Design Criteria for Greenland WRF Pipelines: Water, Reclaimed Water and Sanitary Sewer Force mains

Jacksonville, FL

PREPARED FOR: JEA

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1.0 INTRODUCTION

Currently, JEA serves Duval County and portions of Nassau and St Johns Counties for wastewater service. Wastewater is generated in seven service areas south of the St Johns River: Buckman, Mandarin, Blacks Ford, Monterrey, Arlington East and Julington Creek Plantation. Significant growth is not anticipated by JEA in the Julington Creek Plantation or Monterrey service areas, however considerable growth is expected within the other service areas, as well as a substantial amount of planned development north of US Hwy 1, east of US Hwy 9B, south of Butler Boulevard and west of Nocatee Parkway. On Figure 1, the existing wastewater areas can be seen on the JEA Current WW Service Areas map.

To manage wastewater generated by the anticipated growth in these areas, JEA has proposed to add a Greenland wastewater service area and construct a new 6.0 million gallons per day (MGD) Greenland Water Reclamation Facility (WRF). The proposed wastewater service areas can be seen on Figure 2, the JEA Future WW Service Areas Map. The proposed WRF site is generally located southeast of the intersection of the E-Town Parkway exit and US Hwy 9B near the Greenland Energy Center and Greenland Water Treatment Plant. The following flows will be included in the Greenland wastewater service area:

- Redirected wastewater from the Burnt Mill Master Pump Station (MPS), which is currently handled by Arlington East WRF;
- Redirected wastewater in the US Hwy 9B area, currently directed to and handled by the Mandarin WRF;
- Transferred wastewater flow from the Nocatee development;
- Anticipated wastewater flow collection in the Greenland service area.

