

TECHNICAL MEMORANDUM**Index Number 102-37 SIPS – Greenland – Southside Blvd – Deerwood 3 to Greenland WTP - W**

PREPARED FOR: JEA CAPITAL BUDGET PLANNING

PREPARED BY: WATER/WASTEWATER SYSTEMS PLANNING

DATE: February 5, 2018 Susan R. West, P.E.

Revision History (add rows as needed)			
Version	Date	Author	Comments
2.0	2-Mar-21	Elizabeth DiMeo	Updated PD to incorporate selected route, additional scope (priority 1 projects), updated estimate and project schedule. Renamed pipeline program to SIPS.

Introduction

This Technical Memorandum (TM) is prepared for a planned water main extension. The proposed project was identified as part of the iWater study which is investigating JEAs future water supply needs (Project Number DS12). Implementation of this project will deliver raw water from the Main Street WTP (North Grid) to the Greenland WTP which serves the South Grid resulting in a direct offset of water withdrawal from the JEA South Grid wellfield of concern. This project will expand the hydraulic influence of the TWMP (Total Water Management Plan). Approximately 40,500 feet of 30" water main is planned. This TM identifies the route, itemizes potential design and construction considerations, provides a preliminary opinion of probable cost and includes a proposed project schedule.

Justification & Project Description

This project is part of the Southside Integrated Water System (SIPS) for the South Water Grid and was identified as part of the iWater project (Project Number DS12). Preliminary modeling reveals this project will improve the reliability and consistency of water pressures within the South Grid by providing a dedicated water feed to the Greenland WTP. This is a continuation of CIP 102-34 SIPS Deerwood- Southside Blvd Intertie to Deerwood III WTP. It is proposed to install approximately 40,500 feet of 30" water main from the 30" water main stub out provided by CIP 102-34 from the intersection of Validus Dr and Burnt Mill Parkway to the Greenland WTP. See Figure 1: Overall Project area map.

Scope**Capacity**

The water main sizing is based on the recommendations of the iWater Project.

Route & Alignment

It is proposed to install approximately 40,500 feet of 30" water main from the proposed 30" water main with CIP 102-34 at the intersection of Validus Dr and Burnt Mill Rd to the Greenland WTP. No stub-outs or connections are proposed. The route of this pipeline will utilize transmission easements, public right-of-ways and other obtained easements. The pipeline will cross I-295 around the Gate Parkway interchange. See Figure Wetland and flood zone crossings will also be required. Coordination with the electrical transmission group will be required. This project should include the piping needed to connect to the

Greenland WTP. This project is located in Duval County. Figures 1 and 2 detail the project work area. This project is located in Duval County. Figures 1 and 2 detail the project work areas.

CIP	Project Name	iWater No.	Pipe Size
102-34	SIPS Deerwood - Southside Blvd Intertie to Deerwood III WTP	DS04	30
102-35	SIPS Oakridge - Saints Rd - St. Johns Bluff to Oakridge WTP	DS03	30
102-36	SIPS Ridenour - Cortez to Ridenour WTP	DS06	24
102-38	SIPS Southeast - T Line to Southeast WTP	DS11	16
102-37	SIPS Greenland - Southside Blvd - Deerwood III to Greenland WTP	DS12	30

Individual route studies were performed by Jacobs Engineering for the Southside Blvd Intertie to Deerwood III WTP, Oakridge - Saints Rd - St. Johns Bluff to Oakridge WTP and Greenland - Southside Blvd - Deerwood III to Greenland WTP segments. The route study for 102-36 Ridenour - Cortez to Ridenour WTP was deferred and will be completed in later budget years, if the project is needed. The CIP project 102-38 Southeast - T Line to Southeast WTP pipeline segment has been deleted, it was determined by W/WW Planning that this line is not needed.

See Figure 1-Overall Project area (Initial) and Figure 2- Selected routes for CIP 102-34, 102-37 and 102-25.

At the southern portion of the SIPS Greenland pipeline route, there are three projects that are in construction and segments of SIPS- Greenland 30-inch water main will be constructed and funded under CP102-37.

1. Developer Cost Participation- Apex Trail
2. Greenland WRF
3. Greenland Pipe Program

Also as part of the SIPS Greenland design and construction, capital project 417-47 – Davis - Gate Pkwy To RG Skinner - Trans - R will be design and constructed.

See Figure 3: Greenland Route Map Modified.

Figure 1 – Overall Project Area (Initial)

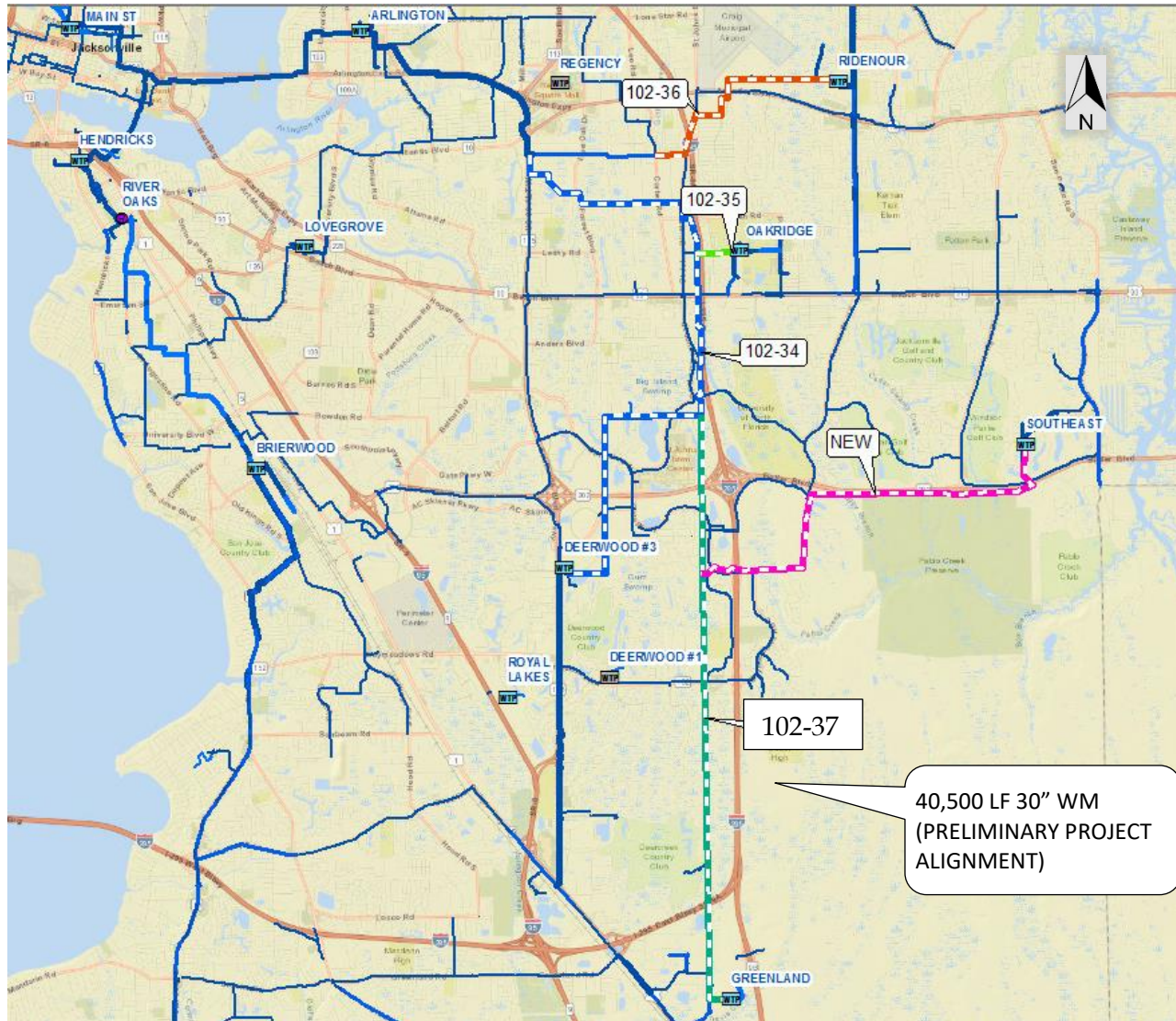


Figure 2 –Selected routes for CIP 102-34, 102-37 and 102-25

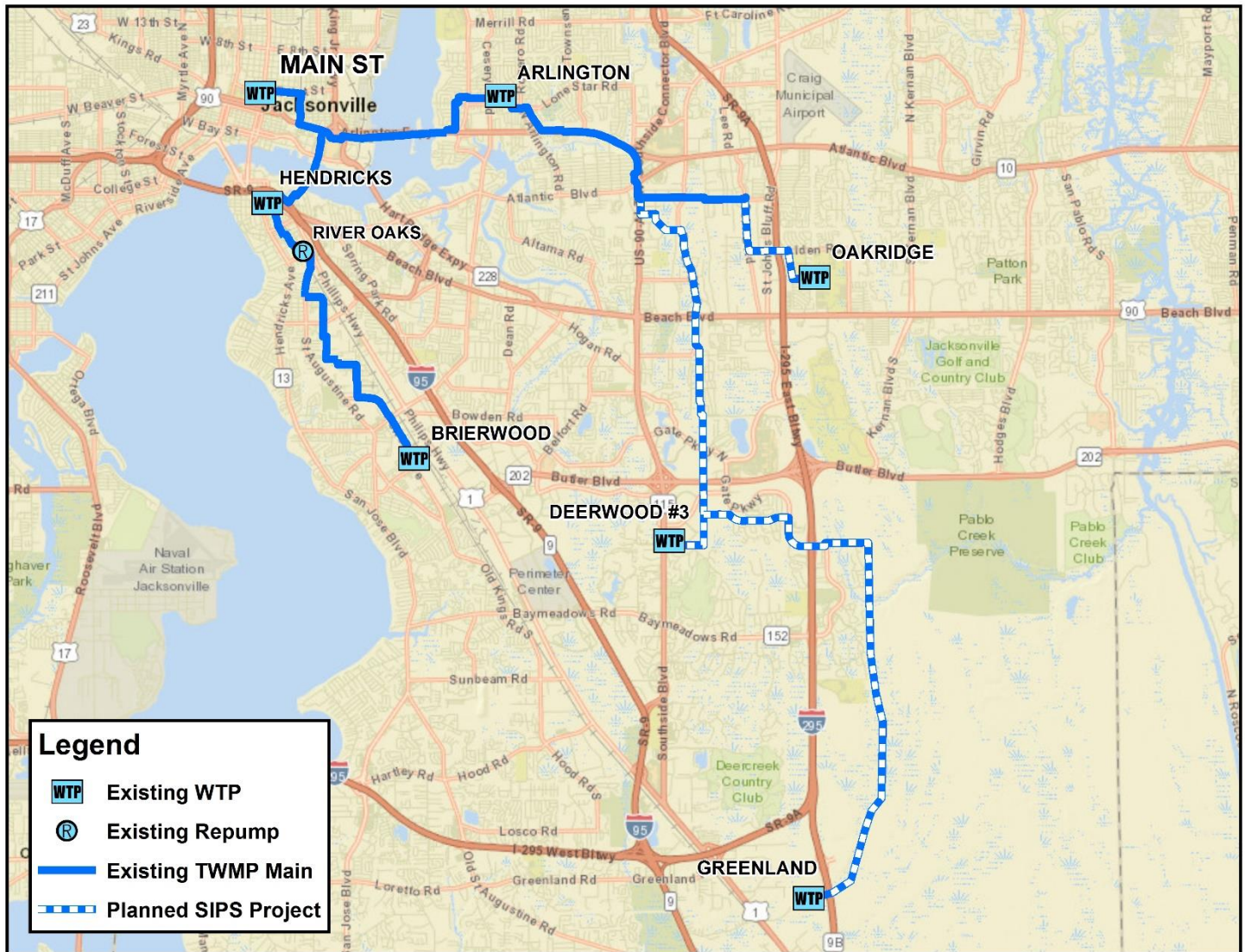
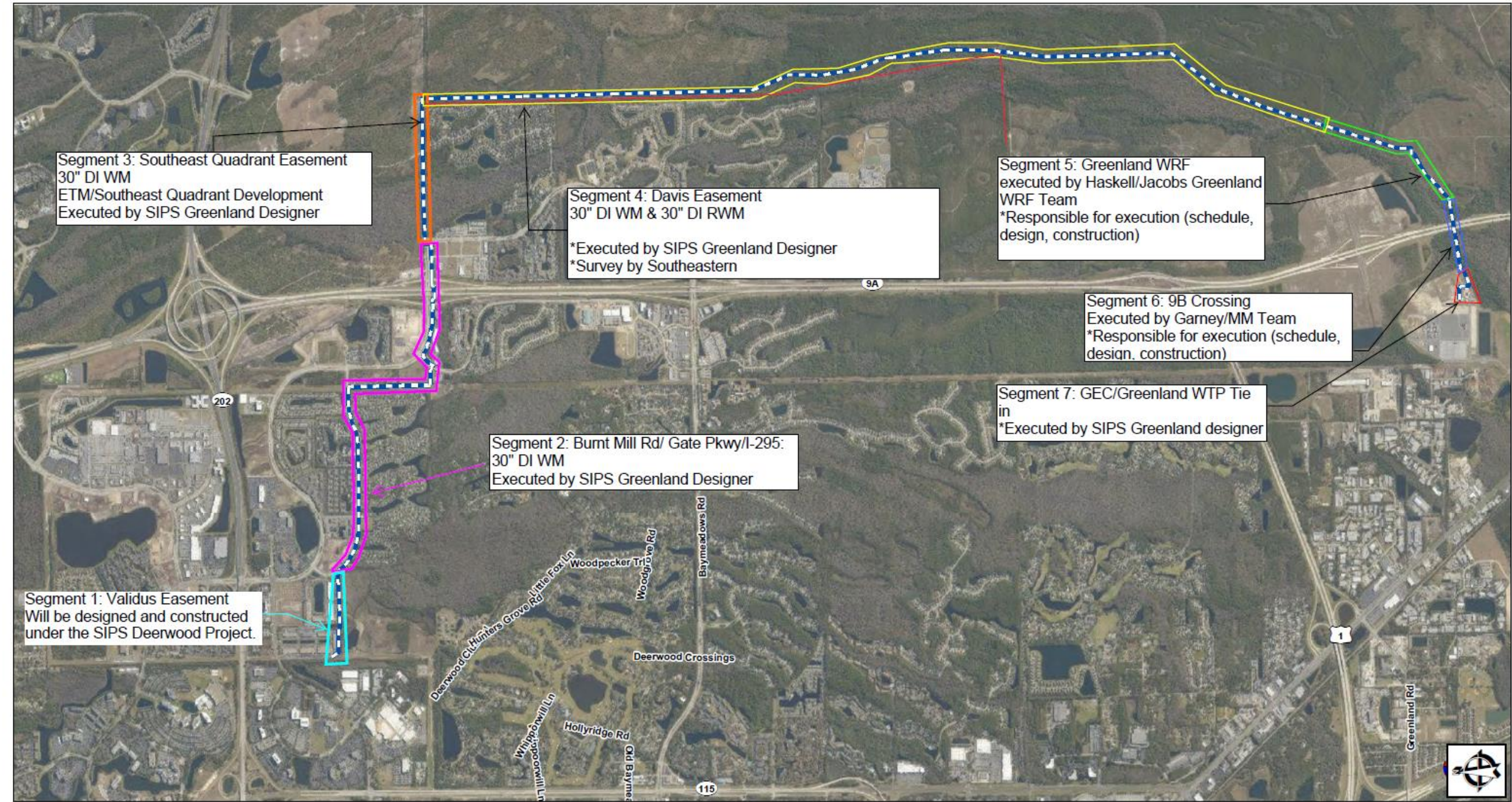


Figure 3b: Final Selected Route: SIPS- Greenland (Modified)



Priority 1 & 2 Projects

Priority 1 projects are projects identified in the 2018 iWATER Master Plan and are deemed to be critical for the 30-inch pipeline to be fully operational upon construction completion. Therefore, the priority 1 project scopes and associated costs are being added to this project definition below and see Appendix C for detailed scope statement prepared by Jacobs Engineering.

