FACILITIES PLAN

for the

WASTEWATER SYSTEM IMPROVEMENTS PROJECT

Clean Water State Revolving Fund

PREPARED FOR:

WAKULLA COUNTY

PROJECT No.: 50124954

Report Date: November 2020

PREPARED BY:

Dewberry®

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Professional Engineer's Certification

I hereby certify that I am a Licensed Professional Engineer in the State of Florida practicing with Dewberry and that I have supervised the preparation of and approve the evaluations, findings, opinions, conclusions, and technical advice hereby reported for:

Project: WAKULLA COUNTY
Wastewater System Improvements

Location: Wakulla County, Florida

____
Trevor L. Burch, P.E.
Project Manager
License No.: 85315

____
Date

Section 1 – Executive Summary

This Facilities Plan was prepared by Dewberry on behalf of Wakulla County, Florida. The purpose of this Plan is to evaluate alternatives for multiple sewer infrastructure upgrades required to maintain service within the County. The existing system serves approximately 3,344 residences and 362 commercial accounts within the County. A sewer service area map is provided in Attachment 1. The estimated current service population is approximately 8,594. This Facilities Plan addresses the sewer system improvements needed for a 20-year planning period. The recommendations from this report are consistent with the County's Comprehensive Plan.

The primary needs to be addressed within the County's wastewater system have been identified with the following categories: transmission system, treatment system, and effluent discharge system. Each of these three categories are further discussed in the appropriate sections of this report. The selected alternative for each of these categories should allow the overall wastewater system to operate properly for the next 20 years based on growth trends currently documented within the County and discussed within this report. These alternatives improve reliability and capacity while reducing negative impacts.

The total project cost for the selected alternatives is $32,527,250.00, including construction, administration, permitting, engineering, and other technical service costs. Although it is not anticipated that all projects and phases will be completed simultaneously, the following data summary represents the project as a whole to understand the overall financial impact to the County. As the proposed improvements are related to system growth, impacts to operation and maintenance costs are anticipated. However, without the projects, the system would no longer be able to provide service to the growing County and meet its needs. Due to the proposed phasing of the projects, the annual debt service will grow as additional phases are implemented. Ultimately, the anticipated annual debt service for the proposed project capital cost is $1,629,892.94, assuming 100% SRF Loan funding at 0.421% interest rate for design over a 10-year term and 0.00% interest rate for construction over a 20-year term. Pledged revenues for debt payments are the County's monthly sewer income. A utility rate and impact fee study is underway for the system by Raftelis Financial Consultants, Inc. This was planned prior to the preparation of this Facilities Plan. The findings of this report are planned to be included in their rate study. The County plans to aggressively pursue grants and other funding sources to offset the local contribution required for the completion of the proposed projects. It is anticipated that the maximum debt service presented in this report will be greatly minimized through these efforts.

Section 2 – Introduction

2.1 Project Description

The Wakulla County sewer collection and treatment system is owned and operated by the County. The system services customers who are supplied water by Talquin Electric, City of Sopchoppy, Panacea Area Water, and private wells (the County does not own or operate the water utility). The County's service area encompasses areas across both incorporated and unincorporated areas of Wakulla County. Attachment 1 is a sewer service area map and the project location map is provided in Attachment 2.

The County's estimated average service population is approximately 8,594 residents. The County currently services approximately 3,706 total connections. Of these, 3,344 are residential and 362 are commercial. All wastewater collected by the County is directed to Otter Creek WWTP (FLA010225) which is currently under construction for upgrades which will increase the permitted treatment from 0.6 MGD to 1.2 MGD.

2.2 Justification for Project

The County's sewer system has been in service for several years and continues to support a growing community. However, the demand is quickly outgrowing the system infrastructure. The WWTP is currently under a Consent Order issued by FDEP (Appendix A) which, in summary, cites issues with nitrogen exceedances in the monitoring wells at the sprayfield. Facility operations staff believe this is most likely due to overloading at the sprayfield as it is permitted for 0.600 MGD AADF and has been consistently exceeded since July 2016. Although an additional 0.6000 MGD AADF land application at the Wildwood Country Club is available after the plant upgrades (currently under construction) are complete, the County is concerned that the growth in the system will cause flow exceedances at this facility in the near future as well. Flow projections described in Section 3 of this report show exceedance of the 1.2 MGD AADF limit for treatment and discharge by 2027. Furthermore, the transmission system has grown greatly over the past several years due to population growth and septic remediation projects performed to protect Wakulla Springs. The increased flow and pressure in the existing system has caused pump upgrades to be greater and greater in size to overcome ever increasing system pressures. This causes the next project to be increased even larger to overcome the previous addition. This has become a cycle that is beginning to cause tremendous increases in capital and operational costs for new and rehabilitated lift stations. Ultimately, the selected projects should ensure that a reliable, economical, and safe sewer collection, treatment, and discharge system is in place to accommodate the citizens of Wakulla

County. The County has requested Dewberry (DEI) to conduct this planning effort in order to ensure the sewer system will be capable of meeting both its immediate and future customer demand.

2.3 Scope of Study

The scope of the Facilities Plan is described below:

- Evaluate the existing conditions of the County's sewer transmission, treatment, and effluent discharge systems.
- Build a computer model of the transmission system using SewerCAD software and run existing and future scenarios.
- Determine the sewer system's available capacity and future demand.
- Identify facility components that have inadequate capacity.
- Identify facility improvements required to meet the system's existing and future needs.
- Develop alternatives for a system improvements project that will best meet the current and future needs.
- Recommend the most cost-effective, environmentally sound facilities to meet the needs identified in the Facilities plan.
- Present a schedule of implementation for the recommended sewer system improvements.
- Identify any adverse environmental impacts and proposed mitigating measures.
- Identify a source of financing and provide an engineer's opinion of the probable cost.

Section 3 – Evaluation of Existing Sewer System

3.1 Description of Existing Facilities

Wakulla County's estimated average service population is approximately 8,594 residents (2.57 persons per household, Bureau of Economic and Business Research [BEBR] Volume 53 – Bulletin 185) consisting of 3,344 residential and 362 commercial connections. The existing service area is shown in Attachment 1. For the purpose of this report, the overall wastewater system will be reviewed as three components: the transmission system (forcemain, pump stations, etc.), the wastewater treatment plant (WWTP), and the discharge system (effluent reuse).

The transmission system consists of lines ranging in size from 2-inches and 12-inches in diameter and services the US 319 corridor from SR 267 southward to Sopchoppy, the US 98 corridor from Spring Creek Hwy to Panacea, various areas in and around Crawfordville, and some outlying communities such as Shell Point and Mashes Sands. There are a total of 88 lift stations in the collection system. Five of these are considered primary lift stations: Sopchoppy Master (LS 68), Panacea Master (LS 8), Jerry Moore (LS 76), Magnolia Gardens Master (LS 80), and Hickory Park (LS 35). Nearly all of the other lift stations pump to one of these. Those that do not are typically smaller in size and are located too far from the primary stations to be feasibly routed for repumping.

The treatment system, Otter Creek WWTP (FLA010225), is located along Lawhon Mill Road near Sopchoppy in southwestern Wakulla County. A new treatment train has recently been added and retrofitting of the existing treatment train is underway. After these improvements are completed in December 31, 2020, the WWTP's permitted capacity will be increased to 1.2 MGD AADF. Treatment is accomplished by means of an aero-mod sequox process for biological treatment, tertiary filtration using a cloth media disk filter system, and high-level disinfection via sodium hypochlorite. The effluent is treated to Advanced Wastewater Treatment (AWT) standards and Part III Public Access Reuse disinfection standards. The facility is capable of receiving and treating septage from private septage haulers. Biosolids are dried and disposed of in a Class I landfill.

The effluent discharge system is currently permitted to include discharge at two land application sites: R-001 (0.600 MGD AADF slow-rate restricted public access 40 acre spray irrigation field) and R-002 (0.600 MGD AADF slow-rate public access consisting of a General Service Area and 98 acre golf course). Although R-002 is permitted, discharge to this site is not yet allowed until the current retrofit project at the WWTP is complete. Each of these discharge sites have their own effluent pumping station. A process flow diagram showing the improvements that are currently under construction is included in Appendix B.

3.2 Evaluation of Existing System

3.2.1 Condition of Existing Infrastructure

The wastewater system is in good condition as most of the major infrastructure is new or has been rehabilitated and replaced in the past several years. The primary issue plaguing the system is capacity. For the transmission system, this translates to flow and pressure issues. For the treatment and discharge systems, this is simply available capacity related to prevent overflows and overloading of the respective systems.

Wakulla County has experienced growth in two major ways, contributing to the issues discussed within this report. First, the County has partnered with the State in massive septic remediation projects over the past several years to remove to date approximately 536 aged and failing septic systems from environmentally sensitive areas within the Wakulla Springs basin. The County plans to steadily continue these remediation projects. The exact timeframe and scope of these septic-to-sewer projects are currently being analyzed in a separate Sewer Master Plan being prepared for the Florida Department of Environmental Protection (FDEP) by Dewberry. As the Sewer Master Plan is underway, this Facilities Plan will use past trends to project septic-to-sewer growth (explained further in later sections). Second, the County has experienced higher rates of population growth over recent years. Many new developments have been added as well as an increase in new housing filling in developments left empty after the housing crisis of the late 2000's. Supporting data for this growth is provided in the Future Demand and Capacity section of this report.

Information from the WWTP is provided in Graph 3.2.2.1d which shows the demand since January 2007. Based on the projections in the following section, the maximum three-month average daily flow (MTMADF) will exceed the permitted limit in 7.3 years from present. Furthermore, FDEP requires the County to recommend WWTP upgrades 5-years prior to MTMADF reaching permitted capacity. Based on the aforementioned data, MTMADF exceedance is anticipated to occur in 2027 which would require upgrades being considered 5-years prior in 2022.

3.2.2 Future Demand and Capacity

Wakulla County's sewer system services 3,344 residences, approximately 39.6% of the total existing residences in the County. The data in the following section analyzes multiple records of growth tracked by the County. These records include BEBR data, Building Department records, Planning and Zoning development information, and WWTP flow records.

