberglass reinforced pipe stub-outs for the Kor-N-Seal boot sealing surface.

- (g)** Manhole Bottom: Fiberglass manholes will be required to have resin fiber-reinforced bottom. Deeper manholes may require a minimum of two fiberglass channel stiffening ribs. All fiberglass manholes manufactured with a fiberglass bottom will have minimum three (3) inch wide anti-flotation rings as required based on the depth of the manhole, the weight of the gravel backfill and the groundwater uplift forces anticipated at the site. The manhole bottom shall be a minimum of one-half ($\frac{1}{2}$) inch thick.
- (h)** Fiberglass enclosed invert and bench area: A fiberglass enclosed invert and bench area shall be installed in the manhole by the manufacturer. The invert will be formed using a non-corrosive material and completely enclosed in a minimum one-fourth ($\frac{1}{4}$) inch layer of fiberglass chop.
- (i)** Height Adjustment: Fiberglass manholes must have the ability to be height adjustable with the use of a height adjustment ring. Height adjustment can be made as a field operation without the use of uncured resins or fiberglass lay-ups. Fiberglass manholes must maintain all load and soundness characteristics required by ASTM D3753 after height adjustment has occurred.
- (j)** Fillers and Additives: Fillers, when used, shall be inert to the environment and manhole construction. Sand shall not be accepted as approved filler. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific ASTM D-3753 standard. The resulting reinforced-plastic material must meet the requirements of this specification.
- (k)** Manufacture: Manhole cylinders, man-way reducers, and connectors shall be produced from fiberglass-reinforced polyester resin using a combination of chop and continuous filament wound process.
- (l)** Interior Access: All manholes shall be designed so that a ladder or step system can be supported by the installed manhole.
- (m)** Man-way Reducer: Man-way reducers will be concentric with respect to the larger portion of the manhole diameters through 60 inches. Larger manholes may have concentric or eccentric man-way reducer openings.
- (n)** Cover and Ring Support: The manhole shall provide an area from which a grade ring or brick can be installed to accept a typical metal ring and cover and have the strength to support a traffic load without damage to the manhole.

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- (o) Exterior Surface: The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than 0.5 inch in diameter, de-lamination or fiber show.
- (p) Interior Surface: The interior surface shall be resin rich with no exposed fibers. The surface shall be free of crazing, de-lamination, and blisters larger than 0.5 inch in diameter, and wrinkles of 0.125 inch or greater in depth. Surface pits shall be permitted if they are less than 0.75 inch in diameter and less than 0.0625 inches deep. Voids that cannot be broken with finger pressure and are entirely below the resin surface shall be permitted if they are less than 0.5 inch in diameter and less than 0.0625 inch thick.
- (q) Wall Thickness: Fiberglass manholes forty eight (48) inch in diameter and up to twenty (20) feet in depth will have a minimum wall thickness of .3125 inches. Fiberglass manholes forty eight (48) inch in diameter and twenty (20) feet to thirty (30) feet in depth will have a minimum wall thickness of .5 inches.
- (r) Repairs: Any manhole repairs are subject to meet all requirements of this specification.
- (s) Manhole Length: Manhole lengths shall be in six (6) inch increments +/- two (2) inches.
- (t) Diameter Tolerance: Tolerance of inside diameter shall be +/- 1% of required manhole diameter.
- (u) Load Rating: The complete manhole shall have a minimum dynamic-load rating of 16,000 lbs. when tested in accordance with ASTM 3753 8.4 (note 1). To establish this rating the complete manhole shall not leak, crack, or suffer other damage when load tested to 40,000 lbs. and shall not deflect vertically downward more than 0.25 inch at the point of load application when loaded to 24,000 lbs.
- (v) Stiffness: The manhole cylinder shall have the minimum pipe-stiffness values shown in the table below when tested in accordance with A.S.T.M. 3753 8.5 (note 1).

**Figure GS-3
Pipe-Stiffness Table**

LENGTH (FT)	F/AY (PSI)
3.0 to 6.5	0.75
7.0 to 12.5	1.26
13.0 to 20.5	2.01

- (w) Soundness: In order to determine soundness, the manufacturer shall apply an air or water pressure test to the manhole test sample. Test pressure shall not be less than 3 psig or greater than 5 psig. While holding at the established pressure, inspect the entire manhole for leaks. Any leakage through the laminate is cause for failure of the test. Refer to ASTM 3753 8.6.
- (x) Chemical Resistance: The fiberglass manhole and all related components shall be fabricated from corrosion proof material suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection system.
- (y) PHYSICAL PROPERTIES:

	Hoop	Axial
Tensile Strength (PSI)	18,000	5,000
Tensile Modulus (PSI)	600,000	700,000
Flexural Strength (PSI)	26,000	4,500
Flexural Modulus (PSI)	1,400,000	700,000
Compressive (PSI)	18,000	10,000

- (z) TEST METHODS/QC/CERTIFICATION: All tests shall be performed as specified in ASTM 3753 latest edition, section 8. Test method D-790 (see note 5) and test method D-695; each completed manhole shall be examined by the manufacturer for dimensional requirements, hardness, and workmanship. All required A.S.T.M. 3753 testing shall be completed and records of all testing shall be kept and copies of test records shall be presented to customer upon formal written request within a reasonable time period; and as a basis of acceptance the Manufacturer shall provide an independent certification which consists of a copy of the manufacturer's test report and accompanied by a copy of the test results stating the manhole has been sampled, tested, and inspected in accordance with the provisions of this specification and meets all requirements.

3.5.6.4 Manhole Frames and Covers

Manhole frames and covers shall be Gray Cast Iron conforming to specification ASTM-A48 Class 35B. Castings shall be of uniform quality, and free from blowholes, porosity, hard spots, shrinkage distortion and other defects. Frames and covers shall be smooth, well-cleaned by shot blasting and shall remain unpainted. All castings shall be manufactured true to pattern, and component parts shall fit together in a satisfactory manner. The frame and cover shall be designed to withstand an AASHTO H-20 wheel loading. The frame and cover shall have an "O" Ring type rubber seal or neoprene gasket designed to eliminate or significantly reduce surface water infiltration, have two non-penetrating pick-holes in the cover and four one (1) inch diameter anchor holes in the frame flange. The cover shall read "Sanitary Sewer"

- (a) manhole frames and covers on four (4) foot diameter manholes shall have a minimum inside opening diameter of not less than twenty three (23) inches and no more than twenty four (24) inches and considered a standard twenty four (24) inch frame & cover;
- (b) manhole frames and covers on five (5) foot diameter manholes and greater shall have a minimum inside opening diameter of not less than thirty (30) inches and not more than of thirty one (31) inches and considered a standard thirty two (32) inch frame & cover;
- (c) manhole frames and covers within easements and in areas where security is an issue shall be equipped with manhole locking devices or bolt down covers.

3.6 INSTALLATION OF SEWER MAINS AND APPURTENANCES

The contractor shall install gravity sewer systems in accordance with the installation specifications detailed in this section. All references to industry standards (ASTM, ANSI, AWWA, etc.) shall be to the latest revision unless stated otherwise.

3.6.1 Gravity Sewer Main Depth

Gravity sewer mains shall be designed meeting minimum depth requirements of thirty six (36) inches as measured from finished grade to pipe crown. This depth is based on the minimum height of standard precast manhole sections commonly available; however, where manholes are made of fiberglass or other approved materials where manhole depths can be manufactured to specified heights, this depth restriction may be waived and a minimum depth of thirty (30) inches approved.

Gravity sewer mains with service laterals shall not be constructed at any depth greater than fifteen (15) feet as measured from finished grade to pipe crown.

Gravity sewer mains without service laterals shall not be constructed at any depth greater than twenty (20) feet as measured from the finished grade to pipe invert. Where such deep lines must be constructed, a gravity sewer high-line with services connecting directly into the deep manholes will be allowed. Such high-lines must be off-set at least ten (10) foot laterally from the deep line. Major sanitary sewer transmission mains eighteen (18) inch diameter and greater may be excepted from depth restrictions upon approval by the JWSC.

3.6.2 Gravity Sewer Main Location and Alignment

Gravity sewer mains shall be designed for installation on the centerline of roadways as much as possible where landscaping, trees or other obstruction to manhole access is anticipated or probable.

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At no time, shall gravity sewer mains or manholes be less than ten (10) feet inside of road rights-of-way lines. Gravity sewer manholes may not be designed or constructed to be less than four (4) feet off roadway curb & gutters. No gravity sewer manholes may be designed or constructed to lie within ditch lines.

Gravity sewer mains shall be installed with a straight alignment between manholes.

Gravity sewer mains up to twelve (12) feet in depth that are not in public rights-of-way shall be centered in a twenty (20) foot wide exclusive easement dedicated to the JWSC. The JWSC retains the right to require additional or less easement width where maintenance or access circumstances warrant.

Gravity sewer mains greater than twelve (12) feet in depth that are not in public rights-of-way shall be centered in a thirty (30) foot wide exclusive easement dedicated to the JWSC. The JWSC retains the right to require additional or less easement width where maintenance or access circumstances warrant.

All gravity sewer main easements shall be accessible and unobstructed to JWSC maintenance vehicle traffic with a stabilized twelve (12) foot wide access with a minimum Load Bearing Ratio (LBR) of 30. The access must be adequately graded for service vehicle use and provided with adequate drainage. The access travel area may, at minimum, be composed of a sturdy grassed surface to prevent erosion from storm runoff and maintainable by mowers or bush hogs.

Easements interrupted by wetlands, streams or ditches that would preclude the travel of maintenance equipment from end to end must be provided with auxiliary lateral ingress/egress easements to permit access to the sewer line easement so that each line segment and manhole is accessible to maintenance service vehicles. A truck turnaround area should be provided at the intersection of all ingress/egress and sanitary sewer line easements.

A horizontal distance of six (6) feet minimum shall be maintained from all gravity sewer mains or manholes to drainage structures, telephone duct banks, electrical transformers, signal relays, power poles and other structures in the right-of-way as well as any other parallel underground utilities. Gravity sewer mains crossing other underground utilities, (with the exception of water mains), shall have a minimum vertical separation of six (6) inches. All distances shall be measured from the outside edge of the pipes. Exceptions must be approved by JWSC.

Gravity sewer mains located adjacent to storm water retention, ponds, lakes and water courses shall be designed with sufficient easement and spacing from bank crowns. The potential for side slope collapse shall be based on 3 to 1 side slopes and the pipe's depth of bury. The JWSC reserves the right to require casing pipe in such situations where inadequate spacing can be demonstrated.

3.6.3 Gravity Sewer and Water Main Separation Requirements

There should be no physical connections between a public or private potable water supply system and a sanitary sewer, or appurtenances which would permit the passage of any sewage or polluted water into the potable supply. No water pipes shall pass through or come in contact with any part of a sewer manhole.

Sanitary sewers shall be laid at least ten (10) feet horizontally from an existing or proposed water main. On a case by case basis, when this separation is not possible or practical, a deviation may be allowed if the water main is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at an elevation so that the bottom of the water main is at least eighteen (18) inches above the top of the sanitary sewer.

At crossings, pipe joints shall be as far as possible and equidistant from the point of crossing. Water main preferred on top. Separation shall be measured from the outside edge of the pipe to the outside edge of the pipe. A full length of water main pipe must be centered at the crossing. Water pipe joints shall be arranged so that all water main joints are at least six (6) feet from all gravity sewer line joints. Where a water main must cross under a gravity sanitary sewer, adequate structural support shall be provided for the sewer to prevent damage to the water main.

3.6.4 Encasements and Casing and Aerial Crossings

Reaches of gravity sewer located in easements that cross wetlands, which are to be restored as wetlands, shall be sub-aqueous, shall be encased in corrosion resistant coated steel or Fusible PVC casing and treated for leakage. Those runs which include manholes, located across wetlands, shall be accessible to maintenance vehicles. A stabilized access road, twelve (12) foot wide with a minimum Load Bearing Ratio (LBR) of 30 shall be provided and indicated on the Record Drawings for easements requiring multiple manholes. The access road should be designed to provide for adequate drainage and to prevent erosion from storm runoff. A truck turnaround area should be provided at the end of all access roads.

Reaches of gravity sewer located in easements that cross under streams or within three (3) vertical feet of the bottom of canals, ponds, lakes or ditches that may be considered Waters of the State or otherwise environmentally sensitive due to local recreational use, shall be sub-aqueous, shall be encased in a corrosion resistant coated steel or Fusible PVC casing and tested for leakage.

Casing ends shall extend a minimum of twenty five (25) feet beyond stream banks and be electronically marked using an approved method or signed to show the casing end points. Such crossings shall be limited in length as much as possible and no reach of gravity sewer across such water body shall exceed four hundred (400) linear feet between manholes.

Reaches of gravity sewer crossing public rights-of-way on State, County and City Primary Roads or railroads shall be encased in corrosion resistant coated steel or Fusible PVC

casing (if allowed by the Railroad or Department of Transportation Authority) and tested for leakage. Casing ends shall extend a minimum of ten (10) feet beyond the furthest edge of pavement, curb and gutter, storm drain systems or sidewalks, whichever is greater, and be electronically marked using an approved method to allow the positive identification of casing end points. Such crossings shall be limited in length as much as possible and no reach of gravity sewer shall exceed four hundred (400) linear feet between manholes.

Reaches of gravity sewer crossing streams, ditches and canals where sub-aqueous crossings are not practical by system design due to grade considerations may be aerial crossings. Where stream width allows, one pipe joint of Sewer Safe DIP shall be used with precast concrete pipe piers having saddle type top sections and anchored galvanized pipe straps. Such piers shall be set a minimum of ten (1) feet beyond the existing stream banks with bases set a minimum of two (2) feet below the existing stream bottom. Where the stream width dictates that more than one joint of Sewer Safe DIP be used, the crossing pipe shall be Sewer Safe DIP flanged joint with piers set adjacent to each pipe joint and end piers set and as specified for single joint crossings. Attachment to stream bridges and other stream crossing structures will not be permitted.

3.6.5 Gravity Main Stub-outs

Gravity sewer main stub-outs shall be provided to all undeveloped property and/or future phases of the project in accordance with the sewer master plan for the collection system service area.

Where gravity stub-outs are required, they shall be extended to within four (4) feet of the property line, plat line or phase line and shall extend a minimum of ten (10) feet past the edge of pavement or a distance of 1.5 times the sewer depth whichever is greater. The stub-out shall be terminated with a "no-invert" manhole with the effluent line plugged by a mechanical plumber's plug. *(See JWSC Standard Detail)*

Where gravity sewer extensions are made where there is no reasonable definition of undeveloped or un-subdivided property to be served with a stub-out, as specified above, the end of line manhole shall be set so as not to accept any wastewater contribution from the installed system and be constructed without an invert or any influent line wall core or hole.

3.6.6 Sewer Services

Single gravity services shall be provided to each lot or parcel provided that adequate and accessible utility corridors are also provided for maintenance.

Each residential lot shall have only one connection point to the public sanitary sewer system main.

Where commercial developments require multiple connection points to a sanitary sewer main, an internal privately owned piping system shall be installed that will drain to the public main at only one connection point.

Where services must be constructed through private property to access the public sanitary sewer system, it is the property owner's responsibility to secure a private sewer utility easement with the owner of the property through which the line will be constructed and provide documentation of such filed easement with the JWSC.

Gravity sewer services shall be at least one nominal diameter less than the size of the gravity main to which it is connected. Where the size of the service must be the same size of the main a sanitary sewer manhole shall be installed. No sanitary sewer service that is larger than the diameter of the serving sewer main shall be permitted unless specific plans by the JWSC to upgrade the sewer main allow a temporary connection to be approved.

Gravity sewer services shall be a minimum of four (4) inches in diameter where serving a single unit or six (6) inches in diameter where serving two lots with a common connection to the main. All service laterals shall be constructed from the main to the lot to be served at a one-eighth (1/8) inch per foot slope (1%).

Gravity sewer service stub-outs shall be marked with a two (2) inch diameter pressure treated pine post. The bottom of the post shall be set two (2) to three (3) inches above the top and directly over the end of the stub-out and protrude approximately two (2) feet above finished grade. The post shall be painted green.

A service shall be designed to connect to the gravity main with an inline wye fitting rotated 45 degrees up. The invert elevation of the service at the wye connection shall be at or above the crown of the mainline pipe and the sewer flow shall enter the main through the wye positioned at 10 o'clock or 2 o'clock on the main. No service connections made at the 12 o'clock position on a main will be acceptable (*See JWSC Standard Details*).