Figure 1: Current WW Service Areas

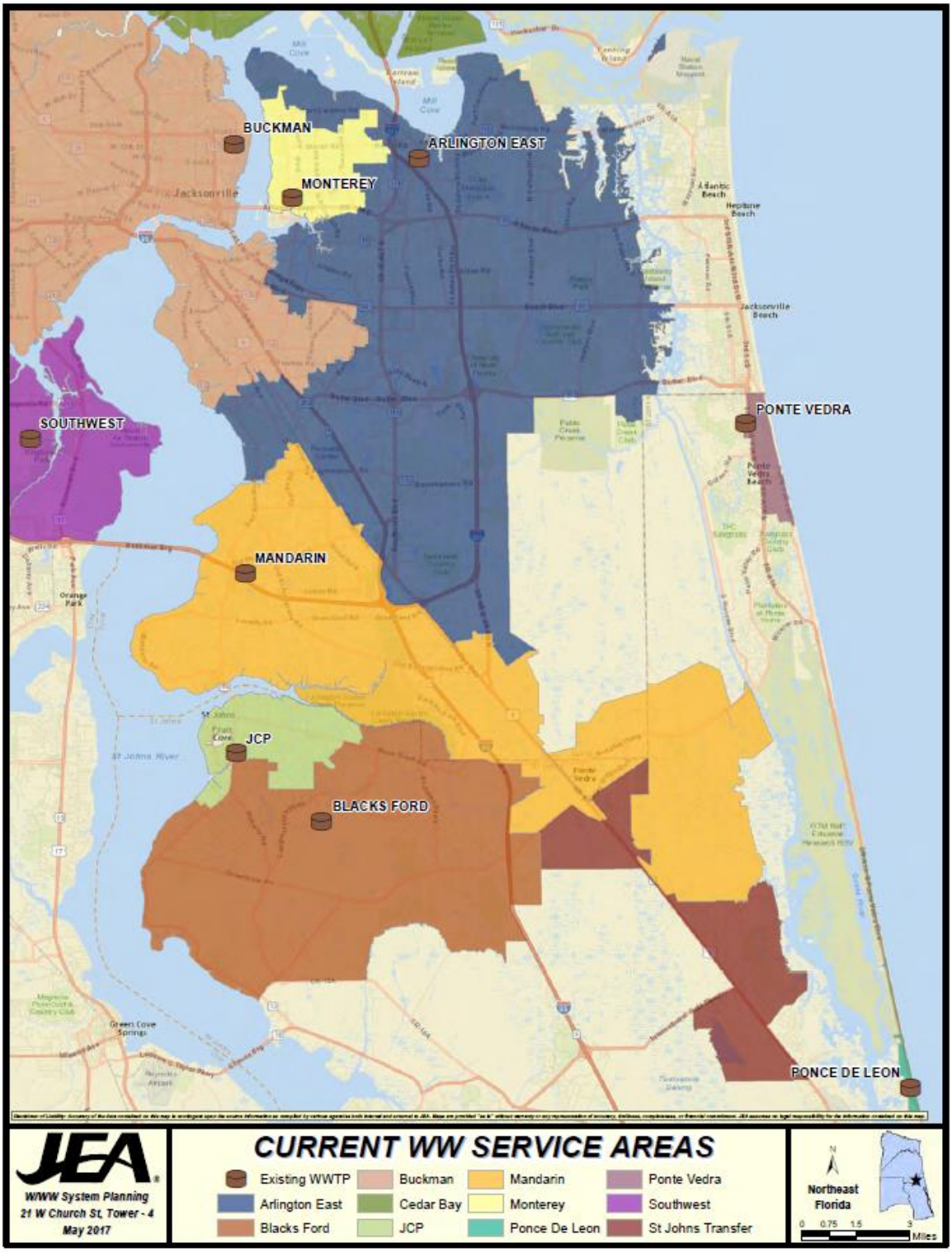
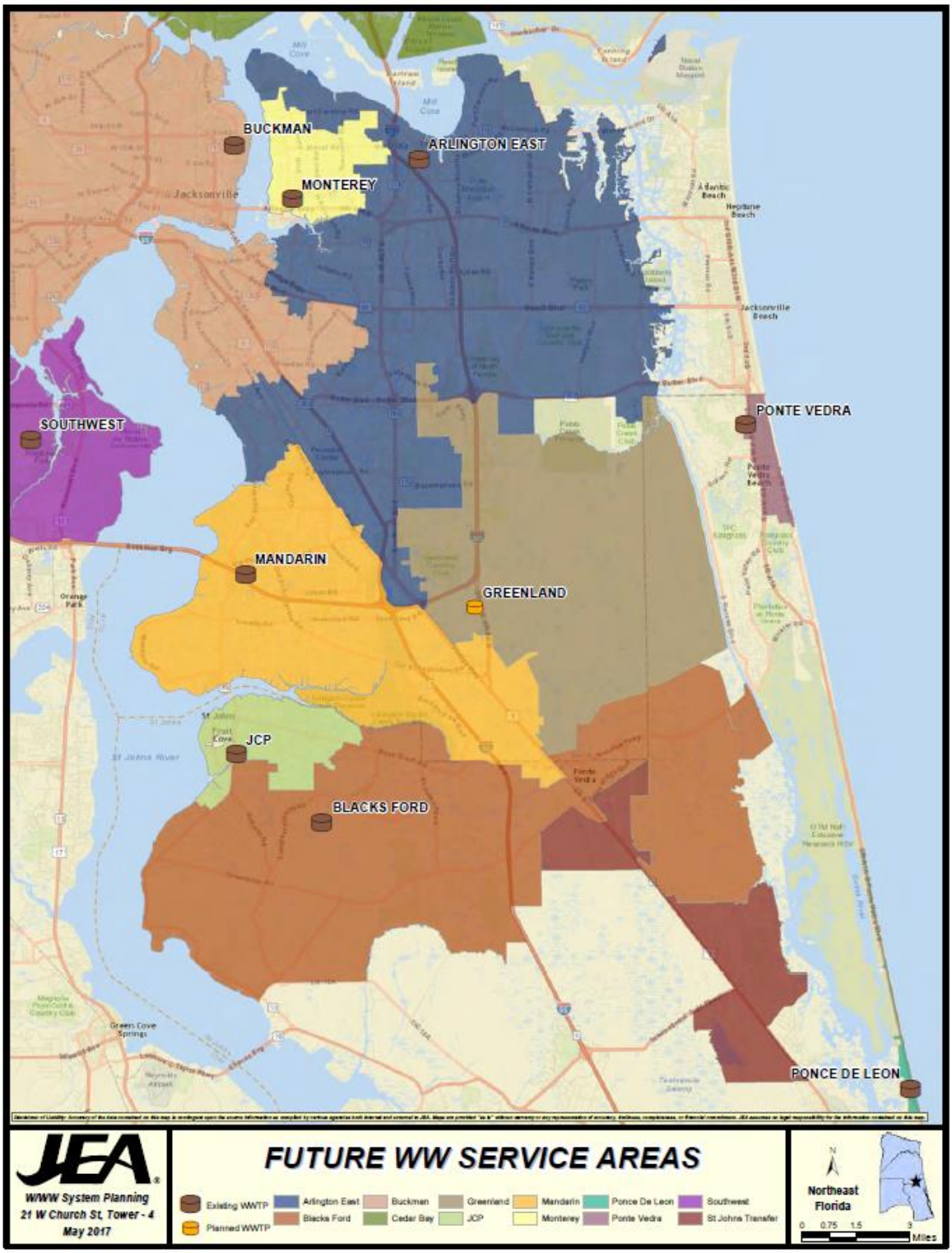


Figure 2: Future WW Service Areas



In addition to the anticipated increased wastewater generation in the Greenland wastewater service area there is projected to be a higher demand for reclaimed water for irrigation, based on the SE Regional Reclaimed Water Management Report prepared by Hatch Mott MacDonald in 2016.

With the planned construction of the new Greenland WRF, JEA has developed a Greenland WRF Pipelines project with the purpose of providing a means of transferring wastewater and reclaimed water to and from the WRF site. The project will also include a water main extension identified as part of the iWater study.

As seen on Figure 3, the scope of work for the Greenland WRF Pipelines program project includes the installation of approximately the following:

- 34,500 linear feet (LF) of 24-inch (min. diameter) force main extension (CIP 100-62);
- 39,000 LF of 24-inch (min. diameter) reclaimed water transmission main (CIP 730-12);
- 2,000 LF of 24-inch (min. diameter) reclaimed water main stub out for a future reclaimed water main to Mandarin Wastewater Treatment Plant (WWTP);
- 20,500 LF of 24-inch (min. diameter) water main extension (CIP 102-33).

Construction of the proposed force main and reclaimed water transmission main are critical path activities for the proposed Greenland WRF. Due to the aggressive schedule for the Greenland WRF and the nature of the pipe construction, JEA has decided that Progressive Design-Build (PDB) is the proper application for designing, permitting, and constructing the components of this project. The following sections present design criteria for the Greenland Road Pipe Program but are not intended to cover detailed construction execution or the exact requirements for submittals related to the same.