3.2.2.1 Service Area Population Projections

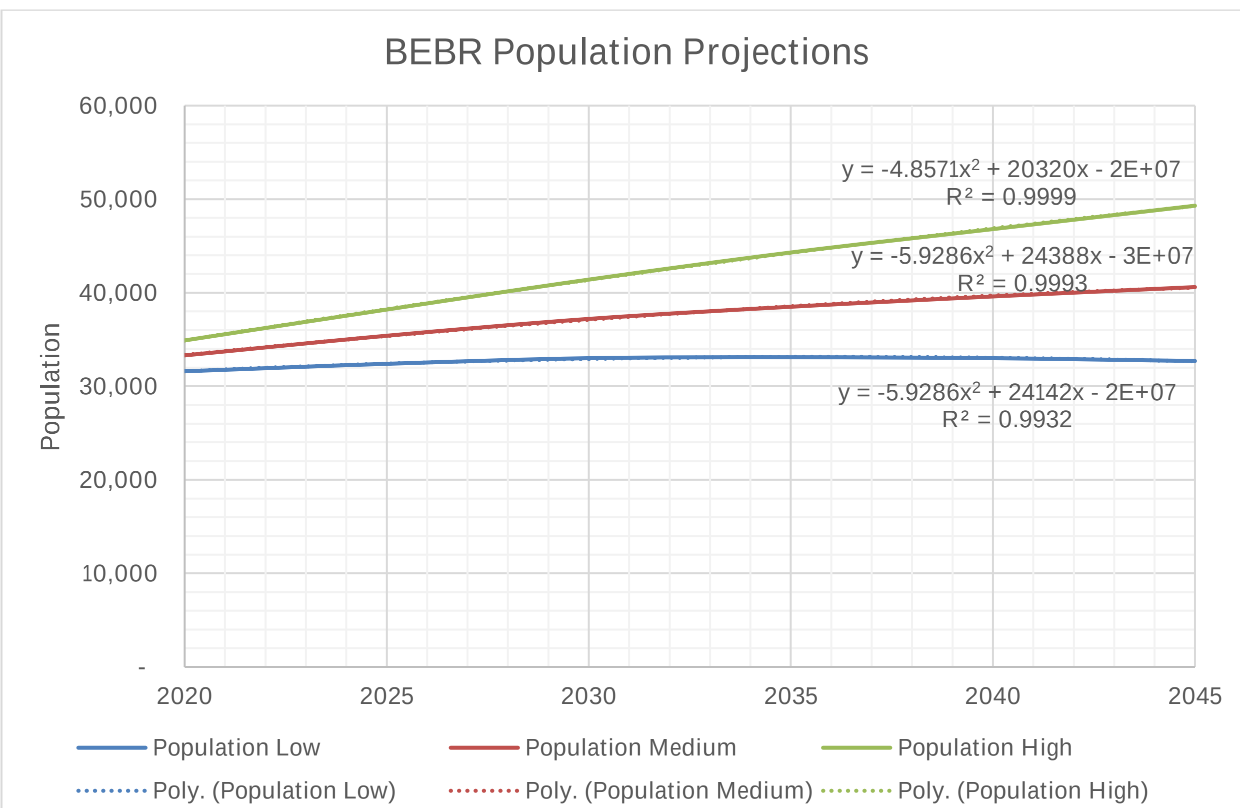
<u>BEBR Data</u>

The table and chart below show Wakulla County's data provided by the BEBR Projections of Florida Population by County (Volume 53, Bulletin 186, January 2020).

Table 3.2.2.1a – BEBR Population Projections

Year	Population		
	Low	Medium	High
2020	31,600	33,300	34,900
2025	32,400	35,400	38,200
2030	33,000	37,200	41,400
2035	33,100	38,500	44,300
2040	33,000	39,600	46,800
2045	32,700	40,600	49,300

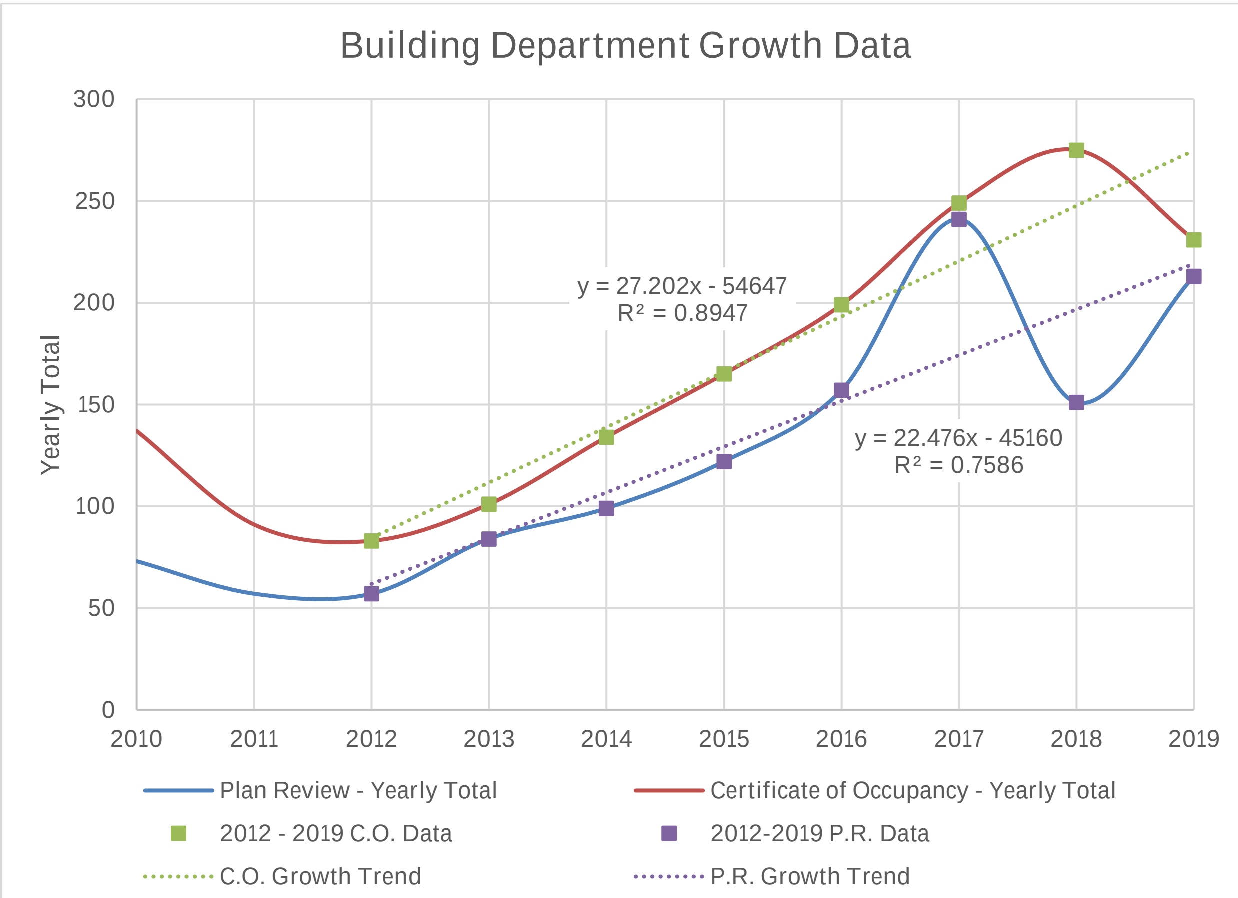
Graph 3.2.2.1a – BEBR Population Projections



Building Department Data

The Building Department provided records of Certificates of Occupancy and Plan Reviews for single family dwellings since 2010. The data is plotted in the graph below and shows the growth trend which can be seen from 2012 to present.

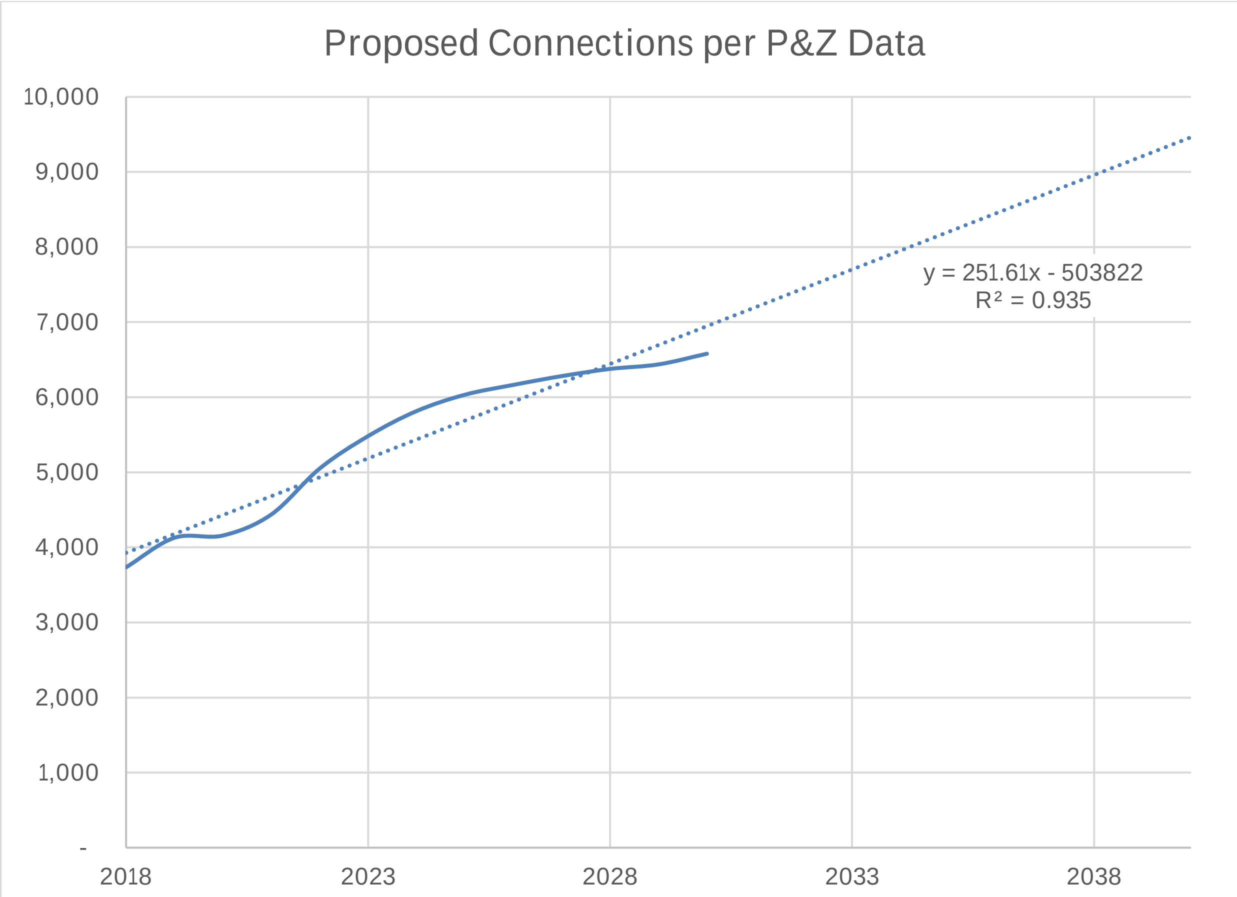
Graph 3.2.2.1b – Building Department Growth Data



