INVITATION TO BID
LIFT STATION 4048 FORCE MAIN IMPROVEMENTS
BGJWSC PROJECT NO. 701
TO THE
BRUNSWICK-GLYNN COUNTY
JOINT WATER AND SEWER COMMISSION

Mandatory Pre-Bid Meeting:

Wednesday, April 5, 2017 – 2:00 p.m.
JWSC Commission Chambers
1703 Gloucester Street
Brunswick, Georgia 31520

Bids Due by 12:00 NOON, EST on Friday, April 28, 2017 to:

Office of Procurement
Joint Water and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520
(912) 261-7127
Pamela Drury-Crosby, Procurement Director
pcrosby@bgjwsc.org

Complete RFP Document and Specifications may be accessed electronically at

http://www.bgjwsc.org/about-the-bgjwsc/bid-opportunities-and-rfps/

Please Label Submission with Firm's Name, Address and Project Title:
"Sealed Bid – Lift Station 4048 Force Main Improvements – BGJWSC Project No. 701"

INVITATION FOR BIDS

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS
BGJWSC PROJECT NO. 701

Sealed bids will be received by the Brunswick-Glynn County Joint Water and Sewer Commission (BGJWSC) at the JWSC's Office of the Procurement Director, 1703 Gloucester Street, Brunswick, Georgia 31520 until ***12:00 NOON EST, FRIDAY APRIL 28, 2017,*** at which time and place they will be publicly opened and read aloud.

Plans, specifications and bidding documents are on file at the JWSC Main Office, 1703 Gloucester Street, Brunswick, GA 31520. Copies may be obtained at the same address by contacting Pam Crosby at the B G JWSC Phone: 912-261-7127; E-mail: pcrosby@bgjwsc.org upon payment of a non-refundable one hundred fifty dollars **($150.00)** for each set of documents requested. The documents are also available electronically at http://www.bgjwsc.org/about-the-bgjwsc/bid-opportunities-and-rfps/ or (CD) free of charge. All addenda will be available electronically on the BGJWSC website. Interested bidders are advised to review these postings frequently throughout the solicitation process and prior to all bid submissions being finalized to ensure the most accurate information is being taken into consideration.

SCOPE OF WORK

The work to be performed under this contract consists of furnishing all skill, labor, materials (unless noted otherwise), tools, equipment and incidentals required to construct complete, in place, and ready to operate a new 24-inch force main along Lee and Fifth Streets in Glynn County and the City of Brunswick, Georgia. More specifically, the work includes, but is not limited to:

- Installation of approximately 1,831 linear feet of 24-inch HDPE (DR11) force main by horizontal directional drill including all necessary appurtenances.
- Installation of approximately 950 linear feet of 24-inch HDPE force main by open cut construction and all necessary appurtenances.
- Installation of approximately 220 linear feet of 30-inch steel casing by jack and bore under railroad tracks.
- Connection of 24-inch force main to the existing Lift Station 4048 force main at Townsend Street and Branham Avenue.
- Connection of 24-inch force main to the existing Lift Station 4005 force main at Fifth Street.
- Connection of 24-inch force main to the existing 30-inch gravity sewer at Fifth Street, including a new force main termination manhole.
- Installation of air release valves in manholes.
- Preparation and coating of new force main termination manhole and existing downstream manhole.
- Temporary bypass operations for force main connections, installation of new termination manhole and rehabilitation of existing manhole.
- All HDPE force main piping will be pre-purchased by JWSC for the project and will be delivered to the Contractor at the project site by the supplier. All HDPE fusion services, fittings, valves, manholes, non-HDPE piping and necessary appurtenances will be purchased and provided by the Contractor.
- Installation & Maintenance of erosion and sedimentation control BMPs.
- All Maintenance of Traffic required to complete the work in construction documents and required for the project by Glynn County and the City of Brunswick.
- All restoration including but not limited to sidewalk, curbing, asphalt paving, seed, sod, fencing, and all other areas disturbed by construction as per construction documents to equal or better than existing condition.

The Bidder is ***encouraged*** to examine the location of the work and inform themselves fully as to the conditions present along the proposed route. Except for the work at the LS 4048 site, the majority of the project improvements are located within the public rights of way, and site visits can be performed at the

bidder's convenience. A ***mandatory pre-bid meeting*** will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520, **Wednesday, April 5, 2017, at 2:00 p.m.** followed by a site visit to LS 4048 for anyone interested in attending.

The deadline for questions is 5:00 P.M. EST. FRIDAY, APRIL 14, 2017. Answers to the official questions regarding this project will be posted no later than **5:00 P.M. EST. THURSDAY, APRIL 20, 2017**.

A bid guarantee in an amount not less than five percent (5%) 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.

Brunswick - Glynn County
Joint Water and Sewer Commission

BIDDING DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS
BGJWSC PROJECT NO. 701

Wednesday, March 22, 2017

BIDDING DOCUMENTS
AND
TECHNICAL SPECIFICATIONS

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS
BGJWSC PROJECT NO. 701

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Hussey Gay Bell Specifications

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02451 - Chain Link Fence
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02580 - Pipe Installation by Directional Drilling
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BIDDING DOCUMENTS

Office of the Director of Procurement

Brunswick-Glynn County
Joint Water and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520

Advertisement for Bids
Instructions to Bidders
Bid Form
Oath
Bid Bond
Representation
Legal and Character Qualifications
Affidavit
E-Verify Affidavit Contractor
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Instructions to Bidders

1. Intent and Timeline

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 and all questions during the bidding period must be submitted in writing via e-mail to the Director of Procurement, Pam Crosby at pcrosby@bgjwsc.org on or before ***5:00 p.m. EST on Friday, April 14, 2017***. Requests for clarification received after this date will not be considered. Responses to requests for clarification and questions will be issued by addendum and will be posted on the JWSC website (www.bgjwsc.org). The bid due date is ***NOON EST on Friday, April 28, 2017.***

Timeline

Date	Event
Wednesday, 3/22/2017 - 5:00 p.m.	IFB Released - First Newspaper Advertisement appears
Thursday, 3/30/2017 – 5:00 p.m.	Second Newspaper Advertisement appears
Wednesday, 4/5/2017 – 2:00 p.m.	**Mandatory Pre-Bid Meeting Held; Optional Site Visit**
Friday, 4/7/2017 - NOON	Issue any addenda that is a result of pre-bid feedback
Friday, 4/14/2017 - 5:00 p.m.	**Deadline for Questions**
Thursday, 4/20/2017 - 5:00 p.m.	Issue Addenda for responses to final questions
Friday, 4/28/2017 - NOON	**Bids Due**
Monday, 5/8/2017 – 5:00 p.m.	Bid Tabulation; Memo Update for Facilities and Finance Committees
Thursday, 5/11/2017 – 3:00 p.m.	**Facilities Committee Approval**
Wednesday, 5/17/2017 – 2:00 p.m.	**Finance Committee Approval**
Thursday, 5/18/2017 - 2:00 p.m.	**Full Commission Approval**
Thursday, 5/18/2017 – 6/19/2017	Execute Contract Documents
Wednesday, 6/21/2017 or sooner	Pre-Construction Meeting
Week of 6/26/2017	**Issue Notice To Proceed - Physical Construction Begins**

2. Work to be Done

The work to be performed under this contract consists of furnishing all skill, labor, materials (unless noted otherwise), tools, equipment and incidentals required to construct complete, in place, and ready to operate a new 24-inch force main along Lee and Fifth Streets in Glynn County and the City of Brunswick, Georgia. More specifically, the work includes, but is not limited to:

- Installation of approximately 1,831 linear feet of 24-inch HDPE (DR11) force main by horizontal directional drill including all necessary appurtenances.
- Installation of approximately 950 linear feet of 24-inch HDPE force main by open cut construction and all necessary appurtenances.
- Installation of approximately 220 linear feet of 30-inch steel casing by jack and bore under railroad tracks.
- Connection of 24-inch force main to the existing Lift Station 4048 force main at Townsend Street and Branham Avenue.
- Connection of 24-inch force main to the existing Lift Station 4005 force main at Fifth Street.
- Connection of 24-inch force main to the existing 30-inch gravity sewer at Fifth Street, including a new force main termination manhole.
- Installation of air release valves in manholes.
- Preparation and coating of new force main termination manhole and existing downstream manhole.
- Temporary bypass operations for force main connections, installation of new termination manhole and rehabilitation of existing manhole.
- All HDPE force main piping will be pre-purchased by JWSC for the project and will be delivered to the Contractor at the project site by the supplier. All HDPE fusion services, fittings, valves, manholes, non-HDPE piping and necessary appurtenances will be purchased and provided by the Contractor.
- Installation & Maintenance of erosion and sedimentation control BMPs.
- All Maintenance of Traffic required to complete the work in construction documents and required for the project by Glynn County and the City of Brunswick.
- All restoration including but not limited to sidewalk, curbing, asphalt paving, seed, sod, fencing, and all other areas disturbed by construction as per construction documents to equal or better than existing condition.

3. Site Examination

The Bidder is ***encouraged*** to examine the location of the work and inform himself fully as to the conditions present along the proposed route. Except for the work at the LS4048 site, the majority of the project improvements are located within public rights of way, and site visits can be performed at the bidder's convenience. A ***mandatory pre-bid meeting*** will be held in the JWSC Commission Chambers, 1703 Gloucester Street, Brunswick, Georgia 31520 on **Wednesday, April 5, 2017, at 2:00 p.m.** followed by an optional site visit to LS4048 for anyone interested in attending.

4. Bid and Contract Security

A bid guarantee in an amount not less than five percent (5%) 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. Determination of Successful Bidder

The contract will be awarded to the lowest responsive, responsible Bidder; if awarded.

The determination of the Bidder's ***responsibility*** will be made by the JWSC based on whether the Bidder:

1. maintains a permanent place of business,
2. has the appropriate technical experience (including proposed subcontractors),
3. has adequate plant and equipment to do the work properly and expeditiously,
4. has suitable financial means to meet obligations incidental to this work, and
5. is appropriately licensed for the described work in the State of Georgia.

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.

6. Bid Alternates

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

7. 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. Bid Form

Bids shall be submitted on the Bid Form included. Bids shall be based upon 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. Submission of Bids

Bids shall be submitted at the time and place designated in the Invitation for Bids. On the outside of the envelope containing the Bid shall be noted the following:

SEALED BID

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS

BGJWSC PROJECT NO. 701

The Bidder shall submit ***one (1) original Bid, five (5) duplicates (hardcopies) and one (1) electronic copy (USB or CD)*** in an opaque sealed envelope at the time and place indicated in the Invitation. The outside of the envelope containing the Bid also shall be marked with the Bidder's name, address and Georgia Utility Contractor's License Number. If there is a discrepancy between the electronic copy and the hard copy, the hard copy will prevail.

All blanks in the Bid 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 completed **Section 02750 – HDD Contractor Qualifications, *Oath, Bid Bond, Representation, Legal and Character Qualifications, Affidavit, E- Verify Affidavit Contractor and E-verify Affidavit Subcontractor (if applicable)*** 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.

BID FORM

LIFT STATION 4048 FORCEMAIN IMPROVEMENTS - BGJWSC PROJECT NO. 701

BASE BID (Reference Section 01150 of the Technical Specifications for Scope of Each Item)					
Item	**Description**	**QTY**	**Unit**	**Unit Price**	**Total**
1	Mobilization, Demobilization, Insurance & Bonds	1	LS	$	$
2	Maintenance of Traffic	1	LS	$	$
3	Temporary Bypass Pumping	1	LS	$	$
4	Temporary 14-Inch Bypass Piping Installed by Open-Cut including Relocation of Existing Utilities, Temporary Fittings, Connection to Existing 14-Inch Force Main and Connection to Existing Manhole	1	LS	$	$
5	24-Inch HDPE Installed by HDD (JWSC Pre-purchased Pipe)	1,831	LF	$	$
6	24-Inch HDPE Installed by Open-Cut (JWSC Pre-purchased Pipe)	920	LF	$	$
7	30-Inch Steel Casing Installed by Jack and Bore	220	LF	$	$
8	24-Inch HDPE Installed in Steel Casing with Spacers and End Seals (JWSC Pre-purchased Pipe)	220	LF	$	$
9	30-Inch HDPE Installed for Gravity Sewer by Open-Cut and Connections to Proposed and Existing Manholes	1	LS	$	$
10	30-Inch DIP Installed by Open-Cut	20	LF	$	$
11	14-Inch HDPE Force Main Installed by Open-Cut at LS 4005	20	LF	$	$
12	Connect 30-inch DIP for Force Main to Proposed Manhole	1	LS	$	$
13	Remove Temporary Bypass Piping and Connect Permanent Piping to Existing 14-Inch CI Force Main	1	LS	$	$
14	Connect to Existing 14-Inch CI Force Main at LS4005	1	LS	$	$
15	Connect to Existing 18-Inch PVC Force Main Including 18-Inch HDPE Pipe as Necessary	1	LS	$	$
16	6-foot Diameter Precast Manhole with Epoxy Coating	1	EA	$	$
17	Coat Existing Manhole with Epoxy Coating	14	VF	$	$
18	2" Air Release Valve in Manhole	4	EA	$	$
19	24-Inch DI RJ Plug Valve in Manhole	2	EA	$	$
20	18-Inch DI RJ Plug Valve with Box and Cover	2	EA	$	$
21	14-Inch RJ Plug Valve with Box and Cover	3	EA	$	$
22	24-Inch DI RJ 11.25˚ Bends	6	EA	$	$
23	14-Inch DI RJ 45˚ Bends	5	EA	$	$
24	24-Inch DI RJ 22.5˚ Bends	2	EA	$	$
25	24-Inch DI RJ 45˚ Bends	8	EA	$	$

26	30-Inch DI RJ 45˚ Bend	1	EA	$	$
27	30” x 14” DI RJ Wye	1	EA	$	$
28	30" x 24" DI RJ Reducer	1	EA	$	$
29	14” x 14” DI RJ Wye	1	EA	$	$
30	24” x 14” DI RJ Wye	1	EA	$	$
31	18” x 18” DI RJ Wye	1	EA	$	$
31	24” x 18” DI RJ Reducer	1	EA	$	$
32	18-Inch DI RJ Sleeve	1	EA	$	$
33	Remove, Dispose Off-site and Replace Asphaltic Concrete	1650	SY	$	$
34	Remove Unsuitable Material, Dispose Off-site and Replace with Crushed Stone	100	CY	$	$
35	Remove Unsuitable Material, Dispose Off-site and Replace with Approved Off-site Fill Material	400	CY	$	$
36	Clearing & Grubbing	0.5	AC	$	$
37	Grassing, Fertilizing and Mulching	1,000	SY	$	$
38	Silt Fence – Sd1-S	250	LF	$	$
39	Silt Fence – Sd1-NS	1,700	LF	$	$
40	Remove and Replace Signs, Monuments, Mailboxes, Trees/Landscaping, Driveways, Fencing and Other Miscellaneous Items, Including Final Clean-up, Needed for a Complete Job	1	LS	$	$
	Sub-Total Base Bid			$	
	10% Supplemental Work Allowance			$	
	Total Base Bid			$	

Total Base Bid in Words: _____

Oath

State of Georgia
City of Brunswick
County of Glynn

I, _____ (name of individual), solemnly swear that in the procurement of the contract for

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS

PROJECT NO. 701

that I, nor any other person associated with me or my business, corporation or partnership, has prevented or attempted to prevent competition in the bidding or Bids of said project or from submitting a bid for this project by any means whatever.

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 the_____day of_____2017.

Name of Party: _____

Corporate or Partnership Name: _____

Sworn to and subscribed before me this the_____day of_____2017.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(SEAL)

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:

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS or

JWSC PROJECT NO. 701

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_____, 2017.

PRINCIPAL: _____

Signed and sealed in the Presence of:

By: _____

Title: _____

(Seal)

1. _____

2. _____

SURETY: _____

Signed and sealed in the Presence of:

By: _____

Title: _____

(Seal)

1. _____

2. _____

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.

a. Does the Bidder have the above EEO policy in place?

[ ] Yes [ ] No

b. 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*)**

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
a. Fraud	[ ]	[ ]	h. Obstruction of justice (or any other misconduct affecting public or judicial officers' performance of their official duties)	[ ]	[ ]
b. Embezzlement	[ ]	[ ]			
c. Tax Evasion	[ ]	[ ]			
d. Bribery	[ ]	[ ]	i. False/misleading advertising	[ ]	[ ]
e. Extortion	[ ]	[ ]	j. Perjury	[ ]	[ ]
f. Jury Tampering	[ ]	[ ]	k. Conspiracy to commit any of the Foregoing offenses	[ ]	[ ]
g. 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
a. Unfair/anti-competitive business practices	[ ]	[ ]	c. Violations of securities laws (state & federal)	[ ]	[ ]
			d. False / misleading advertising	[ ]	[ ]
b. Consumer fraud misrepresentation	[ ]	[ ]	e. Violation of local Government 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 [ ]

Responses: If "yes" is the response to any of the questions on the previous page, provide information such as date, court, sentence, fine, location, and all other specifics for each "yes" response.

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: _____

FORM OF CONTRACT

Office of the Director
Brunswick-Glynn County Joint Water and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520
(912) 261-7127 Phone
(912) 261-7178 Fax
E-Mail: pcrosby@bgjwsc.org

PART A – CONTRACT FORM

CONTRACT FOR SERVICES
BY AND BETWEEN
BRUNSWICK-GLYNN COUNTY JOINT WATER AND SEWER COMMISSION AND
Company

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_____, a_____ __ 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 March 22, 2017 (hereinafter referred to as the "Solicitation") from qualified vendors to provide for its **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS, BGJWSC PROJECT NO. 701** (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 May 18, 2017, 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 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. INDEPENDENT CONTRACTOR STATUS AND RESPONSIBILITIES

(a) 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.

(b) 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.

(c) 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.

(d) 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. CONTRACT DOCUMENTS

(a) 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:

(1) JWSC's Solicitation, dated _____ including Addendums, if any.

(2) Contractor's Bid for **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS, BGJWSC PROJECT NO. 701** dated _____, 2017.

(3) This Agreement, which includes the following Parts:

Part A: Contract Form
Part B: Performance Bond
Part C: Payment Bond
Part D: Affidavit of Payment of Claims
Part E: Certificate of Insurance
Part F: Certificate of Drug Free Workplace
Part G: E-Verify Contractor Affidavit and Agreement
Part H: E-Verify Subcontractor Affidavit and Agreement

(b) 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, Contract Documents.

3. SCOPE OF WORK

(a) 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 **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS, BGJWSC PROJECT NO. 701,** 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, Special Conditions, Construction Plans, Standards for Water and Sewer Design and Construction, Technical Specifications, this Agreement and all addenda hereto annexed, and the Contract Documents shall form essential parts of this Agreement as if fully contained herein.

(b) 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.

(c) 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. NOTICE TO PROCEED; LIQUIDATED DAMAGES

(a) *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.

(b) *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 compete 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. COMPENSATION

(a) 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.

(b) The JWSC and Contractor agree that the Construction Plans, Standards for Water and Sewer Design and Construction, Technical Specifications, 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.

(c) 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.

(d) 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. TERM OF AGREEMENT

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

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

7. 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. 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. 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. 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. 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. REMEDIES: DISPUTE RESOLUTION

(a) 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.

(b) 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.

(c) 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. 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. 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 any one 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. TERMINATION OF AGREEMENT

(a) 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.

(b) 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.

(c) 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. AGREEMENT SECURITY - BONDS

(a) A bid guarantee in an amount not less than five percent (5%) 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.

(b) 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.

(c) 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.

(d) 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. NOTICES

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

(b) 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:

(1) If to Contractor: Name of Contractor

(2) If to JWSC: Jimmy W. Junkin, Executive Director
Brunswick-Glynn County Joint Water
and Sewer Commission
1703 Gloucester Street
Brunswick, Georgia 31520

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

(c) 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.

(d) 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. 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. ENTIRE AGREEMENT; BENEFIT TO PARTIES

(a) 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.

(b) 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.

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

20. GOVERNING LAW

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

21. TIME IS OF THE ESSENCE

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

22. 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. MISCELLANEOUS PROVISIONS

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

(b) 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.

(c) 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

Attest to:

By: _____

Name and title of corporate officer to be named Date and SEAL

BRUNSWICK-GLYNN COUNTY JOINT WATER AND SEWER COMMISSION

By: _____

Thomas A. Boland, Sr., Chairman

Attest to:

By: _____

Jimmy W. Junkin, Executive Director 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 **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS – GLYNN COUNTY, GEORGIA, BGJWSC PROJECT NO. 701** agreement which will include the standard contract provisions as set forth in the Contract Form herein, as applicable.