Priority 2 projects are projects also identified in the 2018 iWater Master Plan but they are not critical to the 30-inch pipeline to be operational. The priority 2 projects will be listed in this project definition. However, the scope and costs are not included in this project.

Priority 1 Projects

The priority 1 projects identified in the iWater Master Plan and that are being included in this project are the following (See Appendix C for further detail):

1. Water Quality Monitoring Stations

A water quality monitoring station will be installed at the Greenland WTP to enable water quality monitoring for biomass growth, bacteria growth, and/or taste and odor development.

The design of the SIPS Water Quality Monitoring Station is anticipated to include the following:

- A removable coupon assembly to monitor for biomass growth on interior surfaces of the pipeline will be included at the Greenland WTP SIPS Intertie Station. The assembly will be manufactured by Metal Samples Company, Model RT4000 or similar.
- Permanent sample taps will be provided in the SIPS Greenland WTP Pipeline project for manual sampling.

Final Water Quality Monitoring Station scope/design will be in alignment to the final design of the water quality monitoring stations designed in 102-34: SIPS Deerwood Project.

2. Greenland WTP SIPS Intertie Station

A new SIPS Intertie Station will connect the SIPS Greenland WTP Pipeline to the Greenland WTP (see Figure 1 Appendix C). Work on the new intertie station is expected to take place within the boundaries of the WTP site; therefore, additional real estate will not need to be acquired.

The design and construction of the new SIPS Intertie Station is anticipated to consist of the following:

- 30-inch yard piping to connect the 30-inch SIPS Greenland WTP Pipeline to the new Greenland WTP Intertie Station.
- 30-inch yard piping from the Intertie Station to the existing 1 million-gallon (MG) ground storage tank and a new 1.1 MG ground storage tank with isolation valves to each.
- SIPS fill line connections to the existing and new ground storage tanks. The tank connections are anticipated to be similar to the existing Arlington WTP TWMP fill line connection and include the following:
 - 30-inch ductile iron standpipe pipe external to the tank supported primarily off the external grade with stabilization support off the side and top of the tank wall
 - 30-inch tank dome penetration
 - The design shall include verification of the need for the surge relief valve for redundancy purposes.
 - Pressure piping, valves and appurtenances shall conform to the latest version of

the JEA Water & Wastewater Standards Manual.

3. Supervisory Control and Data Acquisition (SCADA) System

SCADA will control delivery of water from the SIPS pipeline to supplement the local wellfield supply and maintain CUP compliance. The following facilities will require SCADA control and monitoring from the

Ridenour WTP Control Room:

- SIPS Intertie Stations
- Main Street WTP High Service Pump Station
- Arlington Booster Pump Station

The SIPS Deerwood WTP Intertie Station, Main Street WTP, and Arlington Booster Pump Station SCADA control and monitoring improvements are anticipated to be implemented with the SIPS Deerwood III WTP Priority 1 project, therefore this Priority 1 project will only include the SCADA design necessary at the SIPS Greenland WTP Intertie Station. The overall control strategy and framework will be developed as part of the SIPS Deerwood III WTP Priority 1 project.

The following major instrumentation and controls (I&C) components and services are anticipated for integration of the SIPS Greenland WTP Intertie Station with the existing control system infrastructure:

- Electromagnetic flowmeter and interface
 - Remote Input/Output (RIO) panel
 - Hardware – Siemens per current JEA standards
 - Uninterruptible power supply
 - Fiber-optic cabling for interfacing the proposed RIO with the existing WTP control network
- JEA will perform the programming required to integrate these new components into their existing control network at the Deerwood III WTP and at the Ridenour Control Room.

Final SCADA integration scope will be revised to align with the SCADA integration design work that is currently underway for the 102-34 SIPS Deerwood project.

4. Greenland WTP Ground Storage Tank

The need for a new ground storage tank at the Greenland WTP was identified as a SIPS Greenland WTP Priority project in the TM titled Activity 3: Integrate iWATER Program Recommendations into SIPS (Jacobs, 2020). JEA elected to size the new third storage tank at 1.1 MG to match the planned second 1.1 MG storage tank that is currently under construction. The usable volume of the new storage tank should be no less than 1.0 MG. The design and construction of the new Greenland WTP ground storage tank is anticipated to consist of the following:

- A 1.1 MG prestressed concrete ground storage tank designed to AWWA D110 and ACI 372 standards
- Tank Dimensions: Diameter should not exceed 80 feet with a side wall depth of 30.33 feet.
- Tank Piping Connections:
 - 30-inch SIPS water fill (dome penetration)
 - 24-inch raw water fill (floor penetration) with internal standpipe to the tray aerator on the dome of the tank. The tray aerator piping discharge elevation should match the

- existing ground storage tank discharge elevations.
 - 30-inch tank discharge (floor penetration) with fiberglass vortex breaker
 - Tank overflow (floor penetration) with internal standpipe
 - Tank drain line to three recessed floor penetrations
- Tray Aerators for Sulfide Removal: Fiberglass tray aerator rated at 15 gpm/square foot, with seven trays and a minimum 12-inch separation.
- Ventilation Fans: Four aluminum vane axial, forced-draft ventilation fans. The fans will provide one air change per minute for the air volume above the high-water level in the tank.
- Level Controls: Submersible pressure transducer and level alarm switches.
- Emergency Overflows: A minimum of eight emergency overflows on the dome.
- Handrail: Aluminum handrail around the tank perimeter.
- Stairs: Exterior aluminum stairs with aluminum railing and landing.
- Ladder: Interior ladder constructed from fiberglass, reinforced plastic and safety-climb device.
- Baffles: Interior polypropylene baffle curtains.
- All interior surfaces of the tank and pipes will be coated with NSF 61 certified paint systems. The tanks will be coated per JEA's latest standard concrete storage tank coating systems.

The design and construction of the new Greenland WTP ground storage tank is also anticipated to consist of the following supporting work:

- Yard piping: The anticipated yard piping is shown in Appendix C, Figure 1.
 - All new pressure piping located on the WTP site shall be restrained-joint cement lined ductile iron (CLDI) pipe per Section 350 – Potable Water Piping in the JEA Water & Wastewater Standards Manual.
 - All new isolation valves shall be resilient seat gate valves per Section 351 – Water Valves & Appurtenances in the JEA Water & Wastewater Standards Manual.
 - A hydraulic evaluation of the existing and proposed water mains from the ground storage tanks to the high service pumps should be performed during the design phase with a goal of providing similar flow from the tanks when operated in parallel and series.
 - Clear and grade the existing JEA WTP site as needed to construct the new 1.1 MG storage tank and associated yard piping.
 - Remove and replace existing security fence along the JEA property lines as shown in Figure 1. Provide a new security gate along the north side of the new 1.1 MG storage tank and WTP Intertie Station.
 - Evaluation of the existing WTP electrical systems (primary and backup) to accommodate the additional electrical loads associated with the storage tank.
 - Electrical and instrumentation and controls associated with the 1.1-MG ground storage tank and connection to the WTP Intertie Station.
 - Evaluation of the existing stormwater management system for the new WTP improvements.
- Stormwater management system improvements are not anticipated however will be as needed to meet the requirements of the Environmental Resource Permit (ERP)

Method of Construction

The methods of installation for the proposed water main shall be by any means necessary in accordance with the latest edition of the JEA Water & Sewer Standards Manual and as allowed by the City of Jacksonville and other applicable governing agencies. The project engineer should determine the most

economical pipe routing and installation methods while remaining consistent with the JEA standards and specifications. An equivalent pipe diameter of 30" PVC should be maintained when selecting pipe size and material.

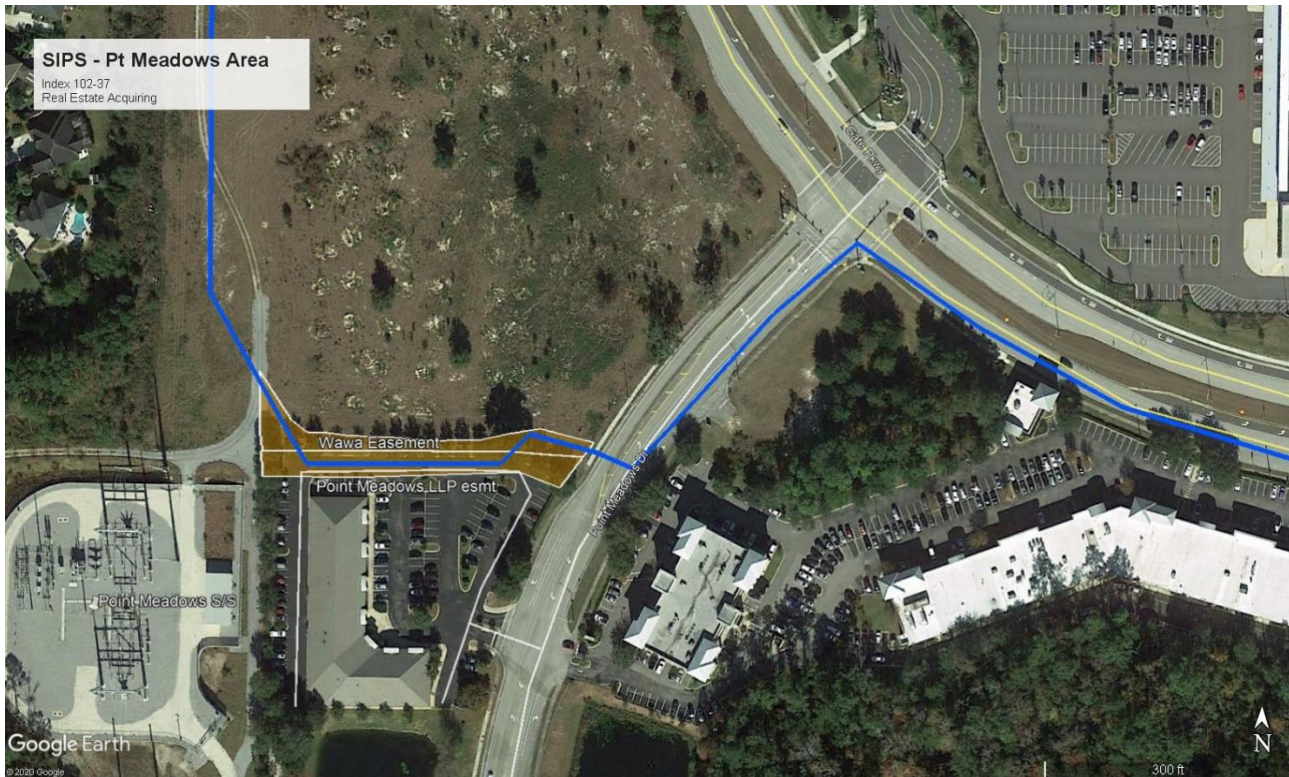
Special Crossings

The installation route will require crossings of City of Jacksonville and FDOT roadways. Other JEA water, sewer and electric facilities are located along the proposed corridor. It is expected other utilities such as gas, phone, fiber optic and cable are also present in some locations. In areas of limited space, travel lane encroachment or temporary construction easements may be required. It is expected that horizontal directional drills (HDD) will be required along the final route.

Land Ownership/Real Estate Issues

It is anticipated the pipe installation will occur within public rights-of-way, JEA fee simple owned tracts and within JEA easements on private properties. During the route study several properties were identified that required permanent easements to accommodate the final selected route, see figure below. Real Estate is actively working on the following parcels:

- Point Meadows
- Wawa
- Skinner Dev Agreement
- Davis Family Easement





Survey Requirements

Final design of the project should be based on field survey data including horizontal and vertical locations and identification of existing utilities, pavement, guardrail, structures, electrical power poles, mail boxes and drainage features within the project area limits. Right-of-way boundary limits, existing easements and parcel ownership lines should be included on the survey as well as any vegetation deemed 'protected' by the governing jurisdictions including City of Jacksonville protected trees. Any wetland lines or significant habitat community limits should be flagged prior to survey commencement.

Boundary survey and wetland flagging limits survey work has been completed by Southeastern Land Surveying along the Davis Family Easement corridor for real estate acquisition. It would be beneficial to the project for the selected design firm to utilize Southeastern for the topographic survey along this section of the pipe route.