Figure 3: Greenland WRF Pipelines Program –
Water, Reclaimed Water, and Sanitary Sewer Force Mains General Layout

1.1 Force Main Extension

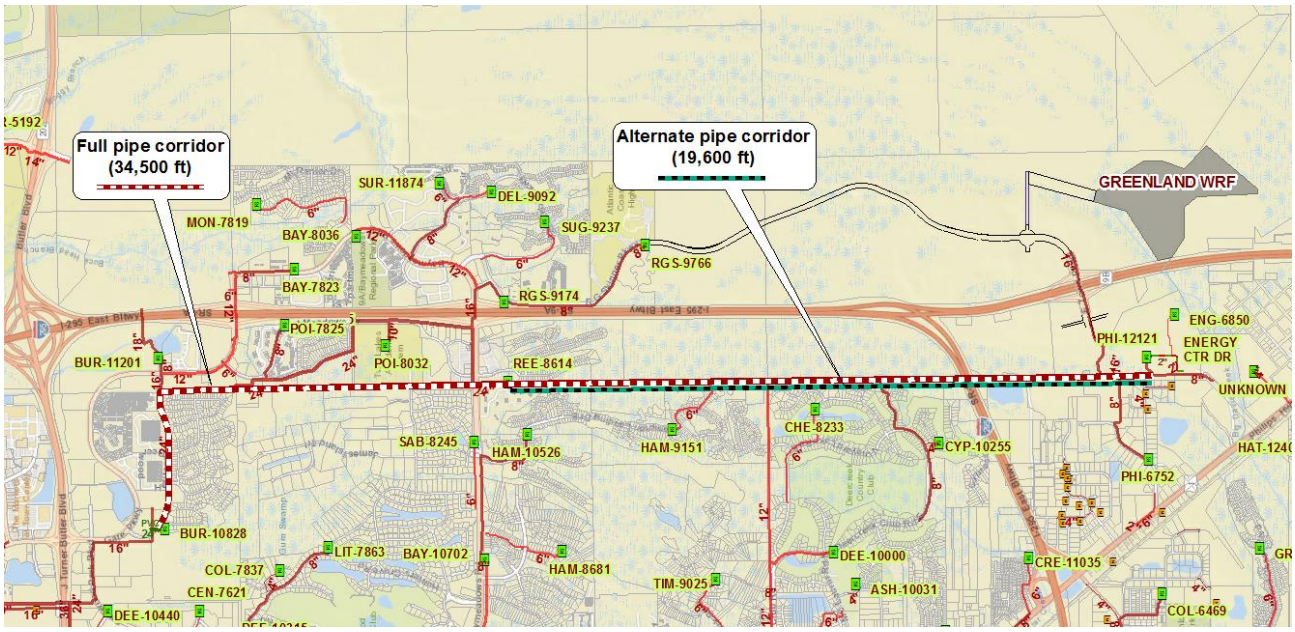
The design and installation of approximately 34,500 LF of new 24-inch (min. diameter) force main extension will redirect an estimated 2 MGD flow from the Burnt Mill MPS to the proposed Greenland WRF. The new piping is proposed to be installed along Burnt Mill Road from the pump station, south along a JEA electric transmission corridor and terminating at the Greenland WRF. As the Greenland WRF site layout is still under evaluation and in design, the PDB) Company will be required to coordinate with the project engineer and potentially the selected Greenland WRF contractor to determine and coordinate the force main connection at the WRF site. The force main extension is anticipated to require crossing under Baymeadows Road, US Hwy 9B and I-295 depending on the determined route. As part of the approach for the force main installation, the PDB Company must evaluate all pipe line routing, appropriate installation methods and evaluate cost saving measures.

The force main sizing was based on the current 3,600 gallon per minute (gpm) peak hourly flow (PHF) to the Burnt Mill MPS plus the proposed flow from the future development parcels within the basin, which includes the Skinner SE Quadrant of 2,400 gpm PHF. The current pumping capacity of the Burnt Mill MPS is 8,100 gpm.

The routing study should include the potential option of utilizing the existing 24-inch force main between the Burnt Mill MPS and the Reedy Branch MPS, which currently pumps north to Burnt Mill MPS. The routing study will additionally need to determine if the pump stations currently manifolded on the existing 24-inch force main will require modifications to achieve the new operating conditions. These pump stations include BUR-11201, BAY-7823, POI-7825, POI-8032, RGS-9174, BAY-8036, REE-8614. The flow south of Reedy Branch MPS on an existing 12-inch force main will need to be connected to the gravity pipe discharging into the Reedy Branch MPS, as the flow currently bypasses the station and is manifolded with the existing 24-inch discharge force main. If this option of utilizing the existing 24-inch force main between Burnt Mill MPS and Reedy Branch MPS is deemed feasible, the overall Greenland Road force main extension footage could be reduced by 14,900 LF and the proposed force main installation would start at the Reedy Branch MPS and travel south to the Greenland WRF.

Regardless of full or decreased installation footage, wetlands are anticipated to be encountered along the JEA electrical easement. The preliminary proposed force main route and option for using the existing force main can be seen on Figure 4.