PART B - 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 (JWSC), 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 JWSC has engaged the said Contractor for the not to exceed sum of _____ $ (_____)

for the **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS, BGJWSC**
PROJECT NO. 701, 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 a 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 JWSC 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 JWSC 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. § 36-91-1 *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_____, 2017, 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. _____

PART C - 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 (JWSC), for the use and benefit of those entitled thereto in the not to exceed the 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 JWSC has engaged the said Contractor for the not to exceed sum of
_____ $ (_____)

For the **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS – GLYNN COUNTY, GEORGIA, BGJWSC PROJECT NO. 701**, 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 preceding 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. § 36-91-1 *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_____, 2017, 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. _____

PART D - AFFIDAVIT OF PAYMENT OF CLAIMS
(***Submitted with Final Invoice***)

_____this the_____day of_____, 2017,

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:

Brunswick-Glynn County Joint Water and Sewer Commission (JWSC) and _____ (Contractor), last signed for the **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS – GLYNN COUNTY, GEORGIA, BGJWSC PROJECT NO. 701**

CONTRACTOR **Company:** _____

By: _____

Title: _____

(SEAL)

Sworn to and subscribed before me this the_____day of_____, 2017.

NOTARY PUBLIC:

Name: _____

My Commission Expires: _____

(NOTARY SEAL)

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 name 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 Brunswick-Glynn County Joint Water and Sewer Commission shall be named as an additional insured on the Contractor's policy.

1. Insured: _____

2. Project: **LIFT STATION 4048 FORCE MAIN IMPROVEMENTS**
BGJWSC PROJECT NO. 701

3. Policy Number(s): _____

Date: _____ _____
(Insurance Company)

Issued At: _____ _____
(Authorized Representative)

Address: _____

_____

_____

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

PART F – 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: _____

PART G - 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, s*tating 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_____, 2017.

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).

PART H - 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_____, 2017.

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).

GENERAL CONDITIONS

INDEX:

0.0 DEFINITIONS

Where used in the Invitation of Bids documentation, 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 Owner 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 flooding. 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, includes joint ventures, offering a bid to perform the work.

Contract. The writings and drawings embodying the legally binding obligations between the Owner 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 Contract, 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 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, includes joint ventures that enter into the contract with the Owner for the performance of the work. The term covers subcontractors, equipment and material suppliers, and their employees.

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 Owner 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 Owner 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 Owner, or such other Engineer, supervisor or inspector as may be authorized by the Owner 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 Owner.

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

May. Refers to permissive actions.

Owner. Brunswick-Glynn County Joint Water and Sewer Commission (JWSC).

Owner's Representative. The person, firm or corporation designated by the Owner.

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 Contract Project Representative when the Contractor (1) notifies the Contract Project Representative in writing that the work has been completed in accordance with the contract and (2) requests in writing that the Owner accept the work.

Shall. Refers to actions by either the Contractor or the Owner and means the Contractor or Owner 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.

1.0 CONTRACT ADMINISTRATION

The Contract Administrator for this IFB shall be Mr. Jimmy W. Junkin, Executive Director (912) 261-7112. The Contract Administrator shall act as the JWSC'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 bidding 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
Attn: Mr. Jimmy W. Junkin, Executive Director
1703 Gloucester Street
Brunswick, Georgia 31520
Phone: (912) 261-7112
E-Mail: jjunkin@bgjwsc.org

2.0 CONTRACT PROJECT REPRESENTATIVE

The Contract Project Representative is the JWSC'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 JWSC. Any project questions arising, subsequent to contract award, are to be addressed to the Contract Project Representative at the following address:

Brunswick-Glynn County Joint Water and Sewer Commission
Attn: Mr. Todd Kline., P.E., Senior Engineer Planning & Construction Division
1703 Gloucester Street
Brunswick, Georgia 31520
Phone: (912) 261-7122
Email: tkline@bgjwsc.org

3.0 NOTICE OF AWARD OF CONTRACT

As soon as possible, and within thirty (30) days after receipt of bids, the JWSC shall notify the successful Bidder of its intent to enter into a contract agreement. Should the JWSC 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 thirty (30) 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.

4.1 EXECUTION OF CONTRACT DOCUMENTS

4.2 Within fifteen (10) days subsequent to successful contract negotiations, the JWSC shall furnish the successful Bidder the conformed copies of Contract Documents for execution by him.

4.3 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, proper licenses required by Federal, State, or Local authorities, and performance and payment bonds as required herein

4.4 Within thirty (30) days after receipt of the Contract Documents, executed by the successful Bidder, certificates of insurances and licenses, the JWSC shall complete the execution of the documents. Distribution of the completed documents will be made upon completion.

4.5 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 JWSC. 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 JWSC 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 or rejection of a purchase must be filed in writing with the JWSC within ten (10) days after the award of bid or proposal. 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 JWSC Executive Director and the review shall be limited to any alleged violation of federal, state or local law.

7.1 INSURANCE

The successful Bidder shall not commence work under this contract until all insurance described below has been obtained and such insurance has been approved by the JWSC, 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 JWSC, 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 JWSC. 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:

7.2 Claims under workers' compensation, disability benefit, and other similar employee benefit acts;

7.3 Claims for damages because of bodily injury, occupational sickness, disease, or death of any employee of the successful Bidder;

7.4 Claims for damages because of bodily injury, sickness, disease, or death of any person other than an employee of the successful Bidder;

7.5 Claims for damages insured by usual personal injury liability coverage which are sustained by any other person;

7.6 Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom;

7.7 Claims for damages because of professional errors and omissions; and

7.8 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.

Further, the successful Bidder shall maintain, during the period beginning with the commencement of the performance by the successful Bidder of the services and ending one year after the Project shall be substantially completed, subject to a policy or policies having a deductible not greater than $25,000 on account of any one claim, professional errors and omissions insurance in an amount not less than $1,000,000 per claim and annual aggregate with a $25,000 deductible.

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 JWSC, shall be filed with the JWSC prior to the commencement by the successful Bidder of the contracted services. Such certificates shall be in form and substance reasonably acceptable to the JWSC, shall indicate that, except in respect to workers' compensation insurance coverage and professional errors and omissions insurance, JWSC 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 JWSC, 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 JWSC.

8.0 QUANTITIES

None of the various JWSC 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 IFB.

9.1 SUSPENSION OR TERMINATION OF SERVICES

The anticipated contract between the successful Bidder and the JWSC may be terminated based on any one of the following:

9.2 Failure of the Bidder to perform based on the Bidders 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 JWSC 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.

9.3 The JWSC may terminate the contract at will. All correspondence of this nature will be forwarded by certified or registered mail with return receipt requested.

9.4 Any termination of the successful Bidder services shall not affect any right of the JWSC against the successful Bidder then existing or which may thereafter occur. Any retention of payment of monies by the JWSC 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 JWSC, its officers, employees, 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 JWSC 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 JWSC. 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 JWSC.

The successful Bidder shall at all times observe and comply with all such existing laws, ordinances and regulations, and shall protect and indemnify the JWSC 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.

13.1 NOTICE AND SERVICE THEREOF

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

13.3 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 JWSC 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.

13.4 All papers required to be delivered to the JWSC shall, unless otherwise specified in writing to the Contractor, be delivered to the Contract Administrator. Any notice to or demand upon the JWSC 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 JWSC or to such other address as the JWSC may subsequently specify in writing to the Contractor.

14.0 SCHEDULE, REPORTS, AND RECORDS

The Contractor shall submit to the JWSC schedules, reports, estimates, records and other data as the JWSC may request concerning services performed or to be performed.

15.1 CHANGES IN THE CONTRACT

15.2 <u>Changes in the Service</u>

The JWSC 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 JWSC.

The JWSC 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 JWSC shall indicate this intent in a written notice to the Contractor.

15.3 Changes in Contract Price

The contract price shall be changed only by a mutual agreement by the Contractor and the JWSC transmitted as a Contract Amendment. The Contractor shall, when required by the JWSC, furnish to the JWSC the method and justification used in computing the change in price as related to the services ordered.

15.4 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 JWSC and if the conditions warrant, an appropriate adjustment of the Contract Periods will be made.

16.1 PAYMENTS AND COMPLETION

16.2 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 Contract Project Representative listed in Paragraph 2.0.

16.3 Certificate for Payments

If the Contractor has made application for payment, as above, then the Contract Project Representative will issue a Certificate for Payment to the Finance Division 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 Finance Division 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.

16.4 Failure of Payment

If the Contract Project 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 Finance Division 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 JWSC reserves the right to reject the Contract Project Representative's certification of any request for payment by the Contractor without the accrual of interest.

16.5 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.

16.6 Final Payment

Upon receipt of written notice from the Contractor that all contracted services are complete, the Contract Administrator will, within a reasonable time, review all services and reports. If the Contract Administrator 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, direct the Finance Division 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 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.

19.0 OWNERSHIP OF DATA

All data and other records supplied to the Contractor for this project shall remain the sole property of the JWSC. 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 IFB, and will return submitted records to the JWSC upon completion of the work hereunder. The JWSC 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 JWSC. The JWSC acknowledges that the storage, compilation, format, and layout constitute proprietary and secret trade information of the Contractor, and are protected by Federal copyright law.

SPECIAL CONDITIONS

1.0 EXISTING FACILITY OPERATIONS

The Contractor shall coordinate the work with the Owner so that the construction activities required do not interfere with or prevent the operation of the existing facilities. If at any time, any portion of the facility is out of service, the Contractor must obtain approval from the Owner as to the date, time and length of time that portion of the facility is out of service. Extended outages will require that the Contractor provide, at Contractor's expense, any necessary by-pass pumping or other arrangements as required.

Connections to the existing facilities or alteration of existing facilities will be made at times when the facility involved is not in use or at times established by the Owner when the use of the facility can be conveniently interrupted for the period of time needed to make the connection or alteration. Notify the Owner at least ten (10) days prior to relocating any facility piping or taking any existing facility component out of service.

2.1 PROJECT SCHEDULE

2.2 Project Schedule: The following activities shall be completed by the indicated date or days after Notice to Proceed.

Task or Milestone	Completion (Days after NTP)
Shop Drawing Submittals	
Completion and submission of all Shop Drawings by Contractor	14
Review of Shop Drawings By JWSC/Engineer	14
Re-submittal of Shop Drawings By Contractor (if Required)	14
Review of Re-submittal Shop Drawings By JWSC/Engineer (if Required)	21
Critical Submittals	
Project Schedule*	7
Schedule of Values*	7
Horizontal Directional Drill Work Plan, Supplemental Work Plan, and Calculations	7
Superintendent Qualifications and Contact Information	7
Temporary Bypass Systems Plan and Requirements	14
Dewatering Plan	14
Final Completion of All work (including all restoration)	120
* The construction progress schedule shall show the proposed dates of commencement and completion of the various milestones of the work required under the contract as well as the anticipated amounts of each monthly payment that will become due to the Contractor in accordance with the progress schedule. The construction progress schedule will be a true reflection of the actual construction progress, shall be reviewed and updated for the bi-weekly project meetings and submitted with the monthly periodic payment request. The monthly payment request shall not be considered complete without the accurately updated construction progress schedule.	

2.3 Work Hours

Unless otherwise noted in the Contract Documents, the time allotted for completion of the project is based on a standard work week with construction activities between 7:00 a.m. and 7:00 p.m., Monday through Friday. Contractor shall coordinate any necessary night or weekend construction activities a minimum of 24 hours in advance with the JWSC project representative and Glynn County/City of Brunswick.

2.4 Delays

Contractor shall not be compensated for delays caused by Contractor's inefficiency, rework made necessary by Contractor's error, failure to perform the Work as scheduled, or any other corrective or productivity measures made necessary by errors, omissions, or failures to properly perform the Work. Neither shall the Contractor be compensated for delays caused by events by Act of God as described in the General Conditions. Within thirty (30) days after the onset of a delay, Contractor shall notify the JWSC in writing of the delay, which shall provide: (1) a detailed description of the delay and its probable duration, (2) the specified portion of the Work affected, and (3) an opinion as to the cause of the delay and liability (if any) for the delay. In the case of continuing delay for the same cause, only one notice of delay is necessary. Failure to provide this notice within thirty (30) days of the delay waives any claim for extension of time resulting from such delay. If the delay is due to the failure of another contractor on a separate but conflicting project to complete its work in a timely manner, changes ordered in the Work, an Act of God event, or any other cause which the JWSC, in its sole judgment and discretion, determines to justify the delay, then the Contract Completion Date may be extended as necessary to compensate for the delay. All time extensions shall be in the form of a written amendment signed by both parties.

3.1 SUBSTITUTIONS

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

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.

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

Any ***Contractor*** proposing to furnish products or processes other than those listed as base bid items shall make a written application for approval of the proposed substitution to the JWSC/Engineer at least 15 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 Owner with a cash deposit or bond acceptable to the Owner 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/Engineer 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/Engineer beyond all doubt. To be acceptable, a proposed substitute must meet or exceed all requirements of the drawings and 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 in the bid form for the Owner's consideration. 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/Engineer shall be the final judge on questions of equivalence.

4.1 SUBMITTALS

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

4.2 Definitions

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.

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.

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.

4.3 Routing of Submittals

Submittals and routine correspondence shall be routed as follows:

- Supplier to Contractor
- Contractor to JWSC
- JWSC to Engineer
- Engineer to JWSC
- JWSC to Contractor
- Contractor to Supplier

4.4 Submittal Log

The Contractor shall submit to the Engineer a complete list of preliminary items for which shop drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way expressed or implied relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Specifications. This procedure is required in order to expedite final review of Shop Drawings.

The Engineer will review the submitted preliminary shop drawing list and information and will develop a submittal log required for the project. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the JWSC and the Engineer. This log should include the following items:

1. Submittal-Description and Number assigned.
2. Date to JWSC.
3. Date returned to Contractor (from JWSC).
4. Approval Status of Submittal.
5. Date of Resubmittal and Return (as applicable).
6. Date material release (for fabrication).
7. Projected date of fabrication.
8. Projected date of delivery to site.
9. Status of O&M manuals submittal.
10. Related Specification Section.
11. Related Drawings Sheet Number.

4.5 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. **If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer and the shop drawings shall clearly indicate any deviations in the submittal from the requirements of the Contract Documents.** 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/Engineer in each case where his submittal may affect the work of another contractor or the Owner. The Contractor shall ensure coordination of submittals among the related crafts and subcontractors.

The transmittal letter which accompanies all submittals must include the following information:

1. Date.
2. Project Title and Number.
3. Contractor's name, address, phone and fax numbers.
4. The number of each Shop Drawing, Project Data, and Sample submitted.
5. Notification of Deviations from Contract Documents.
6. Submittal Log Number.

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 (6) copies of all specified information and/or submittals may be made electronically in PDF format. **Submittals which do not have all the information required to be submitted including notification of deviations and the Contractor's stamp or written indication of review, are not acceptable and will be returned without**

review.

The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of work prior to the completion of the review by JWSC of the necessary Shop Drawings.

The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposed to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of Drawings and Specifications.

4.6 Review Procedures

The JWSC/Engineer'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/Engineer will review the submittal and return three (3) copies or an electronic PDF format of the review 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 JWSC or Engineer 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/Engineer has no objection to the Contractor, upon his own responsibility, using or providing the materials or equipment proposed.

5.0 INTERPRETATION OF PLANS AND SPECIFICATIONS

All questions regarding the meaning or intent of the plans, specifications and contract documents shall be directed in writing to the JWSC’s Contract Project Representative identified in Paragraph 2.0 of the General Conditions. Reference may be made throughout the Contract Documents to the Standards for Water and Sewer Design and Construction of the Brunswick – Glynn County Joint Water and Sewer Commission. In the event of a conflict between the aforementioned Standards and the project plans and specifications prepared by Four Waters Engineering, Inc. (4Waters), the 4Waters plans and specifications shall take precedence.

6.1 FIELD ENGINEERING

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.

6.2 Owner’s Responsibilities

The Owner will provide the following:

- At least one (1) vertical control point on the project site with its elevation
- A topographic survey (included on the drawings)

The Owner 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.

6.3 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 that the work is not deviating from the indicated limits.

- Record drawing surveys shall be performed in accordance with Paragraph 7.0 of these Special Conditions.

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.

7.1 RECORD DOCUMENTS

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:

- Drawings
- Specifications
- Change orders and other modifications to the Contract
- Engineer field orders or written instructions, including requests for information (RFI) and clarification memos
- Reviewed shop drawings, product data and samples
- Test records

The Contractor shall maintain on-site an up to date set of As-Built Drawings.

7.2 Record Drawings

The Contractor is solely responsible for proper and correct documentation of all work, and for meeting the following As-Built requirements. The Contractor shall plan ahead and have their surveyor on-site to record information and

data during construction. As-Built 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.

Contractor shall provide Final As-Built drawings to the Engineer of Record in AutoCAD format, in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD88), conducted by a surveyor licensed in the State of Georgia of all installed components of the project from a post construction field run survey. As-Built data provided to the Engineer of Record for incorporation into the Record Drawings shall include Horizontal Directional Drill pipe installation information in plan and profile views in AutoCAD format with X, Y, and Z coordinates in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD88) conducted by a surveyor licensed in the State of Georgia. Directional Drill Bore Log shall be provided as part of the As-Built documentation and shall be in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD88) and be relative to the established surface survey bench mark and baseline stationing that is tied to existing, fixed and visible sight features. Directional Drill Bore Log shall show recorded X, Y, and Z locations of the drill head at minimum every 20 feet in the AutoCAD format documentation.

The Contractor shall pay all surveying and preparation costs associated with the Final As-Built Drawings. The Final As-Built Drawings shall provide elevations to the nearest 0.01 foot for all manhole inverts, manholes frames and all other pertinent items constructed by the Contractor. The Final As-Built Drawings shall provide dimensions, distances and coordinates to the nearest 0.1 foot and angles to the nearest 10 seconds.

Final As-Built Drawings shall be labeled “FINAL AS-BUILT DRAWINGS” and shall include the name of the licensed surveyor who prepared the drawings, the date the survey was conducted, certification statement with the horizontal and vertical datum used, and surveyor’s seal.

Final As-Built Drawings shall include the following:

- Horizontal and vertical location of all exposed and underground piping systems, valves, appurtenances, fittings, taps; etc., and all deviations from the design plans. Provide size, material, top of pipe elevations, invert elevations, slope percentages, length and type of all pipes, vertical clearances at each utility crossing.

- Location and dimensions of roadways and parking areas;

- Location of structures including finish floor elevations, tank depths, top and bottom elevations;

- Horizontal angle and distance between manholes;

- If profiles or cross-sections are part of the design plans, then As-Built data shall be shown on each profile or cross-section on the As-Built drawings.

The Engineer of Record shall review and utilize the Final As-Built information provided by the Contractor for the preparation of the Final Record Drawings. Contractor shall provide written certification of the accuracy and completeness of the Final As-Built information provided to the Engineer of Record.

7.3 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.

7.4 Submittal

At the completion of the project, deliver Record Documents to the JWSC/Engineer. Include a signed transmittal letter which lists the title and number of each record document. Final As-Built Drawings shall be provided as noted in Section 7.1.

8.0 WARRANTY

Contractor shall warrant that the Work, workmanship and material furnished by Contractor shall be new and of specified quality, shall conform to the requirements of the Contract Documents, shall be free from defects, and shall be free from any security interest, lien, or other encumbrances. This warranty shall remain in effect for a period of twelve (12) months after FINAL ACCEPTANCE OF THE WORK, unless otherwise specified in the Contract Documents. Any defective Work, workmanship, or material corrected during the warranty period shall be similarly warranted for twelve (12) months following its correction or for such other period as specified herein. The express warranty set forth herein shall not be exclusive and shall not act as a limitation upon any statutory or other warranty of any kind, express or implied, including any implied warranty of merchantability or fitness for a particular purpose.

In the event of breach of this warranty, Contractor shall take the necessary actions to correct the breach in the most expedient manner as dictated by then-existing circumstances. All costs incidental to the repair, replacement, redesign, and testing incurred as a result thereof, including the removal, replacement, and reinstallation of equipment in place when the Work was started, shall be Contractor’s responsibility. Upon written notification of a breach, Contractor shall promptly send the necessary personnel to the project site to assume responsibility for corrective action. Time is of the essence. Contractor shall be afforded necessary and reasonable access to

perform warranty work. If Contractor fails to promptly correct the breach, the JWSC may take corrective action without waiving any other rights or remedies it may have, and Contractor shall reimburse the JWSC for all expenses reasonably incurred in performing such corrective action.

9.0 SEWAGE SPILLS

9.1 Contractor Requirements

During the contract period the Contractor shall be responsible for repair of any damaged sewer system infrastructure and for any sewer system overflows or spills which result from the Contractor's activities. The Contractor shall be responsible for, at no cost to the Brunswick-Glynn County JWSC, the cleanup, notification, advertisement, monitoring, sampling and analysis, reporting, and other requirements as noted in the following section 8.2, of any sewer system overflows or spills which result from the Contractor's activities.