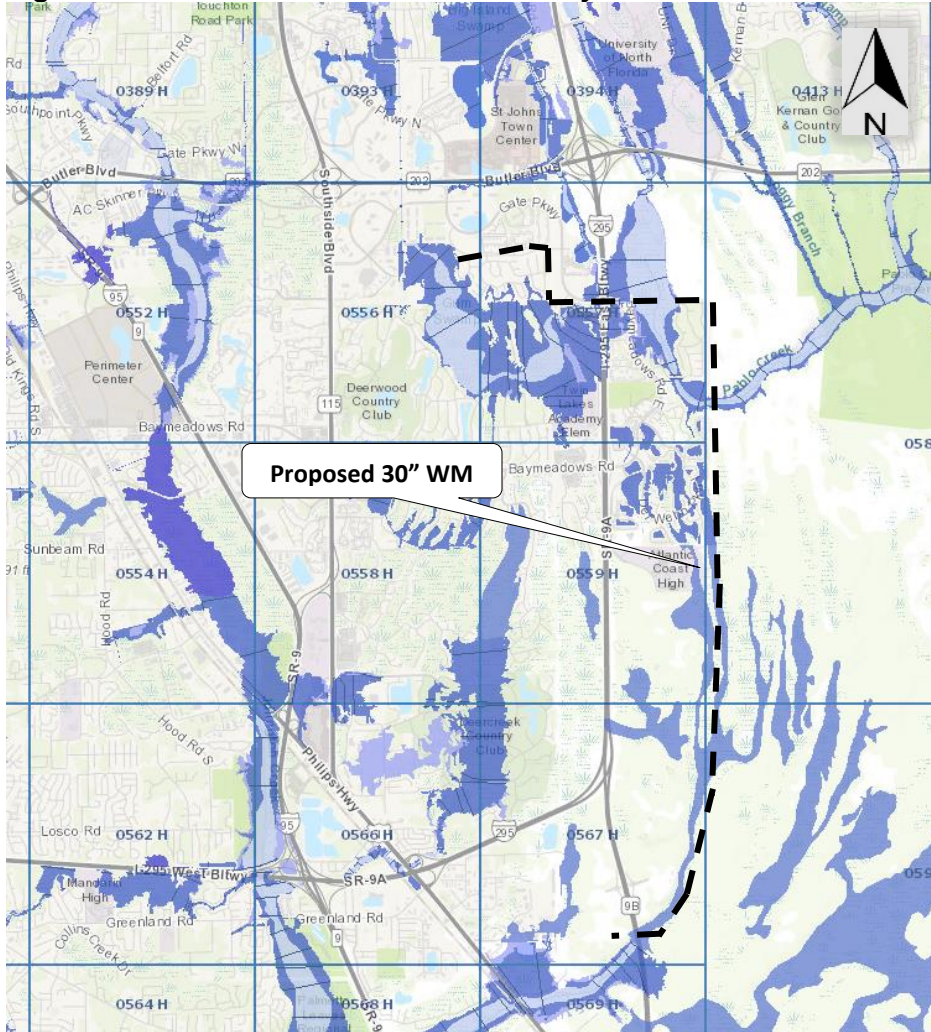
Site Development Characteristics

The project area includes work within public right-of-ways and transmission easements. The presence of environmentally sensitive wetlands within the project corridor should be evaluated. The presence of any listed species should be evaluated concurrently with the wetland line review.

Limits of Flood Plain

The project corridor crosses multiple flood plain areas per FEMA FIRM panels 394, 557, 559 and 567 for Duval County (see Figure 3). While work will likely occur within the 100 year flood plain, no additional permitting is anticipated as the finished grade of the work limits should be consistent with the original elevations.

Figure 3. FEMA Flood Zone – Site Overlay



Permit List

It is anticipated that at a minimum permits will be required by the City of Jacksonville (10 set review and Right-of-Way permit), Florida Department of Environmental Protection, FDOT, St. Johns River Water Management District and the Army Corps of Engineers. The project corridor should be evaluated for the presence of jurisdictional wetlands, listed species and protected trees. The need for any associated permitting should be addressed during the design phase. Other permits may be determined necessary during the design process and will be obtained by the design team.

Risks

The purpose of this water main project as well as the future interconnected water mains is to expand the hydraulic influence of the TWMP and offset the volume of water withdrawn from the JEA South Grid wellfields. The proactive installation of infrastructure will help ensure a stable, reliable water source is available to all JEA customers in the future.

Project Schedule

Milestone	Project Request	PD/10% Design	30% Design	60% Design	90% Design	100% Design	Bid
Project Start	08-Feb-18	22-Jul-20					
Design Start	18-Aug-20	07-Dec-21					
Design Finish	12-May-21	18-May-23					
Construction Start	17-Sept-21	23-Jan-24					
Substantial Completion	17-Aug-23	22-Dec-25					
Final Completion	24-Sept-23	01-Feb-25					

Cost Estimate and Expenditure Forecast (Current \$)

Cost Category	Project Request	PD/10% Design	30% Design	60% Design	90% Design	100% Design	Bid
Direct Const. (seg 2,3,4 &7 & Priority 1)	\$14,645,000 (all segments)	\$34,309,024					
Contingency(Seg 2,3,4,7 and Priority 1)	\$2,929,000	\$6,861,805					
Greenland WRF Seg 5	\$0	\$1,165,071					
Apex Trail Seg. 4a	\$0	\$161,408					
Greenland Pipe Program Seg 6	\$0	\$1,333,352					
SWA	\$0	\$0					
JEA Direct Const.	\$0	\$0					
Project Mgmt							
Engineering							
Prog. Mgmt							
Prj. Support							
Serv.During Const							
Miscellaneous							
Real Estate							
Total							

Appendix A

Supporting Cost Estimate Information

CONSTRUCTION COST ESTIMATE

Project: SIPS - Greenland - Southside Blvd - Deerwood 3 to Greenland
CIP Cat: Water Distribution
File Name: WS20057-3 102-37 SIPS-Greenland-Southside Blvd-Deerwood 3 to Greenland - W
Cost Index: 11698.80 for February 2021
CP No: 102-37



Project Mgr: Beth DiMeo
Estimator: M Spurlock
Estimate No: WS20057-3
Rev. No: 3
Date: 3/1/2021

Project Definition

Class 5

DIRECT CONSTRUCTION COSTS

<u>Contractor Cost</u>		<u>Material</u>	<u>Labor</u>	<u>Equipment</u>	<u>Other/Sub-Cont.</u>	<u>TOTAL</u>
Total From Estimate Details - Priority 1 Projects		\$0	\$0	\$0	\$3,064,118	\$3,064,118
Total From Estimate Details - 30" Raw WM - Segments 2,3,4 & 7		\$0	\$0	\$0	\$29,302,886	\$29,302,886
Total From Estimate Details - 30" Raw WM - Segment 4a		\$0	\$0	\$0	\$161,408	\$161,408
Total From Estimate Details - 30" Raw WM - Segment 5		\$0	\$0	\$0	\$1,165,071	\$1,165,071
Total From Estimate Details - 30" Raw WM - Segment 6		\$0	\$0	\$0	\$1,333,352	\$1,333,352
Escalation - Priority 1 + Segments 2,3,4 & 7	6%	\$0	\$0	\$0	\$1,942,020	\$1,942,020
Subtotal Contractor Cost		\$0	\$0	\$0	\$36,968,856	\$36,968,856
Contingency (Priority 1 + Segments 2,3,4 & 7 Only)	20%	\$0	\$0	\$0	\$6,861,804.94	\$6,861,805
Subtotal Contractor Costs		\$0	\$0	\$0	\$43,830,661	\$43,830,661

<u>Additional Direct Costs</u>		<u>Material</u>	<u>Labor</u>	<u>Equipment</u>	<u>Other/Sub-Cont.</u>	<u>TOTAL</u>
JEA Supplied Material		\$0	\$0	\$0	\$0	\$0
JEA Other Contract Costs		\$0	\$0	\$0	\$0	\$0
Subtotal: Additional Direct Costs		\$0	\$0	\$0	\$0	\$0
Total Direct Costs		\$0	\$0	\$0	\$43,830,661	\$43,830,661

Total Project Costs

Install 52,240 LF of 30in CLDI Water Main from Deerwood III WTP to Greenland WTP
Class 5 Accuracy Range -30% to +50%

Appendix B

Project Schedule

[illegible]

Appendix C

Priority 1 Project Scope Statement

Project Scoping Document –SIPS Greenland WTP Priority 1 Project

Project Name:	SIPS Greenland WTP Priority 1 Project
----------------------	---------------------------------------

Revision History [add rows as needed]			
Version	Date	Author	Comments
1.0	9/28/2020	Larry Gunn	
2.0	2/8/21	Elizabeth DiMeo	Deleted scope items that will not be included in CP102-37.

Project Scope

Following the completion of the Total Water Management Plan (TWMP) in 2014, the planned Southside Integrated Piping System (SIPS) will convey water from JEA's North Grid Main St. Water Treatment Plant (WTP) to multiple South Grid WTPs. The current TWMP system can only deliver water to the northern part of the South Grid and is not capable of delivering water to the rapidly growing southern portion of the South Grid. The SIPS project will deliver water directly to South Grid WTPs, including those in the center and southern areas of the Grid, for final treatment and delivery to customers. Water supplied through SIPS will supplement each WTP's local wellfield supply and enable JEA to limit wellfield withdrawals to their permitted annual limits.

One of the first SIPS construction projects is the SIPS Greenland WTP Pipeline project running from the SIPS Deerwood WTP Pipeline to the Greenland WTP. The SIPS Greenland WTP Priority projects described in this Project Scoping Statement (PSS) includes the other facilities needed to create and support a fully functional water delivery system to the Greenland WTP. These improvements were first identified in the 2018 iWATER Master plan and are described in the Technical Memorandum (TM) titled *Activity 3: Integrate iWATER Program Recommendations into SIPS (Jacobs, 2020a)*.

This SIPS Greenland WTP Priority projects included in this PSS are as follows:

- ~~1. Engineering Evaluation of 2040 Greenland WTP Capacity~~ **Scope Not included in 102-37 Greenland SIPS project**
2. Water Quality Monitoring Stations
3. Greenland WTP SIPS Intertie Station
4. Supervisory Control and Data Acquisition (SCADA) System
5. Greenland WTP Ground Storage Tank
- ~~6. Replacement of High Service Pumps~~ **Scope not included in 102-37:Greenland SIPS project**

~~Engineering Evaluation of 2040 Greenland WTP Capacity~~

~~In the iWater report, the 2040 projected peak hour demand is approximately 21.4 mgd. The Greenland WTP has two 1,000 gpm and three (two existing and one in construction) 2,000 gpm high service pumps that will have a firm capacity of 6,000 gpm (8.6 mgd) and a total capacity of 8,000 gpm (11.5 mgd). Therefore, the high service pumps require replacement to meet the projected peak hour demands. Additionally, the increase in demand will require overall improvements to the Greenland WTP, such as expansions to storage, sodium hypochlorite storage and feed, and discharge mains.~~

Due to the significant increase in capacity required at the Greenland WTP high service pumps, all of the associated WTP improvements required for the 2040 condition cannot be determined at this time. Therefore, an engineering evaluation is required during the design phase to determine the following:

- 1) Firm and total high service pumping capacity for Priority 1 and Priority 2 projects
 - a. In this Priority 1 project scoping document, the two 1,000 gpm pumps are assumed to be upsized to 3,700 gpm pumps. The firm capacity of the high service pumps will then increase from 8.6 mgd to 14.0 mgd. This increase in high service pumping capacity along with the tank included in this Priority 1 project will provide JEA an interim increase in WTP capacity.
 - b. To meet the 2040 projected peak hour demand, the remaining three pumps are assumed to be upsized to 3,700 gpm each. This pump upgrade as well as other WTP upgrades needed to meet the 2040 condition will be carried out as part of a Priority 2 project.
 - c. The engineering evaluation will include assessing JEA's 2025, 2030, and 2040 projections and the iWater projections for the Greenland WTP to validate the pump capacities prior to beginning detailed design.
- 2) Improvements to the WTP
 - a. This Priority 1 project includes addition of a 1.1 MG (1.0 MG usable volume) storage tank. The engineering evaluation shall determine if additional storage is needed in the Priority 2 project to meet the projected 2040 demands.
 - b. For the Priority 1 project described in this PSS, it is assumed that the existing sodium hypochlorite storage and feed system can accommodate the increased flows. However, this assumption will need to be verified in this evaluation. The engineering evaluation shall also determine the necessary upgrades to the existing sodium hypochlorite storage and feed system to accommodate the 2040 condition WTP capacity for the Priority 2 project.
 - c. The Priority 1 project has made assumptions detailed below regarding electrical improvements that need to be verified in this evaluation. Additionally, the evaluation shall determine the necessary electrical improvements for the Priority 2 project.
- 3) Impacts of increasing the pumping capacity to meet 2040 projected demands have on the pump suction and discharge piping
 - a. This project scoping document includes upgrades to the individual pump suction and discharge piping for the two pumps to be replaced as part of the Priority 1 project. The evaluation shall validate that no other piping improvements are required for the Priority 1 project.
 - b. The projected 2040 peak hour demand of 21.4 mgd will exceed the capacity of the 24-inch discharge header and discharge main that leaves the high service pump station. It is possible that a parallel main will need to be constructed, and the discharge header in the high service pump station may require replacement. The projected demands also result in a high velocity in the pump suction piping; however, they do not exceed the Hydraulic Institute Standards maximum velocity of 8 fps. Due to the uncertainty of the necessary discharge and suction piping improvements to meet the 2040 demands, an engineering evaluation shall be performed to determine what piping improvements are required to meet the 2040 projected demands for the Priority 2 project.

Water Quality Monitoring Stations

A water quality monitoring station will be installed at the Greenland WTP to enable water quality monitoring for biomass growth, bacteria growth, and/or taste and odor development.

The design of the SIPS Water Quality Monitoring Station is anticipated to include the following:

- A removable coupon assembly to monitor for biomass growth on interior surfaces of the pipeline will be included at the Greenland WTP SIPS Intertie Station. The assembly will be manufactured by Metal Samples Company, Model RT4000 or similar.
- Permanent sample taps will be provided in the SIPS Greenland WTP Pipeline project for manual sampling.

Greenland WTP SIPS Intertie Station

A new SIPS Intertie Station will connect the SIPS Greenland WTP Pipeline to the Greenland WTP (see Figure 1). Work on the new intertie station is expected to take place within the boundaries of the WTP site; therefore, additional real estate will not need to be acquired.