Planning and Zoning Data

The County has an internal projection spreadsheet that tracks proposed developments known to the County and septic-to-sewer projects for the next 10 years. The graph below shows the number of new developments and septic-to-sewer connections anticipated by the County over the next 10 years with a trendline to extrapolate data for future years.

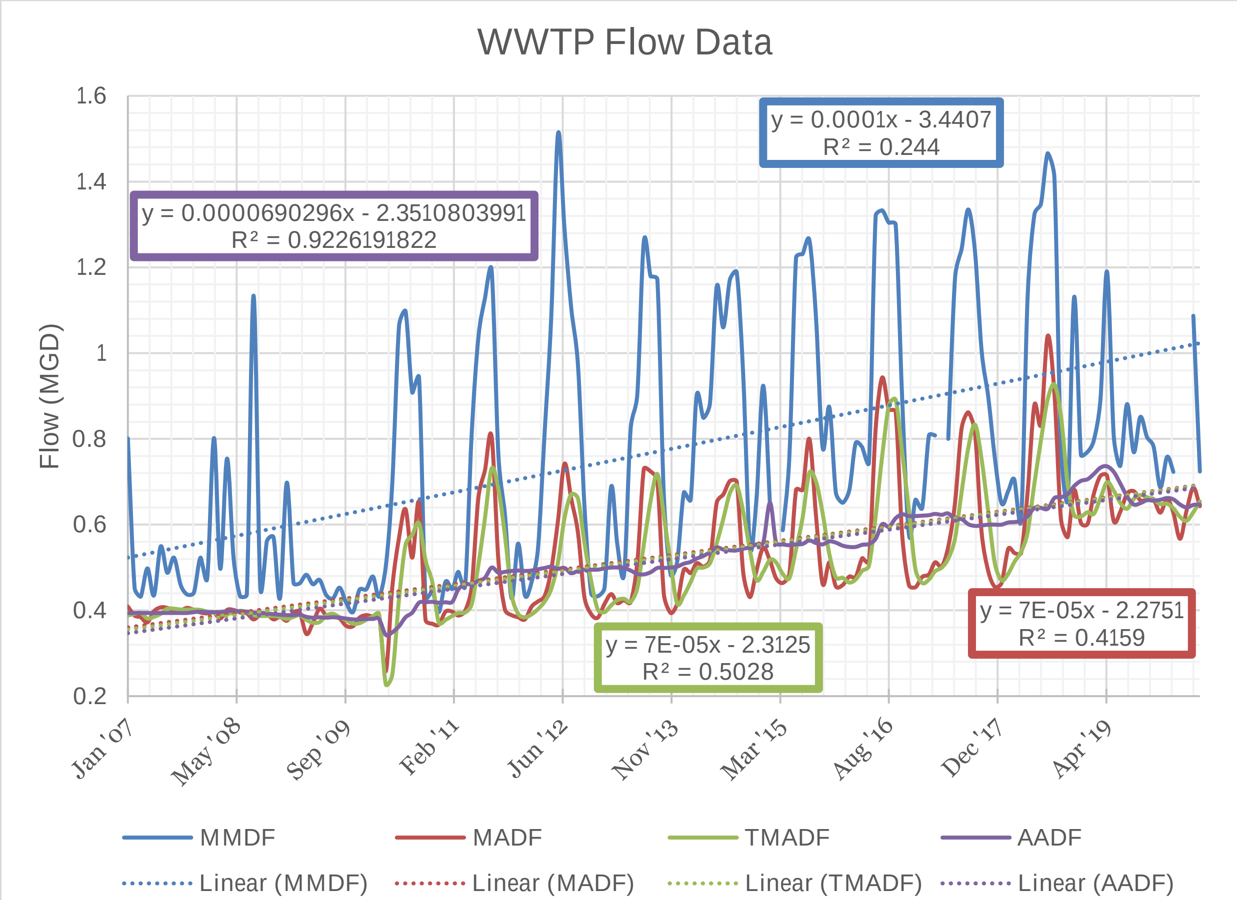
Graph 3.2.2.1c – Planning and Zoning Data



WWTP Flow Records

Flow data recorded at the WWTP is provided in the following graph. Trendlines approximating linear growth are provided for each tracked flow: Max Monthly Daily Flow (MMDF), Monthly Average Daily Flow (MADF), Three Month Average Daily Flow (TMADF), and Average Annual Daily Flow (AADF). Upon observation of each of the trendline formulas, the approximated AADF growth trendline has the highest reliability ($R^2 = 0.9226$) of the four tracked flow rates. (Note: the trendline formulas on this chart use the Excel numeric date value as "x")

Graph 3.2.2.1d – WWTP Flow Data



Comparison of Growth Rates

A summary of 2020 values compared to 2040 values along with the growth percentage is shown in the table below. Data from BEBR has already been projected by that agency. The Plan Review, Certificate of Occupancy, Planning and Zoning, and WWTP Flow data is projected by methods previously described in their respective sections.

Table 3.2.2.1b – Growth Projection Summaries

Evaluation Category	2020	2040	Growth %
BEBR - Low	31,600	33,000	104%
BEBR - Medium	33,300	39,600	119%
BEBR - High	34,900	46,800	134%
Plan Review	242	691	286%
Certificate of Occupancy	301	845	281%
Planning and Zoning	4,158	9,463	228%
WWTP Flow (AADF)	0.656	1.180	180%

The actual growth of the County's wastewater systems is based on two factors: septic-to-sewer and new developments. Upon review of the categories listed above, only the WWTP Flow (AADF) and Planning and Zoning growth rates take both catalysts for growth into consideration. The BEBR, Plan Review, and Certificate of Occupancy evaluations only take population-based growth into account. Furthermore, these projections represent the far upper and lower values in the evaluation summary. For the purposes of this report, the average of the WWTP Flow (AADF) and Planning and Zoning growth rates (204%) will be used to target a balanced growth prediction for the County.

3.2.2.2 Future Demand

Based on the aforementioned growth rate of 204% between 2020 and 2040, it is anticipated that the following values will be relevant for the wastewater system evaluation.

Table 3.2.2.2a – Present and Future System Values

Category	Year	
	2020	2040
General System		
Population Served	8,594	17,532
Service Connections	3,706	7,560
Wastewater Treatment Plant		
AADF	0.656	1.338
MADF	0.635	1.295
MTMADF	0.870	1.775

Note: MTMADF is 1.37-times the AADF per peaking factor calculated in the Capacity Analysis Report created by Baskerville-Donovan, Inc. (2020)

Assuming linear growth between 2020 and 2040, the MTMADF wastewater flow can be approximated by the formula $y = ax+b$ where y is the flow (MGD) x years from 2020. The values of a and b are constants with values of 0.04525 and 0.870, respectively. Based on this formula, MTMADF is anticipated to exceed WWTP capacity in 2027. Per FDEP guidelines, capacity increase should be considered 5-years prior to exceedance which would be 2022.

Section 4 - Environmental Impacts

4.1 Socio-Economic Conditions

Creating this Facilities Plan gives Wakulla County alternatives for multiple sewer upgrades that are required to maintain service. This plan will have a positive impact on residents within the service area because the project will allow the system to provide safe, reliable, uninterrupted sewer service. Current billing data shows 3,344 residential sewer services within the County. The BEBR's estimated residents per home for Wakulla County equates to approximately 2.57 persons per residential connection. Therefore, it is estimated that Wakulla County sewer system currently serves 8,594 people.

The 2018 US Census Bureau American Community Survey 5-Year Estimates for Wakulla County estimate approximately 11.5% for all ages, (or 14.5% of under the age of 18) live below the national poverty line. The County's median household income was $62,778 and the State of Florida's estimated median household income was $53,267.

According to the SRF Affordability Calculation Spreadsheet, the calculated Wakulla County Affordability Index is 118. An overview of Wakulla County and the State of Florida's demographic data is provided in Appendix C.

4.2 Land Use and Development

The proposed projects will be primarily located within County and State right-of-way or easements. Some of the easements will need to be procured by the County prior to construction of the project; however, no opposition is anticipated in the acquisition of such agreements.

4.3 Cultural and Historical Resources

No cultural resources are known to be within the project area. No Federal or State Historical landmarks have been identified with in the project area. No negative impacts to any cultural resource or historical sites are expected with this project.