9.2 Georgia EPD Requirements for Sewage Spills

A. It shall be the duty of the person in charge of such substances at the time to forthwith notify EPD in person or by telephone of the location and nature of the danger, and it shall be such person's further duty to immediately take all reasonable and necessary steps to prevent injury to property and downstream users of said water.

1. Spills and Major Spills:

a. A "spill" is any discharge of raw sewage by a Publicly Owned Treatment Works (POTW) to the waters of the State.

b. A "major spill" means:

1) The discharge of pollutants into waters of the State by a POTW that exceeds the weekly average permitted effluent limit for biochemical oxygen demand (5-day) or total suspended solids by 50 percent or greater in one day, provided that the effluent discharge concentration is equal to, or greater than 25 mg/L for biochemical oxygen demand or total suspended solids.

2) Any discharge of raw sewage that 1) exceeds 10,000 gallons or 2) results in water quality violations in the waters of the State.

c. "Consistently exceeding effluent limitation" means a POTW exceeding the 30-day average limit for biochemical oxygen demand or total suspended solids for at least five days out of each seven day period during a total period of 180 consecutive days.

2. The following specific requirements shall apply to POTW's. If a spill or major spill occurs, the owner of a POTW shall immediately:

a. Notify EPD, in person or by telephone, when a spill or major spill occurs in the system.

b. Report the incident to the local health department(s) for the area affected by the incident. The report at a minimum shall include the following:

1) Date of the spill or major spill;

2) Location and cause of the spill or major spill;

3) Estimated volume discharged and name of receiving waters; and

4) Corrective action taken to mitigate or reduce the adverse effects of the spill or major spill.

c. Post a notice as close as possible to where the spill or major spill occurred and where the spill entered State waters and also post additional notices along portions of the waterway affected by the incident (i.e. bridge crossings, boat ramps, recreational areas, and other points of public access to the affected waterway). The notice at a minimum shall include the same information required in 8.2 A. 2. b. (1-4) above. These notices shall remain in place for a minimum of seven days after the spill or major spill has ceased.

d. Within 24 hours of becoming aware of a spill or major spill, the owner of a POTW shall report the incident to the local media (television, radio, and print media). The report shall include the same information required in 8.2 A. 2. b (1-4) above.

e. Within five (5) days (of the date of the spill or major spill), the owner of a POTW shall submit to EPD a written report which includes the same information required in 8.2 A. 2. b (1 -4) above.

f. Within 7 days (after the date of a major spill), the owner of a POTW responsible for the major spill, shall publish a notice in the largest legal organ of the County where the incident occurred. The notice shall include the same information required in 8.2 A. 2. b (1-4) above.

g. The owner of a POTW shall immediately establish a monitoring program of the receiving waters affected by a major spill or by consistently exceeding an effluent limit, with such monitoring being at the expense of the POTW for at least one year. The monitoring program shall include an upstream sampling point as well as sufficient downstream locations to accurately characterize the impact of the major spill or the consistent exceedance of effluent limitations described in the definition of "Consistently exceeding effluent limitation" above. As a minimum, the following parameters shall be monitored in the receiving stream:

1) Dissolved Oxygen;
2) Fecal Coliform Bacteria;
3) pH;
4) Temperature; and
5) Other parameters required by the EPD.

h. The monitoring and reporting frequency as well as the need to monitor additional parameters, will be determined by EPD. The results of the monitoring will be provided by the POTW owner to EPD and all downstream public agencies using the affected waters as a source of a public water supply. Within 24 hours of becoming aware of a major spill, the owner of a POTW shall provide notice of a major spill to every county, municipality, or other public agency whose public water supply is within a distance of 20 miles downstream and to any others which could be potentially affected by the major spill.

Brunswick – Glynn County Joint Water and Sewer Commission

TECHNICAL SPECIFICATIONS

FOR

LIFT STATION 4048 FORCE MAIN IMPROVEMENTS
BGJWSC PROJECT NO. 701
BRUNSWICK, GEORGIA

PREPARED BY

HUSSEY GAY BELL

TECHNICAL SPECIFICATIONS

JWSC Standard Specifications

Section 3 - Gravity Sewer Systems
Section 4 - Sanitary Sewer Lift Stations and Force Mains

Hussey Gay Bell Specifications

GENERAL REQUIREMENTS

00700 - General Conditions
01002 - Supplementary Conditions
01150 - Measurement and Payment

SITE WORK

02100 - Clearing and Grubbing
02210 - Erosion and Sedimentation Control
02221 - Excavation, Trenching & Backfill for Utility Systems
02310 - Boring and Jacking
02451 - Chain Link Fence
02480 - Grassing and Sodding
02513 - Asphalt Concrete Paving
02580 - Pipe Installation by Directional Drilling
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SECTION 3
GRAVITY SEWER SYSTEMS

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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 Without Independent Water & Sewer Connection	 175 per site 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:

Peak Flow = PF x 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.

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
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 HDPE	57	148.2	6.9	17,100	82	0.32	2.45	430
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
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 HDPE	118	306.8	6.1	35,400	150	0.20	3.88	340
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 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;

(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 (¼) 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 (½) 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 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 (½) 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 (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 ASTMD-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.

(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.

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 furthermost 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 or 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 (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 cementious 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;

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.

APPENDIX 3A
ACCEPTABLE MANUFACTURERS

APPENDIX 3A

GRAVITY SEWER SYSTEMS
ACCEPTABLE MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
3.5	**Material Specifications**	
3.5.2	*PVC 1120, Class 160, SDR 26* *PVC 1120, Pressure Class (PC) 235*	Vulcan Plastics JM Eagle
	SDR 26 Gasketed Fittings	Multi-Fittings GPK Products Plastic Trends
	PVC 1120, Class 118, SDR 35	Vulcan Plastics JM Eagle
	SDR 35 Gasketed Fittings	Multi-Fittings GPK Products Plastic Trends
	No Hub Fittings	Fernco LDR
	PVC 1120, Class 150, DR 18	Vulcan Plastics JM Eagle
	DR 18 Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
3.5.3	*Ductile Iron Pipe*	Griffin Pipe US Pipe
	Ductile Iron Pipe Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
3.5.4	*High Density Polyethylene (HDPE) Pipe*	Performance Pipe JM Eagle Lamson & Sessions
3.5.5	*Fusible Polyvinyl Chloride (PVC) Pipe*	Underground Solutions Inc. (ONLY MANUFACTURE)
	Sewer Safe Coupling	HyMax Star Pipe Sigma Corp.
3.5.6	**Manholes**	
3.5.6.2	*Precast Concrete Manholes*	Hanson Pipe and Precast MegaCast MST Concrete Products
3.5.6.3	*Fiberglass Manholes*	L.F. Manufacturing, Inc.
3.5.6.4	*Manhole Frame and Covers*	U.S. Foundry and Manufacturing
3.6.7	**Sewer Manholes**	
3.6.7.6	*Grade Rings*	Sealing Systems, Inc. Custom Concrete
3.6.7.7	*Corrosion Protection*	
	Moderate Risk	Raven Epoxy Sewer Shield Parsonpoxy Hydro-Pox Epoxy

PARAGRAPH	PRODUCT	MANUFACTURERS
3.6.7	**Sewer Manholes**	
	High Risk	Spectra Shield SewperCoat Green Monster
	Significant Risk	SewperCoat Green Monster

SECTION 4
SANITARY SEWER LIFT STATIONS AND FORCE MAINS

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SECTION 4
SANITARY SEWER LIFT STATIONS AND FORCEMAINS

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.

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 laundry)	10 per 100 SF
Stadium	5 per seat
Supermarket/Grocery Store	20 per 100 SF
Theater	5 per seat
Travel Trailer Park* With Independent Water & Sewer Connection Without Independent Water & Sewer Connection	 175 per site 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 gpd/1,440 minutes per day = 32 gpm ADWF * 2.0 = 64 gpm = 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.

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:

$$\textbf{Required Volume} = V_R = .25TQ + V_L + V_A$$

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.

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 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/Ultimate Lift Stations

Initial/Ultimate 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.

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 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 disproportionally 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.

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.

4.5.3 Wetwell Configuration

4.5.3.1 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 28ft^2), 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 36ft^2).

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 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 (¼) 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.

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 cementious 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.

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 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.

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. Crazing: 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

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" With Ribs 96", 144"	 1,400,000 700,000	 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.

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.

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.

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 epoxy (twelve (12) Mils 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 H_2O (0 – 140 feet H_2O) 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.

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 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.

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 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 coasted 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.

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 distributer 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.

4.5.10 Site Electrical Work

4.5.10.1 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-amps (kVA) as determined by the equation:

$$kVA = (\text{Total Load}) \times (\text{Voltage}) \times (1.73/1000)$$

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 hall 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 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

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 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 re actor 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).

***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.

***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.

***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 (½) inch wide by four (4) inches long and cut on opposite sides of the pipe.

   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.

***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, pealing 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.

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.

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

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)

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 will 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

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.

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.

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 quadraplex 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

   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

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 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.

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.

4.6.2 Single Family Residential & Single Lot Commercial Lift Stations

4.6.2.1 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.

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 9force 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.

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 ion 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.

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.

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.

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.

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.

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.

APPENDIX 4A
ACCEPTABLE MANUFACTURERS

APPENDIX 4A

SANITARY SEWER – LIFT STATION AND FORCE MAINS
ACCEPTABLE MANUFACTURERS

PARAGRAPH	PRODUCT	MANUFACTURERS
4.5.2	**Site Requirements**	
4.5.2.6	*Bypass Pumping Connection Cam Lock*	Dixon OPW
	Bypass Piping *PVC 1120, Class 150, DR 18*	Vulcan Plastics JM Eagle
	DR 18 Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
	Bypass Piping *Ductile Iron Pipe*	Griffin Pipe US Pipe
	Ductile Iron Pipe Sewer Safe Mechanical Joint Fittings	Star Pipe Sigma Corp.
4.5.3	**Wet Well Configuration**	
4.5.3.4	*Access Hatches*	U.S. Foundry
4.5.4	**Precast Concrete Structures**	
4.5.4.1	*Precast Concrete Structures*	MST Inc. Hanson Pipe and Precast Mega Cast
4.5.4.2	*Moderate Risk Corrosion Protection*	Raven Epoxy Sewer Shield Parsonpoxy Hydro-Pox Epoxy
	High Risk Corrosion Protection	Spectra Shield SewperCoat Green Monster
	Significant Risk Corrosion Protection	SewperCoat Green Monster
4.5.5	**Fiberglass Structures**	
4.5.5.1	*Fiberglass Structures*	Xerxes L.F. manufacturing Flowtite
4.5.7	**Wet Well and Discharge Header Piping**	
4.5.7.1	*Interior Piping High density Polyethylene (HDPE) Pipe*	Performance Pipe JM Eagle Lamson & Sessions
	Interior Piping Class 53 Flange by Flange Ductile Iron Pipe	Star Pipe Sigma Corp.
4.5.7.2	*Exterior Piping Class 53 Flange by Flange Ductile Iron Pipe*	Griffin Pipe US Pipe
	Exterior Pipe Fittings Flange by Flange	Star Pipe Sigma Corp.

PARAGRAPH	PRODUCT	MANUFACTURERS
4.5.8	**Valves and Appurtenances**	
4.5.8.1	*Isolation (Plug) Valves*	Mueller Dezurik
4.5.8.2	*Check Valves*	Clow
4.5.8.3	*Air Release Valve*	
4.5.8.4	*Discharge Gauge Fittings*	
4.5.9	**Pumping Station**	
4.5.9.2	*Submersible Pumps*	Flygt, KSB, Ebarra
4.5.9.3	*Grinder Pumps*	Flygt, KSB, Ebarra
4.5.11	**Electrical Equipment and Controls**	
4.5.11.1 A	*Enclosure*	Hoffman APX Flygt Bison
4.5.11.2 B	*Panel Components*	Listed Below
4.5.11.2 C	*Motor Starters* *Variable Frequency Drives*	Square D Yasakawa ITT
4.5.11.2 D & E	*Circuit Breakers*	Square D GE Cutler Hammer Westing House
4.5.11.2 F	*Audible Alarm*	Federal Signal
4.5.11.2 G	*Alarm Light*	Federal Signal
4.5.11.2 H	*GFI Receptacles*	ISO GE Morris Levite
4.5.11.2 I	*Generator Receptacles*	Crouse Hinds
4.5.11.2 J	*Manual Transfer Switch*	Square D GE Westinghouse
4.5.11.2 K	*Hand Off Auto Switches*	Cutler Hammer Square D
4.5.11.2 N	*Power Monitor*	Diversified Electronics
4.5.11.2 O	*Relays*	NTE Allen Bradley AA Electric Idec
4.5.11.2 S	*Lighting Arrestors*	Ditek Delta
4.5.11.2 T	*Elapsed Time Meter*	ENG Yokogawa
4.5.11.2 U	*Level Controls*	Roto Float Blue Ribbon ITT
4.5.11.2 V	*Transformers*	Warrick GE ACME

PARAGRAPH	PRODUCT	MANUFACTURERS
4.5.12	**Remote Terminal Unit**	
4.5.12	*RTU (SCADA)*	Data Flow Systems Scadatek
4.5.14	**Low Flow Station (Only) RTU System**	
4.5.14.1	*RTU (SCADA)*	Data Flow Systems Scadatek
4.5.16	**On-Site Standby Generators & Automatic Transfer Controls**	
4.5.16	*Standby Generators*	Onan Caterpillar
4.5.16.2	*Engine-Generator Controls*	Onan Caterpillar
4.5.16.3	*Auto Transfer Switches*	Onan Caterpillar
4.7.6	**Force Main Materials**	
4.7.6.1	*SDR 21 Class 200 PVC Pipe* *AWWA C-900/C-905 DR-18*	Vulcan Plastics JM Eagle U.S. Plastic Corp.
	DR 11 (HDPE) Pipe High Density Polyethylene	Performance Pipe JM Eagle Lamson & Sessions
	Interior Coated CL52 Ductile Iron Pipe	Griffin Pipe US Pipe
4.7.6.3	*Sewer Safe Mechanical Joint Fittings*	Star Pipe Sigma Corp.
	Sewer Safe Coupling	HyMax Star Pipe Sigma Corp.
4.7.6.4	*Isolation (Plug) Valves* *Air Release Valves*	Clow Mueller

SECTION 01150 - MEASUREMENT AND PAYMENT

A. SCOPE

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

B. ESTIMATED QUANTITIES

All estimated quantities for unit price items, stipulated in the Bid Form, 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 price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and material furnished. 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 Bid Form.

C. 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 sites 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. 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 (not including the Supplementary Work Allowance).

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.

2. Maintenance of Traffic

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 maintenance of vehicle and pedestrian traffic to the satisfaction of the Owner, Glynn County and City of Brunswick.

3. 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.

4. Temporary 14-Inch Bypass Piping Installed by Open-Cut including Relocation of Existing Utilities, Temporary Fittings, Connection to Existing 14-Inch Force Main and Connection to Existing Manhole

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 to install and place into operation temporary bypass temporary bypass piping to route the existing 14-inch force main to the downstream manhole as described in the bid documents. If required fittings are listed separately elsewhere in the Bid Form, payment for those fittings will be under the appropriate item. Fittings not listed elsewhere but required for this item shall be included in the lump sum price for this item.

5. 24-Inch HDPE Installed by HDD (JWSC Pre-purchased Pipe)

Measurement for this item shall be on a linear foot basis, as measured along the centerline from end to end. Payment includes all work for excavation, drilling operations, pipe adapters, expansion joints, tracer wire, markers, signs, safety cleanup, restoration, testing, layout of work, drill path survey, record keeping, as-builts, etc for a complete installation. The cost for special pipe fittings for transitioning between different types of pipe shall be included in the unit price bid per linear foot for the horizontal directional drilling.

The 24-inch HDPE force main pipe will be pre-purchased directly by the JWSC, including supplier delivery charges. **The contractor shall include all fusion services, receiving of delivery and handling for**

the pipe in the unit price bid per linear foot for this item.

The depth and length of the horizontal directional drill and pipe shown on the plans is the minimum required. Additional length required for increased depth or bending radius to accommodate the pipe installation will be the responsibility of the Contractor.

6. 24-Inch HDPE Installed by Open-Cut (JWSC Pre-purchased Pipe)

Measurement of the force main pipe will be on the centerline length installed. Payment will be on the basis of the unit price in the Bid Form. Payment includes all work for tracer wire, tape, markers, signs, excavation, dewatering, pipe connections, bedding, backfill to grade, and testing.

The 24-inch HDPE force main pipe will be pre-purchased directly by the JWSC, including supplier delivery charges. **The contractor shall include all fusion services, receiving of delivery and handling for the pipe in the unit price bid per linear foot for this item.**

7. 30-Inch Steel Casing Installed by Jack and Bore

Measurement for this item shall be on a linear foot basis, as measured along the centerline from end to end. Payment will be on the basis of the respective unit price in the Bid Form. Payment will constitute full compensation for the casing, entry and exit pits, jacking equipment, dewatering, backfill, compaction, all incidental labor, material, equipment to complete the jack and bore as per the unit price in the Bid Form.

8. 24-Inch HDPE Installed in Steel Casing with Spacers and End Seals (JWSC Pre-purchased Pipe)

Measurement of the force main will be on the basis of centerline length inserted in casing. Payment will be on the basis of the unit contract price in the Bid Form and will include all costs for the work, including furnishing and installing the carrier pipe, joints, fittings, spacers, end seals and testing. The cost for special pipe fittings for transitioning between different types of pipe shall be included in the unit price bid per linear foot for this section.

The 24-inch HDPE force main pipe will be pre-purchased directly by the JWSC, including supplier delivery charges. **The contractor shall include all fusion services, receiving of delivery and handling for the pipe in the unit price bid per linear foot for this item.**

9. 30-Inch HDPE Installed for Gravity Sewer by Open-Cut and

Connections to Proposed and Existing Manholes

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.

10. 30-Inch DIP Installed by Open-Cut

Measurement of the force main pipe will be on the centerline length installed. Payment will be on the basis of the unit price in the Bid Form. Payment includes all work for tracer wire, tape, markers, signs, excavation, dewatering, pipe connections, bedding, backfill to grade, and testing.

11. 14-Inch HDPE Force Main Installed by Open-Cut at LS 4005

Measurement of the force main pipe will be on the centerline length installed. Payment will be on the basis of the unit price in the Bid Form. Payment includes all work for tracer wire, tape, markers, signs, excavation, dewatering, pipe connections, bedding, backfill to grade, and testing.

12. Connect 30-inch DIP for Force Main to Proposed Manhole

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.

13. Remove Temporary Bypass Piping and Connect Permanent Piping to Existing 14-Inch CI Force Main

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.

14. Connect to Existing 14-Inch CI Force Main at LS4005

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.

15. Connect to Existing 18-Inch PVC Force Main Including 18-Inch HDPE Pipe as Necessary

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.

16. 6-foot Diameter Precast Manhole with Epoxy 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.

17. Coat Existing Manhole with Epoxy 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.

If bypass pumping is required, the cost for all bypass pumping operations shall be included in the temporary bypass pumping bid item in the Bid Form.

18.-32. Miscellaneous Valves, Fittings and Appurtenances

Measurement for this item shall be on the basis of completed units in place. Payment will be based on the respective unit contract price per unit for the respective types and sizes in the Bid Form.

33. Remove, Dispose Off-site and Replace Asphaltic Concrete

Measurement for this item shall be on the basis of completed units in place. Payment shall be based on the unit price per square yard in the Bid Form and shall include the removal and off-site disposal of the removed asphaltic concrete surface as well as replacement and overlay of new asphaltic concrete as required.

34. Remove Unsuitable Material, Dispose Off-site and Replace with Crushed Stone

Measurement of this item shall be on the basis of completed units in place. Payment shall be on the basis of the unit price in the Bid Form.

35. Remove Unsuitable Material, Dispose Off-site and Replace with Approved Off-site Fill Material

Measurement of this item shall be on the basis of completed units in place. Payment shall be on the basis of the unit price in the Bid Form.

36.-40. Miscellaneous Soil Erosion Control Measures and Remove and Replace Items

Measurement of this item shall be on the basis of completed units in place. Payment shall be on the basis of the unit price in the Bid Form.

D. SUMMARY OF ITEM TOTALS

The Bidder shall fill in the appropriate totals which shall be used as a basis for comparison of bids. The Owner reserves the right to award the Contract in the best interest of the Owner. The total Contract amounts will be determined upon completion of the project using the quantities actually incorporated into the project corresponding to the unit prices and lump sum amounts in the Bid Proposal.