The design and construction of the new SIPS Intertie Station is anticipated to consist of the following:

- 30-inch yard piping to connect the 30-inch SIPS Greenland WTP Pipeline to the new Greenland WTP Intertie Station.
- Intertie Station consisting of the following:
 - 24-inch flow meter
 - 24-inch flow control valve
 - 24-inch Intertie Station bypass
 - 24-inch surge relief valve
 - Piping, valves, and associated appurtenances
 - Electrical and SCADA equipment
 - Concrete equipment pad
- 30-inch yard piping from the Intertie Station to the existing 1 million-gallon (MG) ground storage tank and a new 1.1 MG ground storage tank with isolation valves to each.
- SIPS fill line connections to the existing and new ground storage tanks. The tank connections are anticipated to be similar to the existing Arlington WTP TWMP fill line connection and include the following:
 - 30-inch ductile iron standpipe pipe external to the tank supported primarily off the external grade with stabilization support off the side and top of the tank wall
 - 30-inch tank dome penetration
- The surge relief valve was evaluated as part of the TM titled *JEA Southside Integrated Pipeline System Subprogram Surge Analysis (Jacobs, 2020b)*. The design shall include verification of the need for the surge relief valve for redundancy purposes.
- Pressure piping located will be restrained-joint cement lined ductile iron (CLDI) pipe per *Section 350 – Potable Water Piping* in the JEA Water & Wastewater Standards Manual.
- Isolation valves shall be resilient seat gate valves per *Section 351 – Water Valves & Appurtenances* in the JEA Water & Wastewater Standards Manual.

SCADA Design Integration

SCADA will control delivery of water from the SIPS pipeline to supplement the local wellfield supply and maintain CUP compliance. The following facilities will require SCADA control and monitoring from the Ridenour WTP Control Room:

- SIPS Intertie Stations
- Main Street WTP High Service Pump Station
- Arlington Booster Pump Station

The SIPS Deerwood WTP Intertie Station, Main Street WTP, and Arlington Booster Pump Station SCADA control and monitoring improvements are anticipated to be implemented with the SIPS Deerwood III WTP Priority 1 project, therefore this Priority 1 project will only include the SCADA design necessary at the SIPS Greenland WTP Intertie Station. The overall control strategy and framework will be developed as part of the SIPS Deerwood III WTP Priority 1 project.

The following major instrumentation and controls (I&C) components and services are anticipated for integration of the SIPS Greenland WTP Intertie Station with the existing control system infrastructure:

- Electromagnetic flowmeter and interface
- Remote Input/Output (RIO) panel
- Hardware – Siemens per current JEA standards
- Uninterruptible power supply
- Fiber-optic cabling for interfacing the proposed RIO with the existing WTP control network

JEA will perform the programming required to integrate these new components into their existing control network at the Deerwood III WTP and at the Ridenour Control Room.

For cost estimating purposes, the anticipated SCADA components required for the SIPS Greenland WTP Intertie Station were accounted for in an allowance of \$50,000.

Greenland WTP Ground Storage Tank

The need for a new ground storage tank at the Greenland WTP was identified as a SIPS Greenland WTP Priority project in the TM titled *Activity 3: Integrate iWATER Program Recommendations into SIPS (Jacobs, 2020)*. JEA elected to size the new third storage tank at 1.1 MG to match the planned second 1.1 MG storage tank that is currently under construction. The usable volume of the new storage tank should be no less than 1.0 MG. The design and construction of the new Greenland WTP ground storage tank is anticipated to consist of the following:

- A 1.1 MG prestressed concrete ground storage tank designed to AWWA D110 and ACI 372 standards
 - Tank Dimensions: Diameter should not exceed 80 feet with a side wall depth of 30.33 feet.
- Tank Piping Connections:
 - 30-inch SIPS water fill (dome penetration)
 - 24-inch raw water fill (floor penetration) with internal standpipe to the tray aerator on the dome of the tank. The tray aerator piping discharge elevation should match the existing ground storage tank discharge elevations.
 - 30-inch tank discharge (floor penetration) with fiberglass vortex breaker
 - Tank overflow (floor penetration) with internal standpipe
 - Tank drain line to three recessed floor penetrations
- Tray Aerators for Sulfide Removal: Fiberglass tray aerator rated at 15 gpm/square foot, with seven trays and a minimum 12-inch separation.
- Ventilation Fans: Four aluminum vane axial, forced-draft ventilation fans. The fans will provide one air change per minute for the air volume above the high-water level in the tank.
- Level Controls: Submersible pressure transducer and level alarm switches.

- Emergency Overflows: A minimum of eight emergency overflows on the dome.
- Handrail: Aluminum handrail around the tank perimeter.
- Stairs: Exterior aluminum stairs with aluminum railing and landing.
- Ladder: Interior ladder constructed from fiberglass, reinforced plastic and safety-climb device.
- Baffles: Interior polypropylene baffle curtains.
- All interior surfaces of the tank and pipes will be coated with NSF 61 certified paint systems. The tanks will be coated per JEA's latest standard concrete storage tank coating systems.

The design and construction of the new Greenland WTP ground storage tank is also anticipated to consist of the following supporting work:

- Yard piping: The anticipated yard piping is shown in Figure 1.
 - All new pressure piping located on the WTP site shall be restrained-joint cement lined ductile iron (CLDI) pipe per *Section 350 – Potable Water Piping* in the JEA Water & Wastewater Standards Manual.
 - All new isolation valves shall be resilient seat gate valves per *Section 351 – Water Valves & Appurtenances* in the JEA Water & Wastewater Standards Manual.
- A hydraulic evaluation of the existing and proposed water mains from the ground storage tanks to the high service pumps should be performed during the design phase with a goal of providing similar flow from the tanks when operated in parallel and series.
- Clear and grade the existing JEA WTP site as needed to construct the new 1.1 MG storage tank and associated yard piping.
- Remove and replace existing security fence along the JEA property lines as shown in Figure 1. Provide a new security gate along the north side of the new 1.1 MG storage tank and WTP Intertie Station.
- Evaluation of the existing WTP electrical systems (primary and backup) to accommodate the additional electrical loads associated with the storage tank.
- Electrical and instrumentation and controls associated with the 1.1-MG ground storage tank and connection to the WTP Intertie Station.
- Evaluation of the existing stormwater management system for the new WTP improvements. Stormwater management system improvements are not anticipated however will be as needed to meet the requirements of the Environmental Resource Permit (ERP)

~~Replacement of High Service Pumps~~

~~In the Priority 1 project, it is anticipated that the two existing 1,000 gpm high service pumps will be replaced with two 3,700 gpm pumps, which will be verified by the engineering evaluation during the design phase. It is assumed that the firm capacity of the high service pump station after completion of the Priority 1 and Priority 2 projects will be 20.6 mgd to meet the projected 2040 peak hour demand. The design and construction of the replacement of the two high service pumps is anticipated to consist of the following, also to be verified in the engineering evaluation:~~

- ~~• Remove two existing 1,000 gpm high service pumps and associated pipe and fittings (see Figure 2).~~
- ~~• Construct two 3,700 gpm @ 185' TDH horizontal split case pumps. The pumps are assumed to require 250 HP motors.~~
- ~~• Replace existing 16-inch suction piping and supports with 20-inch suction piping, fittings, and pipe supports.~~

- Replace existing 12-inch discharge piping and supports with 16-inch discharge piping, fittings, rubber flapper check valve, and pipe supports.
- Two new breakers to be installed in existing switchgear.
- Two new adjustable frequency drives (AFDs).
- Replace existing safety switches and feeders as required.
- Replace trip plug of main service entrance breaker
- Replace the existing generator with one suitable for the future WTP electrical load identified in the engineering evaluation.
- Assume that existing pad mounted transformer capacity is sufficient.

Survey, Subsurface Utility Engineering (SUE), and Geotechnical Investigation

Survey of the Greenland WTP Priority 1 project area will be required for the design. The following areas, at a minimum, will be surveyed:

- Existing property/easement/right-of-way lines.
- Proposed staging areas.
- Surveyor to identify above-ground and below-ground utilities.
 - Ground-penetrating radar should be used to map all subsurface utilities, piping, and appurtenances for the proposed tie-in. Unidentified utilities could result in a significant change order.
 - SUE investigation is required to locate existing utilities within the project boundaries. Specifically, test holes should be obtained where the proposed piping crosses existing utilities.
- Geotechnical borings will be required to for the new 1.1 MG ground storage tank and Intertie Station concrete pad.

Delivery Method

This project will be delivered by design-bid-build delivery.

Reliability, Redundancy, and Resiliency

A project request will be submitted during design to JEA's Asset Management group for resiliency evaluation.

Land Ownership/Real Estate Issues

This project is limited to JEA property; therefore, real estate acquisitions or involvement is not expected. This project consists of improvements to a fully permitted, existing WTP facility.

Permitting

The following permits are anticipated to be required on this project:

- Florida Department of Environmental Protection (FDEP) PWS Construction Permit
- City of Jacksonville 10-Set Permit
- FDEP ERP permitting to determine stormwater management and endangered species requirements. No wetland impacts are anticipated in this project.

Risk Issues and Assumption

The following risks have been identified:

- Congested underground infrastructure is anticipated at the WTP site and should be investigated further during the design phase

- Completion of the following components included in this PSS are required to be operational in order to place the SIPS Greenland WTP pipeline in service:
 - Water Quality Monitoring Stations
 - Greenland WTP SIPS Intertie Station
 - Supervisory Control and Data Acquisition (SCADA) System

Project Cost

The estimated project costs are included in the tables below. The direct construction costs represent AACE International Class 5 construction cost estimates. See Attachment A for a detailed breakdown of the pre-escalation construction costs.

The following assumptions were made for the non-construction costs:

- Contingency = 25 percent of direct construction
- JEA Project Management = 3 percent of direct construction, including contingency
- JEA Project Support = 2.5 percent of direct construction, including contingency
- JEA Services During Construction = 5 percent of direct construction, including contingency
- Engineering = 12 percent of direct construction, including contingency

Direct Construction Breakdown

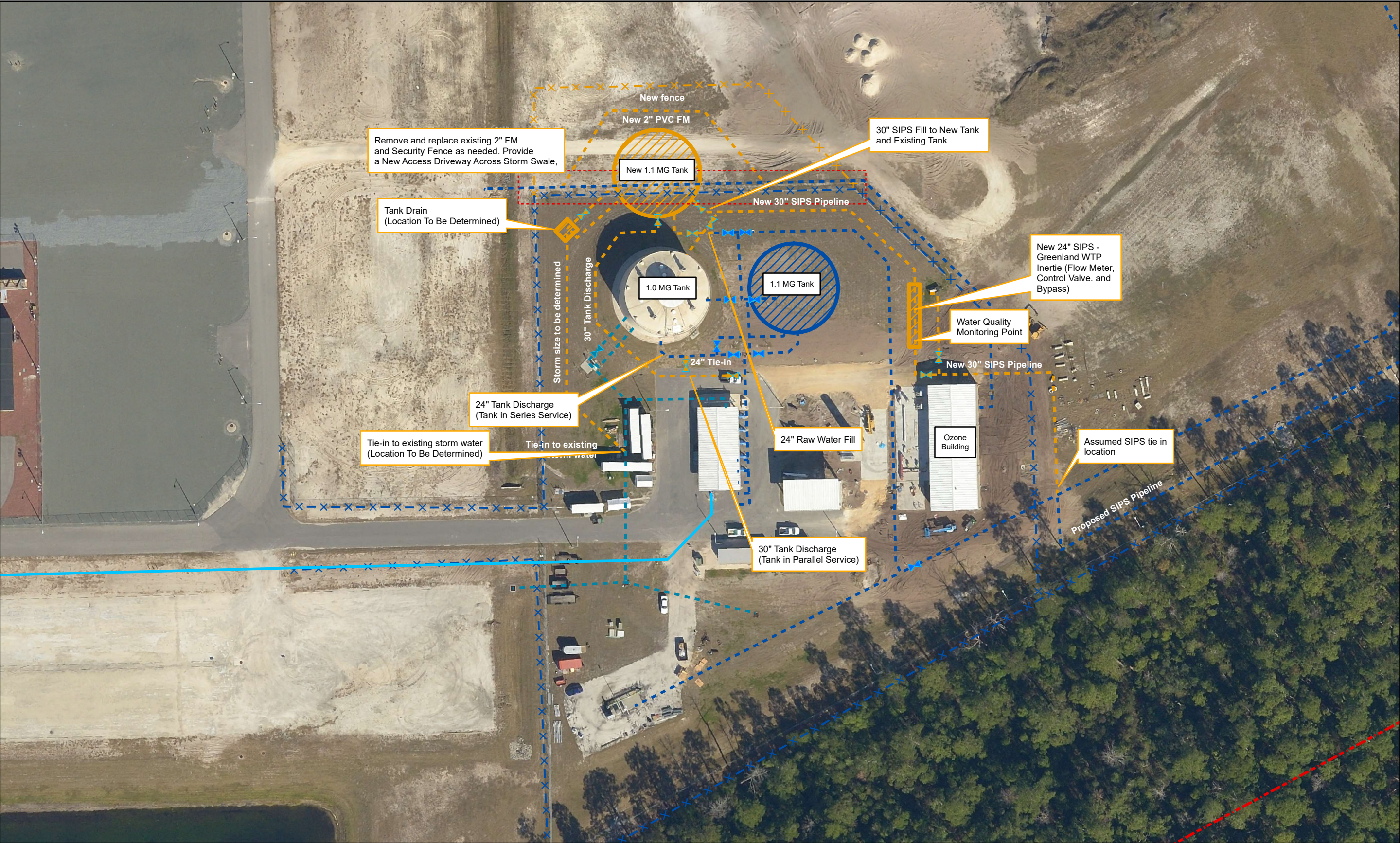
The costs below total the direct construction costs for the SIPS Greenland WTP Priority 1 project elements (AACE International Class 5).

Item	Description	Cost	
01	Water Quality Monitoring Station	\$2,532	
02	Greenland WTP SIPS Intertie Station	\$517,400	
03	Supervisory Control and Data Acquisition (SCADA) Design Integration	\$62,567	
04	Greenland WTP Ground Storage Tank	\$2,481,617	
05	Replacement of High Service Pumps	\$488,603	
Direct Construction Sub-Total		\$3,552,719	\$3,064,116
6% Escalation		\$213,000	\$183,847
Direct Construction Total		\$3,766,000	\$3,247,963

Project Cost

The costs presented in the following table reflect the JEA project costs for the SIPS Greenland WWTP Priority 1 project.