4.4 Threatened and Endangered Species

The proposed treatment and transmission project improvements will be located within existing road corridors, right of ways, and developed areas that do not contain natural vegetation. These are areas that are regularly mowed and maintained. All vegetation in these areas has been previously removed. The proposed effluent discharge system project improvements will occur in areas that have been modified from natural conditions as well as previously undisturbed lands. There are no known rare, endangered, or threatened species of vegetation or animals within the existing facilities area. The only documented rare species noted in the Florida Natural Areas Inventory Biodiversity Matrix Query Results is the Gopher Tortoise. A copy of these reports for the project area is provided in Appendix D. The habitat of likely species indicated in this report is not consistent with the portions of the project area where existing facilities are located (developed sites and roadside right-of-way). Should any species be encountered, they will be reported to the proper agency and guidance from that agency will be utilized to proceed.

Threatened and endangered species may be present at newly acquired properties outside of the current infrastructure. Any improvements which will require development on vacant land will proceed according to all local and state permit requirements. Consultation with Florida Fish and Wildlife and the United States Army Corps of Engineers will be coordinated during the permitting process in order to mitigate potential impacts to threatened or endangered species.

4.5 Wetlands and Critical Habitats

The proposed project area includes a very small total wetland area. Wetlands encountered within the limits of proposed improvements will be protected from disturbance by the use of directional bores and/or temporarily impacted with open trenches. Wetlands will be preserved and protected by a 25-foot buffer zone. The exact location and limits of wetland impacts will be identified during design of the project and all necessary coordination with regulatory agencies will be performed throughout the permitting process. Wetland impacts are expected to be temporary and proper minimization, avoidance, and mitigation will be implemented as required. Please see Appendix E for the National Wetland Inventory map for Wakulla County.

According to the USDA Natural Resources Conservation Service, there are no prime or unique farmlands in the service area.

4.6 Surface Water Bodies

There are no Outstanding Florida Waters or Wild and Scenic rivers within the project area. Appendix F includes the 303(d) Listed Waters for the Ochlockonee/St. Marks basin which covers the project area. The proposed project is not anticipated to negatively impact water quality in surrounding water bodies. Appropriate Best Management Practices will be incorporated into both design and construction of the improvements to address stormwater pollution and erosion during project implementation. Once the improvements have been implemented there is very low risk to surface water bodies.

4.7 Floodplain

Portions of the Wakulla County's wastewater system fall within FEMA flood zones A, AE, and X. Proposed electronic controls, pumps, or other infrastructure that may be affected by flood are to be designed and constructed in compliance with best management practices and appropriate laws, rules, and codes to mitigate any potential challenges. Issues regarding the floodplain are not anticipated for this project. Appendix G contains the FEMA Flood Maps for the project area.

4.8 Climate

The Wakulla County wastewater system mainly services areas accessible from the Highway 98 and US 319 corridors, west to east from Sopchoppy to Spring Creek Highway and south to north from Panacea to Bloxham Cutoff. Wakulla County has a moderate climate. Summers are long, warm and humid. Winters are generally mild. The Gulf of Mexico moderates the maximum and minimum temperatures. According to the Wakulla County data provided by the NOAA National Center for Environmental Information, the average summer, temperature is 80˚F and the average daily high is 90˚F. In winter, the average temperature is approximately 56˚F and the average daily minimum is 44˚F. Wakulla County does experience occasional freezes between the months of November and March.

The total annual precipitation is about 46 inches. Approximately 43% of the rainfall occurs in the summer. An additional 16% occurs during the months of January, February and March. The driest months of the year are October, November, and April.

The Wakulla County service area is located near the coast; therefore, hurricanes should be considered with regard to climate effects on local infrastructure. Hurricanes in Wakulla County are most likely to occur between the months of June through November. Sections of the wastewater system are more vulnerable than others to hurricane impacts. The County attempts to mitigate these risks by elevating electrical equipment and controls above the documented floodplain and provides on-site emergency backup capabilities at critical pieces of their infrastructure.

4.9 Soils, Topography, Geology, and Groundwater

Project area soils have been mapped by the Soil Conservation Service of the U.S. Department of Agriculture. The topography within the project area is mostly flat terrain. The average elevation varies from sea level to 30 feet. The majority of the soils in the project area consist of fine sands and silty sands which are moderately drained to excessively drained, as shown in the Area Soils Map provided in Appendix H. Aggressive/corrosive soils are known to be located within the project area. Bedrock and overburden are generally deep (greater than 15 feet) and groundwater is typically encountered within this area as shallow as 2 feet deep. There are no challenges to the project design anticipated based on the soils, topography or geology. However, buoyancy of buried structures in areas with shallow groundwater will be considered during the design phase of the project.

4.10 Air Quality

The air quality in Wakulla County is high due to a lack of major sources of air emissions. The FDEP Air Quality Monitor in Wakulla County is located at St Marks Wildlife Refuge. Air quality normally ranges from good to very unhealthy, although this area usually has good to moderate air quality. The most prominent air quality issue that occurs is with particle pollution. The historical Air Quality Index for Wakulla County reports 89% percent Good days with less than 1% Unhealthy for Sensitive Groups. The remaining 11% of days are classified as Moderate. The proposed project will have no long-term adverse air quality effects.

Section 5 – Transmission System Alternatives

The main priority of the transmission system project is to reduce pressure within the forcemain leading to the WWTP while preparing for system growth. To determine the necessary improvements needed, a hydraulic model of the County's sewer system was generated using Bentley's SewerCAD software. Site inspections and interviews with County staff and system operators were also conducted to further analyze the components and challenges of the existing system.

Three alternatives were considered for the proposed transmission system improvement project. The first alternative involves increasing forcemain diameter along the existing route along with associated system upgrades. The second alternative includes upgrades to existing pipelines, system infrastructure, and the configuration of a new route from the northern pump stations to the WWTP. The third alternative is similar to Alternative Two with the exception that the new route to the WWTP is upsized sufficiently to accept flow from the entire system instead of splitting flows. A comparison of each alternative is provided at the end of this section with maps and detailed cost analyses provided in Attachments 3 – 8.

Recent projects have experienced increases in system pressure which required pumps, controls, and electrical equipment to be up-sized drastically to achieve operational values which were in prior years achieved with smaller equipment. Furthermore, the primary pumping stations within the County have no way of communicating with each other and commonly pump against each other to deliver flow to the headworks at the WWTP.

As mentioned previously, Dewberry built and used a computer model to evaluate the existing system and proposed improvements. The model results were instrumental in developing alternatives to be evaluated to provide the necessary system improvements.

5.1 Alternative One

5.1.1 Description

Alternative One considers a multi-phased approach to meeting system needs. Phase I-A includes construction of approximately 22,800 LF of 16-inch forcemain from LS 76 along US 98 to the intersection of US 319 to replace an existing 8-inch forcemain. From this intersection to the WWTP, the existing 12-inch forcemain would be replaced with approximately 20,000 LF of 20-inch forcemain during Phase I-B. The existing 8-inch and

12-inch forcemains along Sopchoppy Highway, US 319, and US 98 are proposed to be converted to reuse water lines to service the effluent reuse sites proposed in Section 7 of this report. A portion of this converted line currently services a small number of private grinder stations. These stations would need to be individually connected back to the proposed 20-inch forcemain.

Phase II-A includes construction of a new master lift station along Alexander Road on a parcel owned by the County and reroute some existing flow from the Crawfordville area to this new station. This would further reduce demand on the Hickory Park Lift Station that is responsible for re-pumping the majority of wastewater coming from the north end of the County along US 319 and the central Crawfordville area. This would include the construction of the master lift station on Alexander Road and forcemain south along Rehwinkel Road to Highway 98. Furthermore, this Phase II-A includes construction of forcemain upstream of the proposed Alexander LS to reroute existing flows to the new station. To further assist with pressure relief, a communication SCADA system is proposed to be installed at the major lift stations in the system that will allow them to intelligently control the pressure and flow rate in the system. Phase II-B is triggered by growth in the new Alexander LS basin and includes upgrades to the Palmetto LS which is currently under construction. Palmetto LS was designed to be expanded when future demand in the corridor increase but will have reduced pumping capacity at construction to meet the current system demand and not create adverse system impacts.

Phase III involves increasing the pipe size between the Hickory Park LS and its tie in point to the existing system near the intersection of High Drive and US 319. The current forcemain is 8-inch along this stretch and ties to a 12-inch main along US 319 at High Drive. This line restricts flow from the Hickory Park LS. Replacing the 8-inch with 16-inch forcemain will reduce the restriction thereby allowing the station to operate at a higher flow rate and lower pressure. This ultimately includes approximately 3,900 LF of 16-inch pipe.

Phase IV proposes to replace the existing 12-inch forcemain along US 319 with 16-inch forcemain between High Drive and the Phase I forcemain on US 98. It is anticipated that this project could be done in conjunction with the Florida Department of Transportation's (FDOT) US 319 widening efforts.

It should be noted that these changes in forcemain diameter will require replacement of pumps at some of the lift stations along the upgraded route during different phases. This is due to the performance range of the pumps and is anticipated to result in new pumps with reduced horsepower requirements, thereby providing significant energy savings to the County over time. The County has been successful in the past working with FDOT alongside their ongoing US 319 widening project to secure funding for design and construction of infrastructure. Based on past projects, FDOT has only replaced infrastructure in a like-for-like manner and the County has been responsible for any increases in infrastructure size or capacity. The cost opinion for this scenario does not include funding allocations from FDOT to ensure the financial capacity of the County should future FDOT funding not be made available.

Implementation of Alternative One should not cause adverse environmental impacts. All work is proposed to be performed within right of way controlled by the County, State, and National Forest Service or on easements. Acquisition of easements along established roadways in the National Forest will be pursued by the County. The County does not anticipate that acquisition of these easements will be problematic. As further clarification, the easements that are proposed will be within existing maintained travel ways within the National Forest and adverse impacts to the forests flora and fauna are not anticipated. Wetland impacts are not anticipated for the forcemain route. The improvements included in this alternative will improve the reliability and safety of the existing wastewater transmission system through the next 20 years. For further clarification, existing and proposed system line diagrams for this alternative and its phases are included in Attachment 3.

5.1.2 Map

The project area and proposed improvements for Alternative One are shown in Attachment 3. System line diagrams are also included in this attachment.