Figure 4: Greenland WRF Pipelines Program – Sanitary Sewer Force Main Route

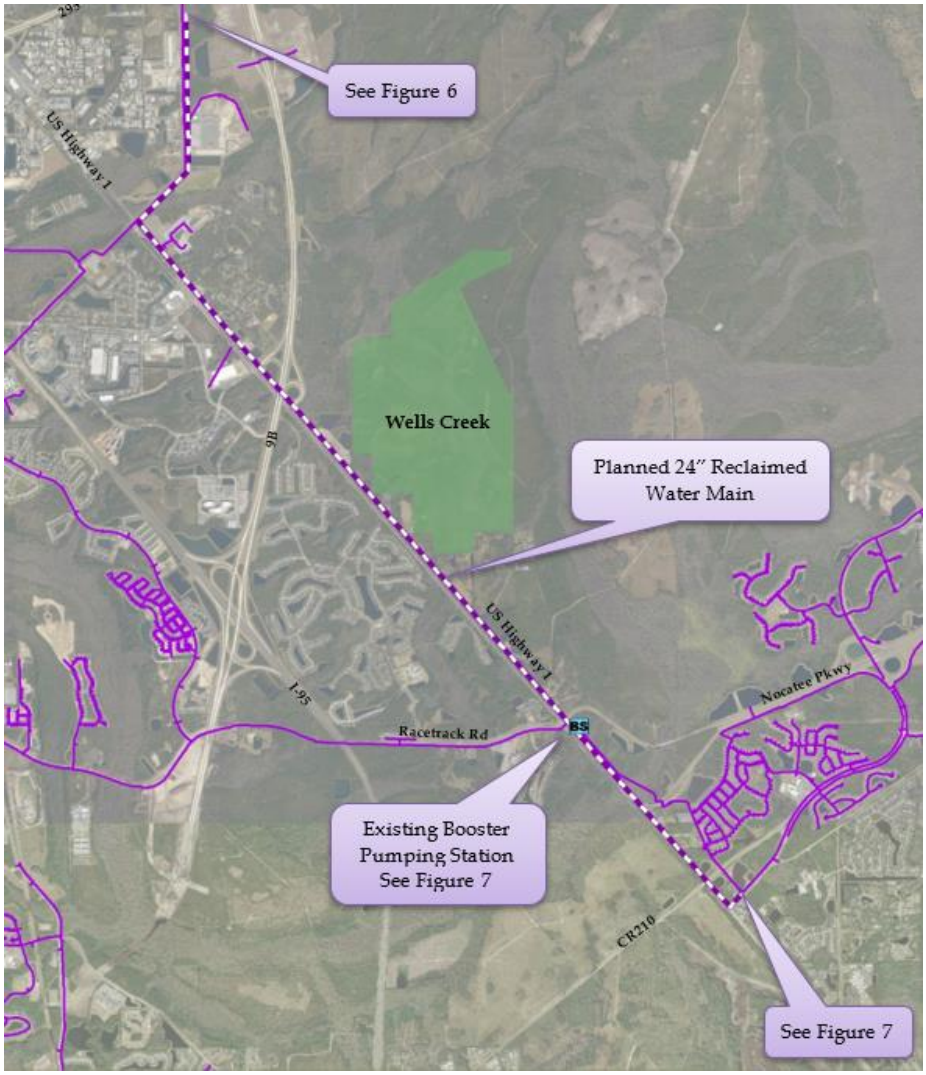


1.2 Reclaimed Water Main Extension

The design and installation of approximately 39,000 LF of new 24-inch (min. diameter) reclaimed water transmission main will transfer effluent from the Greenland WRF to serve reclaimed needs of the Nocatee and Twin Creeks developments as well as some communities along US Hwy 1 that currently utilize potable water for irrigation (existing water main jumpers will need to be removed from these communities as part of this project). The new reclaimed water main is proposed to be installed along US Hwy 1 from the Greenland WRF to an existing 24-inch stub out located at Valley Ridge Blvd and Old Dixie Hwy. Since the Greenland WRF site layout is still under evaluation, the PDB Company will need to coordinate with the project engineer and potentially the selected Greenland WRF contractor to determine and coordinate the reclaimed water main connection location from the WRF site. The reclaimed water main installation is anticipated to require crossing under US Hwy 9B, CR210, Racetrack Road and Nocatee Parkway. Wetlands impacts are not anticipated. As part of the approach for the reclaimed water main installation, the PDB Company must evaluate all pipe line routing, appropriate installation methods and evaluate cost saving measures.

The reclaimed water main sizing was based on conveying the buildout capacity (12 MGD) of the Greenland WRF reclaimed water production to customers. At 5.0 fps, up to 7,050 gpm can be conveyed through a minimum 24-inch pipe and an even greater amount depending on supply pressure and/or peak demand. The preliminary proposed reclaimed water main route can be seen on Figure 5.

Figure 5: Greenland WRF Pipelines Program – Reclaimed Water Main Route



The following three reclaimed water interties/system connections will also be required:

- Connection to an existing 20-inch reclaimed water main running north-south in the electrical easement adjacent to the Greenland Energy Center from the Arlington East WRF. The intertie will require a valve, which will remain normally closed to direct water south along US Hwy1, and opened as needed. Figure 6 depicts the northern connection.
- Connection at CR210 to a proposed 20-inch reclaimed water main to be installed under US Hwy1 (as part of a different project) which will connect to the 20-inch reclaimed water main from Nocatee to the Twin Creeks development. The proposed 20-inch reclaimed water main between Nocatee and Twin Creeks development is a conceptual project and the necessary intertie location may vary. Also, FDOT has a resurfacing project in the vicinity of US Hwy 1 and CR210 which is planned for May 2020, that will need to be taken into consideration. Figure 7 depicts the southern connection at CR210.