Payment shall be considered to cover the cost of all labor, supervision, material, equipment and performing all operations necessary to complete the work in place. The items listed in the proposal shall be considered as sufficient to complete the work in accordance with the Plans and Specifications; incidental items of work not listed in the bid form shall be a part of the item with which it is associated and shall be included in the cost of the unit shown on the bid form. The unit of measurement shall be the unit shown in the proposal. Payment will be based upon the actual quantity multiplied by the unit price.

END OF SECTION 01150

SECTION 02050 - DEMOLITION

1. SCOPE:

Under this heading shall be included all operations necessary for demolition of the existing structures, foundations, and utilities as shown on the Drawings.

2. PROCEDURES:

The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and timely disconnection of utility services. Overhanging trees that interfere with the accomplishment of the work shall be trimmed the minimum amount necessary. The submittal shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operation.

3. STRUCTURES:

Structures indicated for removal on the Drawings including related piping are to be removed..

4. EQUIPMENT:

All equipment is to be returned to the Owner at a location directed by the Owner's staff.

5. DUST CONTROL:

The amount of dust resulting from demolition shall be controlled to prevent the spread of dust to occupied portions of the site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

6. DISCONNECTION OF UTILITY SERVICES:

Utilities shall be disconnected at the points indicated. Where such disconnection will interrupt the utility services to an area not included in the Contract, arrangements for such interruption shall be reviewed with the Engineer at least 72 hours in advance of the interruption. Where water and sewer lines are disconnected or removed the remaining utility shall be plugged and left in such a manner that reconnection can be made.

7. BURNING:

The use of burning at the project site for the disposal of refuse and debris will not be permitted.

8. PROTECTION OF EXISTING WORK:

Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired or restored to its original condition or acceptable equivalent.

9. EXISTING UTILITIES:

a) Utility Services.
Disconnections of utility services, shall be coordinated so as not to affect service to other areas outside of the project limits. The owners of all utilities must be contacted prior to proceeding with work.

b) Utilities.
Remove or abandon all existing utilities as indicated. When utility lines are encountered, that are not indicated on the drawings, they shall be removed or abandoned to the extent that they would project into or interfere with the new construction.

10. DISPOSITION OF MATERIAL:

a) Title to Materials.
Title to all materials and equipment to be demolished is vested in the Contractor upon receipt of notice to proceed. The Owner will not be responsible for the condition, loss or damage to such property after notice to proceed. All existing equipment to be salvaged shall be returned to the Owner.

b) Material for Contractor's Salvage.
Material that is salvageable will be removed from the project site by the Contractor.

c) Unsalvageable Materials.
Concrete, masonry, and other noncombustible materials, other than concrete permitted to remain in place, shall be disposed of by the Contractor off the property.

11. HISTORICAL ITEMS:

There are no known historical items on the project site; however, if historical items are discovered, remove historical items in a manner to prevent damage.

Turn over historical items, if found, to the Owner for disposition such as:

Corner Stones

Contents of Corner Stones
Document Boxes wherever located on the site.
Belgian Block

12. CLEANUP:

Remove debris and rubbish from the site as soon as practicable. Do not allow debris or rubbish to accumulate in buildings or on site. Remove and transport debris in a manner as to prevent spillage on streets or adjacent areas.

13. MEASUREMENT AND PAYMENT:

Measurement and payment for work under this Section shall be in accordance with Section 01150.

END OF SECTION 02050

SECTION 02100 - CLEARING AND GRUBBING

1. SCOPE:

Under this heading shall be included the furnishing of all labor, materials and equipment and performing of all operations necessary for clearing and grubbing all areas and disposal of all unsuitable material.

2. LIMITS:

Clearing and grubbing under this Contract shall be performed within the area necessary to perform the work as shown on the plans.

3. CLEARING:

Completely clear, remove and satisfactorily dispose of all unsuitable materials resting on or protruding above the surface of existing ground. Clearing includes trees (unless designated for preservation), stumps, bushes, grass, rubbish, refuse, scrap iron, rubble and all other deleterious materials. Excavate for stumps if necessary.

4. GRUBBING:

Completely grub the entire designated area free of all roots, stumps, logs, rubbish and other deleterious materials to a depth of at least two feet below existing ground. If no further excavation is to be made within the limits of Work under this heading then the holes caused by the removal of stumps, trees and rocks shall be filled and compacted with suitable material and graded to conform with surrounding surface.

5. BENCH MARKS:

The Contractor shall maintain and protect all benchmarks, monuments, settlement monitoring devices and other reference points. Any reference point damaged or destroyed as a result of the Contractor's operations or negligence shall be repaired or replaced at no cost to the Owner.

6. DISPOSAL:

Disposal of all cleared and grubbed materials by burning will only be permitted when weather conditions are favorable, subject to the Owner’s regulations and conditions.

7. MEASUREMENT AND PAYMENT:

Measurement and payment for work under this Section shall be in accordance with Section 01150.

END OF SECTION 02100

SECTION 02210 - EROSION AND SEDIMENT CONTROL

1. GENERAL:

a. RELATED LAND DISTURBING DOCUMENTS:

1. Land Disturbing Activity Permit (LDA) is required for each project over 1.0 acres and is part of the Work associated with the project. The Contractor is required to comply with the best management practices for the control of erosion and sediment from the work site.

2. NPDES General Permit No. GAR 100000 for the discharge of storm water associated with construction activity for projects five (5) acres and larger and for projects fifty (50) acres and larger. Both the Owner and the Contractor are primary permittees (any entity that has submitted a Notice of Intent) of the Erosion, Sedimentation and Pollution Control Plan (ES&PCP). The Owner provides the ES&PCP to the Contractor. A copy of this permit will be provided to the Contractor and the Contractor shall comply with its provisions until the work is completed and accepted by the Owner.

The Contractor cannot start work until seven (7) days after the Owner has filed the Notice of Intent (NOI).

If the disturbed area is five (5) acres or larger the project is governed by the NPDES Permit for the discharge of stormwater associated with construction activity as shown in the Erosion, Sedimentation and Pollution Control Plan.

If the disturbed area is fifty (50) acres or larger, both the Erosion, Sedimentation and Pollution Control Plan (ES&PCP) and the Comprehensive Monitoring Plan (CMP) must be submitted to EPD with the Notice of Intent. The ES&PCP and CMP will indicate when, where and how often the site inspection and water testing should be conducted. Inspections and monitoring will be made by the BGJWSC.

b. DESCRIPTION OF WORK:

Under this section shall be included all measures both temporary and permanent to control erosion and sedimentation, and protect all surface waters and property both on and off site. This shall include all labor, materials and equipment necessary to meet the requirements of this Section. The Contractor shall not begin work until he is in full compliance with the LDA Permit that has been approved for the work associated with this project. Failure to install and maintain erosion control and sedimentation on the site shall constitute a violation of this permit for each day on which such failure occurs.

c. EROSION AND SEDIMENTATION ACT - DEFINED:
It is the intent of this Specification that the Project and the Contractor comply with all applicable requirements of the State of Georgia Erosion and Sedimentation Control Act of 1975 as amended and any County or Municipal Soil Erosion Ordinance.

The Manual for Erosion and Sediment Control in Georgia further defines practices and requirements. All erosion and sedimentation control measures must be designed for a 25-year, 24-hour rain event. The Contractor is responsible for maintaining all sediment and erosion control measures on the project site during construction. The Contractor is responsible for any damage caused due to failure to implement these requirements. A Soil Erosion and Sedimentation Control Permit has been obtained by the Owner. Periodic inspections will be made by the BGJWSC. The Contractor is to cooperate with the person performing these inspections.

d. COORDINATION WITH CONTRACT PLANS:
A Soil Erosion and Sedimentation Control Plan will be provided to the Contractor and is to be implemented as a part of the procedures necessary to implement requirements of the Act and Ordinance.

2 PRODUCTS:

Not applicable to this specification section.

3. EXECUTION:

a. IMPLEMENTATION:
Implementation of the requirements of the Act is based on the following principles:

1. The disturbed area and the duration of exposure to erosion elements should be minimized.

2. Stabilize disturbed areas immediately.

3. Retain or accumulate runoff.

4. Retain sediment.

5. Do not encroach upon watercourses.

4. SYMBOLS:

The Soil Erosion and Sedimentation Control Plan contain standard symbols for the different types of measures for implementing the Act. These symbols are defined for conditions, design criteria and construction specifications in Chapter 6 of the Manual and on the Drawings.

5. SPECIFIC REQUIREMENTS:

a. Obtain the LDA permit from the appropriate authority.

b. All erosion and control measures must be installed prior to initiation of construction activity.

c. A temporary construction egress pad shall be installed and maintained at any point where construction vehicles enter a paved road, street or parking area. The pad shall be used to prevent mud from leaving the construction area. The pad shall be constructed as shown in the Manual for Erosion and Sediment Control.

d. All disturbed areas shall be grassed by sodding or seeding, fertilizing, mulching and watering to obtain a ground cover which prevents soil erosion.

e. All measures installed for sediment control shall be checked at the beginning and end of each day when construction is occurring to ascertain that the measures are in place and functioning properly.

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f. Sewer trenches will not be excavated more than can be properly backfilled by the end of work day.

g. Erosion control measures shall be inspected by the Contractor after each rainfall event and at least daily during prolonged periods of continuous rainfall. Contractor shall make repairs and adjustments as necessary to maintain the effectiveness of all sediment and erosion control measures.

h. The contractor shall remove all silt fencing after permanent grassing is established and accepted by the Owner.

END OF SECTION

SECTION 02221 - EXCAVATION, TRENCHING AND BACKFILL FOR UTILITY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

This section specifies the requirements for excavation, trenching, and backfilling for all underground utility systems. Underground utility systems include water mains and services, sanitary sewers and services, storm drains, and sanitary sewer force mains.

1.2 RELATED SECTONS

Section 02710 – Sewer Force Main

PART 2 - MATERIALS

2.1 BEDDING

A. Bedding material shall meet the following requirements:

1. Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 inches), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry.

2. Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures.

2.2 BACKFILL

A. Backfill material shall consist of suitable excavated materials or imported gravel meeting the requirements of #57 stone.

B. All backfill material shall be free of stones, concrete and clay lumps larger than a cubic foot. Roots, stumps and rubbish which will decompose will not be permitted in the backfill. Backfill material shall have its moisture content corrected, as may be necessary before being placed in the trench to bring the moisture content to approximately "optimum" for good compaction. Any rock, stone, concrete, clay lumps larger than a cubic foot in volume, rubbish and debris shall be removed from the site and properly disposed of by the Contractor.

PART 3 - EXECUTION

3.1 GENERAL

Underground piping and utility systems which are to be installed in trenches whose lowest point of excavation is below the existing ground level and are unaffected by an excavation for structures, may be installed at any time during the course of the work. Piping and systems to be installed in or over fill, backfill or new embankments shall not be installed until all earthwork has been completed to rough grade, nor until settlement of the fill or embankment has taken place.

3.2 LOCATION AND PROTECTION OF UTILITIES AND STRUCTURES

A. It shall be the responsibility of the Contractor to acquaint himself with the location of all utilities and structures both present and proposed, also all existing surface structures which may be affected by work under the Contract. The location of any underground structures furnished, shown on the Drawings or given on the site are based upon the available records but are not guaranteed to be complete or correct, and are given only to assist the Contractor in making a determination of the existence of underground structures.

B. Overhead utilities, poles, etc., shall be protected against damage by the Contractor, and if damaged by the Contractor, shall be replaced by him. The Contractor shall notify those who maintain utilities sufficiently in advance of the proposed construction so that they may locate, uncover and disclose such work. If the progress of construction necessitates the removal or relocation of poles, overhead utilities and obstructions, the Contractor shall make all arrangements and assume all costs of the work involved.

C. The Contractor shall provide for the continuance of the flow of any sewers, drains, water pipes, and water courses, and the like. Where such facilities, water courses, or electric overhead wires or conduits are interfered with by the work of the Contractor, the interruption shall be a minimum and shall be scheduled in advance with the Engineer and the utility owner.

D. The Contractor shall restore all facilities interfered with to their original condition or acceptable equivalent. The cost of such restoration or damage caused directly by his work shall be paid for by the Contractor and shall be included in the prices bid for the items to which it pertains.

3.3 EXCAVATION AND TRENCHING

A. Excavation

Excavate all materials encountered.

B. Caution in Excavation

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures in the trench zone may be determined before being damaged. He shall be held responsible for the repair or replacement of such structures when broken or otherwise damaged because of his operations.

C. Trench Excavation

Trenches shall be wide enough to permit proper installation of pipe fittings and placing and compacting bedding and backfill materials. The width of the trench shall be sufficient to accommodate compaction equipment. Whenever possible, the clear width of the trench at the top of the pipe should not exceed the pipe outside diameter plus 24 inches.

D. Alignment and Grade

Trenches shall be excavated on the alignments shown on the Drawings, and to the depth and grade necessary to accommodate the pipes at the elevations shown. Where elevations of the invert or centerline of a pipe are shown at the ends of a pipe, the pipe shall be installed at a continuous grade between the two elevations.

E. Over Excavation

Excavation in excess of the depth required for proper shaping shall be corrected by bringing to grade the invert of the ditch with compacted coarse, granular material at no additional expense to the Owner. Bell holes shall be excavated to relieve bells of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.

Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of 1500 psi concrete, at no additional expense to the Owner.

F. Rock Excavation

Rock found in trench shall be removed for a depth of at least six (6) inches below the bottom of the pipe.

3.4 SHEETING AND SHORING

Excavations, shall be properly shored, sheeted and braced by the Contractor to maintain excavation in a condition to permit the safe and efficient installation of all items of Contract work. Braced and sheeted trenches and open trenches

shall comply with all state laws and regulations, and local ordinances relating to safety, life, health and property. Also, this shall conform to the Occupational Safety and Health Standards for Excavations, Final Rule (29 CFR Part 1926) as printed in the October 31, 1989 issue of the Federal Register.

3.5 DEWATERING AND PROTECTION AGAINST WATER

A. The Contractor shall remove water from the site and shall lower the ground water level as necessary to complete the excavations to the required depths and so that all required work can be accomplished in the dry. The Contractor shall perform well construction, well pointing, sheeting, ditching, and pumping, and shall construct necessary drains, channels and sumps to keep his excavations and new structures clear of ground water, storm water or sewage and to keep his construction areas dry during the progress of the work.

B. Adequate measures and protection shall be provided by the Contractor to protect his work from damage from uplift due to ground water, storm water, or flood water. Any damages which may result due to dewatering shall be the Contractor's responsibility.

C. All water discharged by pumping operations shall be discharged so as not to interfere with work under this Contract or with existing structures and operations. Water from dewatering operations shall be conveyed to the existing drainage features, using piping and pumping facilities provided by the Contractor. Route of dewatering pipe shall be subject to the Engineer's review. Discharge facilities and water quality shall comply with applicable regulations of State and Federal agencies.

D. Dewatering operations shall be uninterrupted and continuous during the course of the work so as not to endanger any construction in place or to present a hazard to workmen in and around the site. The Contractor shall take all measures necessary including, but not limited to, standby equipment and constant attendance to ensure that the dewatering system remains operational and effective throughout the period of time that it is required.

E. No water shall be allowed to run over any uncompleted portions of the work. No units of the work shall be constructed under water. The cost of dewatering shall be included in the price bid for the item of work for which it is required.

3.6 REMOVAL AND REPLACEMENT OF UNSUITABLE FOUNDATION MATERIAL

A. When the trench is excavated to the plan depth or as required by these Specifications, and soft or other material not suitable for bedding purposes is encountered in the trench, the Contractor shall immediately notify the Engineer for inspection and measurement of the unsuitable material to be removed. Where, in the opinion of the Engineer, the subgrade of the pipe trench is unsuitable material, the Contractor shall remove the unsuitable material to a depth of 6" for the full width of the trench and furnish and place stone backfill in the trench to stabilize the subgrade. Payment for removal and replacement of unsuitable material shall be in accordance with the requirements of the Measurement and Payment Section.

B. Attention is invited to the fact that the presence of water does not necessarily mean that stone backfill is required. If well points or other types of dewatering will remove the water, the Contractor shall be required to completely dewater the trench in lieu of stone backfill. Removal and replacement of unsuitable material with stone backfill will be limited to areas where well pointing and other conventional methods of dewatering will not produce a dry bottom.

C. No payment will be made for any overdepth excavation of soft unstable material due to the failure of the Contractor to provide adequate means to keep the trench dry.

D. No payment will be made for any overdepth excavation of the unsuitable material and replacement not inspected and measured by the Engineer prior to excavation.

3.7 PLACEMENT OF BEDDING MATERIALS

A. Bedding material shall be placed and compacted up to the springline of the pipe.

B. Bedding material around the pipe shall be installed with care. Care shall be used to insure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. Precautions must be taken to prevent movement of the pipe during placing of the material through the pipe haunch.

C. Avoid contact between the pipe and compaction equipment. Compaction of bedding shall be done so that compaction equipment will not damage the pipe.

D. ASTM D2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe" shall be used in conjunction with the above.

3.8 PLACEMENT OF BACKFILL MATERIAL

A. Backfilling operations in this work are referred to herein as Backfilling at the Pipe Zone, Type"A" and Type "B". Type A backfilling shall be used where trenches cross under roadways, paved areas, and structures. Type B backfilling shall be used in all other areas.

B. Type "A" backfill shall consist of suitable excavated materials or imported gravel placed in the trench in 6 inch thick layers from one foot above the pipe to finished grade. Each 6-inch layer shall be compacted before additional material is placed in the excavation. The density of the backfilled material after compaction shall be equal to 100 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). No water shall be used to secure compaction except for adding water to the backfill material before placing in the trench to bring moisture content to approximately "optimum" for good compaction.

C. Type "B" Backfilling shall consist of suitable excavated materials or imported gravel placed in the trench in 12 inch thick layers from the spring line of the pipe to finished grade. Each 12 inch thick layer shall be compacted before additional backfill material is placed in the excavation. The density of the backfilled material after compaction shall be equal to 95 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). Water shall be added to backfill material only before being placed in the trench in order to bring the moisture content to approximately "optimum" for good compaction.

3.9 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

A. Operations

Excavation, trenching and backfilling along highways, streets and roadways shall be in accordance with the applicable regulations of the Georgia State Highway Department with reference to construction operations, safety, traffic control, road maintenance and repair.

B. Removing And Resetting Fences

Where existing fences must be removed to permit construction, the Contractor shall remove such fences. As construction progresses, reset the fences in their original location and to their original condition. All costs of removing and resetting fences and such temporary works as may be required shall be included in the prices for the utility line or as provided for in the Bid Proposal.

C. Protecting Trees, Shrubbery And Lawns

Trees and shrubbery along trench lines shall not be disturbed unless absolutely necessary. Trees and shrubbery necessary to be removed shall be properly heeled-in and re-planted. Heeling-in and re-planting shall be done under the direction of an experienced nurseryman. Where utility trenches cross established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replaced.

Topsoil underlying lawn areas shall likewise be removed and kept separate from general excavated materials. Removal and replacement of sod shall be done under the direction of an experienced nurseryman.

D. Protection of Traffic

Provide suitable signs, barricades and lights for protection of traffic, in locations where traffic may be endangered by construction operations. All signs removed by reason of construction shall be replaced as soon as condition which necessitated such removal has been cleared. No highway, street or roadway shall be closed without first obtaining permission from the proper authorities.

E. Drainage Structures

All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.

F. Maintaining Highways, Streets, Roadways and Driveways

The Contractor shall furnish proper equipment which shall be available for use at all times for maintaining highways, streets and roadways. All such streets, highways and roadways shall be maintained in suitable condition until completion and final acceptance of the work.

The Contractor shall repair all driveways that are cut or damaged and maintain them in suitable condition until completion and final acceptance of the work.

3.10 PROTECTION OF WATER SUPPLY PIPES

A. Parallel Installation

Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge to edge. When local conditions prevent a horizontal separation of 10 feet, the water main maybe laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. The sewer materials and joints shall be the equivalent to water main standards of construction and

be pressure tested as required in Section 02700 to assure water-tightness.

B. Crossing

Water mains crossing sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so that both joints will be as far apart as possible. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under the water mains shall be constructed of materials and with joints that are equivalent to water mains standards of construction and shall be pressure tested as required in Section 02710 to assure water-tightness.

C. Special Conditions

When water mains cross under sewers, additional measures shall be taken by providing:

1. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;

2. That the one full length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and, special structural support for the water and sewer pipes be installed if required.

3. The sewer force main shall be constructed of water pipe materials and subjected to hydrostatic test, as prescribed in Section 02710 - Sewer Force Mains.

3.11 REMOVE AND REPLACE PAVEMENT

A. Pavement and base course which must be removed for constructing sewers, manholes, force mains, water lines, and all other appurtenances in streets shall be replaced in accordance with BGJWSC requirements.