5.1.3 Cost Estimate

The total project cost opinion for the Alternative One wastewater transmission system improvements is estimated at $14,860,000.00, including construction, administration, permitting, engineering and other technical service costs. The alternative includes four phases (2 of which have sub-phases) to prevent oversizing the system too quickly and to reduce the capital cost required to be expended at a single time. The proposed improvements are anticipated to positively affect the Operation and Maintenance cost of the existing transmission system by reducing lift station horsepower requirements and allowing for remote station control and monitoring. A detailed breakdown of the Alternative One project costs are shown in Attachment 4.

5.1.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative One are summarized as follows:

ADVANTAGES

- Reduced system pressure which will lead to less energy consumption as system grows
- Assists to prevent overflows experienced by currently overburdened stations (decreased risk to environment)
- Provides proper capacity within transmission system
- Increases system resilience and longevity
- Remote communication and control system can reduce operation and maintenance required at stations
- Phased construction schedule allows project costs to be spread out over time and prevents oversizing the system too early
- Does not depend on National Forest Service approval of easement

DISADVANTAGES

- Requires replacement of relatively new infrastructure components
- Replacement of existing pumps with smaller pumps increases initial costs (although it provides future cost savings)
- Increases total linear footage of infrastructure requiring maintenance
- Operation and maintenance of new communication system may require specialized training for staff
- Construction along Sopchoppy Highway will be difficult due to crowding from existing utilities

5.2 Alternative Two

5.2.1 Description

Alternative Two considers a multi-phased approach to meeting system needs. Phase I-A includes construction of approximately 23,000 LF of 16-inch forcemain from LS 76 along US 98 to the intersection of US 319. Phase I-B will further extend this 16-inch forcemain an additional 22,000 LF along US 319, Floyd Gray Road, Friendship Church Road, and Lawhon

Mill Road to terminate at the WWTP. This would replace the existing 8-inch forcemain along US 98 and provide a tie in and reroute for existing 12-inch forcemain along US 319. The existing 8-inch and 12-inch forcemains along Sopchoppy Highway, US 319, and US 98 are proposed to be converted to reuse water lines to service the effluent reuse sites proposed in Section 7 of this report. A portion of this converted line currently services a small number of private grinder stations which would need to be addressed during Phase I-B. Approximately 8,700 LF of 2-inch forcemain is proposed to connect these few grinder pumps to the existing forcemain near the intersection of US 98 and Sopchoppy Highway or the proposed forcemain near Friendship Church Road, depending on their proximity.

Phase II-A includes construction of a new master lift station along Alexander Road on a parcel owned by the County and rerouting some existing flow from the Crawfordville area to this new station. This would further reduce demand on the Hickory Park Lift Station that is responsible for re-pumping the majority of wastewater coming from the north end of the County along US 319 and the central Crawfordville area. This would include the construction of the master lift station on Alexander Road and forcemain south along Rehwinkel Road to Highway 98. Furthermore, this Phase II-A includes construction of forcemain upstream of the proposed Alexander LS to reroute existing flows to the new station. To further assist with pressure relief, a communication system is proposed to be installed at the major lift stations in the collection system that will allow them to intelligently control the pressure and flow rate in the system. Phase II-B is triggered by growth in the new Alexander LS basin and includes upgrades to the Palmetto LS which is currently under construction. Palmetto LS was designed to be expanded when future demands in the corridor increase but will have reduced pumping capacity at construction to meet the current system demand and not create adverse system impacts.

Phase III involves increasing the pipe size between the Hickory Park LS and its tie in point to the existing system near the intersection of High Drive and US 319. The current forcemain is 8-inch in diameter along this stretch and ties to a 12-inch diameter main along US 319 at High Drive. The existing 8-inch forcemain restricts flow from the Hickory Park LS. Replacing this with 16-inch diameter forcemain will reduce the restriction thereby allowing the station to operate at a higher flow rate and lower pressure. This ultimately includes approximately 3,900 LF of 16-inch pipe.

Phase IV is comprised of two sub-phases. Phase IV-A proposes the construction of a parallel

16-inch forcemain through the National Forest along the Phase I-B forcemain route to the WWTP in order to split the flow in the system and provide additional capacity. Phase IV-B proposes to replace the existing 12-inch forcemain along US 319 with 16-inch forcemain between High Drive and the Phase I-B and Phase IV-A forcemain on Floyd Gray Road through the National Forest. It is anticipated that Phase IV-B will be constructed in conjunction with FDOT's widening efforts on US 319. The County successfully partnered with FDOT on previous phases of the widening effort with regards to receiving funding for utility relocations. The County will continue to pursue this for the proposed Phase IV-B project.

It should be noted that these changes in forcemain diameter will require replacement of pumps at some of the lift stations along the upgraded route during different phases. This is due to the performance range of the pumps and is anticipated to result in new pumps with reduced horsepower requirements, thereby providing significant energy savings to the County over time. The County has been successful in the past working with FDOT alongside their ongoing US 319 widening project to secure funding for design and construction of infrastructure. Based on past projects, FDOT has only replaced infrastructure in a like-for-like manner and the County has been responsible for any increases in infrastructure size or capacity. The cost opinion for this scenario does not include funding allocations from FDOT to ensure the financial capacity of the County should future FDOT funding not be made available.

Implementation of Alternative Two should not cause adverse environmental impacts. All work is proposed to be performed within right of way controlled by the County, State, and National Forest Service or on easements. Acquisition of easements along established roadways in the National Forest will be pursued by the County. The County does not anticipate that acquisition of these easements will be problematic. As further clarification, the easements that are proposed will be within existing maintained travel ways within the National Forest and adverse impacts to the forests flora and fauna are not anticipated. Wetland impacts are not anticipated for the forcemain route. The improvements included in this alternative will improve the reliability and safety of the existing wastewater transmission system through the next 20 years. For further clarification, existing and proposed system line diagrams for this alternative and its phases are included in Attachment 5.

5.2.2 Map

The project area and proposed improvements for Alternative Two are shown in Attachment 5. System line diagrams are also included in this attachment.

5.2.3 Cost Estimate

The total project cost opinion for the Alternative Two wastewater transmission system improvements is estimated at $16,650,750.00, including construction, administration, permitting, engineering and other technical service costs. The alternative includes four phases (3 of which have sub-phases) to prevent oversizing the system too quickly and to reduce the capital cost required to be expended at a single time. The proposed improvements are anticipated to positively affect the Operation and Maintenance cost of the existing transmission system by reducing lift station horsepower requirements and allowing for remote station control and monitoring. A detailed breakdown of the Alternative One project costs are shown in Attachment 6.

5.2.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Two are summarized as follows:

<u>ADVANTAGES</u>

- Reduced system pressure which will lead to less energy consumption as system grows
- Assists to prevent overflows experienced by currently overburdened stations (decreased risk to environment)
- Provides proper capacity within transmission system
- Increases system resilience and longevity
- Remote communication and control system can reduce operation and maintenance required at stations
- Phased construction schedule allows project costs to be spread out over time and prevents oversizing the system too early

<u>DISADVANTAGES</u>

- Requires replacement of relatively new infrastructure components
- Replacement of existing pumps with smaller pumps increases initial costs (although it provides future cost savings)
- Increases total linear footage of infrastructure requiring maintenance
- Operation and maintenance of new communication system may require specialized

training for staff

- Depends on National Forest Service approval of easement

5.3 Alternative Three

5.3.1 Description

Alternative Three includes the items considered in Alternative 2 with the following differences: the new forcemain route through the National Forest's road corridors is a singular 20-inch instead of parallel 16-inch forcemains and is sized to convey flow from the entire system. This alters Alternative Two's Phase I-B and removes Phase IV-A. The bullet points below describe the items included in Alternative Three:

<u>Alternative Three – Phase I (A & B)</u>

- 25,000 LF of 16-inch forcemain from LS 76 to the intersection of US 319 and Friendship Church Road
- 20,000 LF of 20-inch forcemain from the intersection of US 98 and US 319 along Floyd Gray Road, Friendship Church Road, and Lawhon Mill Road between US 319 and the WWTP
- Conversion of the existing 12-inch and 8-inch forcemains along US 319 and US 98 to reuse water lines
- Upgrades to lift stations #76, #86, and #29
- Construction of small diameter forcemain to connect grinder stations isolated by conversion of existing 12-inch forcemain to reuse water main between Sopchoppy Highway and Friendship Church Road
- Note: upgrade of forcemain between Jerry Moore LS and US 319 to be constructed during the "Jerry Moore LS Upgrades" project currently funded through the US Treasury (RESTORE Act) and under negotiation for design by Wakulla County

<u>Alternative Three – Phase II (A & B)</u>

- Construction of Alexander Lift Station
- New forcemain from Alexander LS along Rehwinkel Road to Highway 98
- Construction of new forcemain upstream of Alexander LS to reroute existing system flows from Hickory Park to Alexander LS
- Implementation of communication equipment between master lift stations
- Upgrades to Palmetto LS for further Alexander LS basin improvement

Alternative Three – Phase III

- Construction of 3,900 LF of 16-inch forcemain between Hickory Park LS and intersection of US 319 and High Drive to replace undersized 8-inch existing forcemain
- Upgrades to Hickory Park LS (LS #35)

Alternative Three – Phase IV

- Construction of 25,000 LF of 16-inch forcemain along US 319 from High Drive to Friendship Church Road to replace existing 12-inch forcemain
- Upgrades to lift station #25

Implementation of Alternative Three should not cause adverse environmental impacts. All work will be performed within right of way controlled by the County, State, and National Forest Service or on easements. Acquisition of easements along established roadways in the National Forest will be pursued by the County. The County does not anticipate that acquisition of these easements will be problematic. As further clarification, the easements that are proposed will be within existing maintained travel ways within the National Forest and adverse impacts to the forests flora and fauna are not anticipated. Wetland impacts are not anticipated for the forcemain route. The improvements included in this alternative will improve the reliability and safety of the existing wastewater transmission system through the next 20 years. For further clarification, existing and proposed system line diagrams for this alternative and its phases are included in Attachment 7.