- An existing reclaimed water booster pump station is located at US Hwy1 and Racetrack Rd. The 24-inch reclaimed water pipe for the Greenland WRF Pipelines program will need to be connected to the suction side of the booster pump station in parallel with the existing 20-inch pipe, and similarly on the discharge side the proposed 24-inch pipe will need to be installed in parallel with the existing 20-inch pipe. Internal piping modifications to the booster pump station may be required to minimize hydraulic losses through the station. Figure 7 shows general layout of the existing reclaimed water booster pump station on US Hwy 1 and Racetrack Rd.
    - The existing reclaimed water booster pump is rated to provide 7,200 gpm of reclaimed water by utilizing four 1,800 gpm pumps at build-out. Currently, only three pumps are installed and as part of the Greenland WRF Pipelines program scope of work, the fourth 1,800 gpm pump will be added along with any required electrical upgrades.

Figure 6: Greenland WRF Pipelines Program –
Reclaimed Water Main Route – Northern Connection

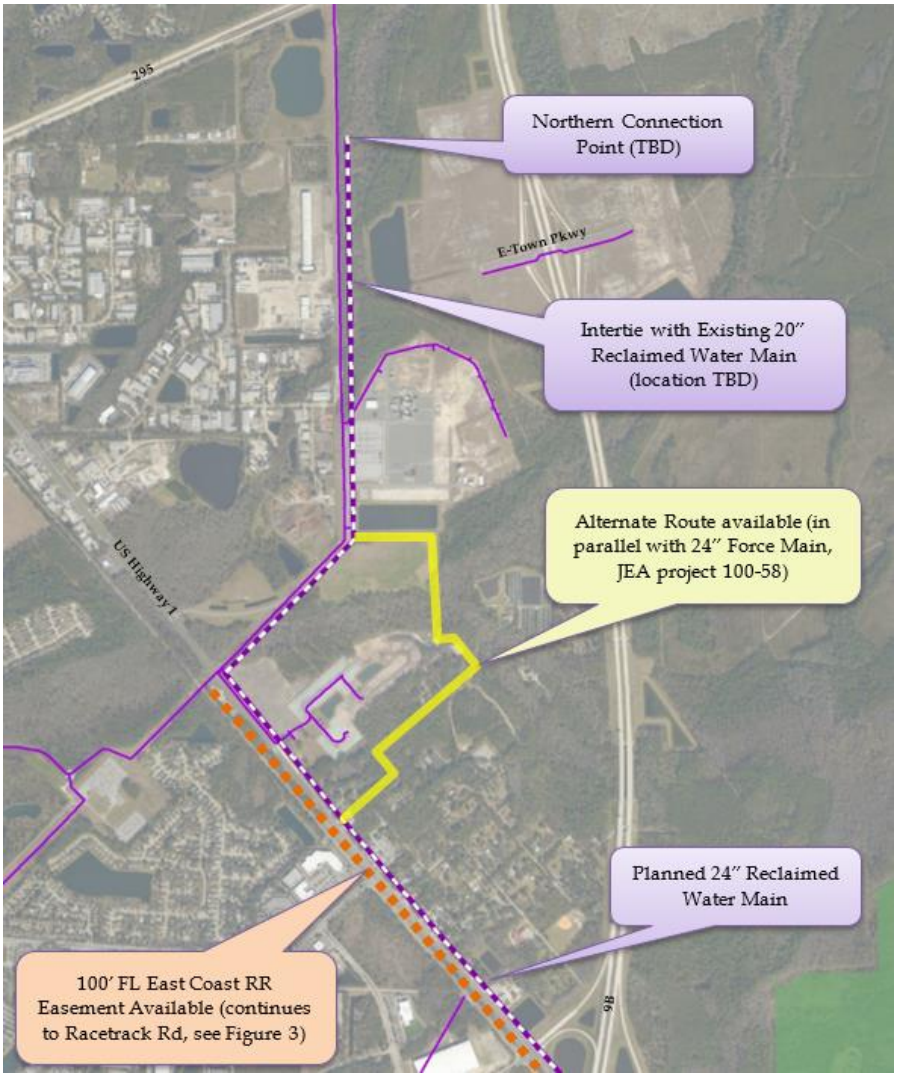
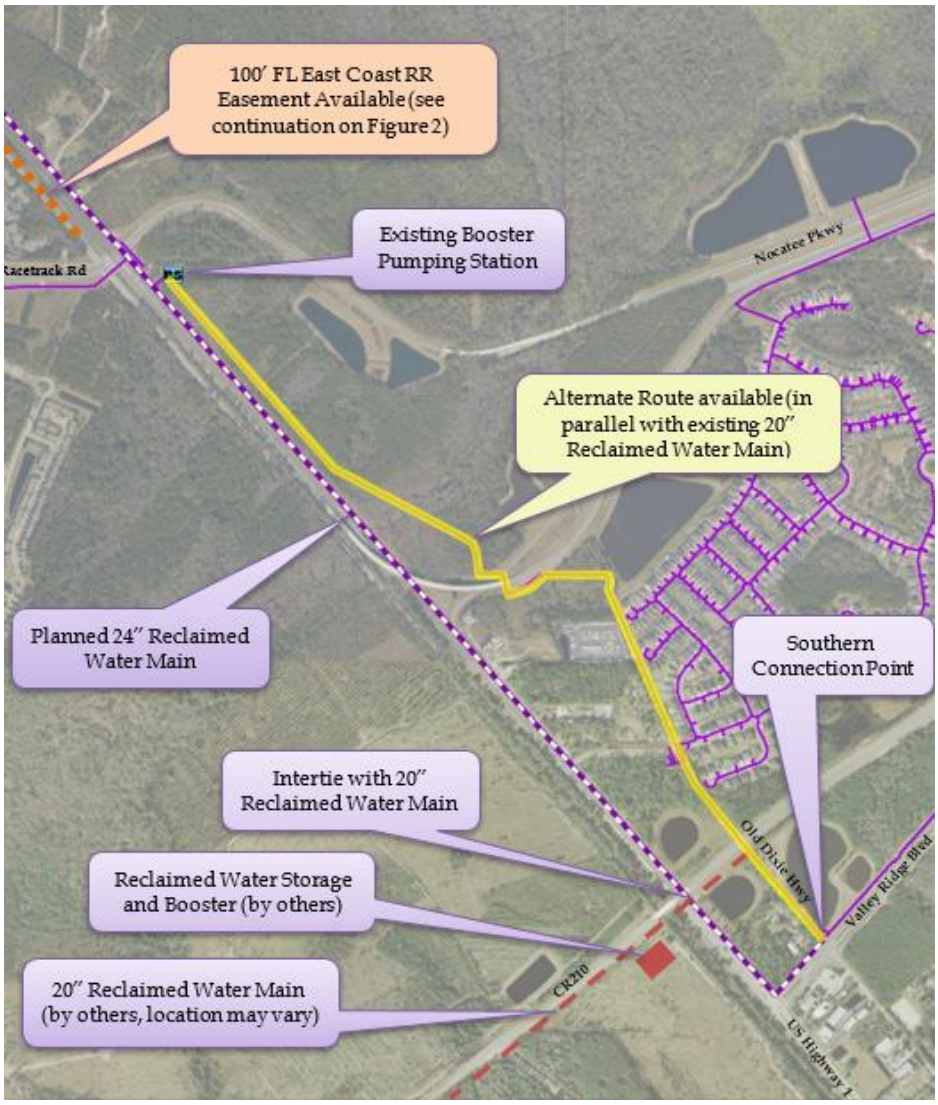