B. The top 18 inches of subgrade material immediately under the paving base and also road shoulder shall be carefully removed and kept separate from the rest of the excavated material. This material shall be placed in the top 18 inches of the backfill. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone or gravel. Settlement in trenches shall be refilled with crushed stone or gravel, and such maintenance shall continue until replacement of pavement.

C. Where utility lines are constructed on unpaved streets, roads or easements, the top 18 inches of soil shall be stripped and windrowed separate from the excavation from trenches. After the line has been installed and the backfill completed within 18 inches of the original grade, the salvaged surfacing shall be replaced. This work shall be considered as general clean-up along with the removal of surplus excavated materials from the site and the restoring of the surface outside trench limits to its original condition, the cost of which shall be included in the price bid for the utility line.

3.12 WALKS, DRIVES, CONCRETE CURB AND GUTTER

A. Walks, driveways, and concrete curb and gutter designated for removal or are damaged during the course of construction shall be replaced.

B. Sidewalks, driveways, and concrete curb and gutter shall be removed by making a vertical saw joint between any existing sidewalk, driveway, or curb and gutter that is to remain in place and the portion that is to be removed. The subgrade shall be compacted in accordance with the requirements of the BGJWSC. Concrete shall be placed in accordance with BGJWSC requirements.

3.13 TESTING

A. General

The Contractor shall select a qualified independent testing laboratory, acceptable to the Engineer, for the purpose of identifying soils, checking densities, and classifying soils materials during construction. All testing will be paid for by the Contractor. Copies of all test results shall be furnished to the Engineer.

B. Moisture-Density Tests

Testing shall be in accordance with ASTM Methods D698. A test shall be performed on each type of material used in the work regardless of source. Tests will be accompanied by particle-size analyses of the soils tested (ASTM Methods D421 and D422). Changes in color, gradation, plasticity or source of fill material will require the performance of additional tests. Copies of all test results shall be furnished to the Engineer.

C. Field Density Tests

Tests shall be made in accordance with ASTM Method D1556. Tests shall be made in accordance with the following minimum schedule or as

required by the soils technician or as may be directed by the Engineer:

One test for each lift of backfill for each 200 feet of trench or fraction thereof.

D. Submittals

1. The soils technicians will submit formal reports of all compaction tests and retests.

2. The reports are to be furnished to the Owner and the Engineer as soon as possible upon completion of the required tests.

3. This report information is to include but not be limited to the following:

a. Date of the test and date submitted.

b. Location of test.

c. Wet weight, moisture content and dry weight of field sample.

d. Description of soil.

e. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.

f. Ratio of field dry density to maximum lab dry density expressed as a percentage.

g. Comments concerning the field density passing or failing the specified compaction.

h. Comments about re-compaction if required.

E. Compaction Results

1. If any compaction test reveals that fill or backfill is not compacted as specified, the Contractor shall scarify and re-compact as required to achieve the specified density. Additional compaction tests shall be made to verify proper compaction. These additional tests, required due to failure of the original test shall be paid for by the Contractor.

2. The soils technician is to advise the Engineer and the Contractor's Superintendent immediately of any compaction tests failing to meet

the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

END OF SECTION 02221

SECTION 02310 - BORING AND JACKING

1. SCOPE:

Under this heading shall be included the installation of pipeline crossings of roads, highways and railroad tracks as shown. The Owner will obtain the necessary permits for all crossings.

2. MATERIALS:

A. Casing pipe.

Casing Pipe shall be steel pipe with welded joints having minimum yield strength of 35,000 psi. Length, wall thickness and diameter shall be as shown on the Plans.

B. Carrier Pipe.

Carrier pipe shall be mechanical joint ductile iron pipe, or as shown on the plans and shall conform with the requirements for pipe as specified in appropriate Section of these Specifications. Casing pipe wall thickness shall be as indicated on the Plans.

3. INSTALLATION:

A. Casing pipe.

Installation of casing pipe, where indicated on the Plans, shall be by boring and jacking as specified herein.

Suitable pits or trenches shall be excavated for the operation and for placing the end joints of pipe. Where necessary, they shall be securely sheeted and braced to prevent caving.

Construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.

Jacks for forcing the pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together, to properly support the section of the pipe and direct it to the proper line and grade. In general roadbed material shall be excavated just ahead of the pipe, using the boring auger, the excavated material removed through the pipe, and the pipe forced through the roadbed into the excavated space.

The diameter of the excavation shall conform to the outside diameter and circumference of the pipe as closely as practicable. Any voids which develop during the installation operation shall be pressure grouted with an approved mix.

Variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extent of 2 percent in lateral alignment, and 1 percent in vertical grade.

When boring and jacking of pipe is once begun the operation shall be carried on without interruption insofar as practicable, to prevent the pipe from becoming firmly set in the embankment.

Any pipe damaged in boring and jacking operations shall be removed and replaced by the Contractor at his expense.

The pits or trenches excavated to facilitate boring and jacking operations shall be backfilled immediately after the operation has been completed. Wet boring and jacking shall not be permitted.

B. Carrier Pipe.

Carrier pipe joints shall be assembled and pushed through casing pipe on skids or rollers. After installation of carrier pipe, the ends of the casing pipe shall be closed with 8-inch brick walls or casing seals.

C. Casing Spacers:

Casing spacer shall be installed in accordance with the manufacturer's recommendations. Casing spacers shall be polyethylene with stainless steel hardware.

END OF SECTION 02310

SECTION 02451 - CHAIN LINK FENCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 and 2 Specification Sections, apply to this Section.

1.2 SCOPE

The work under this heading includes the furnishing and installation of chain link fences and gates with three strands of barbed wire on top as specified herein and as shown on the Drawings.

1.3 MANUFACTURER

The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature that its product is of the type required. The Contractor shall include all supplementary parts necessary or required for a complete and satisfactory installation within the true meaning and intent of the Drawings. All runs of the fence shall present the same general appearance and the product of one manufacturer only will be accepted.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCING

Fencing for chain link fence shall be as follows:

2.1.1 Fabric

The chain link fence fabric shall conform to ASTM A392. The size of mesh shall be 2 inches and the wire shall be No. 9 Gauge Basic Open Hearth Steel, hot-dip galvanized after weaving with a minimum of 1.20 ounces of zinc or 0.40 ounces of aluminum per square foot of uncoated wire surface. The wire shall be standard finish with the top selvage knuckled and the bottom selvage twisted and barbed. Height of fence shall be **8-feet** excluding barbed wire top extension.

2.1.2 Wire Fabric Ties

Wire fabric ties shall be No. 9 Gauge Hot-Dip Galvanized Steel Wire conforming to ASTM A112 and spaced 12 inches apart on all posts and

24 inches apart on all rails.
Tie wires shall be a double loop and 6.5 inches in length. Clips are not allowed.

2.1.3 Posts, Rails and Braces

Metal post shall comply with ASTM F-1083, Group IC, zinc coated. Rolled formed steel is not permitted. Gate posts shall be for the gate type specified subject to the limitation specified in ASTM F-900 and/or ASTM F-1184. Line and brace posts shall be 2-1/2 inches O.D., 3.65 pounds per linear foot, hot-dip galvanized steel pipe. Corner and end posts shall be 3 inches O.D., 5.79 pounds per linear foot, hot-dip galvanized steel pipe. The top rails and braces shall be 1-5/8 inches 0.D., 2.27 pounds per linear foot, hot-dip galvanized steel pipe. Each brace section shall be a diagonally trussed with 3/ 8 inch round hot-dip galvanized steel rod with truss tightener and fittings. All posts shall be furnished with tops and required fittings for attaching fabric and rail. Fittings shall be of malleable iron or pressed steel.

2.1.4 Gates

Gate frames shall be tubular shaped 1.90 inches, 0.120 inches minimum wall thickness, outside diameter with welded or steel fitted corners. Braces and trusses shall be furnished as required to prevent sagging of the gate. Frames shall be covered with fabric as specified for the fence.

Gate posts shall be as follows:

Leaf Width	Post Diameter	Weight/Ft.
0'-5'	4" OD	9.11 lbs.
6'-18'	6-5/8" OD	18.97 lbs.
Over 18'	8-5/8" OD	28.55 lbs.

Posts, frames and fabric shall be hot dipped galvanized as specified above.

2.1.5 Miscellaneous Fittings and Hardware

Miscellaneous fittings and hardware shall be of design standard with the manufacturer. Miscellaneous fittings and hardware shall be zinc-coated steel, and shall be equal to the materials specified in Federal Specifications RR-F-183.

2.1.6 Barbed Wire

Barbed wire shall be of three (3) strands of galvanized No. 12-1/2 gauge

wire conforming to ASTM A121 for copper bearing wire with zinc coating, meeting the requirements of Class 3. Barbs shall be of 14 gauge full round wire with 4 points, wound at 4 inch intervals.

2.1.7 Tension Wire

Tension wire shall be Type I, Class 4 Coating, (7 gauge aluminum coated steel coil spring tension wire) in accordance with ASTM A-824 along the bottom of fence fabric.

2.1.7 Welding

Structural members of gates which are in contact shall by fully welded by a method that will procure a continuous weld on all sides and faces of joints at exposed edges. Surplus welding material shall be removed.

2.2 CONCRETE

Concrete shall conform to ASTM C-94/C 94M, using ¾ inch maximum size aggregate, and having minimum compressive strength of 3,000 psi at 28 days. Grout shall consist of one part Portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.3 ACCESSORIES

2.3.1 Caps

Cast Steel galvanized; sized to post diameter, set screw retainer.

2.3.2 Fittings

Sleeves, bands rail ends, tension bars, fasteners and fittings; steel

2.3.3 Extension Arms

Cast Steel galvanized, to accommodate 3 strands of barbed wire, single arm, sloped 45degrees.

2.3.4 Gate Hardware

Fork latch with gravity drop, two duckbill backstop; two 180 degree gate hinges per leaf and hardware for padlock.

2.3.5 Padlocks

2” size – No. 17 by Master Lock Co, with chain. All padlocks keyed alike.

PART 3 - EXECUTION

3.1 INSTALLATION

The site of the fencing shall be sufficiently cleared of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The bottom of the fence shall be placed a uniform distance above the ground, as shown on the Drawings.

Posts shall be set in concrete as shown on the Drawings, and shall be centered in the concrete. The tops of concrete bases shall be finished smooth slightly above the ground surface and sloped to drain.

After the posts have been installed and the concrete has set so that it will not be damaged, the rails and bracing shall be installed.

The fence fabric shall be tightly stretched and fastened to all rails and posts. Care shall be taken to not stretch the wire so tightly that it will break in cold weather or pull the posts out of line. Fastening to gate, end and corner posts shall be with stretcher bars, clamps and bolts. Top selvage shall be dressed flush with the top rail and the bottom shall be 1-1/2 inches above the ground. Provide a 9 gauge high carbon tension wire along the bottom. Fabric shall be spliced by pulling the ends together and twisting in a spiral connection link or picket so as to make a continuous piece of fabric between end, corner and gate posts, as the case may be.

Each post shall be fitted with a 45 degree extension arm for barbed wire as shown. Extension arms shall be malleable iron suitable for three stands of barbed wire.

Splices in barbed wire shall be of the wrap or telephone type, with each end wrapped around the other wire for not less than 6 complete turns.

The gates shall be hung level and plumb with gate fittings on braced gate posts, and shall be attached in such a manner that they cannot be lifted off the hinges. Gates shall be adjusted for easy and proper operation. Gate frames shall be of adequate size members for the gate openings shown. Welded construction may be used, in which case the frame shall be hot-dip galvanized after fabrication. Fabric shall be stretched tight across the frame and permanently and neatly secured. All gates shall be fitted with suitable hardware for locking with a padlock. Hinges shall permit the gates to swing back against the fence line. Provide catch fittings to hold gates and a plunger rod and catch block in the center of the opening of the leaf gates.

END OF SECTION 02451

SECTION 02480 - GRASSING AND SODDING

PART 1 - GENERAL

1.1 SUMMARY

This section specifies requirements for includes fertilizer, grassing and sodding.

1.2 GENERAL

All disturbed areas resulting from work under this Contract shall be grassed or sodded as shown on the Drawings. For roads under state jurisdiction, grassing on the right-of-way shall meet the requirements of the Department of Transportation Standard Specifications.

1.3 SUBMITTAL

Manufacturer's data shall be submitted to the Engineer on grass seed, sod and fertilizer before the materials are delivered to the project site.

PART 2 – MATERIALS

2.1 FERTILIZER

Fertilizer shall be 10-10-10, commercial fertilizer conforming to state fertilizer laws.

2.2 LIME

Lime shall be agricultural grade, ground limestone and shall meet the requirements of the Georgia Department of Agriculture. Lime shall be added based on the results of soil test.

2.3 STRAW MULCH

Straw mulch shall consist of straw or hay. The mulch shall be reasonable free of mature seed bearing stalks, roots, or bulblets and shall be free of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Wild Mustard, Crotolaria, Pigweed, Witchweed, and Cocklebur.

2.4 WOOD CELLULOSE FIBER MULCH

Wood cellulose fiber mulch shall be made for wood chip particles manufactured for discharging uniformly on the ground when applied by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend

with grass seed and fertilizer to form an homogenous slurry. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

2.5 SEED

A. Seed shall meet the requirements of the Georgia Seed Laws and Rules and Regulations.

B. Seed shall be delivered in suitable sealed containers labeled in accordance with applicable laws and regulations and including name and location of the producer. The pure live grass seed mixture shall be as shown on the Drawings.

C. Mixtures of different types of seed called for in the seeding schedule shall be weighted and mixed in the proper proportions.

2.6 SOD

Sod shall be good quality, densely-rooted centipede grass, free from noxious weeds. The sod shall be obtained from areas where soil is reasonably fertile and contains a high percentage of loamy topsoil. Before cutting, the sod shall be raked free of all debris and the grass cut to two inches. The thickness of the sod shall be such as to contain practically all of the dense root system of the grass and not be less than 1 inch thick. Sod shall be cut into uniform strips not less than 12 inches in width and 24 inches in length.

PART 3 - EXECUTION

3.1 SOIL PREPARATION

A. Immediately before seeding, the soil shall be properly prepared for seeding. The areas shall be made smooth and uniform and shall conform with the finished grade and cross section shown on the Drawings. Area to be grassed, if not loose, shall be loosened to a minimum depth of 3 inches before lime, fertilizer, seed or sod is applied. Seeded areas shall be free of stones larger than 2 inches and of roots and debris of any size.

B. Seeded areas shall be moist when seeding and shall be kept moist by sprinkling until a good stand of grass is obtained and until the work is accepted by the Owner. Reseeding shall be done by the Contractor at his own expense as may be necessary to obtain a satisfactory stand of grass.

C. The Contractor shall use mulch or other additive materials when conditions do not allow an acceptable stand of grass to grow. Mulch and additive materials shall contain no weed seeds.

3.2 SEEDING

A. Seeding shall be performed during the periods and at the rates specified in the seeding schedule in the Drawings. Seeding shall not be performed when the ground is frozen or excessively wet.

B. Seeds are to be sown by a mechanical spreader either hand operated or machine operated. Seeding equipment shall be such as will continuously mix the seeds to prevent segregation

C. Immediately after the seed has been sown, the entire area shall be raked lightly and rolled to pack the soil firmly around the seed. Seeded areas shall be uniformly mulched with a continuous blanket of straw immediately after seeded. Straw shall be applied at a rate of 2 tons per acre.

3.3 SOD

A. Sod shall be placed between March 1st and December 1st. Sod shall be placed within 48 hours of cutting.

B. Sod shall be moist when laid and placed on a moist bed. Sod shall be placed within 48 hours of cutting. The sod strips shall be carefully placed by hand, beginning at the toe of slopes and progressing upward, with the length of the strip at right angles to the direction of flow of surface water. All joints shall be tightly butted and end joints shall be staggered at least 12 inches. The sod shall be immediately pressed firmly into contact with bed by tamping or rolling. Screened soil shall be used to fill all joints between strips.

C. Sod on slopes shall be pegged with sod pegs to prevent displacement. The sod shall be watered, mowed, weeded, repaired or otherwise tended to insure the establishment of a uniform healthy stand of grass.

3.4 HYDROSEEDING (WOOD CELLULOSE FIBER MULCH)

Hyrdoseeding shall be applied at a rate of 1500 pounds per acre in a slurry mixture of seed, fertilizer, and wood cellulose fiber mulch. The slurry mixture shall be regulated to ensure a uniform application of all materials at the rate specified.

3.5 MAINTENANCE AND RESEEDING

A. All seeded and sodded areas shall be maintained without payment until acceptance of the Contract and any regrading, refertilizing, reseeding or resodding shall be done at the Contractor’s expense. Any areas which fail to show a "catch" or uniform stand, for any reason whatever, shall be reseeded or resodded with the original mixture, and such reseeding or

resodding shall be repeated until final acceptance. The Contractor shall properly water, mow, and otherwise maintain all seeded and sodded areas until final acceptance.

B. Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired by filling with topsoil, tamping, refertilizing, and reseeding or resodding by the Contractor at his expense if such damage occurs prior to acceptance of the Contract.

END OF SECTION 02480

SECTION 02513 - ASPHALT CONCRETE PAVING

1. RELATED DOCUMENTS

Drawings and general provisions of Contract, including General and Special Conditions and Division 1 Specification sections, apply to work of this section.

2. DESCRIPTION OF WORK

Extent of asphalt concrete paving work is shown on drawings.

3. SUBMITTALS

Material Certificates: Provide copies of materials certificates, signed by the material producer and the Contractor, certifying that each material item complies with, or exceeds, specified requirements.

4. QUALITY ASSURANCE

Comply with State highway or transportation department standard specifications, latest edition, and with local governing regulations if more stringent than herein specified.

5. SITE CONDITIONS

5.1 Weather Conditions

Prime and Tack Coats: Apply prime and tack coats when ambient temperature is above 50^{o} F (10^{o} C), and when temperature has not been below 35^{o} F (1^{o} C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

Asphalt Concrete: Construct asphalt concrete surface course when atmospheric temperature is above 40^{o} F (4^{o} C), and when base is dry. Base course may be placed when air temperature is above 30^{o} F (-1^{o} C) and rising.

5.2 Grade Control

Establish and maintain required lines and elevations.

6. MATERIALS

6.1 General

Use locally available materials and gradations which exhibit a satisfactory record of previous installations. All materials shall comply with the Department of Transportation Standard Specifications in the State where project is located.

6.2 Base Course Aggregate

Sound, angular crushed stone, crushed gravel, or crushed slag, sand, stone or slag screenings.

6.3 Asphalt Cement

Plant mix conforming to the requirements of Section 400 of the Georgia Department of Transportation Standard Specifications.

6.4 Prime Coat

Cut-back asphalt type; AASHTO M 82 (ASTM D 2027) MC-30, MC-70 or MC-250.

6.5 Tack Coat

Conforming to Section 413 of the Georgia Department of Transportation Standard Specifications.

6.6 Lane Marking Paint

Chlorinated rubber-alkyd type, AASHTO M 248 (FS TT-P-115), Type III.

7. ASPHALT-AGGREGATE MIXTURE

The job mix shall conform to the requirements of Type F, Section 828, Georgia Department of Transportation Standard Specifications. Marshall Stability = 1250 lbs. Voids - 4.5%.

8. SURFACE PREPARATION

Remove loose material from compacted sub-base surface immediately before applying herbicide treatment or prime coat.

Proof roll prepared sub-base surface to check for unstable areas and areas requiring additional compaction.

Notify Contractor of unsatisfactory conditions. Do not begin paving work until deficient sub-base areas have been corrected and are ready to receive paving.

8.1 Prime Coat

Apply at rate of 0.20 to 0.50 gal. per square yard, over compacted subgrade. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and evaporation of volatile.

8.2 Tack Coat

Apply to contact surfaces of previously constructed asphalt or portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at a rate of 0.04 to 0.06 gallon per square yard of surface.

Allow to dry until at proper condition to receive paving.

Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Remove and clean damaged surfaces.

9. PLACING MIX

9.1 General

Place asphalt concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225^{o} F (107^{o} C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

9.2 Paver Placing

Place in strips not less than 10' wide, unless otherwise acceptable to Engineer. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

9.3 Joints

Make joints between old and new pavements, or between successive days= work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

10. ROLLING

Begin rolling when mixture will bear roller weight without excessive displacement.

Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.

Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

Remove and replace paving areas mixed with foreign materials and defective areas. Cut-our such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

11. TRAFFIC AND LANE MARKINGS

11.1 Cleaning

Sweep and clean surface to eliminate loose material and dust.

a) Striping

Use chlorinated-rubber base traffic lane-marking paint, factory-mixed, quick-drying, and non-bleeding. Color to be selected by Owner.