Cost Category	Project Request	10% Design	30% Design	60% Design	90% Design	100% Design	Bid
Direct Construction	\$3,766,000	\$3,247,963					
Contingency	\$942,000	\$811,991					
SWA	\$0						
JEA Direct Construction	\$0						
JEA Project Management	\$141,000	\$97,439					
Engineering	\$565,000	\$389,756					
JEA Services During Construction	\$235,000	\$162,398					
JEA Project Support	\$118,000	\$81,199					
Real Estate	\$0						
Total	\$5,767,000	\$479,0746					



LEGEND

Existing Storm Valve	Distribution_Pipelines_12in_...	New Perimeter Fence	New Construction
New Valves	RawWater_12202016	Peimmitter Fence	Existing Ground Storage Tank
Distribution Valves	Existing Storm Water	New Pipeline	1.1MG
			JEA_Greenland_Parcel_Bo...

0 50 100 200
Feet

Figure 01.
JEA Greenland WTP Site Plan PSS1
Project Scope Statement

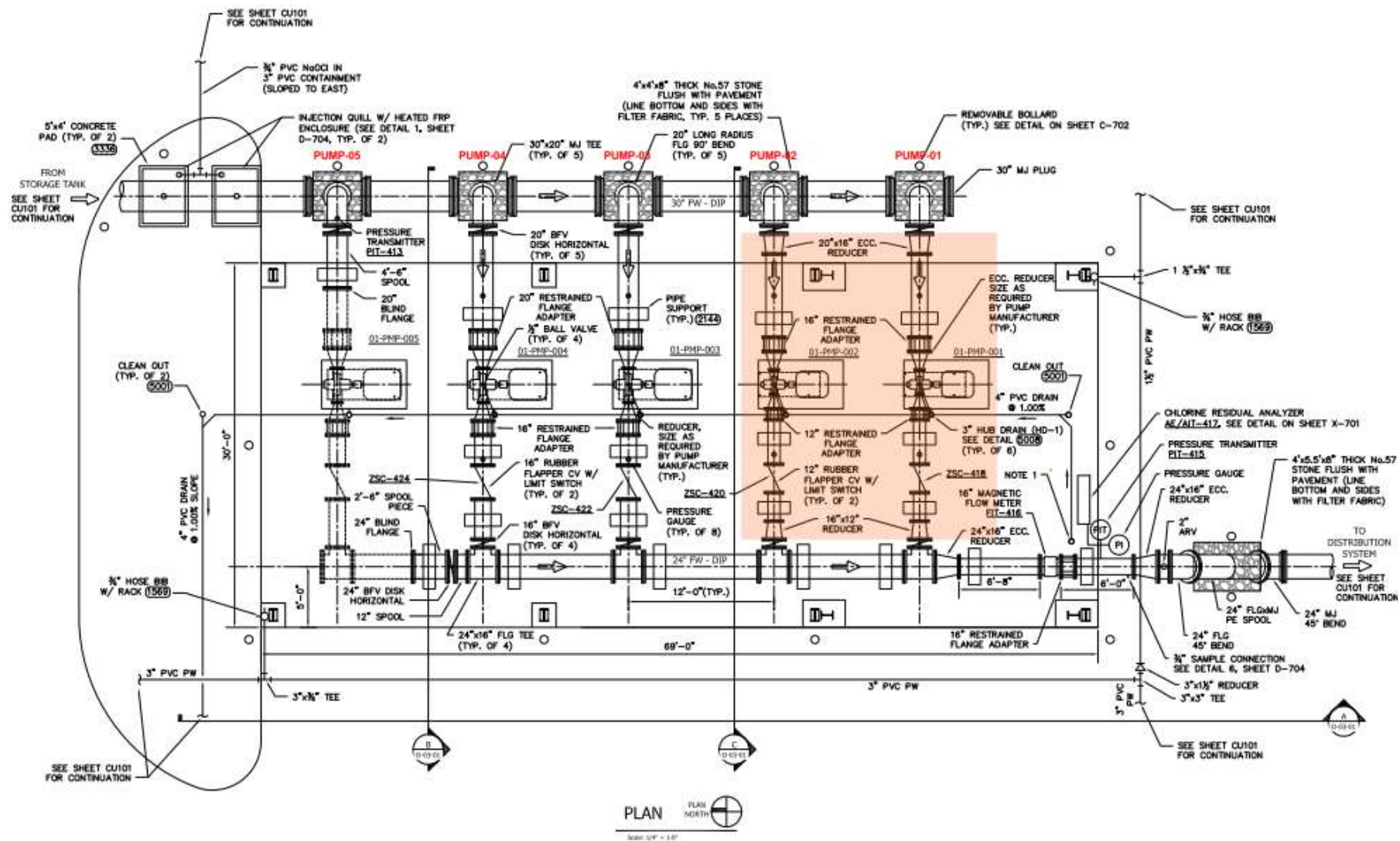


Figure 2 Conceptual High Service Pump 1 and 2 Replacement

Attachment A

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
01	33.03.30.SIPS	Water Quality Monitoring Station											
		30" SIPS Intertie Above Grade Mechanical											
		Permanent Sample tap with removabal coupon assembly (need pricing)	1.00 ea	22.84 /ea	23	2,132.03 /ea	2,132					2,154.87 /ea	2,155
		Strap at conc. support, CS, 30"	1.00 ea	57.13 /ea	57	319.80 /ea	320					376.93 /ea	377
02	33.01.30.SIPS I	30" SIPS - Greenland SIPS to Intertie (Includes Bypass)											
		01 Water Quality Monitoring Station	1.00 LS	79.97 /LS	80	2,451.83 /LS	2,452	/LS		/LS		2,531.80 /LS	2,532
		Greenland WTP SIPS Intertie Station											
		CMPCTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	3,800.00 gal			0.01 /gal	38					0.01 /gal	38
		30" pipe, DI, RJ, excav/bkfill included, 250#	380.00 LF	32.60 /LF	12,386	212.16 /LF	80,622			37.70 /LF	14,325	282.46 /LF	107,333
		30" DI, RJ, Eli, 90	5.00 ea	350.39 /ea	1,752	5,457.97 /ea	27,290			405.24 /ea	2,026	6,213.60 /ea	31,068
		30" DI, RJ, tee	2.00 ea	525.59 /ea	1,051	5,685.39 /ea	11,371			607.85 /ea	1,216	6,818.83 /ea	13,638
		Megalugs for DI Pipe w/ Accessories, 30"	4.00 ea	116.41 /ea	466	2,110.96 /ea	8,444			104.71 /ea	419	2,332.08 /ea	9,328
		Polywrap, 30" pipe	380.00 lf			1.88 /lf	713					1.88 /lf	713
		Add for tie-in to existing (Adjust productivity)	1.00 ea	1,629.74 /ea	1,630	1,066.00 /ea	1,066			1,884.83 /ea	1,885	4,580.57 /ea	4,581
		Pipe Marking, ID Tape	380.00 lf	0.60 /lf	228	0.19 /lf	70					0.78 /lf	298
		Install gate valve, MJ, 30"	2.00 ea	535.48 /ea	1,071					481.67 /ea	963	1,017.15 /ea	2,034
		Gate valve, iron body, solid wedge, MJ, 150#, NO, 30"	2.00 ea			58,630.55 /ea	117,261					58,630.55 /ea	117,261
		CI Valve Box & Cover, w/ Concrete Collar included	2.00 ea	174.61 /ea	349	213.21 /ea	426			157.06 /ea	314	544.88 /ea	1,090
		30" Water Fill Pipe to Existing Tank	1.00 ls					62,567.33 /ls	62,567			62,567.33 /ls	62,567
		33.01.30.SIPS I 30" SIPS - Greenland SIPS to Intertie (Includes Bypass)		/LF	18,933	/LF	247,301	/LF	62,567	/LF	21,148	/LF	349,949
		33.03.30.Intertie Intertie Above Grade Mechanical											
		Paint process pipe and fittings, subcontracted, priced per LF, 30" dia.	50.00 lf					48.65 /lf	2,432			48.65 /lf	2,432
		Install 30" DI, flanged, spool <= 10'	3.00 ea	862.03 /ea	2,586							862.03 /ea	2,586
		Install 30" DI, flanged, spool > 10'	2.00 ea	1,077.39 /ea	2,155							1,077.39 /ea	2,155
		24" Fabricated DI Spool, FxF, 7' 6" - FURNISH	1.00 ea			8,650.31 /ea	8,650					8,650.31 /ea	8,650
		30" Fabricated DI Spool, FxF, 12' 6" - FURNISH	2.00 ea			12,250.59 /ea	24,501					12,250.59 /ea	24,501
		30" Fabricated DI Spool, FxRJPE, 6' 0" - FURNISH	2.00 ea			9,238.75 /ea	18,478					9,238.75 /ea	18,478
		30" DI, FL, Eli, 90	2.00 ea	862.03 /ea	1,724	8,227.82 /ea	16,456					9,089.84 /ea	18,180
		30" DI, FL, reducer, 30" x 24"	2.00 ea	862.03 /ea	1,724	3,771.90 /ea	7,544					4,633.93 /ea	9,268
		30" DI, flanged coupling adapter	1.00 ea	805.47 /ea	805	938.09 /ea	938					1,743.56 /ea	1,744
		Add for boss and 1" tap in pipe, 14"-36" pipe	1.00 ea			319.80 /ea	320					319.80 /ea	320
		Ball valve, bronze, screwed, 1" with plug	2.00 ea	22.86 /ea	46	71.07 /ea	142					93.92 /ea	188
		Strap at conc. support, CS, 30"	2.00 ea	57.13 /ea	114	319.80 /ea	640					376.93 /ea	754
		Strap at conc. support, CS, 24"	2.00 ea	57.13 /ea	114	319.80 /ea	640					376.93 /ea	754
		24" Bolt & Gasket Kits, CS, 150#	6.00 ea	262.78 /ea	1,577	150.66 /ea	904					413.44 /ea	2,481
		30" Bolt & Gasket Kits, CS, 150#	6.00 ea	359.89 /ea	2,159	270.06 /ea	1,620					629.95 /ea	3,780
03	33.041.30.SIPS	Install Control Valve, 24"	1.00 ea	1,199.62 /ea	1,200							1,199.62 /ea	1,200
		FURNISH Control Valve, 24"	1.00 ea			21,320.22 /ea	21,320					21,320.22 /ea	21,320
		FURNISH Magnetic Flow Meter, 24" (750mm)	1.00 ea			31,269.61 /ea	31,270					31,269.61 /ea	31,270
		Install magnetic flow meter, 24"	1.00 ea	799.74 /ea	800							799.74 /ea	800
		Double Strap Saddle, 30" x 1"	2.00 ea	257.08 /ea	514	319.80 /ea	640					576.88 /ea	1,154
		Install Double Strap Saddle, 30" x 1"	2.00 ea	257.07 /ea	514	319.81 /ea	640					576.88 /ea	1,154
		33.03.30.Intertie Intertie Above Grade Mechanical		/LS	16,032	/LS	134,701	/LS	2,432	/LS		/LS	153,166
		33.041.30.SIPS 30" SIPS Intertie SOG											
		Fine grade, for slab on grade, by hand	400.00 sf	0.28 /sf	113	0.01 /sf	6					0.30 /sf	119
		Fill, gravel subbase, under building slab on grade	7.41 cy	20.20 /cy	150	35.54 /cy	263					55.74 /cy	413
		Slab on grade edge forms, 7" to 12"	77.33 sf	6.64 /sf	514	1.92 /sf	148					8.56 /sf	662
		Reinforcing in place, A615 Gr 60, priced per lbs.	1,481.48 lb			0.71 /lb	1,053	0.27 /lb	400			0.98 /lb	1,453
		Concrete, ready mix, 4500 psi	9.88 CY			150.66 /CY	1,488					150.66 /CY	1,488
		Add for concrete waste, 4500 psi	0.49 cy			150.67 /cy	74					150.67 /cy	74
		Add amount for Short Loads - per concrete truck load	1.00 load			177.66 /load	178					177.66 /load	178
		Add amount for Fuel Surcharges - per concrete truck load	2.00 load			21.33 /load	43					21.33 /load	43
		Add amount for Environmental Fee - per concrete truck load	2.00 load			8.52 /load	17					8.52 /load	17
		Placing concrete, direct chute	9.88 cy	18.18 /cy	180							18.18 /cy	180
		Finishing floors, monolithic, broom finish	400.00 sf	0.70 /sf	280	0.03 /sf	11					0.73 /sf	291
		Curing, membrane spray	400.00 sf	0.08 /sf	32	0.06 /sf	23					0.14 /sf	55
		Concrete Pipe Support	4.00 ea	285.63 /ea	1,143	2,042.48 /ea	8,170					2,328.11 /ea	9,312
		33.041.30.SIPS 30" SIPS Intertie SOG		/LS	2,411	/LS	11,474	/LS	400	/LS		/LS	14,285
		02 Greenland WTP SIPS Intertie Station	1.00 LS	37,375.67 /LS	37,376	393,476.41 /LS	393,476	65,400.16 /LS	65,400	21,147.57 /LS	21,148	517,399.81 /LS	517,400
		Supervisory Control and Data Acquisition (SCADA) Design Integration											
		27.00.SCADA SCADA - Allowance - Match Deerwood WTP Tank Proposal											
		SCADA Allowance - Allowance - Match Deerwood WTP Tank Proposal	1.00 LS	/LS		/LS		62,567.32 /LS	62,567			62,567.32 /LS	62,567
		27.00.SCADA SCADA - Allowance - Match Deerwood WTP Tank Proposal		/LS		/LS		/LS	62,567	/LS		/LS	62,567