Figure 7: Greenland WRF Pipelines Program –
Reclaimed Water Main Route – Racetrack Rd. Booster Station and Southern Connection Point



1.3 Reclaim Water Main stub out for future main to Mandarin WWTP

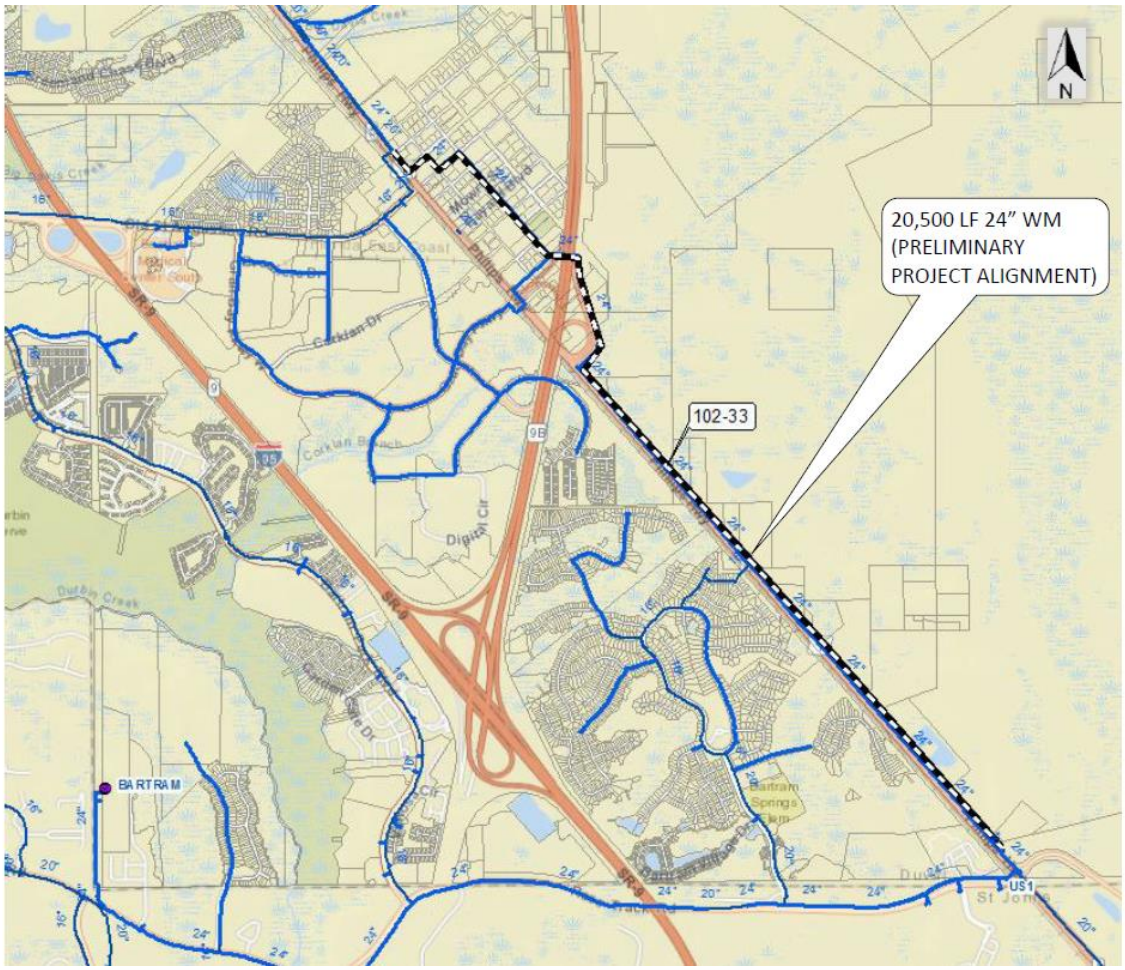
The design and installation of approximately 2,000LF of new 24-inch reclaim water main is additionally required. This main will be a stub out for a future pipeline to the Mandarin WWTP. The pipeline is proposed to be constructed from the future Greenland WWTP to approximately US Hwy 1/ Philips Hwy. The PDB company shall coordinate with the Greenland WRF Design Firm and contractor for site connection locations. As part of the approach for the reclaimed water main installation, the PDB Company must evaluate all pipe line routing, appropriate installation methods and evaluate cost saving measures.