Single/Multiple Family Residential Gravity Sewer Services:

- (a) Where a service is to serve a single lot or a lot on which an indivisible duplex, triplex or quadraplex unit is being constructed, the service shall be installed at the center of the lot and front the property being served. Such services shall be perpendicular to the main. All service stub-outs shall be properly marked as noted above and shall have a clean-out installed within one foot of the property or easement line and within private property, to separate private from public responsibility upon connection. The responsibility for the clean-out shall be the owners (*See JWSC Standard Details*).
- (b) Where adjacent residential properties can share a common service line the service wye that splits the discharge between the users must be constructed completely within the public rights-of-way corridor or easement using a six by four (6X4) inch double-wye fitting with the four

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(4) inch branching service lines from the wye ending at a point at the property line that will not conflict with other utility components such as transformers, phone pedestals, water meters, light poles, etc. Each four (4) inch branch stub-out shall be properly marked as noted in this Section and shall have a clean-out installed within one foot of the property or easement line and within private property, to separate private from public responsibility upon connection. The responsibility for the clean-out shall be the owners. Such double services may be approved for light commercial properties upon approval of the JWSC (*See JWSC Standard Details*).

Double services, as described above may be applicable for certain commercial properties upon approval by the JWSC.

Services shall be limited to 60' maximum length from either the sewer main or the manhole to the property line.

All services shall run perpendicular to the gravity sewer main line; no services shall be constructed parallel to the rights-of-way or easement line or run diagonally across rights-of-ways or easements with the exception of cul-de-sacs or where sharp curves in roadways or easements occur.

Services shall be marked with an "S" inscribed in the curb face, directly over the service line, and painted green.

Services shall terminate no less than thirty (30) inch deep and no greater than sixty (60) inch deep at the property line and where not expected to be in conflict with other crossing underground utilities.

Services that cross under storm drain structures or ditches, and do not have a minimum one and one half (1 1/2) foot vertical clearance between the invert of the storm drain pipe or the ditch bottom, shall be constructed with one joint of sewer safe D.I.P. centered under the storm pipe or ditch.

Private clean-outs shall not be installed in the Rights-of-way or easements. The responsibility for the protection and repair of clean-out shall be the owners.

Service connections are not permitted on trunk sewers larger than 15" in diameter.

Service Connections to manholes are allowed as follows:

- (a) Inline manhole connections are limited to 2 services, one from each side of the rights-of-way or easement and installed perpendicular to the Rights-of-Way or easement.
- (b) Terminal manholes located in residential cul-de-sacs are allowed 3 service connections. The invert of each service connection shall be a

minimum of five (5) inches above the invert of the manholes effluent (outgoing) main line.

Services shall not be connected to main line stub-outs without a manhole.

3.6.7 Sewer Manholes

3.6.7.1 Location

Manholes shall be installed at the end of each main and at all changes in grade, pipe size, pipe material, or alignment and at all pipe intersections. The only recognized exception shall be where pipe material changes are allowed on a particular reach of main by this standard (i.e. D.I.P installed under storm drains, water mains, etc.).

Manholes where pipe diameter changes occur shall establish invert elevations by matching pipe crowns. Where the vertical difference in pipe inverts, caused by matching crowns occurs, are less than 1.5 feet in 4' diameter manholes and 2 feet in 5' or larger manholes between influent and effluent lines, transitional flow slides may be used so long as they do not interfere with the smooth flow through the primary manhole trough or other influent line flows.

Manholes shall be located on the centerline of roadways or out of the wheel lane and a minimum of four (4) feet from the edge of the manhole to the curb and gutter; but never installed in ditch lines.

Manholes shall not be installed in the flow line of inverted crown roads or within the design high water limits of gutters, swales, or retention/detention areas.

Manholes located within easements shall have the ring and cover set six (6) inches to eight (8) inches above final grade.

3.6.7.2 Spacing

The maximum spacing of manholes shall be four hundred (400) feet for sewer mains less than or equal to fifteen (15) inches diameter and five hundred (500) feet for sewer mains greater than fifteen (15) inches diameter. A gravity main exceeding the maximum length may be allowed where a practical and sufficient reason can be demonstrated; however, such additional length shall not exceed the allowed maximum distance by more than fifty (50) feet.

3.6.7.3 Clearance Requirements

Manholes shall have three (3) feet minimum clearance from outside edge to outside edge of other utility components, such as storm drains and storm drain boxes, utility poles, transformers, phone pedestals and cable systems.

3.6.7.4 Depth

The design depth for all manholes is to be at no less than thirty six (36) inches from the top of the manhole to the pipe crown.

3.6.7.5 Drop Connections

Outside and Inside drop connections are only allowed within limited boundary subdivision developments to be dedicated as public infrastructure, where the potential for gravity system extensions from the manhole to adjacent properties is blocked or unanticipated by the sewer master plan, and the main line pipe size is eight (8) inches or greater. Where outside drops are acceptable, they shall be required where the vertical difference between inverts is greater than one and one-half (1 ½) feet in four (4) foot diameter manholes or two (2) feet in manholes greater than four (4) feet in diameter (**See JWSC Standard Details**). Inside drops will only be approved where connections are being made to an existing system where depth restraints preclude the practical installation of an outside drop.

Outside drops, where the vertical distance of the drop is ten (10) feet or less, shall be constructed of SDR-35 PVC pipe, bedded and backfilled along with the entire manhole structure to within ten (10) inches of the final grade with Class I material; where the vertical distance of the drop is greater than ten (10) feet, the drop shall be encased in a concrete column of a minimum two (2) inches thickness around all pipe walls, and poured so as to provide a concrete base as a foundation for the drop bottom connection; the entire concrete structure shall be tied to the manhole wall with rebar studs for the full depth of the drop.

Inside drops, where approved, must enter the manhole with a PVC tee fitting with a gasketed cap cut to one-half (½) of the host pipe diameter attached to the branch following the slope of the pipe reach being drained, the down leg placed closely against the manhole wall fastened with (316) stainless steel anchor bolts and bands on two (2) foot centers, an angled fitting and invert trough at the base to direct the flow smoothly into the existing flow line; all PVC piping and fittings shall be SDR-35 (**See JWSC Standard Details**).

3.6.7.6 Grade Rings

Grade rings, where necessary to serve as spacers between the top cone of the manholes and the base of the manhole cover frame to bring the manhole design or finish grade, shall be hard rubber or approved equal to absorb vibration in paved areas and high density polyethylene or cement rings in off road applications. Adjustments using clay or cement brick are not acceptable.

On new construction, an adjustment using metal riser rings to extend the manhole cover frame to grade is not permitted. No adjustment using grade rings between the top cone section and the manhole cover frame shall exceed sixteen (16) inches.

3.6.7.7 Corrosion Protection

Manhole corrosion protection shall be provided for manholes in accordance with the following schedule based on detention time of sewer flow from the uppermost region of the contributing pipe reach using an average velocity of two (2) feet/sec.

Vapor H2S	Corrosion Risk Level	Detention Time	Corrosion Protection
0-10 PPM	No or Low Risk	<2 Hours	None
11-50 PPM	Moderate Risk	2 - 4 Hours	Coal Tar Epoxies
>50 PPM	High Risk	>4 Hours	Calcium Aluminates Epoxy Coatings Approved Lining Systems
FM Discharge Manhole	High Risk	N.A.	Calcium Aluminates Epoxy Coatings Approved Lining Systems

- (a) Corrosion protection for *High Risk* manholes shall be hydrogen sulfide resistant cementitious products containing calcium aluminates applied at a minimum of one-half (½) inch to three-fourths (¾) inch in thickness or epoxy coatings applied a minimum of 150 mil thickness onto all interior manhole surfaces, excluding the trough, after proper substrate preparation; or precast manholes manufactured of calcium aluminate cement concrete; or manholes manufactured of fiberglass. Alternatives that provide equal or better protection may be approved.
- (b) Any manholes receiving the discharge from upstream lift stations shall be considered a *High Risk* manhole and the 2nd and 3rd manholes downstream shall be considered *Moderate Risk* manholes and protected per this standard.

3.6.8 Pipe Trench Construction, Bedding, Backfill and Workmanship

At no time shall the bedding, haunching, initial backfill or final backfill be less than, or in contradiction to the pipe manufactures recommendations for the pipe materials being used.

3.6.8.1 Rigid Pipe

Rigid Pipe Materials (DIP) shall be laid in a Type 2 (flat bottomed) trench with a pipe bedding of Class I gravel or naturally occurring clean compacted sand, as necessary to provide a firm unyielding pipe foundation; or where the natural trench foundation is weak, on a Class I (#57 or #64 stone) gravel of sufficient depth to provide a firm and unyielding foundation, (in both cases, the compacted bedding shall extend across the entire width of the trench to undisturbed trench walls on either side of the pipe); initial backfill (from bedding to pipe crown) shall be hand tampered gravel or sand material free from cinders, ashes, refuse, vegetable, or organic material, boulders, rocks, or stones,

frozen soil or other materials that, in the opinion of the JWSC is unsuitable. Final backfill in non-traffic areas, (from pipe crown to final grade), shall be Class IV material or better and free of boulders, rocks and stones greater than twelve (12) inches in their greatest dimension, tree trunks or limbs, brush from clearing, refuse or trash, frozen soil or any organic materials which may decompose and create voids. Final backfill in traffic areas shall be Class III material mechanically compacted in two (2) foot lifts to 95% modified proctor to within ten (10) inches of final grade, eight (8) inches of crusher run gravel compacted to 95% modified proctor, and two (2) inches of Type III asphalt pavement to final grade or other pavement type or dimension as required by the road authority on the encroachment permit.

3.6.8.2 Flexible Pipe

Flexible Pipe Materials (PVC, HDPE) shall be laid in a Type 2 trench with Class I gravel or naturally occurring clean compacted sand bedding material as necessary to provide a firm unyielding pipe foundation; or, where the naturally existing foundation is weak, on a Class I gravel bedding of sufficient depth to provide a firm and unyielding foundation; initial backfill (from bedding to crown of the pipe) shall be Class I material placed with shovel slicing (hauching) or clean naturally occurring hand-tamped sand along the sides of the pipe to insure firm side support and that no voids exist along the pipe barrel or between the pipe barrel and the undisturbed trench walls. Final backfill for traffic areas and non-traffic areas shall be as specified for rigid pipe materials.

3.6.8.3 Unsuitable Materials

Where rock or other unsuitable material is encountered at pipe grade, such rock or unsuitable material shall be removed to a minimum of six (6) inches below the proposed pipe grade line, refilled with Class I material to the correct pipe grade to protect the pipe from point loadings from below and provide base material for adjustment to grade and trench drainage; initial backfill and final backfill shall follow as per standards herein delineated.

3.6.9 Gravity Sewer System Testing and Inspection

All gravity sanitary sewer lines up to thirty (30) inches in diameter, to include connected services and/or main stub-outs shall be low pressure air tested in accordance with ASTM F1417 and conducted in substantial conformance with the procedures below.

- a. air testing shall be performed as soon as possible after completing a reasonable length of gravity sewer installation, and before scheduling Preliminary Record Drawing Line Televising;
- b. the system installer shall furnish all equipment, material, and personnel to conduct the test using low pressure air;
- c. the test equipment shall be approved and the test conducted in the presence of a JWSC Construction Inspector;

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- d. testing shall be conducted after backfilling has been completed but before finish grading or surface improvements;
- e. all wye's, tees, and lateral stubs or other fittings shall be suitably capped to withstand the internal test pressures;
- f. after a manhole-to-manhole section of line has been cleaned, it shall be plugged at each manhole with pneumatic plugs inflated to 25 psi internal pressure; plug bracing may be used as necessary to keep plugs from being blown out of lines;
- g. one of the test plugs shall have two factory equipped hole connections in addition to the hose connection used to inflate the plug. One connection shall be used to continuously monitor the rising air pressure in the sealed line. The other connection shall be used only for introducing the low pressure air into the sealed line;
- h. three and one-half (3 ½) inch diameter, 0-30 psi air gauge shall be supplied for reading the internal pressure of the line being tested. Calibrations from the 0-10 psi range shall be in tenths;
- i. low pressure air shall be introduced into the sealed line until the internal pressure reaches 3.5 psi greater than the average back pressure of any ground water that may be above the pipe, but not greater than 9.0 psi. At least two (2) minutes shall be allowed for the air pressure to stabilize.
After this period the hose used to introduce the pressure shall be disconnected from the air source in such a manner as to retain the pressure in the sealed line and the compressor shut down;
- j. the portion of the line being tested shall be accepted if it does not loose air at a rate greater than 0.0015 cfm per square foot of internal pipe surface when tested at an average pressure between 3.5 and 4.0 psi greater than any back pressure exerted by ground water that may be over the pipe at the time of the test;
- k. time requirements for pressure drop of 1.0 psi or 0.5 psi 3.5 to 2.5 or 3.5-3.0 psi greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time shown for the given diameter in the tables provided in the ASTM Standards;
- l. where high ground water is known to exist, the height in feet of ground water above the invert of the sewer shall be divided by 2.31 and added to 3.5 psi to establish the amount of pressure to be used for the test;
- m. if, the line fails to meet the requirements of the test, the source of leakage shall be identified and corrected and the line retested.

3.6.9.1 Low Pressure Air Test

Gravity sewer mains greater than thirty (30) diameter shall be low pressure air tested at the joints and/or noted defects using equipment capable of isolating each joint or defect from the rest of the pipe. Testing pressures and passing values shall be the same as cited above.

3.6.9.2 Infiltration Test

Where gravity sewer lines cannot be low pressure air tested in accordance with this Standard, the system shall be subjected to an infiltration test to establish leakage less than 100 gallons per inch per day per mile (gal/in/day/mile) using a V-notch weir; however, where ground water conditions are not favorable for testing, (ground water levels less than eight (8) feet over the pipe invert for any individual line segment), the end of the line to be checked shall be plugged at the downstream manhole, the upstream manhole partially filled to place a 3.5 psi head on the subject line at the lowest end, and the change in water depth noted during the test period converted to a volume; such volume and test time duration shall be compared against the 100 gal/in/day/mile Standard.

3.6.9.3 Vacuum Test

All sanitary sewer manholes shall be vacuum tested in accordance with ASTM C 1244-93 and conducted in substantial conformance with the following procedures:

- a. The entire manhole structure, to include the joint between the cast iron frame & cover and the top cone or adjustment ring, shall be tested as a unit;
- b. All lift holes shall be plugged
- c. All pipes entering the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole
- d. Place vacuum test head on the top of the manhole structure, setting the sealing face so that the joint between the manhole frame & cover and the main structure is included in the area to be tested;
- e. Draw a vacuum of ten (10) inches of mercury on the manhole, shut the valve on the vacuum line of the test head and turn off the vacuum pump;
- f. Measure the time in seconds that it takes for the vacuum to drop to nine (9) inches of mercury;
- g. Compare the time of the pressure drop from ten (10) inches to nine (9) inches of mercury with the allowable time value for the manhole diameter and depth as shown on the table in the Section appendix;
- h. If the manhole fails the initial test, necessary repairs shall be made by an approved method and the manhole retested until a satisfactory test is obtained.

3.6.9.4 Visual Inspection

All sanitary sewer mains will be visually inspected using color CCTV provided equipment by a PACP (Pipeline Assessment Certification Program) certified operator using PACP certified software. This service will be provided by the JWSC upon demonstration by the installer that the sewer lines and manholes have passed air and vacuum tests, the lines have been hydraulically cleaned using a combination cleaner and presentation of a Preliminary Record Drawing of the sanitary sewer system as installed.

The CCTV equipment shall include inclinometer capabilities that capture the line grade values in percent as the camera proceeds along the line and also provides a chart showing the average line grade from pipe start to pipe end for verification of Record Drawing slopes. The system installer is responsible for providing adequate trafficable access to the system components to perform this work.

A CCTV re-inspection of any and all defects found in mains during any previous test shall be required prior to acceptance.

3.6.9.5 Deflection Testing

Deflection testing shall be performed on any flexible pipe reach installation where CCTV inspection observations indicate that the pipe may be deflected or ovalized in any dimension beyond allowable values. Where required, deflection testing shall be performed in substantial compliance with the following procedures:

- a. Deflection testing shall be accomplished by pulling a five (5%) mandrel through the line if it has been installed for less than thirty days, or a seven and one-half (7 ½ %) mandrel on any line which has been installed longer than thirty days.
- b. An approved mandrel, proving ring, pulling ropes and cables shall be provided by the installer for testing PVC pipe.
- c. The mandrel shall be hand pulled through the pipe using no wenches or other mechanical devices except a pulley at the manhole invert. The pulley allows the mandrel to be pulled from ground level rather than from inside the manhole.
- d. If, at any point in the pipe one (1) man is unable to hand pull the mandrel through the pipe, then the pipe will be deemed unacceptable.
- e. The failed pipe shall be repaired by the installer, the mandrel re-pulled and the line re-televised at the Contractor's expense.