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
05		03 Supervisory Control and Data Acquisition (SCADA) Design Integration	1.00 LS	/LS		/LS		62,567.32 /LS	62,567	/LS		62,567.32 /LS	62,567
		Greenland WTP Ground Storage Tank											
	26.00.000 Electrical	Tank Site Electrical - Allowance - Match Deerwood WTP Tank Proposal											
		Tank Site Electrical - Allowance - Match Deerwood WTP Tank Proposal	1.00 LS			/LS		172,685.82 /LS	172,686			172,685.82 /LS	172,686
		26.00.000 Electrical Tank Site Electrical - Allowance - Match Deerwood WTP Tank Proposal		/LS		/LS		/LS	172,686	/LS		/LS	172,686
	31.01.001.00	Earthwork GC's											
		Mobilization: Excavator, Medium	1.00 ea	834.55 /ea	835					1,128.47 /ea	1,128	1,963.02 /ea	1,963
		Mobilization: Loader, Medium	2.00 ea	834.57 /ea	1,669					1,128.47 /ea	2,257	1,963.04 /ea	3,926
		Mobilization: Dozer, Medium	2.00 ea	834.55 /ea	1,669					1,128.48 /ea	2,257	1,963.03 /ea	3,926
		Mobilization: Compactor, Medium	2.00 ea	625.92 /ea	1,252					846.35 /ea	1,693	1,472.27 /ea	2,945
		Mobilization: Water Truck	2.00 ea	625.92 /ea	1,252					846.37 /ea	1,693	1,472.28 /ea	2,945
		Sitework Superintendent	3.00 mo	15,224.88 /mo	45,675							15,224.88 /mo	45,675
		Drug Tests	5.00 ea					101.35 /ea	507			101.35 /ea	507
		Safety Equipment - Project	1.00 ls			7,106.76 /ls	7,107					7,106.76 /ls	7,107
		Safety Equipment - Per Worker	5.00 ea			213.20 /ea	1,066					213.20 /ea	1,066
		First Aid Consumables	6.00 mo			355.34 /mo	2,132					355.34 /mo	2,132
		Test pits, Vac Truck	10.00 ea	308.41 /ea	3,084					239.74 /ea	2,397	548.15 /ea	5,481
		31.01.001.00 Earthwork GC's		/LS	55,435	/LS	10,305	/LS	507	/LS	11,425	/LS	77,672
	31.03.042.00	Earthwork Site Preparation											
		Strip and Stockpile Top Soil	266.20 cy	4.84 /cy	1,289					6.82 /cy	1,815	11.66 /cy	3,104
		Fence Demolition and Loading	432.00 lf	2.72 /lf	1,175					0.84 /lf	364	3.56 /lf	1,540
		Rough Site Grading	695.11 sy	2.91 /sy	2,020					4.09 /sy	2,844	7.00 /sy	4,863
		Silt Fence, Heavy-Duty, Subcontracted	500.00 lf					4.05 /lf	2,027			4.05 /lf	2,027
		Inlet Protection, Subcontracted	2.00 ea					101.36 /ea	203			101.36 /ea	203
		Concrete Washout Pit	1.00 ea	301.01 /ea	301					565.31 /ea	565	866.32 /ea	866
		Stabilized Construction Entrance, Clean Rock, 1-1/2" thru 3"	133.33 tn	10.51 /tn	1,401	28.43 /tn	3,790			14.11 /tn	1,881	53.04 /tn	7,072
		Filter Fabric under Stabilized Construction Entrance	166.67 sy			2.13 /sy	355					2.13 /sy	355
		Best Management Practice (BMP) Maintenance, Material	1.00 ls			710.67 /ls	711					710.67 /ls	711
		31.03.042.00 Earthwork Site Preparation		/LS	6,186	/LS	4,856	/LS	2,230	/LS	7,469	/LS	20,741
	31.18.006.00	Earthwork Structural Ex: Structural Fill											
		Structural Excavation	792.00 cy	4.84 /cy	3,835					6.82 /cy	5,400	11.66 /cy	9,236
		Structural Backfill	792.00 cy	7.26 /cy	5,753					10.23 /cy	8,100	17.49 /cy	13,853
		Construction Water for Compaction	7,920.00 gal			0.01 /gal	79					0.01 /gal	79
		Import Below Slab Aggregates / 2" Overexcavation Fill	1,092.96 tn	7.26 /tn	7,939	21.32 /tn	23,302			10.23 /tn	11,178	38.81 /tn	42,420
		31.18.006.00 Earthwork Structural Ex: Structural Fill		/LS	17,528	/LS	23,381	/LS		/LS	24,679	/LS	65,588
	32.09.003.00	Ext. Improve: Restore-Landscape: Landscaping											
		Topsoil replacement including fine grade Topsoil replacement including fine grade, small crew	266.20 cy	6.57 /cy	1,750					7.35 /cy	1,956	13.92 /cy	3,706
		Permanent Seed and Mulch	0.50 acre					2,027.00 /acre	1,014			2,027.00 /acre	1,014
		32.09.003.00 Ext. Improve: Restore-Landscape: Landscaping		/LS	1,750	/LS		/LS	1,014	/LS	1,956	/LS	4,720
	32.10.001.00	Security Fence											
		Security Fence, Chain Link, 6'	432.00 lf					31.93 /lf	13,794			31.93 /lf	13,794
		32.10.001.00 Security Fence		/LS		/LS		/LS	13,794	/LS		/LS	13,794
	33.01.002.00	Utilities GC's											
		Mobilization: Excavator, Medium	1.00 ea	834.57 /ea	835					1,128.47 /ea	1,128	1,963.04 /ea	1,963
		Mobilization: Loader, Medium	1.00 ea	834.55 /ea	835					1,128.46 /ea	1,128	1,963.01 /ea	1,963
		Mobilization: Dozer, Small	1.00 ea	625.92 /ea	626					846.37 /ea	846	1,472.29 /ea	1,472
		Mobilization: Compactor, Small	1.00 ea	625.91 /ea	626					846.36 /ea	846	1,472.27 /ea	1,472
		Mobilization: Water Truck	1.00 ea	625.92 /ea	626					846.34 /ea	846	1,472.26 /ea	1,472
		Conex Containers	6.00 mo							284.27 /mo	1,706	284.27 /mo	1,706
		Add for hydrotesting pipeline (labor & Equipment per day)	1,131.00 lf	5.88 /lf	6,648					0.92 /lf	1,045	6.80 /lf	7,693
		Add for disinfecting pipeline (labor & Equipment per day)	1,131.00 lf	5.88 /lf	6,648					0.92 /lf	1,045	6.80 /lf	7,693
		Pipeline Superintendent	3.00 mo	15,224.88 /mo	45,675							15,224.88 /mo	45,675
		Drug Tests	5.00 ea					101.35 /ea	507			101.35 /ea	507
		Safety Equipment - Project	1.00 ls			9,070.31 /ls	9,070					9,070.31 /ls	9,070
		Safety Equipment - Per Worker	5.00 ea			213.20 /ea	1,066					213.20 /ea	1,066
		First Aid Consumables	6.00 mo			355.34 /mo	2,132					355.34 /mo	2,132
		Dumpster Rental	6.00 mo			284.27 /mo	1,706					284.27 /mo	1,706
		Dumpster Pulls	6.00 ea			426.40 /ea	2,558					426.40 /ea	2,558
		Final Clean-up	1.00 ea	13,378.32 /ea	13,378	1,421.36 /ea	1,421					14,799.68 /ea	14,800
		Test pits, Vac Truck	10.00 ea	308.41 /ea	3,084					239.74 /ea	2,397	548.15 /ea	5,481
		Unload Pipeline or Yardpipe	1.00 days	863.43 /days	863					845.31 /days	845	1,708.74 /days	1,709
		33.01.002.00 Utilities GC's		/LS	79,843	/LS	17,954	/LS	507	/LS	11,835	/LS	110,139
	33.01.02.Forcemain	Relocate Forcemain											
		Water Main Pipe Demolition and Loading, 4' Deep	187.00 lf	13.36 /lf	2,498					10.93 /lf	2,044	24.29 /lf	4,542

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
33.01.08.Drain 8" Drain		2" PVC, Sch. 80, socket joint, pipe, excav/bkfill included	251.00 LF	32.60 /LF	8,181	1.48 /LF	371			37.70 /LF	9,462	71.77 /LF	18,014
		2" PVC, Sch. 80, socket joint, ELL, 45	4.00 ea	25.14 /ea	101	7.66 /ea	31					32.80 /ea	131
		Add for tie-in to existing (Adjust productivity)	1.00 ea	1,629.74 /ea	1,630	1,066.02 /ea	1,066		1,884.81 /ea	1,885	4,580.57 /ea	4,581	
		33.01.02.Forcemain Relocate Forcemain		/LF	12,410	/LF	1,468	/LF		/LF	13,390	/LF	27,267
		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	510.00 gal			0.01 /gal	5					0.01 /gal	5
		8" pipe, DI, push-on joint, excav/bkfill included, 350#	51.00 LF	32.60 /LF	1,662	23.56 /LF	1,202		37.70 /LF	1,923	93.85 /LF	4,786	
		8" DI, MJ, cap or plug	1.00 ea	85.56 /ea	86	150.30 /ea	150		98.98 /ea	99	334.84 /ea	335	
		8" DI, MJ, reducer, 8" x 6"	1.00 ea	154.82 /ea	155	222.79 /ea	223		179.07 /ea	179	556.68 /ea	557	
		Polywrap, 8" pipe	51.00 lf			0.58 /lf	30					0.58 /lf	30
		Pipe Marking, ID Tape	51.00 lf	0.60 /lf	31	0.19 /lf	9					0.79 /lf	40
33.01.16.Over Flow 16" Over Flow		Pipe Marking, ID Tape	51.00 lf	0.60 /lf	31	0.19 /lf	9					0.79 /lf	40
		Install gate valve, MJ, 8"	1.00 ea	174.62 /ea	175				157.06 /ea	157	331.68 /ea	332	
		Gate valve, iron body, resil. seat, Figd, 150#, NO, 8"	1.00 ea			710.66 /ea	711					710.66 /ea	711
		CI Valve Box & Cover, w/ Concrete Collar included	1.00 ea	174.64 /ea	175	213.18 /ea	213		157.09 /ea	157	544.91 /ea	545	
		33.01.08.Drain 8" Drain		/LF	2,283	/LF	2,543	/LF		/LF	2,515	/LF	7,340
		Bedding Stone, Material Only	35.35 tn			19.90 /tn	703					19.90 /tn	703
		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	600.00 gal			0.01 /gal	6					0.01 /gal	6
		Load Excess Spoils for Off-Site Hauling, Rubber Tire Loader, Cat 950	31.47 cy	0.26 /cy	8				0.44 /cy	14	0.70 /cy	22	
		Excess Spoils Dump Charges for 17 yd end dumps, per cy	31.47 cy			14.64 /cy	461				14.64 /cy	461	
		16" pipe, DI, RJ, excav/bkfill included, 350#	60.00 LF	32.60 /LF	1,956	92.25 /LF	5,535		37.70 /LF	2,262	162.54 /LF	9,752	
33.01.18.Drain 18" Drain		16" DI, RJ, Ell, 90	1.00 ea	228.15 /ea	228	1,463.99 /ea	1,464		263.88 /ea	264	1,956.02 /ea	1,956	
		Megalugs for DI Pipe w/ Accessories, 16"	4.00 ea	87.31 /ea	349	419.77 /ea	1,679		78.54 /ea	314	585.61 /ea	2,342	
		Polywrap, 16" pipe	60.00 lf			0.95 /lf	57					0.95 /lf	57
		Pipe Marking, ID Tape	60.00 lf	0.60 /lf	36	0.19 /lf	11					0.78 /lf	47
		33.01.16.Over Flow 16" Over Flow		/LF	2,577	/LF	9,916	/LF		/LF	2,854	/LF	15,347
		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	2,180.00 gal			0.01 /gal	22					0.01 /gal	22
		18" pipe, RCP, Class III B & S, excav/bkfill included, 0-8'	218.00 LF	20.37 /LF	4,441	32.68 /LF	7,124		23.56 /LF	5,136	76.61 /LF	16,701	
		18" bend, RCP, B & S	1.00 ea	203.72 /ea	204	490.15 /ea	490		235.61 /ea	236	929.48 /ea	929	
		Add for tie-in to existing (Adjust productivity)	1.00 ea	1,629.73 /ea	1,630	1,066.01 /ea	1,066		1,884.81 /ea	1,885	4,580.55 /ea	4,581	
		33.01.18.Drain 18" Drain		/LF	6,275	/LF	8,701	/LF		/LF	7,257	/LF	22,232
33.01.24.RW Fill 24" RW Fill		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	600.00 gal			0.01 /gal	6					0.01 /gal	6
		Load Excess Spoils for Off-Site Hauling, Rubber Tire Loader, Cat 950	41.96 cy	0.26 /cy	11				0.44 /cy	19	0.70 /cy	29	
		Excess Spoils Dump Charges for 17 yd end dumps, per cy	41.96 cy			14.64 /cy	614				14.64 /cy	614	
		24" pipe, DI, RJ, excav/bkfill included, 350#	60.00 LF	32.60 /LF	1,956	171.51 /LF	10,291		37.70 /LF	2,262	241.81 /LF	14,508	
		24" DI, RJ, Ell, 90	1.00 ea	289.28 /ea	289	3,596.00 /ea	3,596		334.57 /ea	335	4,219.85 /ea	4,220	
		24" DI, RJ, Ell, 22 1/2	1.00 ea	289.29 /ea	289	2,856.90 /ea	2,857		334.54 /ea	335	3,480.73 /ea	3,481	
		Polywrap, 24" pipe	60.00 lf			1.58 /lf	95					1.58 /lf	95
		Add for tie-in to existing (Adjust productivity)	1.00 ea	1,629.77 /ea	1,630	1,066.00 /ea	1,066		1,884.82 /ea	1,885	4,580.59 /ea	4,581	
		Pipe Marking, ID Tape	60.00 lf	0.60 /lf	36	0.19 /lf	11					0.79 /lf	47
		33.01.24.RW Fill 24" RW Fill		/LF	4,211	/LF	18,536	/LF		/LF	4,834	/LF	27,581
33.01.30.SIPS II 30" SIPS - Intertie to New Tank		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	2,750.00 gal			0.01 /gal	27					0.01 /gal	27
		30" pipe, DI, RJ, excav/bkfill included, 250#	275.00 LF	32.60 /LF	8,964	212.16 /LF	58,345		37.70 /LF	10,366	282.46 /LF	77,675	
		30" DI, RJ, Ell, 90	1.00 ea	350.38 /ea	350	5,457.99 /ea	5,458		405.23 /ea	405	6,213.60 /ea	6,214	
		30" DI, RJ, Ell, 45	3.00 ea	350.40 /ea	1,051	4,576.73 /ea	13,730		405.24 /ea	1,216	5,332.37 /ea	15,997	
		30" DI, RJ, wye	1.00 ea	525.61 /ea	526	10,631.66 /ea	10,632		607.86 /ea	608	11,765.13 /ea	11,765	
		Megalugs for DI Pipe w/ Accessories, 30"	2.00 ea	116.41 /ea	233	2,110.96 /ea	4,222		104.71 /ea	209	2,332.08 /ea	4,664	
		Megalugs for DI Pipe w/ Accessories, 30"	2.00 ea	116.42 /ea	233	2,110.95 /ea	4,222		104.71 /ea	209	2,332.08 /ea	4,664	
		Polywrap, 30" pipe	275.00 lf			1.88 /lf	516					1.88 /lf	516
		Pipe Marking, ID Tape	275.00 lf	0.60 /lf	165	0.19 /lf	51					0.78 /lf	216
		Install gate valve, MJ, 30"	2.00 ea	535.49 /ea	1,071				481.67 /ea	963	1,017.16 /ea	2,034	
33.01.30.TkDis 30" Tank Discharge		Gate valve, iron body, solid wedge, MJ, 150#, NO, 30"	2.00 ea			58,630.54 /ea	117,261					58,630.54 /ea	117,261
		CI Valve Box & Cover, w/ Concrete Collar included	2.00 ea	174.61 /ea	349	213.20 /ea	426		157.07 /ea	314	544.88 /ea	1,090	
		33.01.30.SIPS II 30" SIPS - Intertie to New Tank		/LF	12,941	/LF	214,890	/LF		/LF	14,292	/LF	242,124
		Bedding Stone, Material Only	28.58 tn			19.90 /tn	569					19.90 /tn	569
		CMPTION Water (Check Mainline Crew for Water TK, Tank & Operator) Update Wtr \$	400.00 gal			0.01 /gal	4					0.01 /gal	4
		Load Excess Spoils for Off-Site Hauling, Rubber Tire Loader, Cat 950	27.97 cy	0.26 /cy	7				0.44 /cy	12	0.70 /cy	20	
		Excess Spoils Dump Charges for 17 yd end dumps, per cy	27.97 cy			14.64 /cy	409				14.64 /cy	409	
		24" pipe, DI, RJ, excav/bkfill included, 350#	40.00 LF	32.60 /LF	1,304	171.81 /LF	6,861		37.70 /LF	1,508	241.81 /LF	9,672	
		30" pipe, DI, RJ, excav/bkfill included, 250#	265.00 LF	32.60 /LF	8,638	212.16 /LF	56,224		37.70 /LF	9,990	282.46 /LF	74,851	