5.3.2 Map

The project area and proposed improvements for Alternative Three are shown in Attachment 7. System line diagrams are also included in this attachment.

5.3.3 Cost Estimate

The total project cost opinion for the Alternative Three wastewater transmission system improvements is estimated at $15,020,750.00, including construction, administration, permitting, engineering and other technical service costs. The alternative includes four phases (several of which have sub-phases) to prevent oversizing the system too quickly and to reduce the capital cost required to be expended at a single time. The proposed improvements are anticipated to positively affect the Operation and Maintenance cost of the existing transmission system by reducing lift station horsepower requirements and allowing for remote station control and monitoring. A detailed breakdown of the Alternative Three project costs are shown in Attachment 8.

5.3.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Three are summarized as follows:

<u>ADVANTAGES</u>

- Reduced system pressure which will lead to less energy consumption as system grows
- Assists to prevent overflows experienced by currently overburdened lift stations (decreased risk to environment)
- Provides proper capacity within transmission system
- Increases system resilience and longevity
- Remote communication and control system can reduce operation and maintenance required at stations
- Singular upgraded forcemain route to WWTP assists in focusing operation and maintenance efforts

<u>DISADVANTAGES</u>

- Replacement of existing pumps with smaller pumps increases initial costs (although it provides future cost savings)
- Increases total linear footage of infrastructure requiring maintenance
- Operation and maintenance of new communication system may require specialized training for staff
- Directs all system flow through singular route to WWTP, reducing system redundancy
- Flushing program that may be required to maintain section of isolated 12-inch between US 319/Highway 98 intersection and WWTP
- Depends on National Forest Service approval of easement

5.4 Comparison of Alternatives

As shown, Alternative Two appears to be the most expensive and is followed by Alternative One and Three, respectively. Although Alternative Two is the costliest alternative by approximately 12%, it provides additional benefits not offered by One or Three. It provides the only option for splitting the flow between the north and eastern basins as both Alternative One and Three depend on a singular manifolded forcemain. This assists with the reduction of conflicts between master lift stations pumping against each other which can cause reduced flows and increased horsepower for the lift stations. Furthermore, the duplication of the 16-inch forcemain during Phase IV provides better operational control to the County by preventing them from oversizing the system too early. Instead of having to purchase the sections of 20-forcemain early in Phase I, the system can be monitored into the future to determine when the best time to upgrade will be. It is for these reasons that Alternative Two is the recommended project for implementation.

It should be noted, however, that both Alternative Two and Three depend on securing a right-of-way through land owned by the National Forest Service. No issues are currently anticipated with this; however, should issues arise, Alternative One will become the only viable option. This is not desirable as the area along US 319 between the intersection of US 98 and the WWTP is very congested with other utilities and construction will be difficult, potentially causing increases to the projected Alternative One probable cost opinion.

Section 6 – Treatment System Alternatives

The main priority of the treatment system project is to provide sufficient treatment capacity for the growing wastewater system within Wakulla County. To determine the necessary improvements, a capacity analysis report (CAR) was prepared by BDI in conjunction with the WWTP's most recent permit renewal. Further capacity calculations are included in Section 3 of this report denoting the need for WWTP expansion in the immediate future.

Three alternatives were considered for the proposed treatment system improvements. The first is a "do nothing" alternative. The second alternative includes construction of an additional, parallel treatment train at the existing WWTP site along with required site improvements. Alternative Three includes construction of an alternate WWTP and rerouting the existing collection and transmission system to this site for treatment. A comparison of each alternative is provided at the end of this section and detailed cost analysis of each alternative is provided in Attachments 9 – 11.

It is well documented that capacity upgrades are required at the WWTP. The plant is currently undergoing upgrades to become capable of treating 1.2 MGD to Advanced Wastewater Treatment (AWT) standards. It is imperative that these upgrades be conducted in a timely manner to prevent any moratorium on future connections or overloading at the existing facility.

6.1 Alternative One

6.1.1 Description

Alternative One is the "do nothing" alternative. Obviously, this alternative results in no system improvements and no capital costs. The results of this alternative are insufficient treatment capacity at the WWTP, thereby halting any future sewer connections. This alternative would provide no relief to system operation and maintenance

Alternative One could also cause adverse environmental impacts. The lack of increased treatment capacity would halt the septic remediation projects in the County that are designed to protect Wakulla Springs. Furthermore, this would require future development within the County to utilize septic systems, which is contradictory to the efforts made to date to reduce the number of septic systems within the County.

6.1.2 Advantages/Disadvantages

The advantages and disadvantages to Alternative One are summarized as follows:

ADVANTAGES

- No capital costs.

DISADVANTAGES

- No additional treatment capacity.
- Increased risk to the environment.
- Increased operation and maintenance costs.

6.2 Alternative Two

6.2.1 Description

Alternative Two considers the addition of a 0.6 MGD treatment train at the existing WWTP site to increase the total capacity to 1.8 MGD. This would mirror the efforts currently underway at the WWTP. It is proposed that the new treatment train utilize AeroMod technology to conform to the process at the existing facility. Also included in this upgrade are necessary site improvements including a master influent lift station with screening capabilities, site paving, an administration and maintenance building, and reuse pump station. The influent equalization basin and lift station with screening capabilities is important as it will allow the WWTP to control the influent flow rate to the treatment trains as well as reduce transmission system pressures by lowering the elevation for the point of entry of influent flows at the facility. This will result in a reduction of transmission system static head by approximately 10 feet. The additional treatment at the existing site will provide ease of maintenance and operation as staff will not be required to travel to additional sites.

It should be noted that these improvements do not include additional filtration equipment at this time. Per BDI, designers of the previous and ongoing improvements, the current filter system utilizes two basins with 5 filter discs each for a total of 10 filter discs. In previous projects, FDEP has permitted each disc as an individual filter system as each has the ability to be taken offline and isolated without impacts to the other filters. Should FDEP not allow this to be permitted as anticipated, an additional filtration basin will be required to maintain Class I Reliability at the facility.

Implementation of Alternative Two is not anticipated to cause adverse environmental impacts. All work will be performed on property owned by the County; therefore, no land acquisitions will be required. The improvements included in this alternative will increase the reliability and safety of the existing treatment system through the next 20 years.

6.2.2 Map

The project area and proposed water system improvements for Alternative Two are shown in Attachment 9.

6.2.3 Cost Estimate

The total project cost opinion for the Alternative Two treatment system improvements is estimated at $7,344,500.00, including construction, administration, permitting, engineering, and other technical services. The increase in Operation and Maintenance expenses associated with this alternative is not anticipated to be overwhelming. The increase is unavoidable as this alternative provides growth to the existing system. By locating the new infrastructure on the existing WWTP site, the additional costs are minimized as much as possible as staff and equipment will not have to travel between sites. A detailed breakdown of the Alternative Two project costs are shown in Attachment 10.

6.2.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Two are summarized as follows:

ADVANTAGES

- Increased treatment capacity.
- Improvements conveniently located on existing facility site.
- Will provide needed admin and maintenance buildings and site paving for better access.
- Decreased static head in transmission system by constructing influent pump station.
- Influent pump station will assist with peak flow attenuation through treatment trains, thereby providing potential for higher quality effluent.
- WWTP site is outside of BMAP.

DISADVANTAGES

- Increased operation and maintenance costs.

6.3 Alternative Three

6.3.1 Description

Alternative Three focuses on the construction of a new 0.6 MGD WWTP located at an alternate site within the County to increase the County's total treatment capacity to 1.8 MGD between two WWTP's. This would require acquisition of land, rerouting of major wastewater transmission system infrastructure, and potentially the construction of separate effluent discharge sites.

6.3.2 Map

No map for Alternative Three is included for reasons discussed in the Cost Estimate section, below.

6.3.3 Cost Estimate

The total project cost opinion for the Alternative Three treatment system improvements is estimated at $17,179,000.00, including construction, administration, permitting, engineering and other technical service costs. This estimate also includes probable costs for land purchase of the treatment site, connection to the existing effluent disposal system, and an estimate of transmission system re-routes that would be required to direct flow to a new WWTP. Although this project would meet the need of increased capacity, it would greatly increase Operation and Maintenance costs. Furthermore, the impacts on the existing system to make this option viable are unreasonable. A detailed breakdown of the Alternative Three project costs are shown in Attachment 11.

6.3.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Three are summarized as follows:

ADVANTAGES

- Increased treatment capacity.

DISADVANTAGES

- Exorbitant capital costs.
- Immense and intrusive rerouting of existing infrastructure.
- Land acquisition for treatment and disposal sites.
- WWTP would most likely be sited within the BMAP area.
- Increased operation and maintenance costs.

6.4 Comparison of Alternatives

As shown, the Alternative Three total project cost is higher than that of Alternative Two resulting in a higher debt service; $17,179,000.00 compared to $7,344,500.00. Alternative One has no costs associated with it but offers no improvement to treatment capacity and could result in increased risk to the environment and public health and welfare. While Alternative Two and Three offer similar improvements to the system, Alternative Two accomplishes these goals at approximately $9,834,500.00 less in capital cost. Furthermore, Alternative Two would provide significant savings in Operation and Maintenance costs for when compared to Alternative Three. For these reasons, Alternative Two is the recommended project for implementation.

Section 7 – Discharge System Alternatives

The main priority of the discharge system project is to complement the treatment system project by providing a total capacity equivalent to the proposed treatment capacity of 1.8 MGD. Studies within the County have been conducted and are currently being conducted to determine the suitability of land application sites and methods. The capacity required for this project is based on the capacity increase required for treatment. Currently, only one land application site (R-001) which is a sprayfield adjacent to the WWTP is operational. Upon completion of upgrades which are currently under construction, discharge to site R-002 (slow rate land application at Wildwood Country Club) will commence. Sites R-001 and R-002 have a combined capacity of 1.2 MGD which will be insufficient once upgrades to the treatment system as recommended in Section 6 are constructed (requires capacity of 1.8 MGD).