(END OF SECTION)

SECTION 4**SANITARY SEWER LIFT STATIONS AND FORCE MAINS****4.1 GENERAL**

This section provides the minimum guidelines for the design of wastewater lift stations and their associated forcemains that are considered an integral component of the facility's pumping system. The method of design and/or construction shall be according to, these Design and Construction Standards and Specifications and the following:

Recommended Standards for Sewage Works (Ten State Standards) Latest Edition

Georgia Environmental Protection Division State of Georgia Regulations for Water and Sewerage Works, Latest Edition

Applicable Federal, State and Local Requirements

In the event of conflicts among the various sources cited above, the most stringent criteria shall take precedence.

4.2 DESIGN FLOWS

Each system component shall be designed to meet certain flow requirements. The various flow requirements are described below.

4.2.1 Daily Average Dry Weather Flow (ADWF)

Daily Average Dry Weather Flow (ADWF) shall be 300 gallons per day per Residential Equivalent Unit (REU) or 115 gallons per day per capita. The basis for one (REU) shall be a single-family unit **occupied by an average of 2.6 persons**. Where sewer service beyond the basis of the established REU is required, the Sewage Flow Table shown below (Adapted from the Georgia Environmental Division Large Community Design Guidance Document, Pages 8 & 9, Appendix A) shall be used.

ADWF estimates for existing facilities that are scheduled for **rehabilitation** shall be made using data obtained from flow monitoring the existing system over a period of not less than seven (7) days, from which an average daily flow is to be developed. If any rainfall event measuring more than .5 (5/10ths) inches of rain in any of the seven (7) twenty-four (24) hour periods occurs, the monitoring shall continue to provide at least seven (7) days without rainfall.

Flow monitored data shall be adjusted for other potential loadings as appropriate, (i.e. seasonal usages, tourist loading, etc.) as may be developed or estimated from water use records, percentage of increased occupancy or other rational methods approved by the JWSC.

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ADWF for existing facilities that may be scheduled for **upgrading to accommodate additional flows** from proposed developments shall be made using a combination of flow monitoring and REU calculations.

**Figure LS-1
Sewage Flow Table**

FACILITY	Gallons/Day (GPD)
Assembly Hall	5 per seat
Barber Shop/Beauty Parlor	125 per chair + 20/employee
Boarding House*	100 per room
Bowling Alley	75 per lane + 20/employee
Church w/o Day Care or Kindergarten	5 per sanctuary seat
Correctional Institution/Prison	250 per inmate
Country Club, Recreation Facilities Only	25 per member
Day Care Center, No Meals	15 per person
Dental Office	100 per chair + 20/employee
Department Store	10 per 100 SF
Factory	
Without Showers	25 per employee
With Showers	35 per employee
Food Service Establishments*	
Restaurants (Up to 12 hours per day)	35 per seat + 20/employee
Restaurants (12 hours per day to 18 hours per day)	50 per seat + 20/employee
Restaurants (Above 18 hours per day)	75 per seat + 20/employee
Bar and Cocktail Lounge	30 per seat + 20/employee
Drive-in Restaurant	50 per space + 20/employee
Carry-out Only	50 per 100 SF + 20/employee
Funeral Home	10 per 100 SF
Hospital	
Inpatient	300 per bed
Outpatient	275 per bed
Hotel*	100 per room
Kindergarten, No Meals	15 per person
Laundry, Commercial	1,000 per machine
Laundry, Coin	150 per machine
Lodges*	100 per room
Mobile Home Park	300 per site
Motel*	100 per room
Nursing Home*	150 per bed
Office	10 per 100 SF
Physician's Office	200 per exam room
Schools*	
Boarding	100 per person
Day, Restrooms Only	12 per person
Day, Restrooms and Cafeteria	16 per person
Day, Restrooms, Gym and Cafeteria	20 per person
FACILITY	Gallons/Day (GPD)
Service Stations, Interstate Locations	425 + 150 per pump
Service Stations, Other Locations	300 + 100 per pump
Service Station Car Wash	500 per stall
Shopping Center (Not including food service or	10 per 100 SF

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laundry)	
Stadium	5 per seat
Supermarket/Grocery Store	20 per 100 SF
Theater	5 per seat
Travel Trailer Park*	
With Independent Water & Sewer Connection	175 per site
Without Independent Water & Sewer Connection	35 per site
Warehouse	10 per 100 SF
*Add 300 gallons per machine to amount indicated if laundry or dish washing machines are installed	

Note: Where historical data is available from flow monitoring or other approved devices as in the case of existing systems, ADWF shall be as averaged from seven (7) days within the monitoring period of flow with no rainfall event greater than .5 (5/10ths) inches of rain in any of the seven(7) twenty-four (24) hour periods being averaged.

4.2.2 Peaking Factors

Upon calculation of the anticipated ADWF in gallons per day for the basin that is to discharge to the pumping facility, a peaking factor of 2.0 shall be applied to the average daily flow expressed in gallons per minute, (ADWF in gpd / 1,440 minutes per day = ADWF in gpm), to account for the daily (diurnal) peak flow in gallons per minute. This gpm figure with the Peaking Factor being applied shall be the required pump rate for the facility; (i.e. $46,080 \text{ gpd} / 1,440 \text{ minutes per day} = 32 \text{ gpm ADWF} * 2.0 = 64 \text{ gpm} = \text{required pump rate}$). This factor has been determined adequate for pump sizing in the JWSC jurisdictional area and is based on a series of flow monitoring studies conducted on existing lift station basins ranging in size from 25 REU's to 200 REU's (per capita populations of 65 to 520, respectively).

4.3 SIZING OF FORCE MAINS

The discharge piping, to include valves, bends and the force main is to be considered an integral part of the lift station pumping system whether the facility is new or being upgraded to handle additional flows.

Force mains and associated discharge piping for a single family use lift station discharging to gravity shall be sized for peak flow (required pump rate) at a minimum velocity of 2.0 fps with one pump running and a maximum velocity of 5.0 fps with both pumps running in a duplex station. For triplex or quadraplex facilities velocity shall not exceed 5.0 fps with two or three pumps running respectively.

Common force mains for low pressure or STEP type systems shall be sized for the flow of the planned system based on the probability analysis of simultaneous pump operation in each pressure zone and line segments common to pressure zones. Line velocities, based on this analysis, shall be a minimum of 2.5 fps at least once during the 24 hr diurnal cycle and no greater than that velocity necessary to discharge the highest head pump on the pressure zone at 11 gpm.

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4.4 WETWELL DESIGN CRITERIA**4.4.1 Wetwell Volume**

The minimum required wet well storage volume between the SCADA High Water Alarm Level and the all pumps “off” level (top of the submersible pump motor or the required submergence of a self-priming pump suction leg) shall be calculated as follows:

$$\text{Required Volume} = V_R = .25TQ + V_L + V_A$$

Where:

T = Minimum Cycle Time (see table below)

Q = Required Pump Rate

V_L = Lag Level Volume

V_A = SCADA High Water Alarm Level Volume

Pump Hp	Minimum Cycle Time (T)
<20	15 Minutes
20 to 100	20 Minutes
>100	25 Minutes

The distance/volume between the pump “off” level, mid-motor pump housing elevation to the wet well bottom is subject to pump dimensions and is not considered useable volume. The designer shall be responsible for calculating this additional vertical distance and adding this additional wet well depth.

4.4.2 Wetwell Level Control Settings

To reduce wetwell turbulence caused by cascading influent that results in odor/corrosion problems and air entrainment, and to provide wet well structures that are in large degree self-cleaning, this Standard requires that the invert of the wet well influent line coming from the contributing system influent manhole be set at the mid-motor elevation of submersible pumps or at the required submergence elevation of suction lift pumps plus 0.5 feet. This vertical increment will ensure a reasonable time period of free flow through the gravity influent line and influent manhole at the design pump rate and thereby the full development of self-cleansing velocity, through these structures as required in this standard.

Based on this requirement, the design settings for level control in wet wells shall be as follows:

Low Water Level (LWL) Alarm : Top of submersible pump volute.

Pump “Off” Level (Pump Off): 50% immersion of submersible pump motor mid-point of pump motor housing or pump manufacturers minimum water level, whichever is greater.

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Lead Pump “On” Level (Pump On): The vertical dimension in the design wetwell from the Pump “Off” level needed to store the volume required by $V=0.25TQ$.

Lag Pump “On” Level (Lag On): Pump On Level + 0.5 vertical feet (6 inches) Lag Pump On settings for triplex or quadraplex pump installations shall follow the same dimensional protocol of 6 inch increments and be labeled as **Lag2 On, Lag3 On**, etc.

SCADA High Water Level (SHW): Highest Lag On level + 0.5 vertical feet (6 inches). This elevation shall not exceed the influent manhole lowest invert elevation or lowest invert elevation in the wetwell if an influent manhole is not used.

Audio/Visual High Water Level (AVHW): SCADA HW elevation + 0.5 feet (6 inches). This level setting is intended to mitigate neighborhood alarm noise complaints and the only setting that allows a surcharge of the lowest contributing gravity sewer system main entering the influent manhole.

Where primary level control is provided by a Level Transducer, the AVHW float ball and installation shall be as specified for all such devices in this Standard.

Note: Where flow matching pumping systems are approved for use, (either by VFD or mechanical flow matching technology using pre-rotation basin technology), level control settings shall be by specific facility design and as approved by the JWSC.

4.5 DEDICATED WASTEWATER LIFT STATIONS

Lift stations to be dedicated shall have a minimum required pumping rate of 22 gallons per minute (gpm) at peak diurnal flow and a minimum upstream contributory loading of 16,000 gallons per day (gpd) as calculated in Paragraph 4.2 of this Standard.

Lift stations not meeting this standard, shall be privately owned, operated and maintained under the supervision of a Licensed Georgia Wastewater Collections System Operator. Such privately owned facilities and their contributing gravity systems shall be considered Satellite Systems of the JWSC requiring an agreement with the JWSC to discharge to the Public System.

Any future consideration by the JWSC to accept Public ownership of a privately owned facility shall be precedent upon such facility’s adherence to this Standard or upgrade to this Standard.

4.5.1 *Lift Station Types*

4.5.1.1 Low Flow Lift Stations

Low Flow Lift Stations shall be defined as those facilities whose loading requires pumping capacities between 22 gpm and 79 gpm. These facilities are intended to serve limited areas where the service area cannot be expanded and wastewater service cannot be otherwise provided by on-site (septic) systems or low pressure systems capable of

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discharging to Public gravity. Such facilities, where approved, shall be grinder pump duplex stations meeting all criteria of this Standard.

4.5.1.2 Standard Lift Stations

Standard Duplex Lift Stations shall be defined as those facilities whose loading requires pumping rates between 80 gpm and 749 gpm.

Standard Triplex Lift Stations shall be defined as those facilities whose loading requires pumping rates between 750 gpm and 3,000 gpm. Triplex facilities shall be flow proportional and be equipped with an automatic standby power generator.

Standard Quadraplex Lift Stations shall be defined as those facilities whose loading requires pumping rates greater than 3,000 gpm. Quadraplex facilities shall be flow proportional and be equipped with an automatic standby power generator.

4.5.1.3 Initial/Ulimate Lift Stations

Initial/Ulimate Lift Stations shall be defined as those facilities whose initial loading requirement is significantly less than the ultimate loading requirement as determined by a submitted and approved build-out plan. Such facilities shall be designed to meet all criteria of this Standard with exceptions as noted herein.

4.5.2 Site Requirements

The property, on which the facility is constructed, is to include the influent manhole and all related lift station appurtenances.

4.5.2.1 Site Dimensions

Minimum site dimensions of the property shall be as follows:

- a. Four (4) foot and five (5) foot diameter wet wells – minimum 30' x 30' (restricted to Low Flow Stations)
- b. Six (6) foot and eight (8) foot diameter wet wells – minimum 50' X 50'
- c. Ten(10) foot diameter and greater – minimum 60' X 60'
- d. Rectangular structures – minimum 60' X 60'
- e. Irregular sites and site sizes may be considered by the JWSC where atypical conditions exist.

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4.5.2.2 Fencing

Fencing is required on all sites and shall be placed a minimum of two (2) feet inside of all site property lines and constructed as follows:

- a. The fence shall be six (6) feet high, consisting of two (2) inch mesh by nine (9) gauge aluminum coated steel fabric with green PVC coating, conforming to the latest revision of ASTM A-491. The fence shall have a seven (7) gauge aluminum coated steel coil spring tension wire along the bottom of the fence fabric.

Three strands of twelve and one-half (12-½) gauge aluminum coated steel of barbed wire with four (4) point aluminum barb spaced five (5) inches apart mounted on the barbed wire support arms shall be installed along the top of the fence fabric.

- b. The posts shall be galvanized line posts, two and a half (2 ½) inch O.D. (3.65 lbs per ft); galvanized corner posts, three (3) inch O.D. (2.27 lbs per ft) with extra long pressed steel sleeves. Corner and gate post shall have necessary struts and tie bracing. Provide water tight closure caps on all posts.
- c. Gate shall be a pair of 8'-0" long (sixteen (16) foot total width) six (6) feet high sections and shall be equipped with a prop post center latch and hasp assembly. A ground anchor cast in concrete shall be provided. Gates shall be factory fabricated, green PVC coated conforming to the latest revision of ASTM A-429 and equipped with gate holders. Duckbill backstops shall be provided for swing side of both gate sections.
- d. The gate entrance shall be set back at least twenty feet from a public or private road in order to allow vehicles to pull off the road before opening the gate.
- e. Where aesthetics are a concern, the fencing cloth may be interwoven with vinyl stripping to obscure the site from public view. The color of stripping shall be dark green.

4.5.2.3 Site Access, Ground Cover and Drainage

- a. The entire site shall be covered with a geotextile filter fabric covered with six (6) inches of compacted crusher run (GAB) stone. Stone shall be clean with no soil or foreign material present.
- b. The graveled area shall be treated with a high quality, long lasting, EPA environmentally approved weed killer.
- c. Site shall be serviced by a twelve (12) foot wide all weather road with top of road above the two (2) year flood elevation.
- d. Drainage structures and conveyances shall not be allowed and no catch basin shall be located within the pumping station site. The entire site shall graded such that

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storm water runoff sheet flows outwards and away from structures and other appurtenances and into proper drainage channels.

- e. No site shall be located within the backwater of any lake, pond, ditch, canal or other water body without such flood level being taken into consideration by raising the site grade, the structure openings or providing watertight structure hatches above such backwater levels. The twenty-five year flood elevation shall be the governing factor if backwater levels are not historically available or known.
- f. Pump stations shall be designed and located on the site so as to minimize the effects resulting from odor, noise, and lighting.
- g. Where the location of the facility would require backing onto a public road to leave the site an area along the access or at the facility gate shall be wide enough to provide a service vehicle turnaround.
- h. Any proposed on-site landscaping or specialized ground cover being considered to improve the aesthetics of the site or block the site from view shall be approved by the JWSC. No trees will be permitted within the property boundary.

4.5.2.4 Site Electrical Power

- a. All power lines within the site shall be underground. No overhead power line will be allowed to cross the site.
- b. All facilities shall be served with three-phase power. If three-phase power is not available the Design Engineer shall submit a copy of written communication from the commercial power provider stating at what cost three-phase power would be available. In cases where pump station location has been optimized for both elevation and power supply and providing three-phase power costs are disproportionately high, variable frequency drives (VFD's) will be considered to operate the three phase motors. Prior written approval will be required from the JWSC to utilize single-phase power. Add-a-phase units are not allowed.
- c. A facility yard light and pole shall be provided for night operations and security purposes. The light shall be a 120V 500W Quartz or Halogen floodlight pointed at the control panel. The light shall be placed on a switch with a 24-hour timer capable of illuminating the facility on a selectable periodic basis. The switch and timer shall be housed in a weather-proof enclosure on the light pole. The light pole shall extend a minimum of twelve (12) feet from grade with the light fixture mounted within one (1) foot of its top for maximum coverage.

4.5.2.5 Facility Water Supply

- a. The facility shall be provided with a one (1) inch water service line for clean-up use and testing.

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- b. The water service line shall be protected with the installation of a reduced pressure backflow assembly installed within the fenced enclosure. The RPZ shall be in accordance with Paragraph 2.4.6.2 of these Standards and Specifications. Where requested by the JWSC, the backflow preventer piping shall be provided with a 4-20 milli-amp pressure transducer to sense area potable water pressures.
- c. The water service line shall incorporate a frost-proof yard hydrant. Yard hydrants are to be stainless steel and have locking capability. No water meter will be required for water use at lift stations.

4.5.2.6 Facility Bypass Pumping Connection

A facility bypass pumping connection shall be provided in accordance with the **JWSC Standard Details**.