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
06	33.16.013.14B	30" DI, RJ, Ell, 90	1.00 ea	350.39 /ea	350	5,457.96 /ea	5,458			405.26 /ea	405	6,213.61 /ea	6,214
		30" DI, RJ, Ell, 45	4.00 ea	350.39 /ea	1,402	4,576.74 /ea	18,307			405.24 /ea	1,621	5,332.36 /ea	21,329
		30" DI, RJ, red. tee, 30" x 24"	1.00 ea	492.99 /ea	493	5,230.57 /ea	5,231			570.17 /ea	570	6,293.73 /ea	6,294
		30" DI, RJ, reducer, 30" x 24"	1.00 ea	321.86 /ea	322	3,439.66 /ea	3,440			372.24 /ea	372	4,133.76 /ea	4,134
		Megalugs for DI Pipe w/ Accessories, 30"	2.00 ea	116.42 /ea	233	2,110.96 /ea	4,222			104.71 /ea	209	2,332.08 /ea	4,664
		Megalugs for DI Pipe w/ Accessories, 30"	12.00 ea	116.41 /ea	1,397	2,110.95 /ea	25,331			104.71 /ea	1,257	2,332.08 /ea	27,985
		Polywrap, 24" pipe	40.00 lf			1.58 /lf	63					1.58 /lf	63
		Polywrap, 30" pipe	265.00 lf			1.88 /lf	497					1.88 /lf	497
		Add for tie-in to existing (Adjust productivity)	1.00 ea	1,629.74 /ea	1,630	1,066.00 /ea	1,066			1,884.81 /ea	1,885	4,580.55 /ea	4,581
		Add for tie-in to existing, wet tap by subcontractor ("24 on 30")	2.00 ea					13,513.47 /ea	27,027			13,513.47 /ea	27,027
		Pipe Marking, ID Tape	40.00 lf	0.60 /lf	24	0.19 /lf	7					0.78 /lf	31
		Pipe Marking, ID Tape	265.00 lf	0.60 /lf	159	0.19 /lf	49					0.78 /lf	208
		Install gate valve, MJ, 30"	1.00 ea	535.49 /ea	535					481.68 /ea	482	1,017.17 /ea	1,017
		Gate valve, iron body, solid wedge, MJ, 150#, NO, 30"	1.00 ea			58,630.53 /ea	58,631					58,630.53 /ea	58,631
		CI Valve Box & Cover, w/ Concrete Collar included	1.00 ea	174.62 /ea	175	213.20 /ea	213			157.07 /ea	157	544.89 /ea	545
		33.01.30.TkDis 30" Tank Discharge		/LF	16,668	/LF	186,581	/LF	27,027	/LF	18,468	/LF	248,744
		1.1MG Storage Tank											
		Prestressed Concrete Ground Storage Tank	1,100,000.00 gal					0.60 /gal	656,957			0.60 /gal	656,957
		30" Water Fill Pipe	1.00 ls					62,567.32 /ls	62,567			62,567.32 /ls	62,567
		24" RW fill	1.00 ls					43,797.14 /ls	43,797			43,797.14 /ls	43,797
		30" Discharge	1.00 ls					18,770.20 /ls	18,770			18,770.20 /ls	18,770
		Vortex Breaker	1.00 ls					2,502.70 /ls	2,503			2,502.70 /ls	2,503
		24" Tank discharge	ls					/ls				/ls	
		Tank Overflow	1.00 ls					31,283.65 /ls	31,284			31,283.65 /ls	31,284
		Tank Drain	1.00 ls					31,283.66 /ls	31,284			31,283.66 /ls	31,284
		Tray Aerators	1.00 ls					81,337.52 /ls	81,338			81,337.52 /ls	81,338
		Ventilation	1.00 ls					37,540.40 /ls	37,540			37,540.40 /ls	37,540
		Level Controls	1.00 ls					3,128.36 /ls	3,128			3,128.36 /ls	3,128
		Emergency Overflows	1.00 ls					10,010.77 /ls	10,011			10,010.77 /ls	10,011
		Handrail	1.00 ls					10,010.78 /ls	10,011			10,010.78 /ls	10,011
		Stairs	1.00 ls					88,219.92 /ls	88,220			88,219.92 /ls	88,220
		Ladder	1.00 ls					6,256.74 /ls	6,257			6,256.74 /ls	6,257
		Baffles	1.00 ls					175,336.17 /ls	175,336			175,336.17 /ls	175,336
		Coatings	1.00 ls					166,641.80 /ls	166,642			166,641.80 /ls	166,642
06	26-xxx-010	33.16.013.14B 1.1MG Storage Tank	1.00 LS	/LS		/LS		1,425,644.03 /LS	1,425,644	/LS		1,425,644.03 /LS	1,425,644
		05 Greenland WTP Ground Storage Tank	1.00 LS	218,106.19 /LS	218,106	499,130.76 /LS	499,131	1,643,407.10 /LS	1,643,407	120,973.11 /LS	120,973	2,481,617.16 /LS	2,481,617
		Replacement of High Service Pumps											
		Gear											
		200HP VFD	2.00 E	572.25 /E	1,144	38,033.67 /E	76,067					38,605.92 /E	77,212
		1600A trip Plug replacement	1.00 E	1,144.47 /E	1,144	9,128.08 /E	9,128					10,272.55 /E	10,273
		Sawcut and Patch Concrete by cu feet	200.00 E					21.77 /E	4,354			21.77 /E	4,354
		Enclosed Circuit Breaker NEMA 1 400A 3P 600V	2.00 E	534.10 /E	1,068	6,085.39 /E	12,171					6,619.48 /E	13,239
		Circuit Breaker Mounting Hardware 400A	2.00 E	143.05 /E	286	22.83 /E	46					165.88 /E	332
		Hvy Duty NonFused Safety Switch NEMA 4X 400A 3P 600V	2.00 E	534.10 /E	1,068	11,249.60 /E	22,499					11,783.70 /E	23,567
		Safety Switch Mounting Hardware - 400A	2.00 E	143.07 /E	286	98.89 /E	198					241.95 /E	484
		26-xxx-010 Gear			4,998		120,109		4,354				129,460
		Motors											
		Electrical Trench Excavation - Unclassified	59.26 cy	31.47 /cy	1,865							31.47 /cy	1,865
		Electrical Trench Excavation - Layback - Unclassified	59.26 cy	42.92 /cy	2,543							42.92 /cy	2,543
		Electrical Trench Bedding - Crushed Gravel	7.41 cy	51.42 /cy	381	45.65 /cy	338			8.39 /cy	62	105.45 /cy	781
		Electrical Trench Backfill - Reuse Trench Spoils	96.30 cy	25.75 /cy	2,480					15.11 /cy	1,455	40.86 /cy	3,935
		Electrical Trench Spoils - Waste on Site	22.22 cy	14.31 /cy	318					10.08 /cy	224	24.38 /cy	542
		2500 psi Duct Bank Concrete	14.82 cy	61.99 /cy	918	174.96 /cy	2,592					236.95 /cy	3,510
		Add Color Die for Duct Bank Concrete	14.82 cy			27.39 /cy	406					27.39 /cy	406
		Duct Bank Reinforcing Re-bar #4	800.00 lf	0.95 /lf	763	0.76 /lf	610					1.72 /lf	1,373
		Duct Bank Reinforcing Re-bar #4 (Ties)	800.00 lf	2.38 /lf	1,907	0.79 /lf	634					3.18 /lf	2,542
		Hex Nut 3/8"	8.00 E			0.46 /E	4					0.46 /E	4
		Hex Screw 3/8" x 1"	8.00 E			0.14 /E	1					0.14 /E	1
		THHN-THWN Copper Stranded 1/C # 6	8.00 lf	1.15 /lf	9	0.63 /lf	5					1.78 /lf	14
		THHN-THWN Copper Stranded 1/C # 350	24.00 lf	3.82 /lf	92	7.54 /lf	181					11.36 /lf	273
		XHHW Copper Stranded 1/C # 3	140.00 lf	1.72 /lf	240	1.23 /lf	172					2.94 /lf	412
		XHHW Copper Stranded 1/C # 3	140.00 lf	1.72 /lf	240	1.23 /lf	172					2.94 /lf	412
		XHHW Copper Stranded 1/C # 3	140.00 lf	1.72 /lf	240	1.23 /lf	172					2.94 /lf	412
		XHHW Copper Stranded 1/C # 3	140.00 lf	1.72 /lf	240	1.23 /lf	172					2.94 /lf	412

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
		XHHW Copper Stranded 1/C # 3	250.00 lf	1.72 /lf	429	1.23 /lf		307				2.94 /lf	736
		XHHW Copper Stranded 1/C # 3/0	420.00 lf	2.58 /lf	1,082	4.31 /lf		1,812				6.89 /lf	2,894
		XHHW Copper Stranded 1/C # 3/0	420.00 lf	2.58 /lf	1,082	4.31 /lf		1,812				6.89 /lf	2,894
		XHHW Copper Stranded 1/C # 3/0	420.00 lf	2.58 /lf	1,082	4.31 /lf		1,812				6.89 /lf	2,894
		XHHW Copper Stranded 1/C # 3/0	420.00 lf	2.58 /lf	1,082	4.31 /lf		1,812				6.89 /lf	2,894
		XHHW Copper Stranded 1/C # 3/0	3,000.00 lf	2.58 /lf	7,725	4.31 /lf		12,943				6.89 /lf	20,668
		GRC Conduit @ Level 2 2"	100.00 lf	14.31 /lf	1,431	6.61 /lf		660				20.91 /lf	2,091
		GRC Conduit @ Level 2 2"	90.00 lf	14.31 /lf	1,288	6.60 /lf		594				20.91 /lf	1,882
		GRC Conduit @ Level 2 2"	100.00 lf	14.31 /lf	1,431	6.61 /lf		660				20.91 /lf	2,091
		GRC Conduit @ Level 2 2"	90.00 lf	14.31 /lf	1,288	6.61 /lf		594				20.91 /lf	1,882
		GRC Elbow 2"	8.00 E	41.96 /E	336	49.49 /E		396				91.45 /E	732
		GRC Elbow 2"	8.00 E	41.97 /E	336	49.49 /E		396				91.45 /E	732
		GRC Elbow 2"	8.00 E	41.96 /E	336	49.49 /E		396				91.45 /E	732
		GRC Elbow 2"	8.00 E	41.96 /E	336	49.49 /E		396				91.45 /E	732
		GRC Coupling 2"	16.00 E	8.58 /E	137	11.68 /E		187				20.27 /E	324
		GRC Coupling 2"	16.00 E	8.58 /E	137	11.68 /E		187				20.27 /E	324
		GRC Coupling 2"	16.00 E	8.58 /E	137	11.69 /E		187				20.27 /E	324
		GRC Coupling 2"	16.00 E	8.58 /E	137	11.69 /E		187				20.27 /E	324
		Locknut 2"	8.00 E	4.77 /E	38	3.97 /E		32				8.74 /E	70
		Locknut 2"	8.00 E	4.77 /E	38	3.97 /E		32				8.74 /E	70
		Locknut 2"	8.00 E	4.77 /E	38	3.97 /E		32				8.74 /E	70
		Locknut 2"	8.00 E	4.77 /E	38	3.97 /E		32				8.74 /E	70
		Ins Grounding Bushing 2"	4.00 E	49.60 /E	198	34.90 /E		140				84.50 /E	338
		Ins Grounding Bushing 2"	4.00 E	49.60 /E	198	34.90 /E		140				84.49 /E	338
		Ins Grounding Bushing 2"	4.00 E	49.60 /E	198	34.90 /E		140				84.49 /E	338
		Ins Grounding Bushing 2"	4.00 E	49.60 /E	198	34.90 /E		140				84.50 /E	338
		Ins Grounding Bushing 2"	16.00 E	49.59 /E	794	34.90 /E		558				84.49 /E	1,352
		Malleable LBD Condulet - 2"	2.00 E	71.53 /E	143	165.86 /E		332				237.39 /E	475
		Malleable LBD Condulet - 2"	2.00 E	71.53 /E	143	165.87 /E		332				237.39 /E	475
		Unistrut Straps 2"	14.00 E	3.81 /E	53	4.66 /E		65				8.47 /E	119
		Unistrut Straps 2"	12.00 E	3.81 /E	46	4.66 /E		56				8.47 /E	102
		Unistrut Straps 2"	14.00 E	3.82 /E	53	4.66 /E		65				8.47 /E	119
		Unistrut Straps 2"	12.00 E	3.82 /E	46	4.66 /E		56				8.47 /E	102
		Unistrut Conduit Hanger Allowance 2"	14.00 E	5.72 /E	80	2.28 /E		32				8.00 /E	112
		Unistrut Conduit Hanger Allowance 2"	12.00 E	5.72 /E	69	2.28 /E		27				8.00 /E	96
		Unistrut Conduit Hanger Allowance 2"	14.00 E	5.72 /E	80	2.28 /E		32				8.00 /E	112
		Unistrut Conduit Hanger Allowance 2"	12.00 E	5.72 /E	69	2.28 /E		27				8.01 /E	96
		UA Sealtite Flex 3"	6.00 lf	8.58 /lf	51	26.63 /lf		160				35.21 /lf	211
		LT Flex Connector w/ Insul Throat Straight 3"	2.00 E	20.98 /E	42	349.25 /E		698				370.23 /E	740
		LT Flex Connector w/ Insul Throat 90 Deg 3"	2.00 E	23.85 /E	48	496.15 /E		992				520.00 /E	1,040
		PVC Sch 40 in Trench 2"	800.00 lf	4.20 /lf	3,357	1.32 /lf		1,052				5.51 /lf	4,409
		PVC Coated GRC in Trench 2"	100.00 lf	11.45 /lf	1,144	21.79 /lf		2,179				33.23 /lf	3,323
		PVC Coated GRC Elbow 90 deg 2"	16.00 E	61.99 /E	992	67.11 /E		1,074				129.11 /E	2,066
		PVC Coated Coupling 2"	16.00 E	11.44 /E	183	20.06 /E		321				31.50 /E	504
		PVC Base Spacers < 2"	160.00 E	4.77 /E	763	1.52 /E		243				6.29 /E	1,006
		Duct Bank Warning Tape	200.00 lf	2.38 /lf	477	0.38 /lf		76				2.77 /lf	553
		PVC Solvent Cement - Qt	3.20 E	0.95 /E	3	9.13 /E		29				10.08 /E	32
		Compression Lug - 350 MCM	16.00 E	57.22 /E	916	21.63 /E		346				78.86 /E	1,262
		Termination Labor Only - # 3	4.00 E	19.08 /E	76							19.08 /E	76
		Termination Labor Only - # 3	4.00 E	19.08 /E	76							19.08 /E	76
		Termination Labor Only - # 3	4.00 E	19.07 /E	76							19.07 /E	76
		Termination Labor Only - # 3	4.00 E	19.08 /E	76							19.08 /E	76
		Termination Labor Only - # 3	2.00 E	19.08 /E	38							19.08 /E	38
		Termination Labor Only - 3/0	12.00 E	47.69 /E	572							47.69 /E	572
		Termination Labor Only - 3/0	12.00 E	47.69 /E	572							47.69 /E	572
		Termination Labor Only - 3/0	12.00 E	47.69 /E	572							47.69 /E	572
		Termination Labor Only - 3/0	12.00 E	47.69 /E	572							47.69 /E	572
		Termination Labor Only - 3/0	24.00 E	47.69 /E	1,144							47.69 /E	1,144
		480V Motor Conn Insulating Boot - # 350	8.00 E	333.81 /E	2,670	41.42 /E		331				375.23 /E	3,002
		Motor Testing & Commissioning: 200 HP / 480v / 350	2.00 E	562.71 /E	1,125							562.71 /E	1,125
		600V Megger Testing	2.00 E	23.85 /E	48							23.85 /E	48
		600V Megger Testing	2.00 E	23.84 /E	48							23.84 /E	48
		600V Megger Testing	6.00 E	23.85 /E	143							23.85 /E	143
		600V Megger Testing	2.00 E	23.85 /E	48							23.85 /E	48