Three alternatives were considered for the proposed discharge system improvements. The first is a "do nothing" alternative. The second alternative includes three phases of projects which are development of a new land application site (Phase I), upgrades to effluent transmission mains (Phase II), and conversion of the existing on-site sprayfield to rapid infiltration basins (RIB's) (Phase III) to bring the total effluent reuse capacity to 1.8 MGD. Alternative Three includes the recommendations of Alternative Two and adds a capacity increase at the existing Wildwood Country Club site via a hybridized engineered wetlands and RIB system. A comparison of each alternative is provided at the end of this section and detailed cost analysis of each alternative is provided in Attachments 12 – 15.

7.1 Alternative One

7.1.1 Description

Alternative One is the "do nothing" alternative. Obviously, this alternative results in no system improvements and no capital costs. Capacity must be added to the discharge system to allow capacity to be added to the treatment system. Understanding this, the results of this alternative are insufficient capacity for the effluent discharge system which equates to insufficient capacity of the treatment system, thereby halting any future sewer connections. This alternative would provide no relief to system operation and maintenance.

Alternative One could also cause adverse environmental impacts. The lack of increased discharge and treatment capacity would halt the septic remediation projects in the County that are designed to protect Wakulla Springs. Furthermore, this would require future development within the County to utilize septic systems, which is contradictory to the efforts made to date to reduce the number of septic systems within the County.

7.1.2 Advantages/Disadvantages

The advantages and disadvantages to Alternative One are summarized as follows:

ADVANTAGES

- No capital costs.

DISADVANTAGES

- No additional treatment capacity.
- Increased risk to the environment.
- Increased operation and maintenance costs.

7.2 Alternative Two

7.2.1 Description

Alternative Two seeks to improve WWTP effluent disposal capacity in three phases. Phase I includes development of RIB's on a 101-acre parcel in eastern Wakulla County near the intersection of Coastal Highway (Highway 98) and Spring Creek Highway. Although the USGS soils data (included in Appendix H) does not show overly favorable site conditions, the site is currently under investigation by JEA. The preliminary findings anticipate that this site could receive 1.5 MGD. A copy of the report will be made available when it is finalized. A site map for the proposed area is included in Attachment 12. The County is currently permitted to send 0.6 MGD of effluent to the Wildwood Country Club. The current infrastructure at the golf course is unable to handle this amount of flow. Although no improvements are anticipated at this site, the golf course will still use the effluent for irrigation as needed.

Conveyance of reuse water to both the Wildwood Golf Course and the Phase I site can be accomplished via conversion of existing 12-inch and 8-inch forcemains proposed in Alternative 2 of the Transmission System Improvements previously discussed in this report along with the existing 6-inch reuse main currently connecting the WWTP and golf course. The existing 12-inch and 8-inch forcemains are currently used to convey raw wastewater to the WWTP. Conversion of the section of 8-inch forcemain is currently underway as part of a separate project that proposes to construct a new forcemain route and allow the existing

8-inch line to be properly cleaned and disinfected for conversion to reuse conveyance. Conversion of the 12-inch segment of the forcemain will be dictated by the timing proposed for the Transmission System Improvement project defined in this report. Repurposing the existing infrastructure as proposed will create significant cost savings for the proposed project. The pumping station for the 6-inch reuse main is included in the Treatment System alternatives. This alternative proposes an additional pumping station to convey effluent through the retrofitted 12-inch and 8-inch reuse mains.

Phase II will further improve the capacity of the reuse system via replacement of approximately 23,000 LF of 8-inch reuse main along US 98 between US 319 and the Jerry Moore site with a 12-inch reuse main. Between this point and the effluent pump station at the WWTP is a 12-inch diameter line. The 8-inch line restricts the total flow and is anticipated to only convey approximately 0.6 MGD of effluent. By increasing the size of the 8-inch reuse main along US 98 between US 319 and the Jerry Moore site to 12-inch, it appears to be capable of conveying approximately 1.5 MGD, although the pressures could vary between 104 psi to 130 psi.

Phase III involves the conversion of the existing 0.6 MGD spray fields at the WWTP to RIB's with the same capacity. A study providing justification for the sprayfield-to-RIB conversion by Ardaman & Associates, Inc. (AAI) in conjunction with Baskerville Donovan, Inc. (BDI) is included in Attachment 16. It is anticipated that these RIB's could be re-rated in the future to provide additional capacity but would, for the time being, provide reduced operational and maintenance costs due to the simplicity of upkeep in comparison to sprayfields.

Implementation of Alternative Two is not anticipated to cause adverse environmental impacts. The proposed improvements to wastewater treatment will ensure effluent is treated to advanced wastewater treatment (AWT) standards of no more than 3 mg/L total nitrogen (TN) on an annual permitted basis. This meets the RIB requirements set forth by the *Upper Wakulla River and Wakulla Spring Basin Management Action Plan, June 2018* (BMAP). The ongoing site studies mentioned in the previous paragraphs are anticipated to address impacts the project could have to groundwater levels and quality in order to guide future designers on appropriate site usage and layout that will prevent adverse impacts to the environment. All work will be performed within County right of way or on easements that are or will be under the County's control prior to construction; therefore, no land acquisitions will be required. As previously mentioned, the landowners at the Wildwood

Golf Course welcome this project and acquisition of any additional easements are not anticipated to experience opposition. The improvements in areas included in this alternative will improve the capacity of the existing system through the next 20 years.

A map showing the tentative location of the proposed improvements is included in Attachment 12 and the USGS web soil survey showing preliminary site suitability is included in in Appendix H.

7.2.2 Map

The project area and proposed system improvements for Alternative Two are shown in Attachment 12.

7.2.3 Cost Estimate

The total project cost opinion for the Alternative Two discharge system improvements is estimated at $7,578,000.00, including construction, administration, permitting, engineering and other technical service costs. The proposed discharge system improvements will have increased Operation and Maintenance costs. This is unavoidable as the current discharge site adjacent to the WWTP is not anticipated to be able to receive any significant application rate increase and the surrounding land is owned by the National Forestry Service. With regards to the proposed system, the Operation and Maintenance costs anticipated are minimized by utilizing RIB systems wherever possible. A detailed breakdown of the Alternative Two project costs are shown in Attachment 13.

7.2.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Two are summarized as follows:

<u>ADVANTAGES</u>

- RIB site at WWTP has potential to be re-rated in the future for additional capacity.
- Sprayfield to RIB conversion will result in reduced operating and maintenance costs.
- Repurposing of existing infrastructure creates significant cost savings.

<u>DISADVANTAGES</u>

- Construction staging to prevent interim capacity issues during sprayfield-to-RIB conversion.
- Costs of pumping reuse water to offsite locations.

7.3 Alternative Three

7.3.1 Description

Alternative Three includes the recommendations included in Alternative Two with the addition of additional land application capacity at the golf course which is proposed to be included with Phase I. The additional land application site at the golf course would include the addition of 0.6 MGD of effluent disposal capacity via a hybrid wetlands and RIB system. The current permit allows 0.6 MGD of effluent produced by the WWTP to be applied to the Wildwood Golf Course for irrigation. Discussions with the golf course owners indicate that 0.6 MGD is significantly more water than the course needs for daily irrigation, including the dry seasons. However, the Owner has stated that they would like more water features at the golf course and has offered the County some land within the golf course for the installation of a series of flow-through storage ponds that will ultimately flow into a rapid infiltration basin (RIB) for effluent reuse/disposal. The golf course will still use the effluent for irrigation, pumping from the initial pond, and when they are not pumping the effluent will flow through the ponds to the RIB for disposal. Furthermore, the flow through ponds are proposed to function as an engineered wetland, providing biological nutrient uptake for effluent polishing prior to infiltration into the ground. The site investigation for the wetlands/RIB system at Wildwood Golf Course is currently underway with Jones Edmunds & Associates, Inc. (JEA) as the consultant. Per conversations with the County and JEA, the site shows preliminary suitability for the proposed project; however, specific information will not be available until the conclusion of the ongoing study. A map showing the tentative location of the ponds and RIB's is included in Attachment 14 and the USGS web soil survey showing preliminary site suitability is included in Appendix H.

The total capacity proposed to be made available through Alternative Three is 2.7 MGD. The additional capacity will provide greater operational control to the County and allow them to cycle the discharge sites to reduce loading to a particular point. Furthermore, securing site control for these discharge options will assist the County with any future growth as sites sufficiently rated for effluent reuse are difficult to acquire within the southern portion of the County and will become more difficult to acquire as development continues into the future.

Implementation of Alternative Three is not anticipated to cause adverse environmental impacts. The proposed improvements to wastewater treatment will ensure effluent is treated to advanced wastewater treatment (AWT) standards of no more than 3 mg/L total nitrogen (TN) on an annual permitted basis. This meets the RIB requirements set forth by the *Upper Wakulla River and Wakulla Spring Basin Management Action Plan, June 2018* (BMAP). The ongoing site studies mentioned in the previous paragraphs are anticipated to address impacts the project could have to groundwater levels and quality in order to guide future designers on appropriate site usage and layout that will prevent adverse impacts to the environment. All work will be performed within County right of way or on easements that are or will be under the County's control prior to construction; therefore, no land acquisitions will be required. As previously mentioned, the landowners at the Wildwood Golf Course welcome this project and acquisition of any additional easements are not anticipated to meet objection. The improvements in areas included in this alternative will improve the capacity of the existing system through the next 20 years.

7.3.2 Map

The project area and proposed water system improvements for Alternative Three are shown in Attachment 14.

7.3.3 Cost Estimate

The total project cost opinion for the Alternative Two discharge system improvements is estimated at $8,532,000.00, including construction, administration, permitting, engineering and other technical service costs. The proposed discharge system improvements will have increased Operation and Maintenance costs. This is unavoidable as the current discharge site adjacent to the WWTP is not anticipated to be able to receive any significant application rate increase and the surrounding land is owned by the National Forestry Service. With regards to the proposed system, the Operation and Maintenance costs anticipated are minimized by utilizing RIB systems wherever possible. A detailed breakdown of the Alternative Two project costs are shown in Attachment 15.