- a. The facility shall be provided with an external connection to the force main serving the station for use during emergency and maintenance situations.
- b. The bypass connection shall be sized to the diameter of the main pumps discharge line and be set downstream from the isolation valves of the main pump piping header.
- c. The bypass connection shall be provided with a plug valve, set on the underground horizontal run to the bypass connection, and a check valve and CAM Lock with cap set on the aboveground horizontal run to the pump connection point.
- d. The bypass connection shall be placed and oriented on the site to facilitate the setting of a bypass pump between the influent manhole and the bypass connection.
- e. The bypass connection shall be provided with a 3'x3'x6" concrete slab base.
- f. The point of attachment to the bypass connection shall be oriented horizontal and not protrude above its concrete slab more than 1 foot.
- g. The bypass connection piping and fittings shall be epoxy lined "Sewer-Safe" D.I.P. with exterior coating the same as the lift station discharge header piping.

4.5.2.7 Facility Elevation Benchmark

A Standard Brass Benchmark shall be set into the wet well slab top with the NAVD88 Mean Sea Level Elevation stamped on the face of the benchmark by a Georgia Registered Land Surveyor. An alternate location for the benchmark may be approved where structure configuration is atypical.

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4.5.3 Wetwell Configuration4.5.3.1 Size and Depth

- a. The maximum wetwell depth, as measured from the wet well rim to the lowest point of the sump, shall not exceed 20 feet.
- b. The minimum circular wetwell diameter shall be 6 feet; (surface area 28ft²), for all but low flow stations for which wet well diameters of five (5) feet shall be used.
- c. The minimum rectangular wetwell dimensions, where approved for special applications where wetwell depth is critical, shall be 6 feet by 6 feet or other dimension providing an equal or larger surface area; (surface area 36ft²).
- d. Where the JWSC has approved a facility having an initial and an ultimate flow design, the wetwell shall be sized for the ultimate pump rate whereas the storage height (and consequent level control settings) shall be established on the initial pump rate. The level settings shall be as stipulated in Paragraph 4.4.2 of this Standard.

4.5.3.2 Piping and Equipment Layout

- a. All wetwell inverts and pump intake sumps shall be configured to provide self-cleaning characteristics. Water surface levels at low water level shall be minimized to allow the removal of debris before the pump loses prime during a manual maintenance pump-down by operators.
- b. The wetwell shall have only one (1) influent line with its invert set 0.5 feet above the "Pump-Off" (mid-point of pump motor housing elevation), and it shall enter the wetwell coplanar, (aligned parallel and in-line), with the pump discharge lines in accordance with the **JWSC Standard Details**.
- c. The wetwell inverts shall be sloped downward from the top of the submersible pump motor toward the wet well pump sump at a 60 degree angle from the vertical. Flat areas for pump connection discharge elbows shall be eliminated or sloped with coated grout materials as much as possible to shed debris (**See the JWSC Standard Details**).
- d. The wetwell pump sump geometry shall provide for the required spacing between pumps, sump walls and floor as required by the manufacturer while simultaneously minimizing the water surface area at the "lowest" water level (top of pump) to allow the vortex to engulf floating solids quickly before the pump loses prime during periodic cleaning cycles in manual operation.
- e. The wetwell shall be provided with appropriately placed adjacent sleeves, 24 inches below finished grade, for access of the power and control conduits. The sleeves shall be of proper size to accommodate all necessary power and control conduits.
- f. Where the design flow of the station requires a pressure transducer for level control, an additional sleeve shall be required. It shall be placed 24" below finished grade and

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centered between the discharge legs. The sleeve shall be 2" in diameter. A slotted 6" PVC/HDPE joint of pipe shall be installed within the wet well, between the discharge legs, to serve as the housing and stilling well for the transducer. The stilling well shall terminate at the level of the pump intakes and be securely fastened to the discharge piping. The transducer shall be set within the stilling well at the low water level elevation of the station (*See JWSC Standard Details*).

4.5.3.3 Ventilation

The ventilation for the wet well shall be designed as a passive gravity ventilation system where the air volume in the wet well is either increased or decreased as the wastewater level fluctuates due to inflow and outflow. The passive ventilation shall be sized to vent at a rate equal to the maximum pumping rate of the station, not to exceed maximum permissible design airflow through the vent pipe of 600 feet per minute (fpm). Passive "gooseneck" vents shall be turned down so that the opening faces the top slab of the wet well.

The minimum allowable passive vent diameter shall be 6 inches. Stainless steel screens shall be required to prevent birds and/or insects entry into the wet well. The vent shall be placed diametrically opposite of the control panel. Vent piping shall be 304 stainless steel.

4.5.3.4 Access Hatches

Access hatches shall provide the required clear opening for pump removal and be set in the concrete top so as to allow the pump to be removed through the approximate center of the hatch. The hatch material shall be Aluminum Alloy 6063-T5 & T6, one-fourth ($\frac{1}{4}$) inch plate, with flush type lock and inside spoon handle having a live load capacity of 300 pounds per square foot. The frame shall be equipped with a stainless steel hinged and hasp-equipped cover, two (2) upper guide bar holders and stainless steel chain holders. The door shall be torsion bar loaded for ease of lifting, shall have a safety locking handle in the open position and safety grate. All fastening hardware used inside the wet well shall be stainless steel.

- a. Pump access covers shall be suitably sized to provide adequate clearances for installation and removal of the pumping units.
- b. Hatches should be sized for the ultimate pump design. The access hatch should be designed for a minimum width of 36" or 6" beyond the manufacturer's minimum required width, whichever is greater.
- c. The minimum hatch length should be forty-eight (48) inches for standard duplex stations and ninety-six (96) inches for triplex stations or the sum of the pump width, centerline pump separation, plus twelve (12) inches, whichever is greater.
- d. Low Flow Station hatches shall be sized to adequately remove the pumps and shall not be required to adhere to the minimum requirements.

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4.5.4 Precast Concrete Structures**4.5.4.1 Materials**

Precast wet well bases, sections and related structures shall conform to the requirements of ASTM C478 (specification for precast concrete manhole sections and structures) except as modified herein. Cement shall be minimum 4,000 psi concrete meeting the requirements of ASTM C150 (specification for Portland cement, type II).

Minimum wall thickness shall be 1/12th the inside diameter in inches plus one (1) inch. Ring reinforcement shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations. Bases for wet wells shall be cast integrally with the bottom section.

A Flexible Neoprene-EPDM pipe connector, conforming to ASTM C443 shall be used to connect the sewer influent pipe to the precast concrete wet well. The connector shall be a minimum of three-eighths (3/8) inches thick or greater and resistant to ozone, weathering, aging, chemicals and petroleum products. The securing bands shall be stainless steel and screw assembly and totally non-magnetic Series 304 stainless steel. The connector shall be of a size specifically designed for the specified pipe material and size. The interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II lean cement grout. The exterior (below grade) of precast concrete wet wells shall be given two coats of an approved bituminous water proofing materials.

4.5.4.2 Corrosion Protection

The interior corrosion protection for precast concrete wet wells shall be in accordance with the following schedule based on detention time of sewer flow from the uppermost region of the contributing pipe reach using an average velocity of two (2) feet/sec.

**Figure LS-1
Interior Corrosion Protection Table**

Vapor H2S	Corrosion Risk Level	Detention Time	Corrosion Protection
0-10 PPM	No or Low Risk	<2 Hours	None
11-50 PPM	Moderate Risk	2 - 4 Hours	Coal Tar Epoxies
>50 PPM	High Risk	>4 Hours	Calcium Aluminates Epoxy Coatings Approved Coating Systems

- a. Corrosion protection for *High Risk Wet Wells* shall be hydrogen sulfide resistant cementitious products containing calcium aluminates applied one-half (½) inch to three-fourths (¾) inches of thickness onto all interior surfaces after proper substrate preparation; precast wet well structures manufactured of calcium aluminate cement concrete or precast structures with approved epoxy coatings applied a minimum of 150 mil thickness.

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Alternatives that provide equal or better protection may be approved. A (ten 10) year warranty will be required.

- b. All wet wells designed with the intention of being used as a receiving wet well from upstream lift stations, or considered by the JWSC to be Regional Lift Stations, shall be considered *High Risk Wet Wells*.

4.5.4.3 Installation

The base section shall be set in a twelve (12) inch (minimum) leveling course of granular material (57 stone). Precast concrete sections shall be set so the wet well will be vertical and with sections in true alignment.

All holes in sections used for their handling and the annular space between the wall and entering pipes shall be thoroughly plugged with an approved, non-shrinking mortar or grout, applied and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior wall surfaces.

Joint contact surfaces shall be formed with machined castings and shall be exactly parallel and sealed with a joint sealer over the entire joint surface. Joints shall be water tight. Excess joint sealer shall be trimmed flush with the inside and outside surface of the structure.

All exterior joints of precast concrete wet well shall be sealed with one twelve (12) inch wide exterior joint sealant membrane centered on the joint. The tape shall be capable of sealing joints against groundwater infiltration. The installation of the membrane shall be in conformance with the recommendations of the manufacturer. The concrete surface must be smooth, clean, dry and free of voids, loose aggregate, dirt or other matter that will hinder the adhesion of the membrane. A primer shall be used in accordance with the recommendations of the membrane manufacturer.

4.5.5 *Fiberglass Structures (Alternate Construction Material)*

Fiberglass wet wells, when approved for use by the JWSC, shall meet the following requirements.

4.5.5.1 Materials

Unless otherwise noted by the JWSC, a circular fiberglass wet well may be used in lieu of a precast concrete wetwell. The fiberglass wet well shall be designed (signed and sealed) by a Georgia Professional Engineer and meet all applicable configuration criteria as shown in Paragraph 4.5.3 of this Standard.

The wet well shall include a twenty four (24) inch (minimum) thick twelve (12) inch thick inside the wet well and twelve (12) inch thick outside the wet well reinforced concrete hold-down base which extends twenty four (24) inches beyond the outside of the wet

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well, a six (6) inch (minimum) thick reinforced concrete top slab, pump access frame and cover and other standard wet well features. Pumps shall be anchored to a one (1) inch thick steel plate.

Fiberglass reinforced polyester wet wells shall be manufactured from commercial grade polyester resin or vinyl ester resin, with fiberglass reinforcements. The resin system shall be suitable for atmospheres containing hydrogen sulfide and dilute sulfuric acid as well as other gases associated with the wastewater collection systems. The wetwell shall be a one-piece unit unless otherwise approved by the JWSC.

The resins used shall be a commercial grade unsaturated polyester resin.

The reinforcing materials shall be commercial Grade "E" type glass in the form of mat, continuous roving, chopped roving, roving fabric or a combination of the above, having a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

If reinforcing materials are used on the surface exposed to the contained substance, they shall be a commercial grade chemical-resistant glass that will provide a suitable bond with the resin and leave a resin rich surface.

Fillers, when used, shall be inert to the environment and wetwell construction. Additives, such as thixotropic agents, catalysts, promoters, etc., may be added as required by the specific manufacturing process to be used. The resulting reinforced plastic material must meet the requirement of this specification.

The exterior surface shall be relatively smooth with no sharp projections. Handwork finish is acceptable if enough resin is present to eliminate fiber show. The exterior surface shall be free of blisters larger than one-half (1/2) inch in diameter, delamination and fiber show.

The interior surface shall be resin rich with no exposed fibers. The surface shall be free of grazing, delamination, and blisters larger than one-half (1/2) inch in diameter, and wrinkles of one-eighth (1/8) inch or greater in depth. Surface pits shall be permitted up to six (6) square feet if they are less than three-fourths (3/4) inch in diameter and less than one-sixteenth (1/16) inch deep.

The bottom to be fabricated using fiberglass material as stated in Paragraph 4.5.5.1 with material and installation to meet all physical requirements of Paragraph 4.5.5.4 below. The Bottom shall be attached to wetwell pipe with fiberglass layup to comply with ASTM D3299 specifications. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wet well bottom.

The fiberglass wet well top shall be fabricated using fiberglass material as stated in Paragraph 4.5.5.1 with material and installation to meet all physical requirements of Paragraph 4.5.5.4 below. The top is to be attached to wetwell pipe with fiberglass layup to comply with ASTM D3299 specifications. When reinforcement is necessary for strength, the reinforcement shall be fiberglass channel laminated to wetwell top.

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4.5.5.2 Pipe Connections

Effluent, service, or discharge lines may be factory installed. Approved methods are PVC sewer pipe, Inserta-Tee fittings, or Kor-N-Seal boots. The installation of stub outs shall be fiberglass layup to comply with ASTM D3299 specifications.

4.5.5.3 Defects Not Permitted

Any of the following defects observed or present in the finished structure shall be cause for rejection.

- a. Exposed fibers: glass fibers not wet out with resin.
- b. Resin runs: runs of resin and sand on the surface.
- c. Dry areas: areas with glass not wet out with resin.
- d. Delamination: separation in the laminate.
- e. Blisters: light colored areas larger than one-half (1/2) inch in diameter.
- f. Cracking: cracks caused by sharp objects.
- g. Pits or Voids: air pockets.
- h. Wrinkles: smooth irregularities in the surface.
- i. Sharp projection: fiber or resin projections necessitating gloves for handling.

4.5.5.4 Physical Requirements

LOAD RATING: The complete wet well shall have a minimum dynamic-load rating of 16,000 ft-lbs. To establish this rating, the complete wetwell shall not leak, crack, or suffer other damage when load tested to 40,000 ft-lbs and shall not deflect vertically downward more than one-fourth(1/4) inch at the point of load application when loaded to 24,000 lbs.

STIFFNESS: The wet well cylinder shall have a minimum pipe-stiffness value shown in the following table when tested in accordance with this Article of the Standard:

LENGTH (FT)	F/AY (PSI)
0 TO 10	1.26
10 TO 20	2.01

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PHYSICAL PROPERTIES:

	HOOP	AXIAL
Tensile Strength (PSI)	18,000	5,000
Tensile Modulus (PSI)	800,000	700,000
Flexural Strength (PSI)	26,000	4,500
Flexural Modulus (PSI)		
Without Ribs 48", 60", 72"	1,400,000	700,000
With Ribs 96", 144"	700,000	700,000

TEST METHODS: Tests shall be performed as specified in ASTM D3753, Section 8

4.5.5.5 Backfill Material

Unless shown otherwise on the drawings, sand or crushed stone shall be used for backfill around the wetwell for a distance of two feet from the outside surface and extending from the bottom of the excavation to the bottom of the top slab. Suitable material chosen from the excavation may be used for the remainder of the backfill.

The material chosen shall be free of large lumps or clods, which will not readily break down under compaction. This material will be subject to approval by the JWSC. Backfill material shall be free of vegetation or other extraneous material. Excavated materials which are to be used for fill or backfill may be stockpiled on the site. Top soil should be stockpiled separately and used for finish grading around the structure.

- a. Backfill operations shall not begin until the concrete has been allowed to cure and the forms removed.
- b. Backfill shall be placed in layers of not more than twelve (12) loose measure inches and mechanically tamped to at least 95% Standard Proctor Density. Flooding will not be permitted. Backfill shall be placed in such a manner as to prevent any wedging action against the structure.

4.5.5.6 Documentation

Each wetwell shall be marked with the following information.

- a. Manufacturer's name or trademark
- b. Manufacturing special number
- c. Total length and nominal diameter

Marking shall be placed on the interior wall of the wetwell near the top so as to be readable after installation.

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4.5.6 *Influent Manhole and Wetwell Influent Line*

All lift stations shall be equipped with only one influent line to the wetwell to serve as an approach pipe to the self-cleaning wet well pump sump, and one influent manhole to facilitate bypass pumping.

4.5.6.1 Influent Manhole

The influent manhole shall be located within the fenced lift station enclosure area or extension thereof and placed on the same side of the wetwell as the bypass pump connection. The horizontal distance between the wet well and the influent manhole shall be the greatest possible horizontal distance within the confines of the site; however, at a minimum the horizontal distance shall be one (1) foot of horizontal separation for every one (1) foot of vertical wet well depth to avoid taking both structures out if construction work on either is necessary in the future.

All influent manholes shall be outside drop manholes with the influent line being a minimum of two (2) vertical feet above the manhole invert to provide a nominal pumping range during bypass operations. The influent manhole shall be five (5) foot in diameter minimum. Where a wetwell diameter less than the 6 foot minimum is approved, the influent manhole may be four (4) foot in diameter.

The corrosion protection on the influent manhole shall be the same as that required on the wetwell at the site. The manhole frame & cover on the influent manhole shall be a JWSC Standard thirty-two (32) inch frame & cover.

4.5.6.2 Wet Well - Influent Line

The effluent line from the influent manhole to the wet well shall enter the wet well 0.5 feet above the "Pump-Off" (mid-point of pump motor housing) elevation, be at least one nominal diameter larger than the largest diameter influent line coming from the basin gravity sewer system and be sloped no greater than 2% and no less than needed to provide self-cleansing velocity at the facility design pump rate. Larger diameter lines between the influent manhole and wet well may be considered where pump range volume is an issue so long as self-cleaning velocity at the pump-off level is obtained.