1.4 Water Main Extension

The design and installation of approximately 20,500 LF of new 24-inch water main will assist with transferring water from the North Grid to the US1 Booster Pump Station (BPS) which serves the South Grid and growing St. Johns County area. This connection will result in a direct offset of water withdrawal from the JEA South Grid wellfield, which is of concern, and will assist with expanding the hydraulic influence of the Total Water Management Plan (TWMP). The US1 BPS is currently undergoing expansion to meet the growth demands and the existing 24-inch water main is not sufficient to meet future needs. The new 24-inch water main will provide added hydraulic capacity in addition to water system looping and redundancy.

The 24-inch water main is proposed to be constructed along US Hwy1 from the 24-inch stub-out to the northwest of the US Hwy 1/Philips Hwy and Judith Avenue intersection near Old St. Augustine Road to the US-1 BPS. The preliminary proposed reclaimed water main route can be seen on Figure 8. This water main extension project will include the piping needed to connect to the US 1 BPS, however, no stub-outs or connections to this water main are currently proposed. The proposed water main extension is anticipated to require crossing under multiple roadways and US Hwy 9B. Wetland and flood zone crossings will also be required. As part of the approach for the water main installation, the PDB Company must evaluate all pipe line routing, appropriate installation methods and evaluate cost saving measures.

Figure 8: Greenland WRF Pipelines Program – Water Main Route



2.0 EXISTING INFORMATION

JEA has gathered existing information which may by useful for the design and construction of the Greenland WRF Pipelines program as follows:

- JEA Technical Memorandum Index Number 100-62 – Greenland – Burnt Mill PS to GEC – Trans – FM
- JEA Technical Memorandum Index Number 102-33 TWMP – US1 BPS – Old St. Augustine Rd to US1 BPS – W
- JEA Technical Memorandum Index Number 730-12 – US-1 – Greenland WRF to CR 210 - Trans – RW
- As Built Plans for the installation of the Gate Parkway South Sewage Re-Pump Station and Area Truck Sewers (Burnt Mill MPS) dated November 9, 1994
- As Built Plans for the installation of the Racetrack Road Nocatee Reuse Booster Station dated January 2016

These documents are attached to this Design Criteria Package for information on background and existing conditions. The PDB Company may use this information, but its accuracy is not guaranteed. The PDB is encouraged to obtain its own information, as necessary, to complete the design and the construction.

3.0 DESIGN REQUIREMENTS

The Design consultant responsibilities shall include but are not limited to the following:

- Route Study
  - Pipeline routes
  - Appropriate installation methods
  - Cost saving methods
  - Identify required permanent and temporary easements
- System Modeling and Evaluation
  - Including operating conditions, system hydraulics, pressures, etc.
  - Design consultant will take full responsibility for the accuracy of the hydraulic calculations for the overall system study for pumping and transmission. Design consultant will develop signed and sealed Technical Memorandum describing the calculations performed and the overall system results obtained.
- Permitting
  - Provide assistance to JEA in filling and obtaining all applicable and necessary permits which could include but are not limited to the following agencies:
    - Florida Department of Environmental Protection (FDEP)
      - 62-604 Domestic Wastewater Collection/Transmission
      - 62-610 Reuse or Reclaimed Water and Land Application
      - 62-555 Permitting, Construction, Operation and Maintenance of Public Water Systems
    - U.S. Army Corps of Engineers (ACOE)
    - Florida Department of Transportation (FDOT)
    - City of Jacksonville (COJ)
    - St. Johns County
    - St. Johns River Water Management District (SJRWMD)
  - Assistance to include:
    - Pre-meetings with permit authorities as needed to ensure necessary approval;
    - Preparation of applications, exhibits, drawings and specifications as needed for execution of submittal;
    - Furnishing additional information about the project design as required for permit approval;
    - Submittal of application to the permitting authorities.
- Design Documents and Supporting Calculations

The minimum design requirements for all of the items included in this scope of work shall be based on the JEA Water, Wastewater and Reclaimed Water Design Guidelines, latest edition available on www.jea.com website.