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
		600V Megger Testing	6.00 E	23.84 /E	143							23.84 /E	143
		600V Megger Testing	6.00 E	23.85 /E	143							23.85 /E	143
		600V Megger Testing	2.00 E	23.84 /E	48							23.84 /E	48
		600V Megger Testing	6.00 E	23.84 /E	143							23.84 /E	143
		600V Megger Testing	2.00 E	23.85 /E	48							23.85 /E	48
		600V Megger Testing	12.00 E	23.84 /E	286							23.84 /E	286
		600V Megger Testing	1.00 E	23.85 /E	24							23.85 /E	24
		Wire Markers	4.00 E	0.96 /E	4	0.23 /E	1					1.19 /E	5
		Wire Markers	12.00 E	0.95 /E	11	0.23 /E	3					1.18 /E	14
		Wire Markers	4.00 E	0.96 /E	4	0.24 /E	1					1.19 /E	5
		Wire Markers	12.00 E	0.95 /E	11	0.23 /E	3					1.18 /E	14
		Wire Markers	4.00 E	0.96 /E	4	0.23 /E	1					1.18 /E	5
		Wire Markers	12.00 E	0.96 /E	11	0.23 /E	3					1.18 /E	14
		Wire Markers	12.00 E	0.96 /E	11	0.23 /E	3					1.18 /E	14
		Wire Markers	4.00 E	0.96 /E	4	0.23 /E	1					1.18 /E	5
		Wire Markers	24.00 E	0.95 /E	23	0.23 /E	5					1.18 /E	28
		Wire Markers	2.00 E	0.95 /E	2	0.23 /E	0					1.18 /E	2
		26-xxx-025 Motors			51,324		40,587				1,741		93,652
26-xxx-030	Controls												
		Shielded PLTC / Inst Cable 4 Pair #14	360.00 lf	2.62 /lf	944	3.88 /lf	1,397					6.50 /lf	2,341
		GRC Conduit @ Level 2 1"	100.00 lf	9.54 /lf	954	3.27 /lf	327					12.81 /lf	1,280
		Locknut 1"	4.00 E	3.81 /E	15	1.33 /E	5					5.14 /E	21
		Ins Grounding Bushing 1"	2.00 E	33.39 /E	67	18.40 /E	37					51.79 /E	104
		Unistrut Straps 1"	13.00 E	2.86 /E	37	3.20 /E	42					6.06 /E	79
		Unistrut Conduit Hanger Allowance 1"	13.00 E	3.81 /E	50	1.90 /E	25					5.72 /E	74
		Wire Markers	48.00 E	0.95 /E	46	0.23 /E	11					1.18 /E	57
		Cable Markers	6.00 E	1.91 /E	11	0.38 /E	2					2.29 /E	14
		26-xxx-030 Controls			2,124		1,845						3,969
40.PS.0010	Piping												
		Paint pipe supports, subcontracted	2.00 ea					105.11 /ea	210			105.11 /ea	210
		Paint pipe supports, subcontracted	2.00 ea					105.11 /ea	210			105.11 /ea	210
		Paint process pipe and fittings, subcontracted, priced per LF, 10" dia.	14.00 lf					18.92 /lf	265			18.92 /lf	265
		Paint process pipe and fittings, subcontracted, priced per LF, 14" dia.	14.00 lf					25.22 /lf	353			25.22 /lf	353
		Paint process pipe and fittings, subcontracted, priced per LF, 20" dia.	43.00 lf					37.84 /lf	1,627			37.84 /lf	1,627
		Paint process pipe and fittings, subcontracted, priced per LF, 24" dia.	30.00 lf					44.14 /lf	1,324			44.14 /lf	1,324
		Add for hydrotesting	2.00 line	236.97 /line	474							236.97 /line	474
		FURNISH 10" DI pipe	2.00 lf			37.08 /lf	74					37.08 /lf	74
		Install 10" DI, flanged, spool <= 10'	2.00 ea	285.53 /ea	571							285.53 /ea	571
		FURNISH 10" DI flange	4.00 ea			213.46 /ea	854					213.46 /ea	854
		FURNISH 14" DI pipe	2.00 lf			63.96 /lf	128					63.96 /lf	128
		Install 14" DI, flanged, spool <= 10'	2.00 ea	458.52 /ea	917							458.52 /ea	917
		FURNISH 14" DI flange	4.00 ea			301.91 /ea	1,208					301.91 /ea	1,208
		FURNISH 20" DI pipe	13.00 lf			83.34 /lf	1,083					83.34 /lf	1,083
		Install 20" DI, flanged, spool <= 10'	4.00 ea	594.17 /ea	2,377							594.17 /ea	2,377
		FURNISH 20" DI flange	8.00 ea			484.75 /ea	3,878					484.75 /ea	3,878
		20" DI, FL, reducer, 20" x 10"	2.00 ea	594.17 /ea	1,188	1,482.38 /ea	2,965					2,076.55 /ea	4,153
		20" DI, flanged coupling adapter	2.00 ea	553.89 /ea	1,108	647.40 /ea	1,295					1,201.29 /ea	2,403
		FURNISH 24" DI pipe	12.00 lf			104.17 /lf	1,250					104.17 /lf	1,250
		Install 24" DI, flanged, spool <= 10'	2.00 ea	709.68 /ea	1,419							709.68 /ea	1,419
		FURNISH 24" DI flange	4.00 ea			756.89 /ea	3,028					756.89 /ea	3,028
		24" DI, FL, reducer, 24" x 14"	2.00 ea	709.69 /ea	1,419	2,343.12 /ea	4,686					3,052.80 /ea	6,106
		24" DI, flanged coupling adapter	2.00 ea	666.45 /ea	1,333	776.87 /ea	1,554					1,443.31 /ea	2,887
		Pipe stand support, CS, 20"	2.00 ea	236.96 /ea	474	1,121.17 /ea	2,242					1,358.12 /ea	2,716
		Pipe stand support, CS, 24"	2.00 ea	236.95 /ea	474	1,672.92 /ea	3,346					1,909.87 /ea	3,820
		10" Bolt & Gasket Kits, CS, 150#	4.00 ea	130.33 /ea	521	26.49 /ea	106					156.81 /ea	627
		14" Bolt & Gasket Kits, CS, 150#	4.00 ea	148.10 /ea	592	55.91 /ea	224					204.01 /ea	816
		20" Bolt & Gasket Kits, CS, 150#	10.00 ea	242.88 /ea	2,429	117.71 /ea	1,177					360.59 /ea	3,606
		24" Bolt & Gasket Kits, CS, 150#	4.00 ea	272.50 /ea	1,090	155.96 /ea	624					428.47 /ea	1,714
		Pipe Information Labels	2.00 ea	9.89 /ea	20	14.71 /ea	29					24.60 /ea	49
		Pipe Information Labels	2.00 ea	9.90 /ea	20	14.71 /ea	29					24.61 /ea	49
		Install butterfly valve, Flgd, DIP, 20"	2.00 ea	622.01 /ea	1,244							622.01 /ea	1,244
		Install butterfly valve, Flgd, DIP, 24"	2.00 ea	734.57 /ea	1,469							734.57 /ea	1,469
		FURNISH Butterfly valve, iron body, Flgd, HWO, 150#, 20"	2.00 ea			3,925.56 /ea	7,851					3,925.56 /ea	7,851
		FURNISH Butterfly valve, iron body, Flgd, HWO, 150#, 24"	2.00 ea			5,888.34 /ea	11,777					5,888.34 /ea	11,777

Bid Item	WorkActiv	Description	Takeoff Quantity	Labor Cost/Unit	Labor Amount	Material Cost/Unit	Material Amount	Sub Cost/Unit	Sub Amount	Equip Cost/Unit	Equip Amount	Total Cost/Unit	Total Amount
		Install check valve, Flgd, DIP, 20"	2.00 ea	622.00 /ea	1,244							622.00 /ea	1,244
		FURNISH Check valve, iron body, rubber flapper, flgd, 150#, 20"	2.00 ea			14,713.48 /ea	29,427					14,713.48 /ea	29,427
		40.PS.0010 Piping			20,383		78,834		3,990				103,207
44.42.56.02		Horizontal Split Case Pump											
		Demo Existing housekeeping pad	2.00 ea	167.58 /ea	335	220.70 /ea	441					388.28 /ea	777
		Edge forms, housekeeping pads >6" Deep	28.00 sf	7.12 /sf	199	1.99 /sf	56					9.11 /sf	255
		Speed Dowels, #4	16.00 ea	11.48 /ea	184	13.24 /ea	212					24.72 /ea	396
		Reinforcing in place, A615 Gr 60, priced per lbs.	133.33 lb			1.47 /lb	196	0.56 /lb	75			2.03 /lb	271
		Concrete, ready mix, 4500 psi	0.89 CY			213.37 /CY	189					213.37 /CY	189
		Add for concrete waste, 4500 psi	0.04 cy			213.18 /cy	9					213.18 /cy	9
		Add amount for Short Loads - per concrete truck load	4.00 cy			213.34 /cy	853					213.34 /cy	853
		Placing concrete, direct chute wheel barrow	0.89 cy	94.37 /cy	84							94.37 /cy	84
		Finish housekeeping pads	24.00 sf	2.02 /sf	48							2.02 /sf	48
		Sack rub	28.00 sf	1.68 /sf	47	0.07 /sf	2					1.75 /sf	49
		Curing, membrane spray	24.00 sf	0.35 /sf	8	0.61 /sf	15					0.96 /sf	23
		Functional Testing, Pumps, 200 hp	2.00 ea	172.57 /ea	345	147.14 /ea	294					319.70 /ea	639
		Align Pump & Motor, 200 hp	2.00 ea	258.85 /ea	518			1,471.41 /ea	2,943			1,730.26 /ea	3,461
		Vibration Testing, Pumps, 200 hp	2.00 ea	86.29 /ea	173			490.47 /ea	981			576.75 /ea	1,154
		Pressure indicators	4.00 ea	64.71 /ea	259	367.84 /ea	1,471					432.55 /ea	1,730
		Sleeved anchor bolts - Medium	16.00 ea	15.10 /ea	242	30.90 /ea	494					46.00 /ea	736
		Non-Shrink Machine Grout	16.00 cuft	40.98 /cuft	656	108.88 /cuft	1,742					149.86 /cuft	2,398
		Grease, Oil, and Lube Pumps, 200 hp	2.00 ea	172.56 /ea	345	110.35 /ea	221					282.91 /ea	566
		FURNISH Horizontal Split-Case Pump, 200 hp	2.00 EA			68,567.33 /EA	137,135					68,567.33 /EA	137,135
		Demo pump assembly, pipe and accessories, 75 hp	2.00 ea	1,035.37 /ea	2,071	73.56 /ea	147					1,108.93 /ea	2,218
		Set pump assembly, 200 hp	2.00 ea	2,588.44 /ea	5,177	73.57 /ea	147					2,662.00 /ea	5,324
		44.42.56.02 Horizontal Split Case Pump			10,690		143,626		3,998				158,314
		06 Replacement of High Service Pumps			89,519		385,001		12,342		1,741		488,603