4.5.7 *Wetwell and Discharge Header Piping***4.5.7.1 Interior Piping**

All interior wet well discharge piping shall be epoxy lined/exterior coated Class 53 Flange by Flange Ductile Iron Pipe (DIP) with 316 Stainless Steel nuts, bolts and washers; or, IPS DR 11.0 (160 psi) Flange by Flange High Density Polyethylene (HDPE) with 316 Stainless Steel backup rings, nuts, bolts and washers. Each discharge leg shall be one continuous pipe joint. All nuts, bolts and accessories within the wet well shall be 316 Stainless Steel.

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4.5.7.2 Exterior Piping

All pipe and fittings outside of the wet well and above ground shall be epoxy lined “Sewer-Safe” Class 53 Flange by Flange Ductile Iron Pipe (DIP). All bolts, washers and nuts shall be 316 Stainless Steel. Bolt threads shall be coated with “Never Seize” type coating. All above ground pipe, fittings and valves shall receive two coats of an exterior coating of “moisture cured aluminized urethane” or epoxy paint with surface preparation in accordance with the paint manufacturer’s recommendation. The paint color shall be tan.

All header discharge piping, fittings and valves shall be constructed approximately three (3) feet above grade and horizontal to the top of the wet well.

Adjustable pipe stands constructed of 304 Stainless Steel – one and one-half (1 ½) inch all thread into a two and one-half (2 ½) inch SCH 40 pipe w/ nine (9) inch by nine (9) inch by a quarter (¼) inch base plate fixed with four (4) seven-sixteenth (7/16) inch X three (3) inch lag bolts at the corners shall be provided as support. The strength and number of pipe stands may vary depending on header length and weight.

4.5.8 Valves and Appurtenances

All lift station pumps shall be equipped with an isolation valve, check valve and discharge gauge fitting on its discharge header. The common manifold header for the pumps shall be equipped with combination air/vacuum air release valve and an isolation valve to isolate the entire pumping system from the serving force main.

4.5.8.1 Isolation (Plug) Valves

Lift Station Isolation valves on submersible pump installations shall be Plug Valves mounted horizontally on the discharge header.

- a. All plug valves shall be of non-lubricated, eccentric plug type with Buna “N” neoprene, epoxy or fusion bonded, nylon faced plugs. Valve bodies shall be ASTM A126, Class B cast iron with all exterior mounted bolts and nuts to be stainless steel.
- b. Port areas of four (4) inch through twelve (12) inch valves shall be 100% of full pipe area.
- c. The valve seat material shall consist of either a welded in one-eighth (1/8) inch overlay of 90% pure nickel, or 316 Stainless Steel screwed into the cast iron body.
- d. Upper and lower plug stem bearings shall be sleeve-type of a stainless steel or other non-corrosive bearing material.
- e. The packing shall be adjustable and the bonnet shall be bolted.
- f. All bolts, nuts and washers shall be 316 Stainless Steel.

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- g. The valves shall be rated for a minimum of 150 psi, and shall provide drip-tight shut off with this pressure in either direction.
- h. The interior of all plug valves shall be epoxy coated.
- i. All plug valves eight (8) inches and larger shall be equipped with totally enclosed worm gear actuators complying with AWWA C504. All gearing shall run in oil. The actuator housing shall be semi-steel with seals to prevent dirt or water from entering the housing. Shaft bearings shall be permanently lubricated bronze bushings. Appropriately sized hand wheel operators shall be provided for each gear-actuated valve.

4.5.8.2 Check Valves

Lift Station Check Valves on submersible pump installations shall be swing check valves mounted horizontally on the discharge header.

- a. All check valve interiors shall be fully coated with a liquid thermosetting epoxy suitable for use in wastewater applications.
- b. Swing Check valves shall conform to the requirements of AWWA C508.
- c. Swing Check valves larger than two (2) inch nominal size shall be cast iron body with stainless steel bolts and nuts, flanged ends, 316 Stainless Steel shaft connected to a steel outside lever and stainless steel spring, swing-type with straight-away passageway of full pipe area. The valve shall have renewable bronze seat ring and rubber-faced disc.
- d. Swing Check valves larger than two (2) inches shall be 150 psi working pressure.
- e. Swing Check valves two (2) inches and smaller nominal size shall be all brass swing check valves, 200 psi working pressure.
- f. All check valves shall be placed upstream of the pump isolation valve.

4.5.8.3 Air Release Valves

Lift Station Air Release Valves on submersible pump installation discharge headers shall be combination (air release and vacuum release) type valves placed on the discharge header manifold piping upstream of the manifolds station isolation valve on the common header.

- a. Combination air release valves shall be two (2) inch inlet (minimum), stainless steel internal trim (including float, lever arm, leakage, etc.), stainless steel assembly bolts, stainless steel backwash accessories including quick disconnects and stainless steel ball valves (gate valve are also acceptable). The body of the air valve shall be 316 Stainless Steel or iron or steel body with fusion bonded

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epoxy (twelve (12) Mills thickness, minimum) or ceramic coating (inside and outside surfaces) or nylon plastic.

4.5.8.4 Discharge Gauge Fittings

Discharge Gauge fittings shall be installed on the discharge header pipe of each submersible pump.

- a. The gauge fitting shall be installed on discharge header pipe a minimum of six (6) inches upstream from each pumps check valve.
- b. The gauge fitting shall be installed by drilling and tapping a one-fourth (¼) inch NPT hole, installing a 316 Stainless Steel nipple (approximate two (2) inches in length), attaching a one-fourth (¼) inch Stainless Steel ball valve, another 316 Stainless Steel nipple (approximately two (2) inches in length) to the ball valve, and attaching a one-fourth (¼) inch NPT Quick Connect coupler to the nipple.
- c. One (1) four and one-half (4 ½) inch diameter face glycerin filled Wika discharge gauge, graduated in 1 psi increments (0 – 60 psi) and one (1) foot increments of H₂O (0 – 140 feet H₂O) scale range, with quick-disconnect, shall be provided for each submersible pump. Gauges shall be provided in plastic protective cases and equipped with quick disconnects.

4.5.9 Pumping Equipment

Lift station pumps shall be submersible pumps and shall meet the following requirements.

4.5.9.1 General Requirements

All pumps designed and selected shall be within +/- 20% of the pumps best efficiency point. When possible, the pump selection shall be made in the center of the family of curves.

Where the JWSC has approved the station to be designed as an initial/ultimate facility, the pump's base elbow should be sized for the ultimate pumps. The pump manufacturer shall provide an adapter plate for the initial pumps.

4.5.9.2 Submersible Pumps

Submersible Pumps and installation shall be in accordance with the follow minimum standards:

- a. Pumping equipment shall be premium quality submersible non-clog pumps for sewage service. Wet-pit pumps shall be complete with a submersible electric motor, floor-mounted discharge base and elbow, guide rails, motor electrical cable (minimum forty (40) feet in length) to connect at the demarcation box (no splicing allowed) and all other appurtenances specified or otherwise required for proper operation.

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- b. Equipment furnished and installed shall be fabricated, assembled, erected and placed in proper operating condition in full accordance with drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted and approved by the JWSC.
- c. Pump performance shall be stable and free from cavitations and noise throughout the specified operating head range at minimum suction submergence. Pump shall be designed so that reverse rotation at rated head will not cause damage to any component.
- d. Major pump components shall be of gray cast iron. All exposed nuts, bolts, washers, anchor bolts and other fastening devices coming in contact with sewage shall be 316 Stainless Steel.
- e. The impeller casing shall have well-rounded water passages and smooth interior surfaces free from cracks, porosity, blowholes, or other irregularities. The impeller shall be semi-open or enclosed one-piece casting with no more than two non-clog passages and must pass a minimum three (3) inch solid. The interior water passages shall have uniform sections and smooth surfaces and shall be free from cracks and porosity. The impeller shall be dynamically balanced and securely locked to the shaft. All interior water passages and impeller shall be coated with an approved epoxy coating to increase efficiency and resist wear.
- f. Pumps shall have mechanical seals, which shall require neither maintenance nor adjustment and shall be readily accessible for inspection and replacement. The seals shall not rely upon the pumped media for lubrication and shall not be damaged if the pump is run un-submerged for extended periods while pumping under load. Mechanical seals shall be solid hard faced, (not laminated type). The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be carbon-ceramic, tungsten carbide or silicon carbide material. Replaceable or adjustable wear rings shall be provided for all pumps.
- g. All mating surfaces (pump assembly), of major components shall be machined and fitted with o-rings where watertight sealing is required.
- h. The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The base shall be sufficiently rigid to firmly support the guide rails, discharge piping and pump under all operating conditions. The base shall be suitable for bolting to the floor, (bolting to a standard one (1) thick metal plate), of the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange. The pump and motor assembly shall be a “quick disconnect” type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need for unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and guide rail sliding bracket. The bracket shall be designed to

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obtain a leak proof seal between flange faces as final alignment of the pump occurs in the connected position. The bracket shall maintain proper contact and a suitably sealed connection between flange faces under all operating conditions. Metal to metal mating surfaces are acceptable, if machined finished.

- i. The pump shall be driven by a totally submersible electric motor. Pump motor shall be of sufficient horsepower as to be non-overloading over the entire length of the pump curve. The stator housing shall be a watertight casing. Motor insulation shall be moisture resistant, Class F, 155 degree C. at a minimum. Motors 25 HP and larger shall be VFD rated including Class H winding insulation. Motor shall be NEMA Design B for continuous duty at 40 degree C ambient temperature and designed for at least 10 starts per hour.

All motors shall be 3 phase. Motor bearings shall be anti-friction, permanently lubricated type. Motor shall be designed to operate in a totally, partially or non-submerged condition without damage to the motor. Pump cable assembly shall bear a permanently embossed code or legend indicating the cable is suitable for submerged use. Cable sizing shall conform to NEC requirements. The cable shall enter the pump(s) through a heavy-duty stainless steel assemble with grommet. The system used shall ensure a water tight submersible seal. Cable shall terminate in a junction chamber. Junction chamber shall be sealed from the motor by a compression seal.

- j. All rotating parts shall be machined and in near perfect rotational balance as possible. Excessive vibration shall be sufficient cause for rejection of the equipment. The pump impellers shall be re-balanced after being trimmed.
- k. Pump shall be equipped with two guide rails (no cable wire assembly). Guide rails shall be a minimum of two (2) inch diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Intermediate rail braces shall be supplied and solidly secured to the wet well wall. Braces secured to the discharge piping shall not be accepted. Guide rails and brackets shall be 316 Stainless Steel.
- l. A heavy duty chain and shackle appropriately sized (3/8" minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. Unless approved otherwise by the JWSC, the lift chains shall be shackled to a heavy duty 316 Stainless Steel lifting bail attached to the pump/motor housing for removal and reinstallation. Three feet of excess chain above the top of the wet well shall be provided to expedite removal. A chain/motor electric cable holder shall be provided and appropriately sized to accommodate the lift chains and motor electrical cables provided without deformation. Chain/electric cable holder shall include extra heavy duty three-eighths (3/8) inch rod hooks for attaching control floats, lifting chains, and other wet well accessories (6 hooks minimum) and be located on the side of the wet well hatch opening opposite to the discharge piping. The chain, shackles, lifting bail, and cable holder shall be 316 Stainless Steel.

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- m. Exterior of pump shall be coated with manufacturer's standard finish.
- n. Pump discharge base shall be leveled, plumbed and aligned into position to fit connecting piping. The discharge base shall be solidly secured to the wet well floor using a one (1) inch thick steel hold-down plate and appropriately sized 316 Stainless Steel anchors then grouted after initial fitting and alignment and before final bolting of the discharge piping. This work shall be inspected by the JWSC prior to any liquid being allowed into the wet well. After final alignment and bolting, pump discharge base and all connections shall be inspected. If any movement or opening of any joints is observed, any and all piping, including pump discharge base, shall be corrected.

4.5.9.3 Grinder Pumps

Grinder Pumps and installation (for Low Flow Stations only) shall be in accordance with the follow minimum standards:

- a. Pump shall be of the centrifugal type with an integrally built grinder unit and submersible motor. The grinder unit shall be capable of macerating all material in normal domestic and sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like into fine slurry that will pass freely through the pump and two (2) inch discharge pipe connection.
- b. Stator winding shall be of the open type with Class F insulation rated for 130°C (266°F) maximum operating temperature. All motors shall be 3 phase. Motors shall have two heavy duty ball bearings to support the pump shaft and take the radial and thrust loads. Ball bearings shall be designed for 50,000 hours L-10 life. Stator shall be heat shrunk into the motor housing.
- c. The common motor, pump and grinder shaft shall be of 416 Stainless Steel, threaded, on the pump end, to accept the impeller and grinder assembly.
- d. The motor shall be protected by two mechanical seals mounted in tandem in a seal chamber. The seal chamber shall be oil filled to lubricate the seal faces and transmit the heat from the shaft to the outer motor shell. The bottom seal shall be tungsten carbide or silicon carbide material. The top seal may be carbon-ceramic, tungsten carbide or silicon carbide material. Seal faces shall be carbon ceramic and lapped to a flatness of one light band. An electrode shall be mounted in the seal chamber to detect any water entering the chamber through the lower seal.

Water in the chamber shall create an alarm condition. The alarm condition signal shall not stop the motor but act as a warning only, indicating that service is required.

- e. The pump impeller shall be of the recessed type to provide an open and unobstructed passage through the volute for the ground solids. The impeller shall

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be constructed of cast iron and shall be threaded onto a stainless steel shaft. The grinder assembly shall consist of a grinder, an impeller and a shredding ring and shall be mounted directly below the volute passage. Grinder impeller shall be threaded onto a stainless steel shaft and shall be locked to the shaft with a screw and a washer. The shredding ring shall be pressed into an iron holding flange for easy removal and replacement. Shredding ring shall be reversible for double life without disassembly of the pump unit. The holding flange shall be provided with tapped holes such that screws can be used to push the shredding ring from the housing. All grinding of solids shall be from the action of the impeller against the shredding ring. Both the grinder and the shredding ring shall be constructed of 440C stainless steel hardened to 58 to 60 on the Rockwell C scale.

- f. All iron casting shall be pre-treated with a phosphate and chromic rinse and shall be painted before machining. All machined surfaces exposed to sewage shall be repainted. All pump and motor fasteners shall be 316 Stainless Steel.
- g. All mating surfaces of the pumps major components shall be machined and fitted with o-rings where seating is required.
- h. The motor power cord shall be rubber coated wire and shall be fastened by means of a cord grip in the top of the pump. The motor shall contain a waterproof junction box, which will provide space to connect the power cord to the motor leads. The motor leads shall seal between the motor housing and the junction box by means of a rubber compression fitting around each wire. The power cord shall have a green carrier ground conductor that attaches to the motor flange.
- i. The pump manufacturer shall furnish a discharge base and discharge elbow for the pump supplied. The bases shall be sufficiently rigid to firmly support the guide rails, discharge pipe and pump assembly under all pumping conditions. The base shall be bolted to the well floor and sealed on the wet well exterior to prohibit any intrusion or leakage from the wet well. The face of the discharge elbow inlet flange shall make contact with the face of the pump discharge nozzle flange.

The pump and motor assembly shall be a quick disconnect type connected to and supported by the discharge base and guide rails allowing the pump to be removed from the wet well and replaced without the need of unbolting any flange, lowering the liquid level or requiring operating personnel to enter the wet well. Pump shall be provided with a sealing flange and a guide rail sliding bracket. The bracket shall be designed to obtain a leak proof seal between the flange faces as final alignment of the pump occurs on the connected position. The bracket shall maintain proper contact and suitably sealed connection between flange faces under all operating conditions.

- j. All rotating parts shall be machined and in near perfect rotational balance. Excessive vibration shall be sufficient for rejection of the equipment. The impellers shall be rebalanced after being trimmed.

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- k. Pump shall be equipped with two (2) guide rails. Guide rails shall be a minimum of one (1) inch diameter and sized to fit the discharge base and the sliding bracket and shall extend upwards from the discharge base to the access hatch cover at the top of the wet well. Guide rails and brackets shall be 316 Stainless Steel.
- l. A heavy duty chain and shackle appropriately sized (one-fourth (1/4) inch minimum) for removing and installing the pump shall be selected and provided by the pump manufacturer. The chain shall be 316 Stainless Steel and attached.

4.5.9.4 Pump Warranty**PUMP WARRANTY** (Solids Handling and Grinder Pumps):

- a. The manufacturer shall warrant to the JWSC, for permanent installation in municipal sewage service, submersible pump and motor against defects in materials and workmanship including normal wear and tear to the following parts:
 - i. mechanical seals
 - ii. bearings, shafts
 - iii. motor electrical cables
 - iv. motor stators.