3.1 Supplemental Investigation

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. Any vegetation deemed 'protected' by the governing jurisdictions including City of Jacksonville/St. Johns County protected trees should also be surveyed. If necessary, PDB Company shall engage an environmental consultant to determine the presence of jurisdictional wetlands and protected or listed species within the project construction limits. Any wetland lines or significant habitat community limits should be flagged prior to survey commencement and incorporated into survey.

The minimum design requirements for all of the items included in this scope of work shall be based on the JEA Water, Wastewater and Reclaimed Water Design Guidelines, latest edition available on www.jea.com website.

4.0 METHODS OF CONSTRUCTION

The methods of installation for the proposed force main, reclaimed water main and 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, St. Johns County and other applicable governing agencies. The PDB Company should determine the most economical pipe routing and installation methods while remaining consistent with the JEA standards and specifications. It is anticipated that open cut, horizontal directional drill (HDD) and potentially jack and bore will be required means of installation. An equivalent pipe diameter of 24-inch should be maintained for all pipelines when selecting pipe size and material.

The Design consultant shall adhere to the relevant requirements contained in the following design resources: most recent JEA Water and Sewer Standards Manual, ASCE Manuals, ASTM Standards, AWWA Standards and approved manufacturer's information.

4.1 General Requirements – Open Cut

Utilize JEA Water and Sewer Standards Manual, specifically the following Sections:

- III Water Specifications
- IV Wastewater Specifications
- V Reclaimed Water Specifications

4.2 General Requirements – HDD

Utilize JEA Water and Sewer Standards Manual. The following requirements shall be adhered to for HDD design and construction:

- Section 755 of the JEA Water and Sewer Standards Manual shall be utilized for HDD of large diameter pipes greater than 12-inches.

- The PDB Company shall consult with both an experienced HDD Contractor and an experienced HDD engineer. Sealed calculations shall be submitted to JEA as part of the design services.

4.3 General Requirements – Jack and Bore

Utilize JEA Water and Sewer Standards Manual for all State Highway crossing, specifically the following Sections:

- III Water Specifications
- IV Wastewater Specifications
- V Reclaimed Water Specifications

5.0 PROGRESSIVE DESIGN BUILD PHASES

The Greenland WRF Pipelines program is to be completed in two phases by the PDB team:

- Phase One or Design & Preconstruction Services

The proposed tasks include but not limited to the following:

  - Route Study to include an evaluation of all pipeline routes, appropriate installation methods and cost saving measures.
    - The study should take into consideration that portions of the pipeline routes are proposed along the same general corridors and will proceed at the same schedule and pace.
    - Also include evaluation of required easements.
  - Hydraulic evaluation/Modeling for reusing Reedy Branch MPS discharge force main and all impacted pump stations.
  - Overall cost and resource loaded Primavera (P6) Schedule
  - Coordination with Greenland WRF project team
  - 30% Design
  - 60% and Established Guaranteed Maximum Price (GMP)
    - Finalize and submit for permits.

- Phase Two or Final Design and Construction Services

The proposed tasks include but not limited to the following:

  - 90% Design and Lock in GMP
  - Final Design
  - Construction

6.0 REFERENCE

1. JEA Water and Sewer Standards Manual, latest edition at time of proposal submittal.
2. ASTM D2488, “Standard Practice for Description and Identification of Soils”.
3. 2017 Utility Accommodation Manual, Florida Department of Transportation, Rule 14-46.001, F.A.C. Effective July 30, 2017

4. ASCE (2014). ASCE Manuals and Reports on Engineering Practice No. 108: "Pipeline Design for Installation by Horizontal Directional Drilling", American Society of Civil Engineers, 2014.

7.0 CONSTRUCTION PERIOD

During the construction period, the PDB Company will be required to prepare and submit at a minimum the following, standard construction documents, for approval by or response from JEA:

- Cost and resource loaded P6 Schedule
- Requests for Information
- Shop Drawings
- Payment Requests
- Change Orders
- Permit Documents
- Monthly submittal of redline drawings showing all changes made during the billing period and suitable for the preparation of As Built drawings
- Public Information, notifications and coordination with JEA
- Other submittals that may be suitable for the construction approach used and that are required under the Agreement

8.0 PROJECT SCHEDULE

The anticipated project schedule is the following:

Advertise RFP for PDB Company	January 31, 2019
Proposals Due	March 5, 2019
Public Evaluation Meeting	March 26, 2019
Conduct initial Phase 1 Scope Meeting	April 10, 2019
Finalize Phase 1 Scope and Fee	May 10, 2019
Award Phase 1 to PDB Team	May 23, 2019
Kick off meeting Phase 1	June 13, 2019
30% Design-All Pipelines	April 1, 2020
60% Design- All Pipelines	July 3, 2020
Phase 2: GMP Established-RWM &WM	September 11, 2020
Phase 2: GMP Established FM	December 1, 2020
Construction Complete RWM	October 3, 2022
Construction Complete WM	October 3, 2022
Construction Complete FM	December 1, 2022

The PDB Company shall closely coordinate with the Greenland WRF Designer and contractor to ensure that all off site pipelines included under this project are installed and ready for use prior to the testing and start up activities for the proposed Greenland WRF Project.