Do not apply traffic and lane marking paint until layout and placement has been verified with Engineer.

Apply paint with mechanical equipment to product uniform straight edges. Apply in two (2) coats at manufacturer's recommended rates.

12. REMOVE AND REPLACE PAVEMENT

Pavement and base course which must be removed for constructing sewers, manholes, force mains, water lines, and all other appurtenances in streets shall be replaced with the paving section shown on the drawings or match the existing pavement section. The pavement shall be removed to neat lines cut by a masonry saw. The top 18 inches of subgrade material immediately under the paving base and road shall be carefully removed and kept separate from the rest of the excavated material. This material shall be placed in the top 18 inches of the backfill. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone or gravel. Settlement in trenches shall be refilled with crushed stone or gravel, and such maintenance shall continue until replacement of pavement.

13. FIELD QUALITY CONTROL

13.1 General

Test in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Engineer.

13.2 Thickness

In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness.

13.3 Base Course

½-inch.

13.4 Surface Course

¼-inch.

13.5 Surface Smoothness

Test finished surface of each asphalt concrete course for smoothness, using 10' straightedge applied parallel with, and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness.

13.6 Base Course Surface

¼-inch.

13.7 Wearing Course Surface

3/16-inch.

13.8 Crowned Surfaces

Test with crowned template centered and at right angle to crown. Maximum allowable variance from template, ¼-inch.

Check surface areas at intervals as directed by Engineer.

END OF SECTION 02513

SECTION 02580 - PIPELINE INSTALLATION BY HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Special Conditions and Technical Specifications Sections, apply to this Section.

1.2 SUMMARY

The work to be done under this Section addresses the installation of pipelines by directional drilling. Directional drilling is a method of trenchless construction using a surface launched steerable drilling tool controlled from a mobile drilling frame, and includes a field power unit, mud mixing system and mobile spoils extraction system. The drilling frame differs from micro tunneling, auger boring or pipe jacking equipment in that operations are performed from the surface. The drilling frame is set back from an access pit and a high-pressure fluidjet toolhead that uses a mixture of bentonite clay and water is launched. Using an electronic guidance system, the toolhead is guided through the soil to create a pilot borehole. Upon reaching the endpoint, the toolhead is removed and a reamer with the product pipe attached is joined to the drill string and pulled back through the borehole.

1.3 DEFINITIONS

The following are industrial abbreviations for non-metallic materials:

PVC – Polyvinyl Chloride
HDPE – High Density Polyethylene
FPVC – Fusible PVC

1.4 SUBMITTALS

1.4.1 Experience

Submit a list of field supervisory personnel and their experience with directional drilling operations. At least one of the field supervisors listed must be at the site and be responsible for all work at all times when directional drilling operations are in progress. The responsible field supervisor must have a minimum of five (5) year directional drilling experience. **Submit completed Section 02750 – Horizontal Directional Drilling Contractor Qualifications with the Bid Proposal.**

1.4.2 Work Plan

1. Bentonite drilling mud products information (MSDS); special precautions necessary; method of mixing and application; and method of removing spoils.

2. Submit computations to the engineer detailing the pullback forces expected to be encountered for this project.

3. Environmental Response Plan to prevent any adverse impacts to the environment from the directional drilling process. Plan should include information such as emergency contact information, drill mud composition, drilling mud monitoring plan, drilling mud containment plan (both during construction and if a spill were to occur).

4. Working drawings and written procedure describing in detail the proposed method of installation. This will include, but not be limited to, size, capacity and setup requirements of equipment; location and siting of drilling and receiving pits; dewatering if applicable; method of fusion and type of equipment for joining pipe; type of cutting tool head; and method of monitoring and controlling line and grade.

   If the Contractor determines that modifications to the method and equipment as stated in the submittal is necessary during construction, the contractor will submit a plan describing such modifications, including the reasons for the modification. Work shall not commence until the Engineer has approved the submittals.

1.4.3 Coordination Drawings

For piping and specialties including relation to other services in same area. Show piping and specialty sizes, vents and valves and elevations.

1.4.5 Field Quality - Control Test Reports

From Contractor.

1.5 QUALITY ASSURANCE

1.5.1 Product Options

Drawings indicate size, profiles, and dimensional requirements of piping and specialties and are based on the specific system indicated.

1.5.2 Regulatory Requirements

Comply with requirements of utility companies who have service in the

project work area.

1.5.3 Material Markings

Piping materials shall bear label, stamp, or other markings of specified testing agency.

1.5.4 Testing Agencies

Mill certificates of tests on materials made by the manufacturers will be accepted provided the manufacturer maintains an adequate testing laboratory, makes regularly scheduled tests that are spot checked by an outside laboratory, and furnishes satisfactory certificates with the name of the one making the test.

The Contractor shall make hydrostatic tests on pipe with equipment approved by the Engineer.

1.6 DELIVERY, STORAGE & HANDLING

Material shall be unloaded in a manner that will avoid damage and shall be stored where it will be protected and will not be hazardous to traffic. The Contractor shall repair any damage caused by the storage. Pipe and accessories shall be handled so as to ensure delivery to the trench in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the Contractor at his expense shall make the repair in a satisfactory manner. Material shall be examined before installation and no damaged or deteriorated material shall be used in the work.

1.7 GUARANTEE

The Contractor shall guarantee the quality of the materials, equipment, and workmanship for a period of 12 months after acceptance. The Contractor at no cost to the Owner shall repair defects discovered during that period. The Performance Bond shall reflect this guarantee.

1.8 PROJECT CONDITIONS

1.8.1 Existing Utilities

All known utility facilities are shown schematically on Drawings, and not necessarily accurate in location as to plan or elevation. Utility such as service lines or unknown facilities not shown on Drawings, will not relieve the Contractor of his responsibility under this requirement except as noted below. "Existing Utilities Facilities" means any utility that exists on the project in its original, relocated or newly installed position. The Contractor will be held responsible for the cost of repairs to damaged underground facilities; even

when such facilities are not shown on the Drawings. The Contractor is to contact all utility companies prior to beginning work and request an accurate location of their respective utility lines.

1.8.2 Surface Interference

Drilling operations must not interfere with, interrupt or endanger surface activity upon the surface.

1.8.3 OSHA

Contractor must comply with all applicable jurisdictional codes and OSHA requirements.

1.8.4 Obstructions

When rock stratum, boulders, underground obstructions, or other soil conditions that impede the progress of drilling operations are encountered, the Contractor and Project Engineer must review the situation and jointly determine the feasibility of continuing drilling operations, making adjustments or switching to an alternative construction method.

1.8.5 Noise Requirements

The Contractor is responsible for have mufflers on all equipment used on this project. The Contractor may be required to add additional noise reduction measures if requested by the Owner.

1.9 COORDINATION

The Contractor shall furnish the necessary pipe and perform all excavation, dewatering, shoring backfilling, etc., necessary to make the directional drill, install the pipe and plug both ends. The Contractor shall contact the Utility System Owner a minimum of 48 hours in advance of construction. Contractor shall be responsible for coordinating his construction with the Engineer or his representative

1.10 DAMAGE TO EXISTING UTILITY SYSTEM

Damage to any part of the existing utility systems or to the water or sewer system by the Contractor or utility Subcontractors, shall be repaired at no cost to the Owner.

1.11 RECORD DRAWINGS

Record drawings must be received and approved by the Engineer prior to final

acceptance.

PART 2 - PRODUCTS

2.1 FUSIBLE PVC PIPE AND FITTINGS

Fusible PVC Pipe and fittings will be used in accordance with the material specifications. All pipe installed by directional drilling will be joined by an approved butt fusion or electro fusion technique according to the manufacturers specifications. For information only, submit manufacturer's certificate indicating that the pipe and fittings have been inspected and tested at the place of manufacture and meet the requirements on the referenced Standards and these Specifications.

2.2 DRILLING FLUID

Drilling fluid shall be a mixture of water and bentonite clay. The fluid shall be inert. The fluid should remain in the tunnel to ensure the stability of the tunnel, reduce drag on the pulled pipe, and provide backfill within the annulus of the pipe and tunnel.

Disposal of excess drilling fluid and spoils shall be the responsibility of the Contractor who must comply with all relevant regulations, right-of-way, and workspace and permit agreements. Excess drilling fluid and spoils shall be disposed at an approved location. The Contractor is responsible for transporting all excess drilling fluid and spoils to the disposal site and paying any disposal costs. Excess drilling fluid and spoils will be transported in a manner that prevents accidental spillage onto roadways. Excess drilling fluid and spoils will not be discharged into sanitary or storm drain systems, ditches or waterways.

Drilling fluid returns (caused by fracturing of formations) at locations other than the entry and exit points shall be minimized. The Contractor shall immediately clean up any drilling fluid that surfaces through fracturing.

Mobile spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing shall be present during drilling operations.

The Contractor shall be responsible for making provisions for a clean water supply for the mixing of drilling fluid.

2.3 POTABLE WATER

Potable water will be provided by the Contractor as necessary to complete the project. Temporary connections to the Owner's water system must be coordinated with the Owner and meters obtained from the Owner shall be installed by the contractor.

PART 3 - EXECUTION

3.1 GENERAL

The Project Engineer must be notified immediately if any obstruction is encountered that stops the forward progress of drilling operations. The Contractor and Project Engineer must review the situation and jointly determine the feasibility of continuing drilling operations or switching to an alternative construction method. When it is determined that it is impossible to continue drilling operations, the Contractor will be allowed to abandon the completed portion in place, unless otherwise directed by the Project Engineer.

Dewatering method of pits and excavations will be at the option of the Contractor. When water is encountered, the Contractor must provide a dewatering system of sufficient capacity to remove water, keeping any excavations free of water until the backfill operation is in progress. Dewatering will be performed in a manner that removal of soil particles are held to a minimum.

3.2 PREPARATION

3.2.1 Pits

Excavate required pits in accordance with the working drawings.

3.2.2 Electrical

The drilling procedures and equipment shall provide protection of workers, particularly against electrical shock. As a minimum, grounding mats, grounded equipment, hot boots, hot gloves, safety glasses and hard hats will be used by crewmembers. The drilling equipment will have an audible alarm system capable of detecting electrical current.

3.2.3 Removal of Existing Surfaces or Features

Removal of trees, landscaping, pavement or concrete shall meet the general provisions and specifications.

3.2.4 Existing Utilities

The Contractor shall be responsible for determining the location of all underground utilities to be crossed prior to commencing drilling operations.

3.3 DIRECTIONAL DRILLING OPERATIONS

3.3.1 Equipment

The drilling equipment must be capable of placing the pipe within the limits indicated on the Contract Drawings.

The system shall consist of a surface launched steerable drilling tool controlled from a mobile drilling frame, and include a field power unit, mud mixing system and mobile spoils extraction system.

The number of access pits shall be kept to a minimum and the equipment must be capable of boring the following lengths in a single bore. The directional drilling system shall have the capability of boring and installing a continuous run without intermediate pits.

The guidance system shall have the capability of measuring vertical (depth) position, horizontal position and roll. The guidance system must meet the following specifications in soft homogenous soils:

	Accuracy
Vertical position:	Plus or minus 1 inch
Horizontal position:	Plus or minus 3 inches

The Owner's representative shall be kept informed of the drilling progress and pipe location. Information pertaining to the drilling and pipe location shall not be withheld from the Owner's representative.

Equipment set-up requirements must be determined by the Contractor and submitted to the Engineer.

3.3.2 Installation

The actual location of the pipe with respect to the proposed line and grade shall be continuously monitored. A steering head or other suitable method shall be used to control the line and grade of the pipe to within line and grade specifications. A magnetic guidance system shall continually monitor downhole probe location. A locating system shall be established to provide a backup and independent determination of pipeline location.

3.3.3 Drilling Fluids and Excavated Material

Drilling fluids and cuttings shall be contained within designated work/construction areas. Excess fluids, cuttings, and other related materials

shall be disposed of in a legal site in accordance with governing regulations. Fluids shall not be allowed to enter any wetland area or river.

The Contractor shall be responsible for furnishing and using, as necessary, all drilling fluids and any additives needed for salt water or other conditions.

The Contractor shall be responsible for the proper clean-up and disposal of drilling fluids. The Contractor shall be responsible to provide a suitable and approved site for the disposal of the drilling mud and cuttings.

3.3.4 Damaged or Improperly Installed Pipe

If the pipe is damaged before installation or does not meet the specifications, it shall be replaced at no expense to the Owner. If the pipe is damaged during installation by the Contractor's operations, is placed at the improper grade or line or cannot be advanced because of an unseen obstruction or any other reason, it shall be abandoned in place, and filled with concrete. After abandoning a pipe, an alternate installation shall be made, as directed by the Engineer. With the exception of pipe that has to be abandoned in place due to unseen obstructions, the cost for abandonment of pipe shall be at the expense of the Contractor. No additional payment shall be made for the pipe which is abandoned, including dewatering, excavation, drilling, etc.

The Contractor shall continue pull back until 10 linear feet (minimum) of pipe is above ground for the purpose of pipe inspection. Contractor to give As-builts of piping when crossing is complete.

3.4 REQUIRED SAFETY EQUIPMENT

During drilling operations all equipment shall be effectively grounded and incorporate a system that protects operating personnel from electrical hazards. The system shall be equipped with an audible alarm that can sense if contact is made with an energized electric cable. Proper operation of the alarm system will be confirmed prior to the drilling.

3.5 PILOT HOLE BORING

The entry angle of the pilot hole and the boring process shall maintain a curvature that does not exceed the allowable bending radii of the product pipe or inhibit pullback of the pipeline.

3.5.1 Alignment Adjustments and Restarts

The Contractor shall follow the pipeline alignment as shown on the Drawings, within the specifications stated. If adjustments are required, the Contractor shall notify the Project Engineer for approval prior to making the adjustments.

In the event of difficulties at any time during boring operations requiring the complete withdrawal from the hole, the Contractor may be allowed to withdraw and abandon the hole and begin a second attempt at a location approved by the Project Engineer.

3.6 INSTALLING PRODUCT (FUSIBLE PVC) PIPE

After the pilot hole is completed, the Contractor shall commence pullback operations. Once started, pipeline pullback shall be continuous. Pre-reaming may be necessary and is at the option of the Contractor.

The pipe shall be continuously lubricated with bentonite slurry or other suitable techniques.

The pipe being pulled shall be protected and supported so that it moves freely and is not damaged by stones and debris on the ground during installation.

Pullback forces shall not exceed the allowable pulling forces for the pipe.

The Contractor shall allow sufficient lengths of product pipe to extend pass the termination point to allow connections to adjacent pipe sections or manholes. Pulled pipe will be allowed 24 hours of stabilization prior to making tie-ins.

3.7 PERMITS

The Owner shall obtain permits necessary for installation of the pipeline. The pipeline shall be installed in strict compliance with all applicable permits.

3.8 TESTING

The pipeline shall be tested twice, once before insertion into the drilled hole and once after installation. A low pressure air test shall be conducted prior to installation of the pipe. A hydrostatic test shall be conducted following installation of the pipe.

Unless otherwise specified pressure lines installed by horizontal directional drill shall have a low pressure air test prior to installation. Test pressure is to be conducted at 2 psi to check for joint integrity and pin holes. The test shall be maintained at full pressure for at least two hours.

Unless otherwise specified pressure lines shall be hydrostatically tested to the 150% working pressure but not less than 150 PSI or greater than pressure rating of pipe based on the lowest point of the section under pressure. Before applying the test pressure, all air, dirt and foreign material shall be expelled completely from the line through air valves, flushing and other means. The test shall be maintained at full pressure for at least two hours. Pressure gauges on test

apparatus shall be a minimum of 4” diameter with a minimum of 1 PSI graduations. All damaged or defective pipe, fittings, joints, valves, hydrants and appurtenances discovered after the pressure test shall be repaired or replaced with sound material, and the pressure test repeated until satisfactory to the ENGINEER.

a) Pressure lines shall be tested to 150% of the working pressure but not less than 150 psi. for a period of 2 hours. No leakage will be allowed. Pipeline must maintain test pressure for 2 hours.

b) If during the test a pressure drop occurs, the CONTRACTOR shall, at his own expense, locate and repair all defects until there is no leakage or drop in pressure. All visible leaks shall be repaired regardless of the amount of leakage.

c) Water for testing will be furnished by the CONTRACTOR, who shall furnish the test pump, measuring devices and all necessary pipe or hose extensions or transportation to the point of use, and shall exercise care in the use of water.

d) If large amounts of water are needed for flushing, the CONTRACTOR must make arrangements with the JWSC to measure water used.

e) All valves within the test section shall be completely opened and closed several times during the test period.

3.9 CLEAN-UP

The Contractor is required to maintain the work site in a neat and orderly condition throughout the period of work and after completing the work at each site, remove debris, surplus material and temporary structures erected by the Contractor. The site must be restored to a condition equal to the existing condition prior to being disturbed.

3.10 RECORD DATA

Complete record data information shall be submitted by the Contractor to the Engineer, and shall include horizontal and vertical location information of the installed pipeline.

END OF SECTION - 02580

SECTION 02750 - HORIZONTAL DIRECTIONAL DRILLING CONTRACTOR QUALIFICATION

PART 1 - GENERAL

1. SUMMARY

Portions of the proposed force main are required to be installed by horizontal directional drill. The directional drilling contractor must have the following minimum experience qualifications in order to be considered for participation in this project:

A. The Contractor must have a minimum of five (5) years horizontal directional drilling experience.

B. The Contractor must provide documentation of the following project experience in the last five (5) years:

- Five (5) HDD single pulls of greater than or equal to 500 LF and 20 inches in diameter. At least two (2) of the listed HDD projects must include a product pipe of greater than or equal to 24 inches in diameter.

- Provide documentation of the proposed equipment to be used for this project.

PART 2 – QUALIFICATION

2. GENERAL INFORMATION

A. Contractor Name:_____

Address:_____

City/State/Zip:_____

B. Number of Years your firm has been in the business:_____

C. Equipment proposed for this project:

_____

_____

3. PROJECT EXPEREINCE

A. List and describe in detail five (5) HDD single pulls of greater than 500 LF and 20 inches in diameter or larger. Two (2) of these must include a product pipe of 24 inches in diameter or larger.

1. _____

2. _____

3. _____

4. _____

5. _____

_____

_____

_____

_____

D. List owner, contact person, and current telephone number for each of the projects referenced above:

1. _____

_____

_____

_____

2. _____

_____

_____

_____

3. _____

_____

_____

_____

4. _____

_____

_____

_____

5. _____

_____

_____

_____

E. List the original bid price, final construction cost, specified completion time, actual completion time, and explanations of any differences in cost and time:

1. Original contract price:_____

   Final cost:_____

   Specified time:_____

   Actual completion time:_____

   Explanation:_____

   _____

   _____

2. Original contract price:_____

   Final cost:_____

   Specified time:_____

   Actual completion time:_____

   Explanation:_____

   _____

   _____

3. Original contract price:_____

   Final cost:_____

   Specified time:_____

   Actual completion time:_____

   Explanation:_____

4. Original contract price: _____

   Final cost: _____

   Specified time: _____

   Actual completion time: _____

   Explanation: _____

5. Original contract price: _____

   Final cost: _____

   Specified time: _____

   Actual completion time: _____

   Explanation: _____

F. List superintendent(s), foremen, or others in charge who will be available for this project and discuss their qualifications. (insert sheet if required):

G. List all proposed subcontractors and the extent of their work on this project:

Signature: _____

Title: _____

Company: _____

Date: _____

APPENDIX A

GEOTECHNICAL INVESTIGATION

March 17, 2017

Hussey Gay Bell (HGB)
329 Commercial Drive
Savannah, Georgia 31406

Attn: Chris Burke, P.E.
P: (912) 354 4626
E: cburke@husseygaybell.com

Re: Soil Test Borings
5th Street and Lee Street
Brunswick, Georgia
Terracon Proposal No.:ES175054

Dear Mr. Burke:

Terracon Consultants, Inc. (Terracon) has completed the field exploration for the above-referenced project. The services were performed in general accordance with our proposal No. PES175054 dated February 20, 2017.

Based on the results of the field tests, we found the soils in the upper 40 feet are loose to dense silty sands to clean sands interbedded with silty/sandy clays at various depths with thickness of 0.5 to 4 feet. The groundwater table was measured at 3.5 to 5.5 feet below the existing ground surface using a water level meter during field exploration.

Details of the subsurface conditions encountered at each sounding location are presented on the individual CPT sounding logs in **Appendix A** of this letter. Stratification boundaries shown on the logs represent the approximate depth of changes in soil types; the transition between materials may be gradual.