The warranty shall include no less than 100% coverage for original equipment manufactured (OEM) parts and in-shop labor for pump/motor repairs for a minimum of eighteen (18) months at NO COST to the JWSC. This warranty shall not apply to parts that fail due to abuse, neglect, mishandling, or acts of God. The warranty period shall commence upon the date of final acceptance for use of the pumping station and/or of a replacement pump by the JWSC and upon completion of manufacturers startup.

- b. During the warranty period, the pump distributor shall, at no cost to the JWSC, transport and repair the defective pump/motor within forty eight (48) hours or provide a loaner capable of maintaining the operation of the JWSC site. Where, due to the size of the pump/motor a forty-eight (48) hour repair is not feasible and/or a loaner is not available, the distributor shall cover the cost of an appropriately sized engine driven back-up pump to be installed at the site to maintain the station until the pump is repaired and reinstalled or until a loaner is provided. This clause shall only be invoked where the lift station site is considered critical and the availability of only one operating pump at the facility would create a high liability situation. This judgment call shall be at the sole discretion of the JWSC.

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4.5.10 Site Electrical Work4.5.10.1 General

All wiring shall meet the requirements of the National Electrical Code. All wiring outside the control panels shall be enclosed in rigid PVC conduit sized for 40% fill unless indicated otherwise. A separate conduit shall be used for each pump power cable sized for not more than 40% fill. Each conduit shall be sealed gas tight with duct seal putty at motor control panel entry.

4.5.10.2 Electrical Service

The pumping station incoming service shall consist of type THW or XHHW copper conductors in rigid PVC conduit installed a minimum of forty-eight (48) inches below final grade. Electric service shall be sized as required by ultimate station electrical loadings.

Electric service shall be routed within Public rights-of-way, or if approved due to special considerations, within dedicated easements. As-Built documentation shall include a diagram indicating actual routing from utility transformer/s to station meter and to control panel.

If overhead service, an electrical pole shall be set outside of the pump station fencing then installed underground within the pump station's fenced enclosure.

4.5.10.3 Control Panel Connections

The power line and each motor line shall enter the bottom of the motor control panel separately and each in SCH 40 PVC sized as per National Electric Code. Each line shall travel directly from motor control panel to the pump motors and contain only one pulling 90 degree elbow at the base of each panel/box.

The motor control panel and service shall be grounded per NEC Article 250 and utilize a minimum of two grounding electrodes at least six (6) feet apart and eight (8) feet deep. The neutral conductor shall not serve as the grounding conductor to the main breaker panel. A separate conductor shall be used for this purpose. Grounding system shall be zinc coated and buried so as not to present a trip hazard above vapor barrier and below gravel.

4.5.11 Electrical Equipment and Controls

Controls shall be compatible with pumps supplied meeting both pump manufacturer requirements and the minimum standard below pump supplier shall assume sole source responsibility for pumps and controls.

4.5.11.1 General Requirements

Pump motors greater than or equal to 20 Hp shall require a 480 volt service. If a pump motor is less than 20 Hp, but the kilo-volt-amperes (kVA) as determined by the equation:

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$kVA = (\text{Total Load}) \times (\text{Voltage}) \times (1.73/1000)$ is greater than 150, a 480 volt service shall be used. Otherwise, a 230 volt service may be used.

If the pump motor is less than 25 Hp, across the line starters can be used. Therefore, pump breakers are sized by multiplying the full load amperage (FLA) for the specific motor at the appropriate voltage by 300% and rounding up to the nearest breaker size.

If the pump motor is over 25 Hp, VFD's are required. Therefore, pump breakers are sized by multiplying the full load amperage (FLA) for the specific motor at the appropriate voltage by 200% and rounding up to the nearest breaker size.

If the JWSC has approved the station to be designed as an initial/ultimate station, the pump breakers shall be sized for the initial pumps. The dimensions of the control panel shall accommodate the ultimate size components.

The Main and Emergency breaker sizes shall be determined by adding the pump breaker size, the FLA of additional pump motors (beyond the one), and any auxiliary loads and rounding down to the nearest breaker size. If the total load for a 240-volt service is less than or equal to 100 Amps, 100 Amp emergency and main breakers should be used. If the total is greater than 100 and less than 200 Amps, round down to the nearest available breaker size, but, set the service size to 200 Amps. If the total is greater than 200 Amps, the service size shall be the same as the emergency and main breaker size. Where the JWSC has approved an initial/ultimate station, the main and emergency breakers, as well as service size shall be designed for ultimate design conditions.

Starters shall be sized corresponding to the NEMA ratings.

If the JWSC has approved the station to be designed as an initial/ultimate station, the starters shall be sized for the ultimate pumps with a note added to the drawings stating: "**Heater coil sized to protect the initial pumps**".

4.5.11.2 Submersible Lift Station Motor Control Center

Submersible Lift Station Motor Control Center (MCC) shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels and shall bear the UL508A serialized label.

A. Enclosure

- i. Minimum submersible lift station enclosure size for Motor Control Panel shall be forty-eight (48) inches high, thirty-six (36) inches wide and twelve (12) inches deep.
- ii. Minimum low flow submersible lift station enclosure size for Motor control Panel shall be thirty-six (36) inches high, thirty (30) inches wide and twelve (12) inches deep.
- iii. All control components shall be housed in a NEMA 12/4x316 stainless steel enclosures rated NEMA 12 with dip shield resulting in a NEMA 12/4 x rating. The

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enclosure shall have a single handle and a 3 point latch system with padlock feature (no keyed locking handles will be accepted.)

- iv. The enclosure shall have a brushed finish and collar studs. The enclosure shall also have 90 degree flanged lip all around where the outer door makes contact with enclosure to make a more efficient seal.
- v. The enclosure shall have a hinged inner door(s) (dead front) fabricated from 0.125 inch thick marine alloy grained aluminum. The inner door shall have an adjustable latching mechanism to keep door firmly closed and shall be comprised of captive hardware. The inner door(s) shall have stainless steel hardware to be secured open for service.
- vi. The enclosure shall have a twelve gauge steel, formed, removable sub panel. The sub-panel shall be degreased, cleaned, treated with phosphate process, then primed and painted with white industrial grade baking enamel.
- vii. The enclosure and mounting system shall be devices to keep them open when service is being rendered. Mounting system to be as shown in the JWSC Standard Detail.
- viii. Enclosures shall be sized to enable all breakers and controls to be located not more than five (5) feet zero (0) inches above grade or the walkway.
- ix. Construction of MCC III type panels shall have VFD manufacturer recommended cooling as part of overall panel construction.

B. Panel Components

At a minimum, the panel shall consist of the following components:

- i. Motor Starter/Controller - one per pump
- ii. Thermal Magnetic Circuit Breakers - one per pump
- iii. Circuit breaker operators (thru inner door type) - one per pump
- iv. Power Monitor - one
- v. Alarm Light - one
- vi. Duplex GFI Receptacle – two (2)
- vii. Generator Receptacle and Manual Transfer - one (if not equipped with a generator set and automatic transfer switch)
- viii. Hand-Off-Automatic Selector Switch - one per pump
- ix. Moisture Sensors - one per pump

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- x. Heat Sensors - one per pump
- xi. Audible Alarm Device
- xii. Relays - six (11 pin 120 VAC with matching sockets)
- xiii. Indicator Lights (LED Type) for "Run", "Seal Fail", and "Over Temperature" - one set for each pump
- xiv. RTU Circuit Breaker
- xv. Power Distribution Block
- xvi. Lightning Arrestor - one
- xvii. Elapsed Time Meter - one per pump
- xviii. Thermostatically Controlled Panel Heater
- xix. Control Transformer when 480 Volt, 3-phase power is used

C. Motor Starter/Controller

To extend the useful life of the pump station components including the pump and motors, one of the following two (2) starter/controllers is required for each pump/motor based upon the motor horsepower. A minimum eighteen (18) month warranty is required on all starter/controllers (including VFD equipment). The warranty shall include materials or workmanship which does not conform to these specifications.

- i. **Type "one" (MCC I):** 0-25 HP 208/230 VAC started across the line shall be protected at 300% of nameplate FLA (full load amperage), using NEMA motor starters.
- ii. **Type "two" (MCC II):** 26 HP and above 460/480 VAC, requires a variable frequency drives with an internal bypass protected at 200 % of motor nameplate FLA.

Motor Starters (MCC-I Only): Motor Starters shall be NEMA rated Magnetic Motor Starter with solid state overload relay with life time coil warranty.

Overload relay includes phase loss and phase unbalance. Device must be manufactured to ensure full voltage is applied to coil even at 85% of nominal eliminating contact chatter and premature contact failure. When lower than acceptable voltages are applied the motor starter will not start or will break the circuit to prevent contact chatter. Starters shall be mounted twelve (12) inches (minimum) from the bottom of the cabinet.

Variable Frequency Drive (VFD) Controllers (MCC II Only): The Variable Frequency Drive shall be rated for input voltage. The variable frequency drive shall be microprocessor based control for three phase induction motors. The VFD's shall be Pulse Width

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Modulated (PWM) design. Adjustable current source VFD's are not acceptable. Insulated Gate Bipolar Transistors shall be used in inverter section. Bipolar Junction Transistors, GTOs or SCRs are not acceptable. The VFD's shall have efficiency at full load speed that exceeds 97% for motors over 40HP. The VFD's shall limit harmonic distortion onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by using the standard 3% nominal impedance integral ac three phase line reactor.

The system containing the VFD's shall comply with the 5% level of total harmonic distortion of line voltage and the line current limits as defined in IEEE 519-1992. If the system cannot meet the harmonic levels with the VFD provided with standard input line reactor or optional input isolation transformer, the VFD manufacturer shall supply a multiple bridge rectifier AC to DC conversion section with phase shifting transformer for all drives above 100 horse power. The multiple rectifier converters shall cause multiple pulse current waveforms that will more neatly approximate a true sine wave to reduce voltage harmonic content on utility line. Harmonic filters are not acceptable above 100HP. The device shall be capable of communicating with JWSC approved programmable logic controller with optional Profibus communication capability. The VFD's shall be mounted a minimum of twelve (12) inch from bottom of cabinet.

D. Thermal Magnetic Circuit Breakers

- i. Protector operators are to be quick make, quick break and trip free. The thermal and magnetic elements shall operate independently and multiple pole breakers be designed with common trip bar breaking all poles when a fault is received on any pole.
- ii. All "Normal Main" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of a 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18KAIC for 460/480 Volt systems. The use of Q-frame breakers is not acceptable.
- iii. All "Emergency Main" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of 460Volt @ 14KAIC for 240 Volt systems and 600 Volt @ 18 KAIC for 460/480 Volt systems. The "Emergency Main" breaker current rating must be equal to or less than the current rating of the generator receptacle. The use of Q-frame breakers is not acceptable.
- iv. All "Pump" breakers shall be minimum "E" frame. "E" frame circuit breakers shall contain a self-test "Trip Selector" permitting a mechanical simulation of the over current tripping device and shall be rated a minimum of 460 Volt @ 14 KAIC for 240 Volt systems and 600 Volt @ 18 KAIC for 460/480 Volt systems. The use of "MCP", Motor Circuit Protectors or Q-frame breakers is not acceptable.
- v. All "Control" breakers shall be rated for 120/240 @ 20 KAIC (Q Frame).

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E. Circuit Breaker

Each circuit breaker shall be mounted with breaker handles extending through the dead front panel door.

F. Audible Alarm

A horn shall be provided on the left hand upper side of enclosure and shall sound upon high level at 90db at ten (10) feet. A silenced push button shall be mounted on exterior bottom left of cabinet to energize a relay to disconnect the horn when pressed. Horn will be wired to allow remote silencing via the local RTU and radio link.

G. Alarm Light

A red alarm light shall be provided and shall be mounted using threaded stainless steel pipe to top of panel.

H. Duplex GFI Receptacle

Two GFI duplex receptacles shall be provided, one to be mounted on the appropriate weather proof enclosure and the other to be mounted on the outside bottom right hand side of the cabinet. The receptacle face shall be flush with front of cabinet and be supported as required by NEC. The receptacles shall be rated 20 amps, 125vac.

I. Generator Receptacle

A generator receptacle shall be mounted in accordance with the standard detail. A 30° panel mounting adapter and flip cover shall be supplied. The generator receptacle must be sized equal to or greater than the current rating of the Emergency Main breaker. The generator receptacle shall not be required if a generator set is installed on the site.

J. Manual Transfer Switch

If Automatic Generator is not specified, a manual transfer switch shall be provided with one normal power circuit breaker and one emergency power circuit breaker interlocked mechanically to prevent both breakers from being closed at the same time. The emergency breaker will be fed from the generator receptacle. Panel manufacturer is to size breaker and receptacle per facility requirements.

K. Hand-Off-Automatic Selector Switches

A three position selector switch shall be provided for each pump and be mounted on the inner door. The switches shall be heavy duty 30mm devices.

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L. Moisture Sensors

The panel shall be equipped with moisture sensing relays for each pump energizing red status indicator lights mounted on the dead front and send a signal to the PLC. Relays shall not disconnect control power to the pumps. Indicator lights shall remain energized until manually reset.

M. Heat Sensors

The panel shall be equipped with heat sensing relays for each pump energizing red status indicator lights, mounted on the dead front and send a signal to the PLC. Relays shall not disconnect control power to the pumps. Indicator lights shall remain energized until manually reset.

N. Power Monitor

A power monitor relay shall be installed and connected to the control circuits. When the power to the RTU is deactivated it shall disconnect control power from the motor starters and open the 24vdc monitor circuit to the RTU and shall have a dedicated set of contacts to provide input for the RTU. The power monitor relay shall be deactivated in the event that any of the following two (2) conditions occur and shall have a dedicated set of contacts to provide input to RTU.

- i. Phase loss (single Phasing) when one of any three lines drops to 83% of nominal voltage.
- ii. Low voltage (brown out) when all three line voltages drop to 85% or less of nominal voltage.

O. Relays

All relays shall be large ice cube style case and be 3 poles double throw octal type relays for all 120 volt applications. Relays must be standard 11 pin octal type relays with contacts rated 10 amps @ 120VAC. Relays are to have internal LEDs and test push button as standard. Matching 11 pin sockets shall be supplied.

P. Indicator Lights

Lights shall be provided to indicate Pump Run, Seal Fail, (each pump) and motor over temperature (each pump). Indicator lights shall be LED type heavy duty 30mm.

Q. RTU Circuit Breaker

RTU shall be powered through a 20 ampere circuit breaker "Q" Frame.

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R. Power Distribution Block

Power distribution block with touch safe cover shall be provided, sized for 600 volt, 175 amps minimum. The power distribution block shall have a flammability rating of UL 94V-0 and shall be based upon NEC. Power block shall be Busmann 16 series.

S. Lightning Arrestor

A secondary arrestor, complying with ANSI 62.2 shall be installed in accordance with manufacturer's instructions on the outside bottom of the cabinet.

T. Elapsed Time Meters

Elapsed Time Meters shall be five digits non-resetting interfaced with appropriate motor starter and shall be mounted on the dead front door. One will be required for each pump.

U. Level Control Systems

Lift station level control systems shall be either floats or Level Transducer in accordance with the following guidelines:

- i. All Low Flow Lift Station with a design pump rate between 22 gpm and 79 gpm shall be float controlled;
- ii. All Standard Duplex Lift Stations with a design pump rate between 80 gpm and 349 gpm shall be float controlled;
- iii. All Standard Duplex Lift Stations with a design pump rate between 350 gpm and 749 gpm shall be Level Transducer controlled, with the exception of the Audio/Visual High Water Alarm system, which shall be by float;
- iv. All Triplex, Quadraplex and Initial/Ultimate Lift Stations shall be Level Transducer controlled, with the exception of the Audio/Visual High Water Alarm system, which shall be by float.
- v. **Where a Level Transducer level control system is required**, the transducer shall be installed within a slotted six (6) inch DR-11 HDPE casing pipe installed within the wet well as follows:
 - a. The transducer casing pipe shall be placed between the pump intakes on submersible installations, to serve as the housing and stilling well for the transducer assembly;
 - b. The stilling well pipe shall be open on both ends and slotted between six (6) inches from the bottom and twenty-four (24) inches from the bottom with slots approximately three (3) inches center to center; slots shall be one-half ($\frac{1}{2}$) inch wide by four (4) inches long and cut on opposite sides of the pipe.

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- c. The stilling well shall terminate on the “wet” end at the level of the pump intakes in the pump sump or in a sloped recessed area constructed in the sump invert that provides the same elevation relative to the pump intakes.
- d. On submersible installations, the stilling well pipe on the dry end shall terminate approximately two (2) feet below the access hatch and on the same side of the wet well as the guide rails.
- e. Stilling well pipe shall be vertical and plumb to facilitate removal for cleaning and maintenance of the transducer.
- f. On submersible pump installations the casing shall be securely fastened to guide rail brackets with 316 Stainless Steel brackets and off-set so as not to interfere with the installation/removal of pumps.
- g. The transducer shall be set within the stilling well casing at the **Low Water Level** elevation. At the Low Water Level (LWL) elevation in the wet well the transducer calibration setting shall correlate with the “zero” depth of water level.

Level Transducer: The submersible level sensor, where required, shall be a solid state instrument designed to continuously measure and transmit liquid level data. The transducer shall have a 4-20ma output with 24 VDC supply. The transducer shall be calibrated for 0 – 24 feet of water. Transducer shall have conduit adapter, and cable length as required by the installation. The transducer shall not have a breathing (vent line) or boxes. Transducers shall be capable of field calibration and shall have a manufacturer’s one year warranty from date of installation. The transducer shall be in stainless steel housing. The transducer shall be installed in a stilling well as described in this article of the Standard. The electrical connections shall be (two) 2 wire, shielded waterproof cable attached to a terminal strip with screwed connections.

Level Control: Floats, where required, shall activate when switch is horizontal and deactivate when liquid level drops below the activation elevation. The float shall have a chemical resistant polypropylene casing with a firmly bonded electrical cable protruding. One end of the cable shall be permanently connected to the switch with the entire assembly encapsulated to form a completely water tight unit. The float shall be mounted from above on a 316 Stainless Steel hanger.

V. Control Transformer

Control transformer shall be 480 Volt Primary, 120 Volt Secondary sized as necessary to carry all connected loads.

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W. Control Wiring Identification

All wiring shall be color coded sized as follows:

120 VAC (Un-switched Hot) #12 AWG Black
120 VAC (Dry Contacts) # 12 AWG Red
120 VAC (Neutral) # 12 AWG White
120 VAC (Switched Hot) # 12 AWG Red
24 VDC + # 16 AWG Orange
24VDC - # 16 AWG Brown

Control Wiring shall be numbered or lettered at each end. Wire numbers/letters shall be Pass & Seymore “Legrande” or JWSC P&CD equal.

X. Wire Duct

All wiring shall be routed through a wiring duct system to provide protection and an organized appearance.

Y. Terminals

Terminals shall be provided for interface with field installed equipment. The terminal blocks shall be mounted on a 30 degree angle for ease of field connection.

Z. Nameplates

All components shall be labeled using a laser screen Mylar nameplate. The nameplate shall be a laminated two part system using black letters on a white background providing protection against fading, peeling or warping. The labeling system shall be computer controlled to provide logos, post-script type or custom designs. The uses of laminate or plastic engraved legend plates will not be accepted.

AA. Mounting Hardware

All components shall be mounted using stainless steel machine screws. All mounting holes shall be drilled and tapped. The use of self tapping screws shall not be acceptable.

Note: UL Labels: The entire control system shall bear a UL 508 serialized label “Enclosed Industrial Control Panel”. The use of the label “Industrial Control Panel Enclosure” without the UL508 serialized label is not acceptable.

4.5.12 Remote Terminal Unit (RTU) - System and Panel

An approved manufacturer as listed in the Approved Materials Section of this Standard shall manufacture the remote terminal unit (RTU). The panel shall be constructed in accordance with UL 508A requirements for enclosed industrial control panels.

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4.5.12.1 General

The manufacturer shall be responsible for all efforts necessary to select, furnish, supervise installation and connections, calibrate and to place into operation all SCADA system instrumentation and controls along with all other associated equipment and accessories.

The manufacturer shall furnish all materials necessary for a complete operational radio based SCADA System as described herein. System shall include all materials necessary to interface field instruments and devices with the various control panels and SCADA system and shall provide for surge protection of the units.

The base function of the RTU shall be to monitor the status of and provide control of lift station pumps, and to provide historic data of facility operations.

4.5.12.2 Warranty

Warranty on system function and equipment shall be two (2) years from the date of start-up. Warranty shall include any problems (to include lightning and other surges) which prevent satisfactory operation of the system. Warranty shall include, but not be limited to parts, labor and travel expenses.

4.5.12.3 System Requirements

RTU's shall meet or exceed the following requirements:

- a. Each RTU shall incorporate the power supply, logic, memory, communications interface and input/output circuitry.
- b. The unit must be microprocessor based, use a 16 bit processor as a minimum and include the following capabilities:
 - i. Fused, user configurable, digital and input/output
 - ii. User configurable digitally scaled analog inputs
 - iii. On-board trickle type battery charger and battery
 - iv. Bounceless changeover circuitry for primary to battery power transfer
- c. Each digital input/output shall be user configurable through either the host computer or local terminal; each must use a standard input/output module. The selected modules must provide the ability to use input signals up to 140VAC and 30VDC, and provide output signals to the interface with control voltages up to 280VAC/60VDC.

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- d. Configuration of the digital inputs/outputs shall include the following as a minimum:
- i. Normally closed/open point type
 - ii. Accumulation of time on the transitions
 - iii. Accumulation of pulse counts (up to 20 per second)
 - iv. Manual/Automatic mode
 - v. Analog point type
 - vi. Enable/disable of selected features
 - vii. Run time accumulation
 - viii. Number of starts
 - ix. Time between starts
- e. Each analog input/output shall be digitally scaled to assure accuracy. Analog conversion method shall, at a minimum, use dual slope integration techniques with a least two (2) processor samples per second. Analog inputs shall have twelve (12) bit minimum accuracy available. Either voltage or current mode shall be jumper selectable on the unit for each input. Analog outputs shall have twelve (12) bit accuracy. Configuration of the analog inputs/outputs shall have the following features as a minimum:
- i. Point type
 - ii. Communication to the host computer on set point violation
 - iii. Local alarm output interface for set point deviation
 - iv. Value range
 - v. Filter constant
 - vi. Low and high gain
 - vii. Low and high set point
 - viii. Set point dead band
 - ix. Set point delay time
 - x. Scaling

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- xi. Enabling/disabling of selected features
- f. RTU shall be Driver and MODBUS programmable to existing SCADA or approved equivalent
- g. Communication Modem:
 - i. Modem supplied shall be MODBUS Protocol Modem or approved equivalent.
 - ii. VHF Transceiver Radio installations shall include FCC license amendment to include operations at new locations. FCC licensing shall be the approved manufacturer's responsibility to provide radio frequency and radio testing each site.
 - iii. Antenna and cable shall be selected to be compatible with the transceiver and be installed to deliver clear and reliable signals by approved manufacturer.
- h. Contact points for all SCADA systems shall at a minimum provide Input/output functionality and relays for the following settings:
 - i. Off level
 - ii. Low level
 - iii. Lead level
 - iv. Lag level(s)
 - v. High level
 - vi. Power fail (phase failure)
 - vii. Pump run status (all pumps)
 - viii. Pump fail status (all pumps)
 - ix. Pump enable/disable
 - x. Wet Well Water level (transducer facilities only)
 - xi. Water pressure (where required to monitor local water pressure on public mains)

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4.5.13 Combination MCC/RTU Panel

The combination MCC/RTU panel shall include all of the components listed above for the MCC panel and for the RTU panel. The MCC portion of the panel shall include the motor starter/controller as noted in Article 4.5.11.2 of this Standard (MCC-I, MCC-II). All exceptions to the above requirements are provided below. The MCC/RTU shall incorporate all low voltage control and automation components being mounted behind the left hand dead front door. The enclosure shall have a full length aluminum barrier separating the low voltage side from the high voltage power devices. The high power components will be located behind the right hand dead front door. All pilot devices displays etc. shall be on the left hand dead front door. The main, emergency and pump breaker handles reset buttons etc. shall be on the right hand dead front door. The battery, charger and associated equipment shall be mounted near the bottom left hand side of the enclosure and the terminal blocks shall be placed approximately where the battery and charger shelf are located.

Minimum enclosure size for MCC/RTU shall be sixty (60) inches tall forty-eight (48) inches wide and twelve (12) inches deep.

All control components listed here-in shall be housed in a NEMA 12/4X 316 stainless steel enclosures and shall have inner door separating control and automation components from power related equipment.

4.5.14 Low Flow Station (Only) Remote Terminal Unit (RTU) System

The approved material section of this standard will provide a list of approved parts to be installed inside the enclosure.

4.5.14.1 General

Low flow site RTU's minimum shall be monitor only.

The manufacturer shall be responsible for all efforts necessary to select, furnish, supervise installation and connections, calibrate and to place into operation all required system instrumentation and controls along with all other associated equipment and accessories.

The enclosure shall be 14"x12"x6" weather proof NEMA 4X polycarbonate enclosure.

The parts list shall consist of the minimum parts herein:

- a. Modular Backplane
- b. Digital monitoring module card (DMM)
- c. Broadband DC block protector
- d. Radio interface module

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- e. Internal coax connector (pig tail)

4.5.14.2 Warranty

Warranty on system function and equipment shall be one (1) year from the date of start-up. Warranty shall include any problems (to include lightning and other surges) which prevent satisfactory operation of the system. Warranty shall include, but not be limited to parts, labor and travel expenses.

4.5.14.3 System Requirements

RTU's shall meet or exceed the following requirements:

- a. Programming:
 - i. The device shall be configured, programmed, and setup using any standard Internet web browser software.
 - ii. All connected equipment can be monitored and configured from an internet connection to the world-wide-web.
 - iii. Screens shall be Password protected to provide secure access.
 - iv. Operational programming software or user skills shall not be proprietary.
- b. Radio Communication:
 - i. Communication shall be via Radio wave using DFS primary protocol or equivalent MODBUS protocol and shall communicate through the data transmission services using existing licensed frequencies.
 - ii. A factory approved antenna and mast shall be provided as part of the onsite communication structure with accordance to manufactures communication height.
 - iii. N-Series coax cable shall be installed between broadband DC block protector and the antenna.
 - iv. Antenna masts shall be anchored According to the manufactures specifications unless other inspection conflicts are noted.
 - v. All Grounding of communications shall be grounded by one (1) - eight (8) foot copper ground rod and bonded to GA Powers grounding strap.
 - vi. All antenna connections shall be protected by heat shrink.
 - vii. All mast connections shall be brass or bronze coated with galvanized coating or spray.

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- viii. FCC Licensing shall be the approved manufacturer's responsibility to provide radio frequency and radio testing of each site.
- c. Alarming and Monitoring: The device shall monitor connected alarms and analyze and report the following information with alarm notifications sent immediately, or at user selectable time delays:
- i. High water alarm (From level controller)
 - ii. Lag float alarm
 - iii. Float sequence failures
 - iv. Power failure alarm
 - v. Phase monitor
 - vi. Pump 1,2 On/Off Cycles
 - vii. Starter failures
 - viii. Pump 1,2 Runtimes
 - ix. Hand / Off / Auto switch position
 - x. High pump temperature alarm, Pump #1 & #2
- d. Power Supply:
- i. Incoming electrical service shall be 115 VAC, 60 Hz, single-phase power.
 - ii. Fuse protected 12 VDC power supply shall be powered from the 120-volt incoming power and shall include tapered charge type battery circuitry to maximize battery life. The power supply shall be rated at minimum 2.0 Amps @ 12 VDC.
 - iii. A 12-volt battery charging power supply and battery backup with a 2-hour minimum operation time shall be provided.
- e. Protection: A single-phase lightning arrestor shall be connected to each line of the incoming side of the power input terminals. The installation shall include a good (minimum eight (8) foot deep) copper ground rod bonded to GA Power grounding strap.

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4.5.15 Emergency Power

Lift Stations with a design capacity of 1,500 gpm or greater shall be provided with a permanently mounted on-site generator set and automatic transfer switch. Pump stations with a design capacity less than 1,500 gpm shall be equipped with a generator receptacle for use with a portable generator. Generator receptacles, where applicable, shall be matched to accommodate the use of JWSC portable generators.

4.5.16 On-site Standby Generators & Automatic Transfer Controls

On-Site generators shall be installed in accordance with NEC Article 702, Optional Standby Systems.

4.5.16.1 General

On-Site generators shall be sized by the manufacturer based upon the lift stations running electrical load and motor-starting requirements as specified by a Georgia Licensed Engineer, taking into consideration the characteristics of the generator and engine.

On-Site generators shall be sized, designed and capable of operating two pumps simultaneously on duplex and triplex facilities and three pumps simultaneously on quadruplex facilities taking into account the pump motor starting sequence delay interval. The design shall allow for a maximum 20% voltage dip at motor start of the second or third pump while the originally started pump is in full operation. Where the facility includes differing motor sizes, the largest motor shall always be started first.

The generator shall be equipped with field-forcing equipment to sustain the rated excitation and current up to three times the generator's rated output. Downstream and generator circuit breakers shall be coordinated so that the branch circuit breaker trips first. An under-voltage relay shall be provided to trip breakers and shut down the engine if over current at less than full voltage occurs for a predetermined length of time.

On-Site generators shall be powered by a diesel fueled engine capable of supplying the shaft power required by the actual/required maximum load applied to the generator. The diesel fueled generator shall be provided with a UL 142 compliant above ground fuel storage tank or integral belly tank sized to provide a minimum of 24 hours of continuous run time based on full facility power requirements and loadings.

4.5.16.2 Engine-Generator Controls

Controls shall meet or exceed the following requirements:

- a. General controls shall include:
 - i. Manual start/stop
 - ii. Auto/remote start

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- iii. Emergency stop
 - iv. Fault reset
 - v. Remote start input active
 - vi. Fuel gauge
 - vii. Exercise function
 - viii. 3-Phase voltage regulator
 - ix. Fault history
 - x. Output circuit breaker
- b. Instruments for the engine shall include:
- i. Oil Pressure
 - ii. Coolant temperature
 - iii. Engine speed
 - iv. Engine running hours
 - v. Number of starts
 - vi. Battery voltage
- c. Safety controls for engine shut-down shall only be manually reset and shall include:
- i. Low oil pressure
 - ii. High engine coolant temperature
 - iii. Failure to crank shutdown
 - iv. Over crank (failure to start)
 - v. High/low battery voltage/weak battery
 - vi. Over-speed
 - vii. Low fuel

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- d. Instruments for generator shall include:
 - i. 3-Phase L-L and L-N voltage
 - ii. Frequency
 - iii. 3 Phase current
 - iv. Kilowatt hour
 - v. Total kilovolt-amps
- e. Safety control for generator shut-down shall only be manually reset and shall include:
 - i. Under and over voltage
 - ii. Under and over frequency
 - iii. Over current and short circuit
 - iv. Reverse power
- f. Instruments and controls shall be mounted on the generator control panel
- g. Actuating the safety devices shall shut-down the generator set, indicate the cause of the shut-down by lighting the appropriate indicating light, and provide separate outputs for the remote alarm indication panel and the computer.

4.5.16.3 Automatic Transfer Controls/Switches

Automatic Transfer Controls/Switches shall be provided and shall conform to all of the requirements of UL 1008 and be so listed and labeled; Bypass isolation switches that allow the ATS to be removed for repairs shall be provided.

- a. Automatic transfer switches shall be Double-throw type switches having the following ratings:
 - i. Continuous rating.
 - ii. Inrush rating
 - iii. Load interrupting
 - iv. Thermal and Magnetic
- b. Automatic transfer switches shall include a pause-in-neutral position with an adjustable time delay that causes the motor to be disconnected from the power

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source during transfer and allows the motor voltage to collapse to a safe level prior to re-energization. Automatic transfer switch position indicating panel shall include:

4.5.16.4 Starting Batteries and Charging Systems

Starting batteries for the standby generator shall be wet cell lead-acid batteries having a cranking capacity adequately sized for the specific application.

4.5.16.5 Generator Set Enclosure

Generator Set enclosure shall be an aluminum sound attenuated weather protective enclosure with the following features:

- a. Stainless Steel hardware
- b. Compact footprint
- c. Package listed to UL 2200
- d. Fuel and electrical stub-up area within enclosure perimeter
- e. Two or more recessed doors per side, depending on dimensions.
- f. Pad-lockable doors with weather protective seals
- g. Enclosed exhaust silencer
- h. Rain collar and rain cap
- i. Access lifting points for spreader bars or forklift
- j. Window for control viewing
- k. Exterior oil and coolant drains with interior valves for ease of service
- l. Sound attenuated 70 dB(A) at twenty-three (23) feet (non-residential)

4.5.17 Lift Station Testing

Each Lift Station shall be subjected to testing in accordance with JWSC Water and Waste Water Developmental Standards and Procedures.

4.6 PRIVATE LIFT STATIONS

This section delineates the minimum standards for wastewater lift stations intended for private ownership, operation and maintenance that will discharge to the publically owned and operated gravity sewer systems or low pressure system force mains of the JWSC.

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These Standards shall encompass individual residential, single property service commercial, multi-service/multi-lot facilities that require less than 22 gpm falling below the threshold for public ownership, and those facilities discharging greater than 22 gpm not “intended” for dedication by a documented “Notice of Intent” from the property owner to the JWSC.