We appreciate the opportunity to be of service to you. Should you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Yanbo Huang, Ph.D., E.I.T.
Staff Geotechnical Engineer

GEORGIA Registered PROFESSIONAL Engineer GUOMING LIN

Guoming Lin, Ph.D., P.E.
Senior Principal

APPENDIX A
FIELD EXPLORATION

Image Courtesy of
Google Earth™

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES175054
Scale:	N.T.S.
File Name:	
Date:	3-1-17

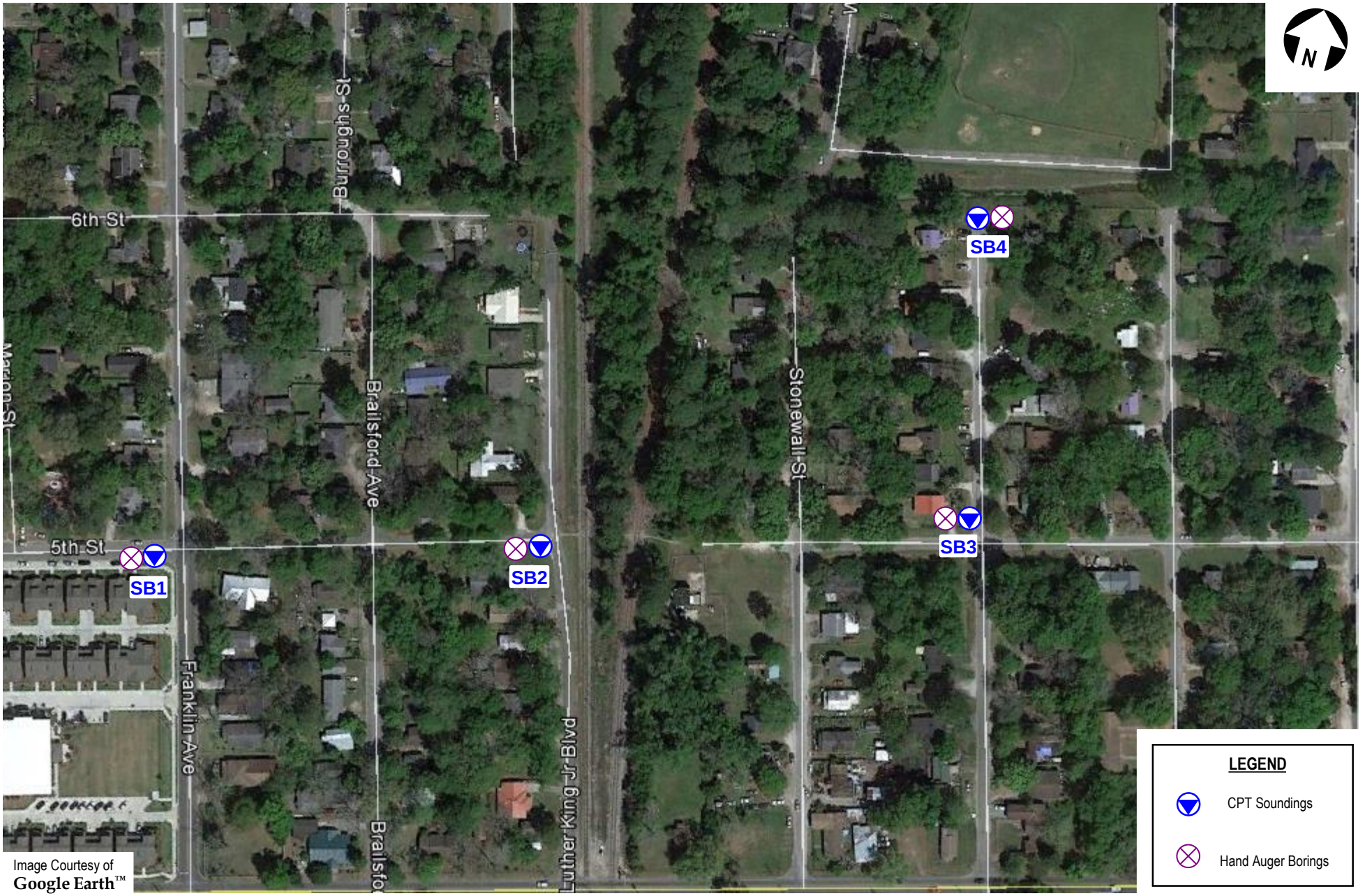
Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

SITE LOCATION MAP

5th Street and Lee Street
Brunswick
Glynn County, Georgia

Exhibit:

A-1



NOTES:

CONCEPTUAL PLAN PROVIDED TO TERRACON BY HUSSEY GAY BELL VIA EMAIL ON 2-17-17.

ALL EXPLORATION LOCATIONS WERE LOCATED IN THE FIELD USING A GPS UNIT AND / OR SITE LANDMARKS. EXPLORATION LOCATIONS SHOULD BE CONSIDERED APPROXIMATE. DIAGRAM IS FOR GENERAL LOCATION ONLY; NOT INTENDED FOR CONSTRUCTION PURPOSES.

Project Manager:	YH
Drawn by:	YH
Checked by:	GL
Approved by:	GL

Project No.	ES175054
Scale:	N.T.S.
File Name:	
Date:	3-1-17

Terracon
Consulting Engineers & Scientists
2201 Rowland Avenue Savannah, Georgia 31404
Phone (912) 629 4000 Fax (912) 629 4001

EXPLORATION LOCATION PLAN

5th Street and Lee Street
Brunswick
Glynn County, Georgia

Exhibit:

A-2

Field Exploration Description

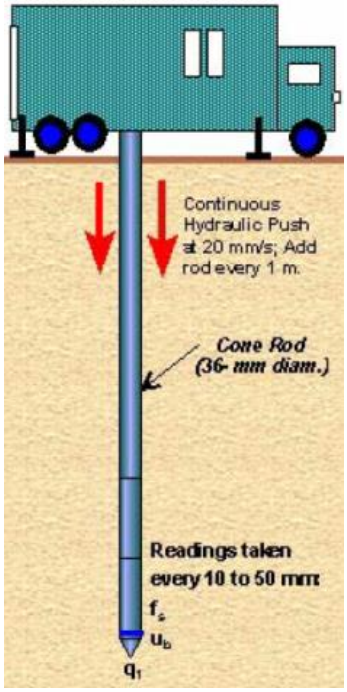
The locations of Cone Penetration Test (CPT) soundings and hand auger (HA) borings are provided by Hussey Gay Bell for the proposed development and were located in the field using hand-held GPS units and in reference to existing features. These locations are shown in the Exploration Location Plan and should be considered approximate.

Cone Penetration Testing

The CPT hydraulically pushes an instrumented cone through the soil while nearly continuous readings are recorded to a portable computer. The cone is equipped with electronic load cells to measure tip resistance and sleeve resistance and a pressure transducer to measure the generated ambient pore pressure. The face of the cone has an apex angle of 60° and an area of 10 cm^2. Digital data representing the tip resistance, friction resistance, pore water pressure, and probe inclination angle are recorded about every 2 centimeters while advancing through the ground at a rate between 1½ and 2½ centimeters per second. These measurements are correlated to various soil properties used for geotechnical design. No soil samples are gathered through this subsurface investigation technique.

CPT testing is conducted in general accordance with ASTM D5778 "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils."

Upon completion, the data collected were analyzed and processed by the project engineer.



Source: FHWA NHI-06-088

Hand Auger Borings

Hand auger borings were conducted in general accordance with ASTM D 1452-80, Standard Practice for Soil Investigation and Sampling by Auger Borings. In this test, hand auger borings are drilled by rotating and advancing a bucket auger to the desired depths while periodically removing the auger from the hole to clear and examine the auger cuttings. The soils were classified in accordance with ASTM D2488.

SB1

SB2

SB3

SB4

Material Description
Normalized CPT Soil Behavior Type

Tip Resistance, q_t (tsf)
0 100 200 300 400

Depth (feet)
0 -5 -10 -15 -20 -25 -30 -35 -40 -45

Distance Along Baseline

Explanation

SB1 — Borehole Number
Moisture Content — %w
LL PL — Liquid and Plastic Limits
Sampling — Borehole Lithology
AR
BT — Borehole Termination Type

Water Level Reading at time of drilling.

Water Level Reading after drilling.

NOTES:
See Exhibit for orientation of soil profile.
See General Notes in Appendix A for symbols and soil classifications.
Soils profile provided for illustration purposes only.
Soils between borings may differ.
AR - Auger Refusal
BT - Boring Termination

Project Manager:	Project No.: ES175054
Drawn by: YH	Scale: N.T.S.
Approved by: GL	File Name:
Date: 3/16/2017	

Terracon
2201 Rowland Ave
Savannah, GA
PH. 912-629-4000 FAX. 912-629-4001

SUBSURFACE PROFILE

5TH STREET AND LEE STREET
BRUNSWICK, GEORGIA

EXHIBIT
A-4

CPT LOG NO. SB1

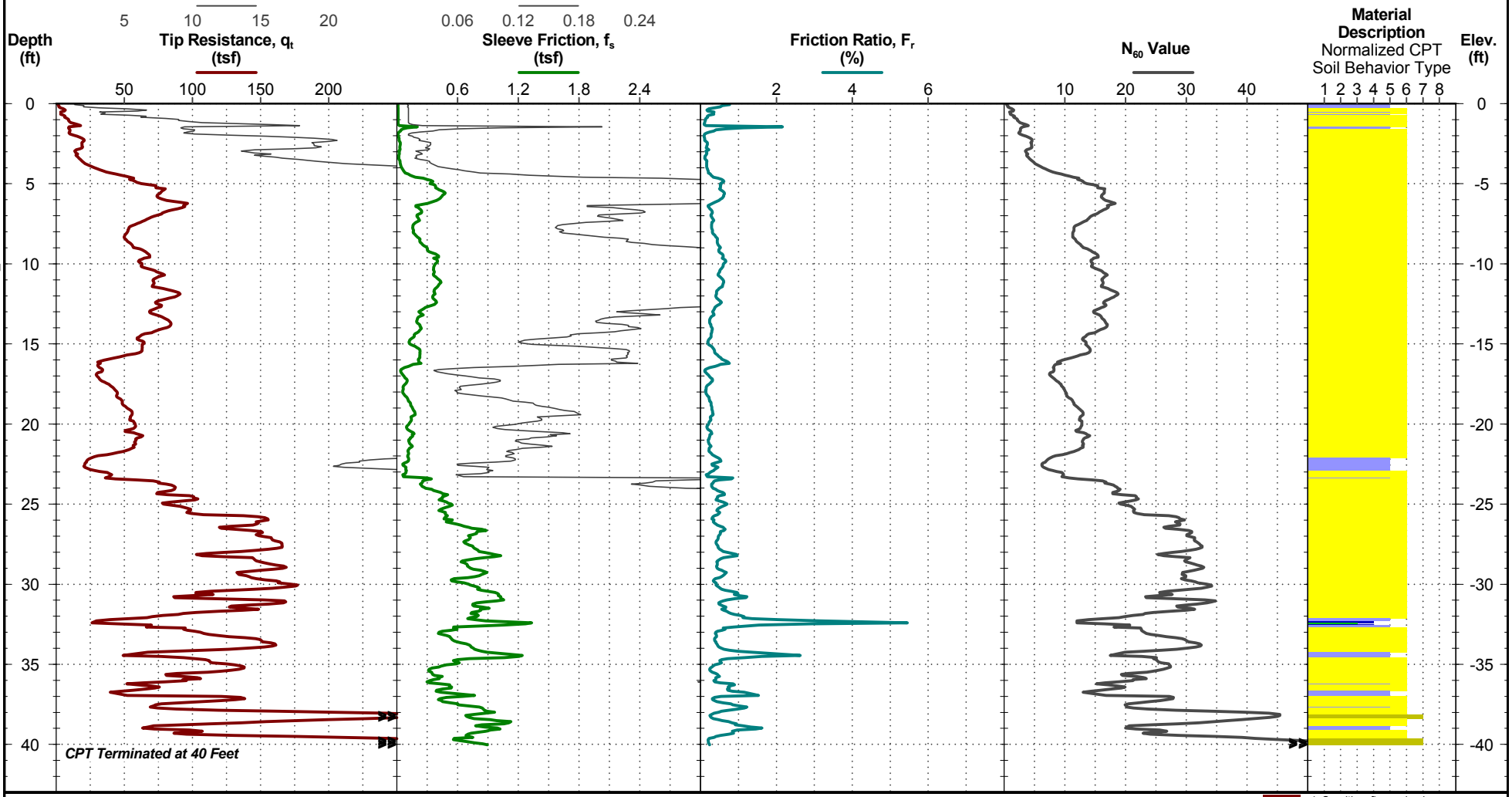
PROJECT: 5th Street and Lee Street

CLIENT: Hussey Gay Bell
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Brunswick, Georgia

Latitude: 31.17702°
Longitude: -81.49956°



See Exhibit A-3 for description of field procedures.
See Appendix B for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 3.8 ft measured water depth
(used in normalizations and correlations; see Appendix B)

Probe no. 7522 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 8/15/2014
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon

CPT Started: 3/15/2017	CPT Completed: 3/15/2017
Rig: Pagani TG73-200	Operator: JB
Project No.: ES175054	Exhibit: A-5-1

CPT LOG NO. SB2

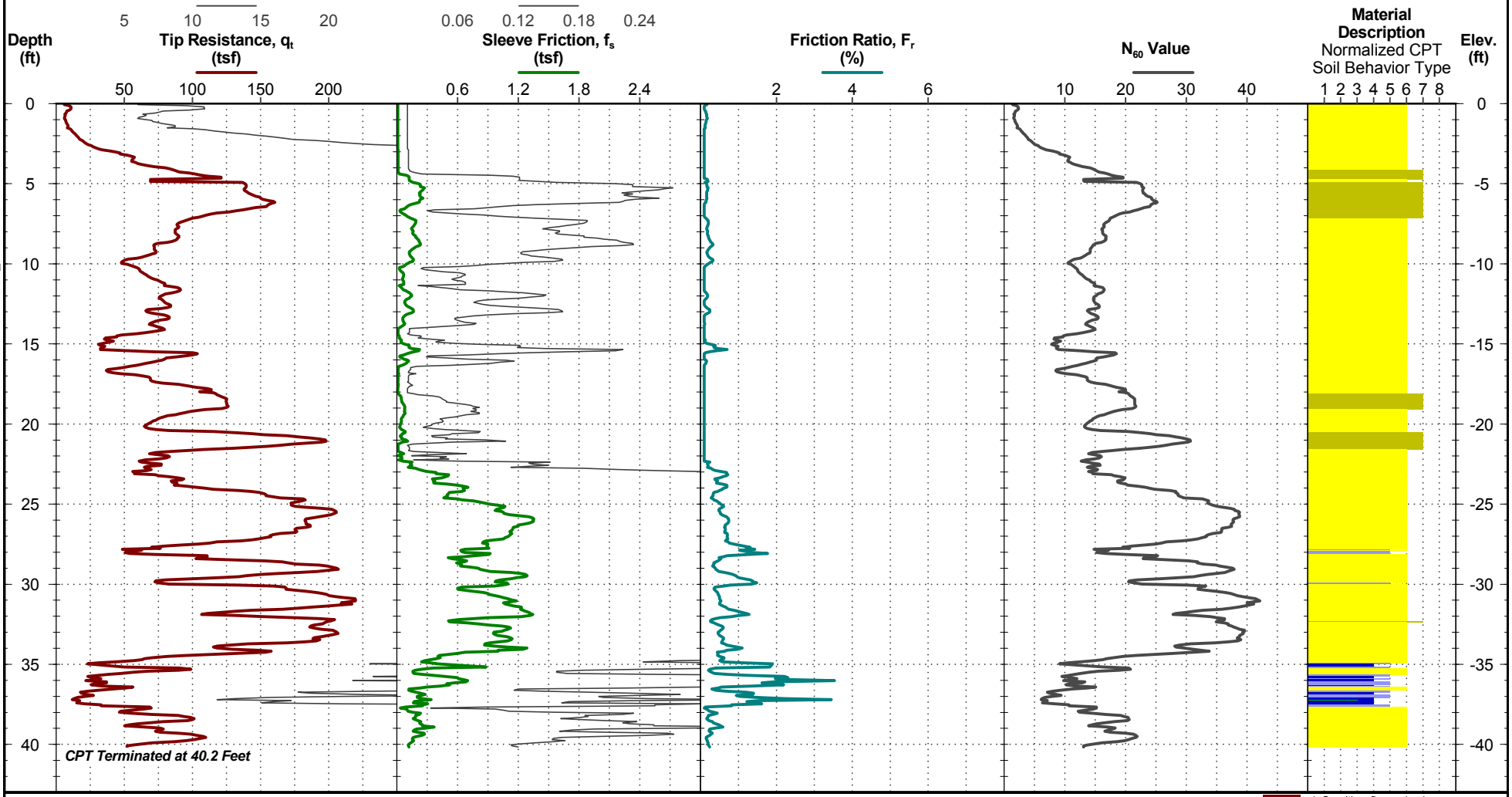
PROJECT: 5th Street and Lee Street

CLIENT: Hussey Gay Bell
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Brunswick, Georgia

Latitude: 31.17752°
Longitude: -81.49787°



See Exhibit A-3 for description of field procedures.
See Appendix B for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION
▼ 3.9 ft measured water depth
(used in normalizations and correlations; see Appendix B)

Probe no. 7522 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 8/15/2014
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon

CPT Started: 3/15/2017	CPT Completed: 3/15/2017
Rig: Pagani TG73-200	Operator: JB
Project No.: ES175054	Exhibit: A-5-2

CPT LOG NO. SB3

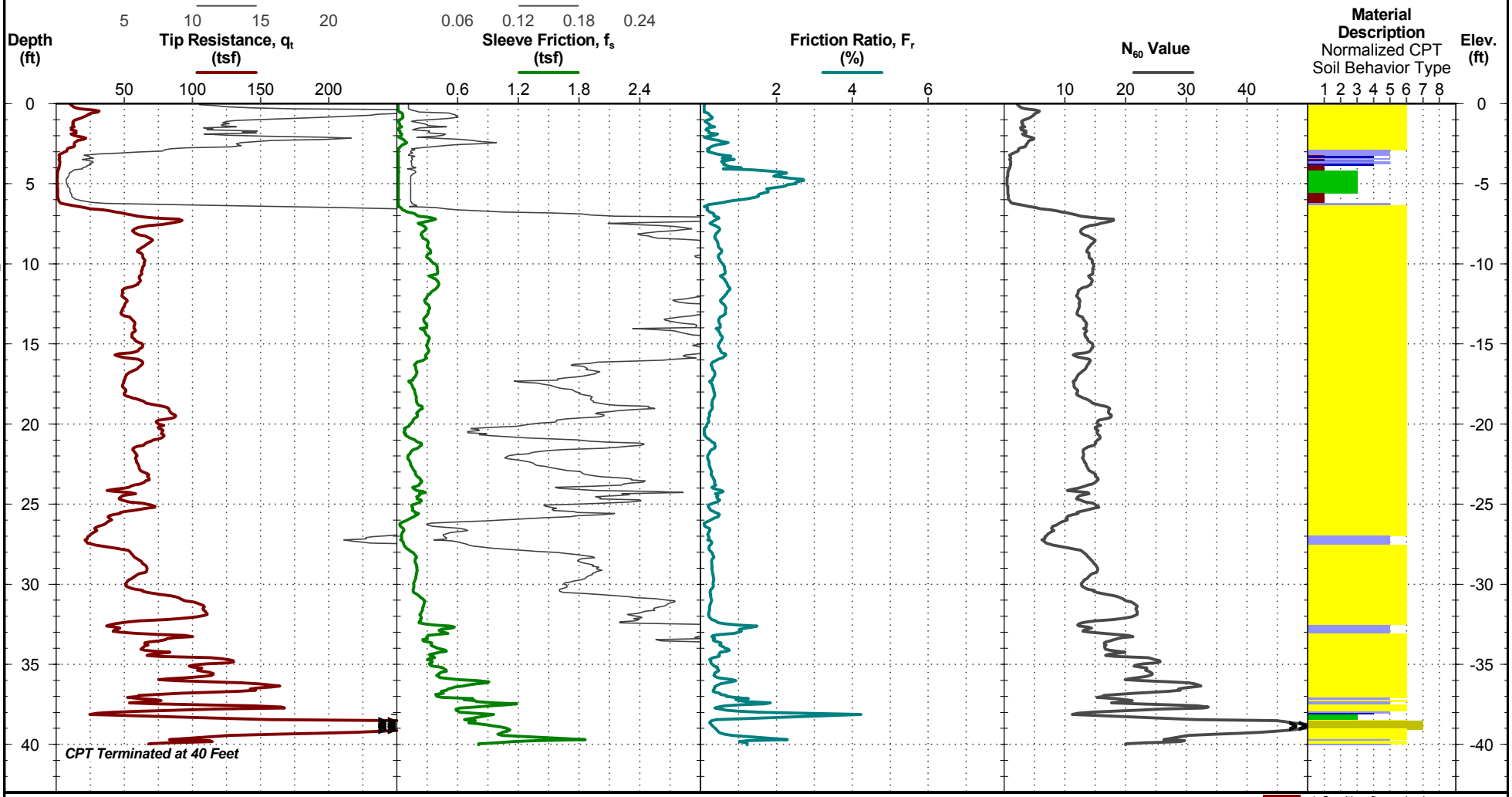
PROJECT: 5th Street and Lee Street

CLIENT: Hussey Gay Bell
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Brunswick, Georgia