4.6.1 General Requirements

No Publically owned and operated sanitary sewer system or lift station shall be permitted to discharge, directly or indirectly, to a privately owned and operated lift station.

All piping systems contributing flow to a private lift station shall be privately owned and operated by the facility owner and/or allowed by a documented agreement between the owners of contributing systems and the lift station owner. Such agreements shall establish the rights and responsibilities for operation and maintenance of the lift station and of the individual piping systems between the parties. The JWSC shall be provided with a copy of such agreement(s) prior to the payment of connection fees.

With the exception of individual residential and single property commercial lift stations, private lift station and sanitary sewer system owners shall be required to enter into a Satellite System Working Agreement with the JWSC prior to payment of connection fees to discharge to the public system.

Private Lift Stations of capacities suitable for dedication to the JWSC that have not been designed and constructed in accordance with the Dedicated Lift Station Standards herein stated shall not be considered for public ownership until such facility is brought to the minimum current Standards for Dedicated Lift Stations. Exempted from this policy will be lift stations designed and constructed in accordance with City of Brunswick or Glynn County Standards at the time of installation and that are functioning properly.

The served property for a low pressure connection to the public force main shall be adjacent or contiguous to the publicly owned low pressure force main; the acquisition of an easement through private property to access a low pressure system force main that is not adjacent or contiguous to the property is the responsibility of the owner.

With the exception of Single Family Residential and Single Lot Commercial Lift Stations serving only one (1), water account customer, all private lift stations shall display a sign in a prominent location at the facility fitted to a post or enclosing fence. The sign shall identify the facility as a wastewater lift station, identify the owner and provide an emergency contact phone number after the phrase **“In Case of Emergency Call”**. The sign lettering shall be large enough to be easily read from fifty (50) feet away with the lettering and sign made of durable weather resistant material.

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4.6.2 Single Family Residential & Single Lot Commercial Lift Stations4.6.2.1 Owner Responsibilities

The individual property owner shall be responsible for the selection, purchase and installation of the on-site wastewater collection and transmission system to the approved point of connection to the public facilities.

Where an existing septic system is on the property, it shall be abandoned in accordance with Environmental Health Department Standards.

All on-site pumping systems shall be installed by a Georgia Licensed Master Plumber or Utility Contractor and permitted through the appropriate local Code Enforcement Department.

The property owner shall remain responsible for the operation, maintenance, repair and replacement of all on-site systems up to the point of connection to the public system.

4.6.2.2 System Components

The lift station (pumping system) shall include a holding tank, anti-floatation collars, grinder pump and electrical and controls. An alarm system that provides a light and/or audible signal when the water in the holding tank is above the normal operating range shall be provided.

The grinder pump shall be designed to handle the required flow rate (gpm) at the estimated backflow pressure (pressure head) for the individual application being considered.

The pump line (force main) from the lift station to the point of connection to the public low pressure system force main or gravity sewer system service line shall be, at minimum, one and one-fourth (1¼) inch diameter PVC or HDPE pressure pipe. At no time shall a force main from a private pumping system lay within a public right-of-way without obtaining a road encroachment permit from the proper authorizing authority with a copy of which submitted to the JWSC with the connection application

When discharging to a public gravity sewer system, the pump line (force main) shall discharge to a gravity sewer system manhole if the force main is connected to a public gravity main within a road right-of-way. If connecting to a gravity main from private property or through an easement, the private force main shall be connected to a sanitary sewer service line in accordance with JWSC Standards for Gravity Sewer Service connections. Requirements for corrosion protection as specified in Section 3 for manholes do not apply for discharge rates of 22 gpm or less.

When connecting to a publically owned and operated Low Pressure Force Main, the pressure line from the lift station shall connect to the Low Pressure System Force Main stub-out provided for the property in accordance with the JWSC Force Main Connection Standards.

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A force main crossing of property not owned by the owner of the lift station to reach a public sewer system connection point shall require an easement from the owner of the property being crossed. Such documentation shall be filed with the JWSC along with the connection permit application.

All on-site systems shall be inspected by a JWSC inspector prior to being placed in service.

4.6.3 Multi-Family, Multi-Lot and/or Multi-User Commercial Stations**4.6.3.1 Owner Responsibilities**

The system owner shall be responsible for the selection, purchase and installation of the on-site wastewater collection and transmission system to the approved point of connection to the public facilities.

The system owner shall remain responsible for the operation, maintenance, repair and replacement of all components up to the point of connection to the public system. The system owner shall be required to enter into a Satellite System Working Agreement with the JWSC prior to payment of connection fees to discharge to the public system.

4.6.3.2 System Components

System shall be designed by a Licensed Georgia Professional Engineer to pump the design peak hourly flow with one pump out of service.

System shall be designed and constructed in accordance with all applicable regulations and guidelines of the Georgia Environmental Protection Division.

System shall have a minimum of 2 pumps with each pump being of the same capacity with the rated flow of each pump being as required for the estimated daily flow in gpm + a 2.0 peaking factor.

The pump line (force main) from the lift station to the point of connection to the public low pressure system force main or gravity sewer system service line shall be, at minimum, one and one-fourth(1 ¼) inch diameter PVC or HDPE pressure pipe. At no time shall a force main from a private pumping system lay within a public right-of-way. Where a public gravity sewer main or manhole or low pressure force main is not available contiguous to the property, the owner shall acquire easements through adjoining property or properties to the point of connection approved by the JWSC.

When discharging to a public gravity sewer system, the pump line (force main) shall connect to a gravity sewer system service line draining to a manhole or gravity main in accordance with JWSC Standards for Gravity Sewer Service connections. Requirements for corrosion protection as specified in Section 3 for manholes do not apply for discharge rates of 22 gpm or less.

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When connecting to a publically owned and operated Low Pressure Force Main, the pressure line from the lift station shall connect to the Low Pressure System Force Main stub-out provided for the property in accordance with JWSC Force Main Connection Standards.

A force main crossing of property not owned by the owner of the lift station to reach a public sewer system connection point shall require an easement from the owner of the property being crossed. Such documentation shall be filled with JWSC along with the connection permit application.

All on-site systems shall be inspected by a JWSC inspector prior to being placed in service.

4.7 FORCE MAINS

4.7.1 General

Force mains shall discharge to sanitary sewer gravity system manholes at the manhole invert level in such a manner as to minimize turbulence and join the normal flow of wastewater through the manhole without disrupting or impeding other flow or flows entering or passing through the manhole. Where the discharge manhole has no other flows entering it, the force main discharge shall be directed straight through the manhole, through a properly constructed invert, into the manhole effluent line.

No force main, with the exception as noted in section 4.6.2.2, System Components for Single Family Residential and Single Lot Commercial Lift Station and stations discharging less than 22 gpm), shall connect to a sanitary sewer manhole that does not meet the requirements for corrosion protection as cited in the Section 3 of these standards for the discharge manhole and downstream manholes.

No force main shall be discharged to a sanitary sewer system unless such downstream gravity system has been verified by the JWSC to have adequate capacity to accept the discharge.

Force mains shall have isolation valves installed at two-thousand (2,000) foot intervals beginning at the isolation valve installed at the lift station. Lift stations with force mains less than two-thousand (2,000) feet to the point of discharge do not require isolation valves beyond the lift station.

4.7.2 Force Main Manifolds

Other than in low pressure systems, force mains from proposed public or private lift stations may not generally be manifolded with existing publicly owned force mains. Where manifolding is recommended for a proposed lift station by the developer's or owner's engineer for consideration by the JWSC, hydraulic modeling will be required. Such modeling shall demonstrate velocities for all interconnected pipes within standard parameters as described in Section 4.7.3 to be considered.

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No force main from a private lift station shall be allowed to manifold with a public force main without documented agreement shown on the approved record drawing, or by written legally binding documentation submitted to the JWSC with the connection application by the owner, accepting responsibility for any private pumping system upgrades that may become necessary if the private lift station's ability to discharge into the public force main, due to changing flow conditions in the public force main were to occur, and/or for any damage or associated liabilities that may result as a failure of such public force main to accept the discharge from the private lift station.

Force mains from single-family residential or single lot commercial users shall only connect to publically owned Low Pressure System force mains at service connections provided at the property line or public right-of-way in accordance with these Standards.

4.7.3 Force Main Size

The minimum size pressure sewer service laterally for single-family residential or single lot commercial shall be one and one-fourth (1 ¼) inch in diameter.

Force mains for a single facility use lift station discharging to gravity shall be sized for peak flow (required pump rate) at a minimum velocity of 2.5 fps with one pump running and a maximum velocity of 5.0 fps with both pumps running in a duplex station. For triplex or quadraplex facilities velocities shall not exceed 5.0 fps with two or three pumps running respectively.

Force mains in manifolded systems, where approved, shall be sized as demonstrated by hydraulic modeling to provide a minimum velocity of 2.0 fps with the minimum of pumps operating as needed to handle the required pump rates of all connected facilities, (i.e. one pump in each duplex facility, two pumps in each triplex facility, three pumps in each quadraplex facility), and to provide a maximum velocity of 5.0 fps with the maximum of pumps operating in each facility, (i.e. two pumps operating in a duplex facility, three pumps operating in a triplex facility, four pumps operating in a quadraplex facility).

With the exception of single-family residential or single lot commercial, no public force main shall be smaller than two (2) inches in diameter while still meeting the minimum and maximum velocities in this standard.

Where the JWSC has approved an Initial/Ultimate Lift Station design concept and the parameters outlined above cannot be achieved with one force main, dual interconnected parallel force mains shall be used. The interconnection of such dual force main systems shall be designed and constructed with valving to provide the use of either force main individually or together simultaneously within required velocity and flow parameters.

4.7.4 Force Main Depth

Force mains shall be designed meeting minimum cover requirements of thirty-six (36) inches with a maximum of 60 inches. Cover shall be measured from finished grade.

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Force main depths shall be designed so as to reduce or minimize the number of high points in the pipeline by varying the depth along the route as is reasonable to maintain a consistent pipe elevation. Changes in elevation which exceed two feet will require an air/vacuum release valve.

4.7.5 Force Main Location

Force mains shall be designed and constructed along the shoulder or within public rights-of-way on the opposite side from water mains.

Force mains shall be designed and constructed within appropriately sized easements dedicated to the JWSC. Easements provided shall be maintenance vehicle and equipment trafficable all weather easements.

A horizontal distance of three (3) foot minimum shall be maintained from all force mains to drainage structures, telephone duct banks, electrical transformers, signal relays, power poles, and other structures in the right-of-way as well as any other parallel underground utility with the exception of water mains.

Where force mains cross other underground utilities, with the exception of water mains, a minimum vertical separation of six (6) inch shall be maintained. All distances shall be measured from the outside edge of the pipes. The vertical separation between force mains and other crossing utilities shall be filled with a suitable pipe bedding material and compacted or filled with flowable fill to prevent settlement, contact and potential pipe to pipe abrasion caused by the vibration of flow through the force main.

Force main connections to manholes shall be cored and booted connections in accordance with Paragraph 4.7.1 of this Standard.

Force mains shall not be constructed within or below open ditch bottoms unless crossing on a perpendicular. Where crossing open ditch bottoms, the forcemain shall be a minimum of sixteen (16) inches below the bottom of the ditch and encased in concrete for the full width of the ditch as measured across the top of ditch banks.

Force mains shall be located outside of paved areas except at roadway crossings.

Sewer force main and water main separations shall be in accordance with Georgia EPD requirements and as follows:

- a. At crossings, pipe joints shall be as far as possible and equidistant from the point of crossing with the water main on top. Separation shall be measured from the outside edge of the pipe to the outside edge of the pipe. A full length of pipe must be centered at the crossing.
- b. Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are at least 6' from all joints in the sewer force main.

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Sewer force mains crossing major ditches, canals, streams, creeks and rivers shall be sub-aqueous crossings installed by horizontal directional drilling or other boring/tunneling method approved by the JWSC. Such crossings shall be provided with isolation valves on both sides of the crossing. Both sides of the crossing shall be treated as high points in the force main and have air release/vacuum valves installed. The placement of isolation valves and air valves shall be a minimum of fifteen (15) feet horizontally away from stream bank tops. The crossing pipe shall be perpendicular to the stream. Aerial crossings and bridge attachments shall not be permitted. No sewer force main shall be designed or constructed under ponds, lakes, retention ponds or other bodies of water other than in crossings as described above. No sewer force main shall be designed or constructed to lay closer than twenty (20) horizontal feet from the top of the bank of any body of water noted in this article.

Tracer Wire shall be provided on all installed force mains; tracer wire shall be continuous or properly spliced single strand No. 10 solid plastic coated (30 mil) copper wire from iron fitting to iron fitting.

Detection Tape shall be provided on all force mains; detection tape shall be two (2) inches wide Mylar encased metal marking tape and shall be buried eight (8) inches – twelve (12) inches below plan-finished grades.

4.7.6 Materials

4.7.6.1 Pipe

Force main piping shall be color coded green. Force main piping shall be fused joint DR 17.0 HDPE meeting the requirements of ASTM D3035 - DIP size with butt fused joints; or, SDR 21 Class 200 PVC meeting the requirement of ASTM D2241, with elastomeric integral bell gasketed joints meeting the requirements of ASTM D-3036; or, AWWA C-900 and C-905 DR-18 PVC. Where specifically approved by the JWSC for special conditions on short runs, interior coated CL52 DIP meeting the requirements of ASTM A-746, with elastomeric push-on joints, mechanical joints conforming to ANSI A-21.11, or flange joints conforming to ANSI 21.1. All bolts and bolt studs associated with flange joint pipe connections shall conform to ANSI B-16.1.

4.7.6.2 Joints

Force mains shall have mechanically restrained joints at changes in direction. The restrainer shall be manufactured of ductile iron and shall meet or exceed all the requirements of ANSI A21.11 (AWWA C111) and ASTM A536. The restrainer system shall provide anchoring ductile iron pipe and fittings, valves and PVC pipe to mechanical joint pipe or fittings, or bell to spigot PVC pipe joints. The restrainer shall accommodate the full working pressure rating of the pipe plus surge allowance. In the assembly of the restraint device, all bolts shall be tightened to the correct torque range as recommended by the restraint manufacturer. Concrete thrust blocking will not be permitted.

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4.7.6.3 Fittings

Horizontal and vertical directional changes in force mains shall be accomplished with bends of 45 degrees or less and properly restrained; no 90 degree bends will be permitted.

All fittings on pvc force mains shall be inside coated “sewer safe” mechanical joint cast iron or ductile iron fittings properly restrained.

4.7.6.4 Valves

Force Main isolation valves shall be interior coated plug valves. Plug valves eight (8) inch and greater shall be provided with worm gear actuators, and extension stems with operating nut no more than eight (8) inches below finish grade.

Isolation valve/check valve connections by a new or replacement force main to an existing force main shall be by cutting-in a mechanical joint wye fitting to discharge in the direction of normal flow. Wet tapping with a “T” connection will not be permitted.

Air release valves shall be two (2) inch air release valve assemblies installed within sealed manholes. Air release valves shall be provided at all force main high points. On force mains discharging to gravity systems combination valves (air release and vacuum valves) shall be utilized in the place of air-only release. The size, depth and configuration of the sealed Air Release/Vacuum vault shall be such as to allow the entry and work of maintenance personnel (*See JWSC Standards Details*).

4.7.6.5 Force Main Casings

Force mains crossings under major roads, railroads or other major obstructions shall be installed within a casing.

Where Steel Pipe is to be used as a casing it shall conform to either ASTM Standard A139 for “Electric Fusion (arc) Welded Steel Pipe” with minimum yield strength of 35,000 psi or “API Specification API-5LX, Grade X-42 Welded Steel Pipe”. Wall thickness shall meet the requirements of the latest Revision of the American Railway Engineering Association Manual of Recommended Practice or the Georgia Department of Transportation Standard Specification for Road and Bridge construction, as applicable. For street uses which are not GDOT or railroad, use GDOT casing thickness. All pipe furnished by the manufacturer shall be cast and machined at one foundry location to assure quality control and provide satisfactory test data. Full pipe length shall be provided. No short pipe lengths less than eight (8) feet long will be allowed unless approved by the JWSC. The pipe ends shall be tapered where welding is required.

Where HDPE pipe is to be used, it shall be DR 9 HDPE meeting the requirements of ASTM D3035 and butt-fusion welded.

Casing pipe interior diameter shall, at a minimum, be twice the outside diameter of the force main being encased.

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4.7.7 Force Main Testing

Force mains shall be hydrostatically tested to 1.5 times the working pressure of the associated lift stations, or 100 psi, whichever is greater in accordance with the procedures of AWWA C600. Testing shall be observed and approved by a JWSC inspector.

All installed isolation, air release and check valves shall be tested for proper operation, set and marking

Force main tracer wire shall be checked for continuity along the pipe run and checked at terminus points for proper connection.

(END OF SECTION)