Latitude: 31.17814°
Longitude: -81.49591°



See Exhibit A-3 for description of field procedures.
See Appendix B for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

WATER LEVEL OBSERVATION
▼ 4.2 ft measured water depth
(used in normalizations and correlations; see Appendix B)

Probe no. 7522 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 8/15/2014
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon

CPT Started: 3/15/2017	CPT Completed: 3/15/2017
Rig: Pagani TG73-200	Operator: JB
Project No.: ES175054	Exhibit: A-5-3

CPT LOG NO. SB4

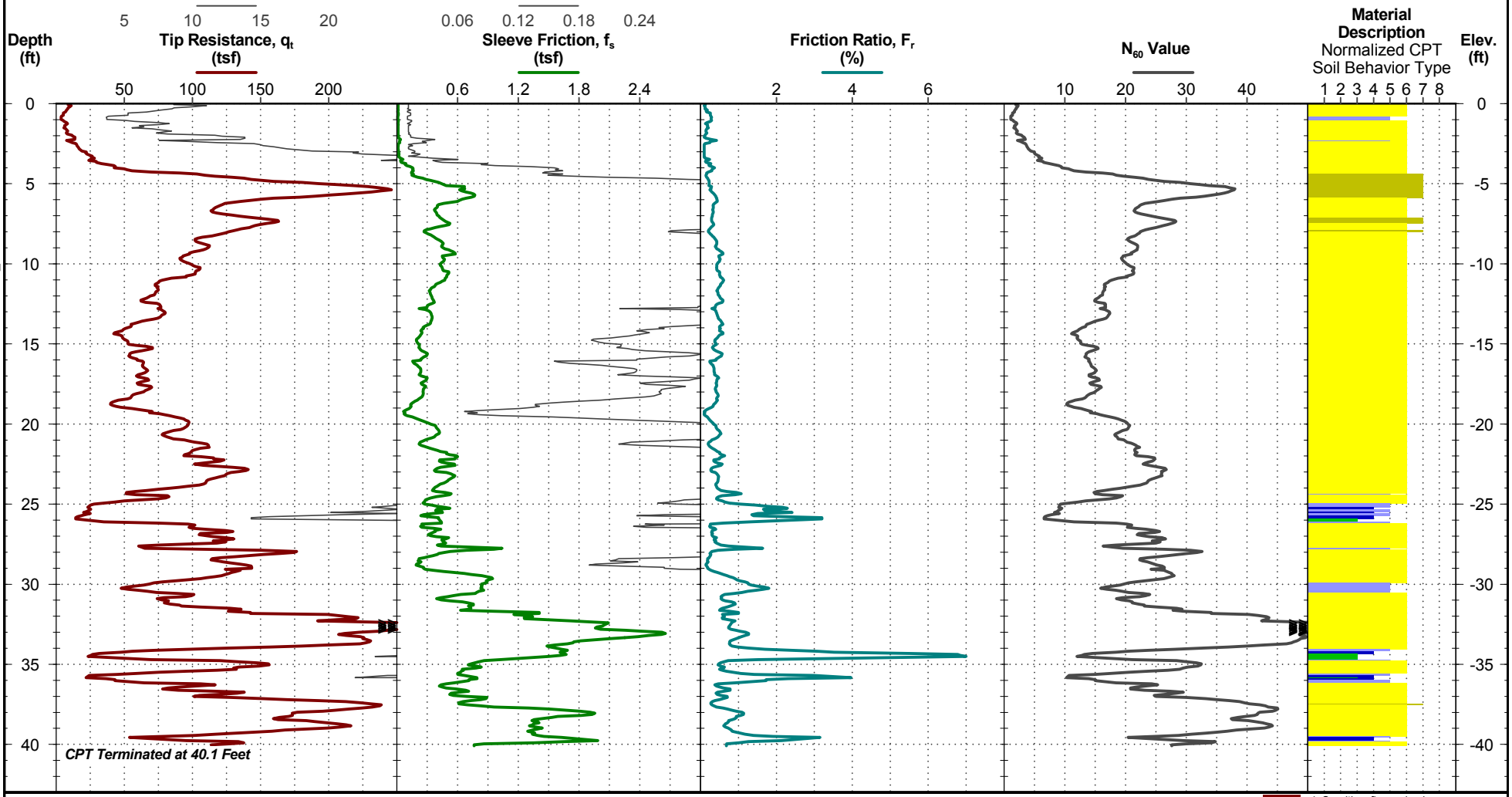
PROJECT: 5th Street and Lee Street

CLIENT: Hussey Gay Bell
Savannah, Georgia

TEST LOCATION: See Exhibit A-2

SITE: Brunswick, Georgia

Latitude: 31.17933°
Longitude: -81.4963°



See Exhibit A-3 for description of field procedures.
See Appendix B for explanation of symbols and abbreviations.

CPT sensor calibration reports available upon request.

1 Sensitive, fine grained
2 Organic soils - clay
3 Clay - silty clay to clay
4 Silt mixtures - clayey silt to silty clay
5 Sand mixtures - silty sand to sandy silt
6 Sands - clean sand to silty sand
7 Gravelly sand to dense sand
8 Very stiff sand to clayey sand
9 Very stiff fine grained

WATER LEVEL OBSERVATION

▼ 5.6 ft measured water depth
(used in normalizations and correlations; see Appendix B)

Probe no. 7522 with net area ratio of 0.84
U2 pore pressure transducer location
Manufactured by Geotech A.B.; calibrated 8/15/2014
Tip and sleeve areas of 10 cm^2 and 150 cm^2
Ring friction reducer with O.D. of 1.875 in

Terracon

CPT Started: 3/15/2017	CPT Completed: 3/15/2017
Rig: Pagani TG73-200	Operator: JB
Project No.: ES175054	Exhibit: A-5-4

Hand Auger Boring Logs

Project Name: 5th Street and Lee Street
Project No.: ES175054
Project Location: Brunswick, Georgia

Tested date: 3/15/2017 Performed by: KH

Hand Auger at SB1		
Depth (inch, BGS)	**Material Description**	**USCS Classification**
0 to 8	Dark brown fine silty sands with roots (topsoil)	--
8 to 24	Brown fine sands with silt with some tree roots	SP-SM
24 to 38	Dark brown fine silty sands	SM
38 to 88	Brown fine sands with silt	SP-SM
Caved in at 88" BGS due to groundwater		
Groundwater @ 48" BGS	**No mottling noted**	

Hand Auger at SB2		
Depth (inch, BGS)	**Material Description**	**USCS Classification**
0 to 6	Dark brown fine silty sands with some roots (topsoil)	--
6 to 30	Brown fine sands with silt	SP-SM
30 to 42	Gray fine sands	SP
42 to 80	Brown fine sands with silt	SP-SM
Caved in at 80" BGS due to groundwater		
Groundwater @ 44" BGS	**No mottling noted**	

Hand Auger at SB3		
Depth (inch, BGS)	**Material Description**	**USCS Classification**
0 to 7	Dark brown fine silty sands with roots (topsoil)	--
7 to 46	Brown fine sands with silt	SP-SM
46 to 80	Dark brown fine silty sands	SM
80 to 86	Brown fine sands with silt	SP-SM
Caved in at 86" BGS due to groundwater		
Groundwater @ 50" BGS	**No mottling noted**	

Hand Auger at SB4		
Depth (inch, BGS)	**Material Description**	**USCS Classification**
0 to 8	Brown fine silty sands with roots (topsoil)	--
8 to 38	Brown fine sands with silt	SP-SM
38 to 48	Brown/orange fine sands with clays	SP-SC
48 to 60	Gray fine sands	SP
60 to 84	Brown/orange fine sands with clays	SP-SC
Caved in at 84" BGS due to groundwater		
Groundwater @ 48" BGS	**Mottling @ 38" BGS**	

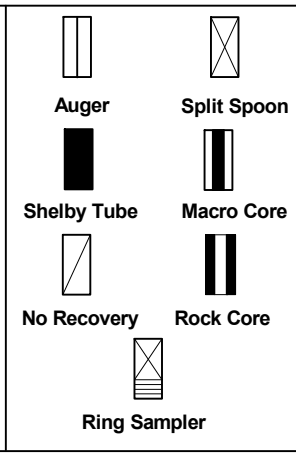
BGS = Below existing Ground Surface

APPENDIX B
SUPPORTING INFORMATION

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



GROUNDWATER

Groundwater Initially Encountered

Groundwater Level After a Specified Period of Time

Static Groundwater Level After a Specified Period of Time

No Groundwater Observed

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Std. Penetration Resistance (blows per foot)**	**Descriptive Term (Consistency)**	**Undrained Shear Strength (kips per square foot)**	**Std. Penetration Resistance (blows per foot)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium-Stiff	0.50 to 1.00	5 - 7
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 14
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	above 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Descriptive Term(s) of other constituents	Percent of Dry Weight
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI plots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

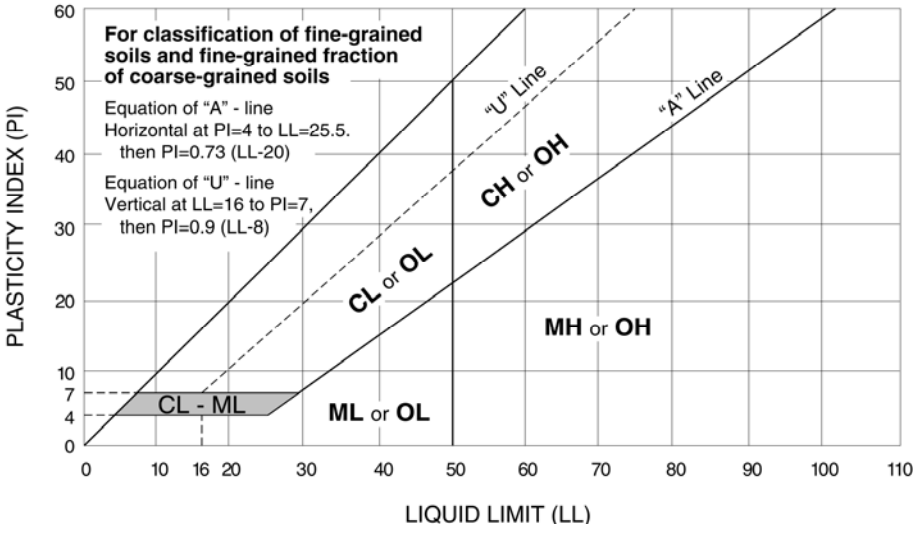


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Exhibit B-2

CPT GENERAL NOTES

DESCRIPTION OF MEASUREMENTS AND CALIBRATIONS

To be reported per ASTM D5778:

Uncorrected Tip Resistance, q_c
Measured force acting on the cone divided by the cone's projected area

Corrected Tip Resistance, q_t
Cone resistance corrected for porewater and net area ratio effects
$q_t = q_c + U2(1 - a)$

Where a is the net area ratio, a lab calibration of the cone typically between 0.70 and 0.85

Pore Pressure, U1/U2
Pore pressure generated during penetration
U1 - sensor on the face of the cone
U2 - sensor on the shoulder (more common)

Sleeve Friction, fs
Frictional force acting on the sleeve divided by its surface area

Normalized Friction Ratio, FR
The ratio as a percentage of fs to q_t, accounting for overburden pressure

To be reported per ASTM D7400, if collected:

Shear Wave Velocity, Vs
Measured in a Seismic CPT and provides direct measure of soil stiffness

DESCRIPTION OF GEOTECHNICAL CORRELATIONS

Normalized Tip Resistance, Q_t
$Q_t = (q_t - \sigma_{v0})/\sigma'_{v0}$

Over Consolidation Ratio, OCR
OCR (1) = $0.25(Q_t)^{1.25}$
OCR (2) = $0.33(Q_t)$

Undrained Shear Strength, Su
$Su = Q_t \times \sigma'_{v0}/N_{kt}$
N_{kt} is a geographical factor (shown on Su plot)

Sensitivy, St
$St = (q_t - \sigma_{v0}/N_{kt}) \times (1/fs)$

Effective Friction Angle, ϕ'
ϕ' (1) = $\tan^{-1}(0.373[\log(q_t/\sigma'_{v0}) + 0.29])$
ϕ' (2) = $17.6 + 11[\log(Q_t)]$

Unit Weight
$UW = (0.27[\log(FR)]+0.36[\log(q_t/atm)]+1.236) \times UW_{water}$
σ_{v0} is taken as the incremental sum of the unit weights

SPT N_{60}
$N_{60} = (q_t/atm) / 10^{(1.1268 - 0.2817Ic)}$

Soil Behavior Type Index, Ic
$Ic = [(3.47 - \log(Q_t))^2 + (\log(FR) + 1.22)^2]^{0.5}$

Small Strain Modulus, G_0
$G_0 = \rho Vs^2$

Elastic Modulus, Es (assumes $q/q_{ultimate} \sim 0.3$, i.e. FS = 3)
Es (1) = $2.6\Psi G_0$
where $\Psi = 0.56 - 0.33\log Q_{t,clean\ sand}$
Es (2) = G_0
Es (3) = $0.015 \times 10^{(0.55Ic + 1.68)}(q_t - \sigma_{v0})$
Es (4) = $2.5q_t$

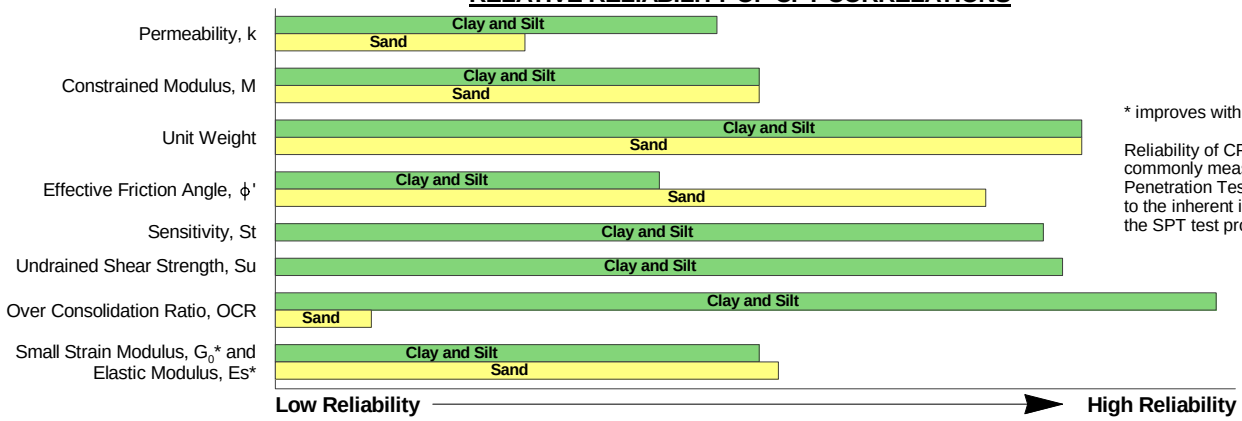
Constrained Modulus, M
$M = \alpha_M(q_t - \sigma_{v0})$
For Ic > 2.2 (fine-grained soils)
$\alpha_M = Q_t$ with maximum of 14
For Ic < 2.2 (coarse-grained soils)
$\alpha_M = 0.0188 \times 10^{(0.55Ic + 1.68)}$

Hydraulic Conductivity, k
For 1.0 < Ic < 3.27 $k = 10^{(0.952 - 3.04Ic)}$
For 3.27 < Ic < 4.0 $k = 10^{(-4.52 - 1.37Ic)}$

REPORTED PARAMETERS

CPT logs as provided, at a minimum, report the data as required by ASTM D5778 and ASTM D7400 (if applicable). This minimum data include tip resistance, sleeve resistance, and porewater pressure. Other correlated parameters may also be provided. These other correlated parameters are interpretations of the measured data based upon published and reliable references, but they do not necessarily represent the actual values that would be derived from direct testing to determine the various parameters. The following chart illustrates estimates of reliability associated with correlated parameters based upon the literature referenced below.

RELATIVE RELIABILITY OF CPT CORRELATIONS



* improves with seismic Vs measurements

Reliability of CPT-predicted N_{60} values as commonly measured by the Standard Penetration Test (SPT) is not provided due to the inherent inaccuracy associated with the SPT test procedure.

WATER LEVEL

The groundwater level at the CPT location is used to normalize the measurements for vertical overburden pressures and as a result influences the normalized soil behavior type classification and correlated soil parameters. The water level may either be "measured" or "estimated:"

Measured - Depth to water directly measured in the field

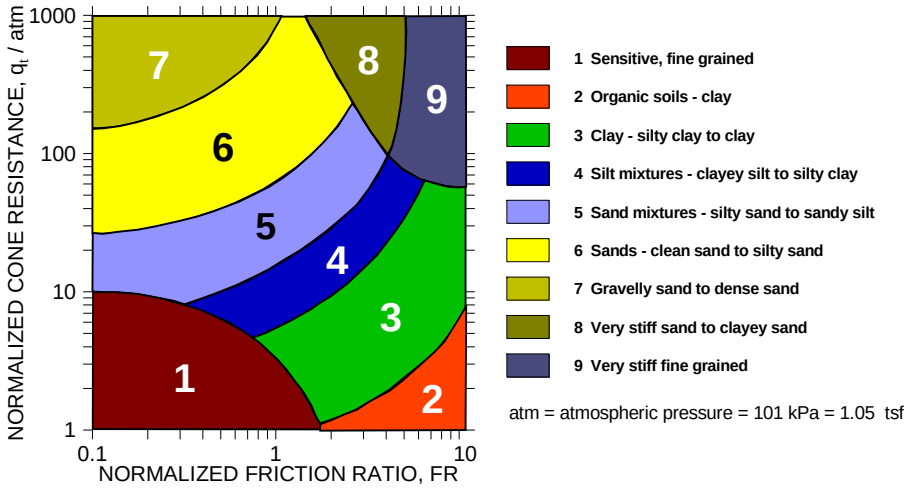
Estimated - Depth to water interpolated by the practitioner using pore pressure measurements in coarse grained soils and known site conditions

While groundwater levels displayed as "measured" more accurately represent site conditions at the time of testing than those "estimated," in either case the groundwater should be further defined prior to construction as groundwater level variations will occur over time.

CONE PENETRATION SOIL BEHAVIOR TYPE

The estimated stratigraphic profiles included in the CPT logs are based on relationships between corrected tip resistance (q_t), friction resistance (fs), and porewater pressure (U2). The normalized friction ratio (FR) is used to classify the soil behavior type.

Typically, silts and clays have high FR values and generate large excess penetration porewater pressures; sands have lower FRs and do not generate excess penetration porewater pressures. Negative pore pressure measurements are indicative of fissured fine-grained material. The adjacent graph (Robertson et al.) presents the soil behavior type correlation used for the logs. This normalized SBT chart, generally considered the most reliable, does not use pore pressure to determine SBT due to its lack of repeatability in onshore CPTs.



atm = atmospheric pressure = 101 kPa = 1.05 tsf

REFERENCES

Kulhawy, F.H., Mayne, P.W., (1997). "Manual on Estimating Soil Properties for Foundation Design," Electric Power Research Institute, Palo Alto, CA.

Mayne, P.W., (2013). "Geotechnical Site Exploration in the Year 2013," Georgia Institue of Technology, Atlanta, GA.

Robertson, P.K., Cabal, K.L. (2012). "Guide to Cone Penetration Testing for Geotechnical Engineering," Signal Hill, CA.

Schmertmann, J.H., (1970). "Static Cone to Compute Static Settlement over Sand," *Journal of the Soil Mechanics and Foundations Division*, 96(SM3), 1011-1043.

APPENDIX B

PERMITS

The following permits are expected to be obtained by the Owner prior to issuing the Notice-To-Proceed.

Georgia Environmental Protection Division (Construction and NOI)
Georgia Soil and Water Conservation Commission (LDA)
Glynn County (ROW Encroachment, LDA and Tree Advisory Board)
City of Brunswick (ROW Encroachment)
CSX (ROW Encroachment)
Norfolk Southern (ROW Encroachment)