7.3.4 Advantages/Disadvantages

The advantages and disadvantages to Alternative Three are summarized as follows:

<u>ADVANTAGES</u>

- RIB site at WWTP has potential to be re-rated in the future for additional capacity.
- Sprayfield to RIB conversion will result in reduced operating and maintenance costs.
- Biological nutrient uptake available in proposed golf course ponds.
- Repurposing of existing infrastructure creates significant cost savings.

DISADVANTAGES

- Construction staging to prevent capacity issues during sprayfield-to-RIB conversion.
- Costs of pumping reuse water to offsite locations.
- County will not own site at Wildwood Country Club.

7.4 Comparison of Alternatives

As shown, the Alternative Three total project cost is higher than that of Alternative Two resulting in a higher debt service; $8,532,000.00 compared to $7,578,000.00. Alternative One has no costs associated with it but offers no improvement to effluent discharge capacity and could result in increased risk to the environment and public health and welfare. While Alternative Two and Three offer similar improvements to the system, Alternative Two does not offer the additional effluent discharge capacity proposed in Alternative Three at the Wildwood Country Club. Although Alternative Three's improvements result in approximately $954,000.00 in additional costs, the availability of significant additional discharge capacity offsets the increased cost. When reviewed on a cost per gallon basis, Alternative Two results in $3.61/gallon and Alternative Three results in $3.16/gallon, revealing the cost benefit for Alternative Three. For these reasons, Alternative Three is the recommended project for implementation.

Section 8 – The Selected Alternatives

8.1 Description of Proposed Facilities

Based on an analysis of the advantages and disadvantages of the alternatives for the Wakulla County sewer system, the following alternatives are recommended to maximize the benefits of improvements for the next 20 years:

- Transmission System – Alternative 2
- Treatment System – Alternative 2
- Discharge System – Alternative 3

The selected alternatives address the deficiencies in their respective systems and reduce the likelihood of system overload or failure within the next 20 years.

8.1.1 Proposed Improvements (Selected Alternatives)

The following is a summary of the proposed improvements by project category:

Transmission System

Phase I (A & B)

- 45,000 LF of 16-inch forcemain from LS 76 to the WWTP
- Conversion of the existing 12-inch and 8-inch forcemains along US 319 and US 98 to reuse water lines
- Replacement of pumps at stations located along upgraded pump route
- Construction of small diameter forcemain to connect grinder stations isolated by conversion of existing 12-inch forcemain to reuse water main between Sopchoppy Highway and Floyd Gray Road
- Upgrades to lift stations #76 (Jerry Moore), #86 (High School), and #29 (Eden Springs)
- Note: upgrade of forcemain between Jerry Moore LS and US 319 is to be constructed during the "Jerry Moore LS Upgrades" project currently funded through the Treasury (RESTORE Act) and under negotiation for design by Wakulla County

Phase II (A & B)

- Construction of Alexander Lift Station
- New forcemain from Alexander LS along Rehwinkel Road to Highway 98
- Construction of new forcemain upstream of Alexander LS to reroute existing

system flows from Hickory Park to Alexander LS

- Implementation of communication equipment between master lift stations
- Upgrades to Palmetto LS for further Alexander LS basin improvement

<u>Phase III</u>

- Construction of 3,900 LF of 16-inch forcemain between Hickory Park LS and intersection of US 319 and High Drive to replace undersized 8-inch existing forcemain
- Upgrades to lift station #35 (Hickory Park)

<u>Phase IV (A &B)</u>

- Construction of 25,000 LF of 16-inch forcemain along US 319 from High Drive to Floyd Gray Road to replace existing 12-inch forcemain
- 21,000 LF of 16-inch forcemain to create parallel transmission mains along Floyd Gray Road, Friendship Church Road, and Lawhon Mill Road between US 319 and the WWTP effectively splitting the northern and eastern collection and transmission basins
- Upgrades to lift station #25 (Love Street)

Treatment System

- Construct additional 0.6 MGD AeroMod treatment train at existing WWTP
- Master influent lift station including:
    - screening capabilities
    - variable frequency drive pumps to control influent flow to treatment basins
- Site paving
- Admin and Maintenance building
- Reuse pump station

Discharge System

- <u>Phase I</u>
    - Implementation of an effluent reuse system near the intersection of Coastal Highway and Spring Creek Road (Jerry Moore Site) for 1.5 MGD
    - Implementation of upgrades to the effluent reuse system at the Wildwood Country Club for 0.6 MGD
    - Construction of an effluent pumping station at the WWTP

- <u>Phase II</u>
  - o Upgrade existing 8-inch reuse main with 12-inch to increase capacity from 0.6 MGD to 1.5 MGD in the conveyance system
  - o Upgrade effluent lift station for increased flow capacity
- <u>Phase III</u>
  - o Convert the existing 0.6 MGD sprayfields at the WWTP to RIB's of identical loading
    - ▪ Future re-rate of RIB's anticipated based on data collected after implementation

8.2 Environmental Impacts of Proposed Facilities

The short-term impacts during construction include increased noise levels and potential for erosion and sedimentation. To prevent erosion from stormwater during construction, Best Management Practices to minimize erosion and stormwater pollution will be utilized. These include but are not limited to minimizing soil disturbance and the installation of erosion controls, such as hay bales and silt fencing and establishing temporary and permanent vegetation. In addition to temporary construction impacts, the proposed project area includes wetlands. Wetlands encountered within the limits of the proposed project will be protected from disturbance by the use of directional bores and/or temporarily impacted with open trenches. Wetlands will be preserved and protected with a 25-foot buffer zone. The exact location and limits of wetland impacts will be identified during design of the project and all necessary coordination with regulatory agencies will be performed throughout the permitting process. It is expected that wetland impacts will be temporary and will be properly minimized, avoided, and mitigated as necessary.

The long-term impacts of the project are beneficial to residents. These benefits include a reliable, economical, and environmentally safe wastewater system capable of sustaining the future growth and demands of the County.

The proposed project will not have significant adverse effects on Wild and Scenic Rivers or on flora, fauna, threatened or endangered plant or animal species, prime agricultural lands, wetlands, undisturbed natural areas, or the socio-economic character of the area. There will be no impacts to archeological, historical, or cultural sites recorded in the project area.

8.3 Phasing Plan for Selected Alternatives

In order to efficiently and affordably proceed, the proposed alternatives have been broken into phases. There are multiple benefits to this approach. At the forefront, the affordability of the projects is benefitted by reducing the amount of capital expended during any particular fiscal year.

Should rate increases be deemed necessary through the Raftelis study, the phased projects should prevent significant changes being required at a singular time. Another benefit will be the County's operational control of the growing system. By spacing out the improvements, the County will be better equipped to determine the exact time that each project is required. Furthermore, this prevents oversizing the system too early and creating issues associated with insufficient flow. The table below shows the breakdown of the proposed projects and phases along with a reasonable timeframe for implementation. As previously stated, system conditions will ultimately dictate when these phases are required to be implemented and the ultimate schedule is, therefore, a fluid document which will be updated periodically based upon updated system information. Attachment 17 includes a project implementation schedule which complements Table 8.3, below.

Table 8.3 - Proposed Phasing Timeline

Phase	Description	Anticipated Start Date		Anticipated Completion Date
		Begin Design	Begin Construction	
Transmission System				
I-A	Forcemain upgrades from LS #76 to US 319	January '21	November '21	September '22
I-B	Forcemain upgrades from US 319 to WWTP	March '21	November '21	September '22
II-A	Alexander LS and basin reroute	October '21	June '22	February '23
II-B	Palmetto LS upgrade in Alexander basin	October '21	March '23	September '23
III	Hickory Park upsize to High Drive	October '23	March '25	July '25
IV-A	Parallel forcemain through National Forest from intersection of Friendship Church Road and US 319 to WWTP	January '25	September '25	March '26
IV-B	Forcemain upsize from High Drive to Friendship Church Road	January '25	January '26	September '26
Treatment System				
N/A	0.600 MGD upgrade at WWTP	March '21	March '23	March '24
Discharge System				
N/A	Conversion of 8-inch forcemain to reuse main (Transmission Phase I-A)	January '21	November '21	September '22
N/A	Conversion of 12-inch forcemain to reuse main (Transmission Phase I-B)	March '21	November '21	September '22
I	Reuse systems at Jerry Moore Site and Wildwood Country Club	March '22	March '24	January '25
II	Upgrade 8-inch forcemain between US 319 and Jerry Moore site	March '22	March '24	January '25
III	Convert existing sprayfield to RIB	January '25	September '25	March '26

8.4 Cost to Construct System Improvements

The cost estimate for the proposed project including construction and technical services costs is $32,527,250.00. It should be noted that each of the proposed components are to be phased; therefore, the initial debt service will be significantly less than the final debt service and will be paid off on timelines based upon the inception of each phase. Furthermore, the County plans to aggressively pursue grant opportunities for the proposed projects to further reduce the final debt service.

It is worth noting that the Transmission System Phase I-A is currently being funded by the RESTORE Act. The current grant agreement for design and construction is valued at $2,573,560.24. The projected costs in this Facilities Plan for this phase are $3,214,000.00, exceeding the RESTORE Act amount by $640,439.76. It has not been uncommon for actual engineering and construction costs for RESTORE projects to be greater than the initially awarded amounts due to the way the grant writing process is set up. In the event that actual engineering or construction costs exceed the estimated costs as awarded, County staff will seek an amendment to increase funding via the Treasury Department pursuant to the amendment process for RESTORE Act Awards. Furthermore, should design and permitting of the project require additional work outside of the original grant application scope of work, County staff will seek approval of an amended scope of work (and any increased costs) from the Treasury Department pursuant to the amendment process for RESTORE Act Awards. Due to this, the costs for Phase I-A as presented in this report are deducted from the total estimated project costs in Table 8.4 to better represent the anticipated debt service.

The rate and impact fee study currently being performed by Raftelis will include the proposed project costs and projected phasing timeline to determine any necessary rate and impact fee adjustments necessary to complete the proposed projects. Detailed construction and technical services cost estimates are presented in Attachment 6, 10, and 15. The following tabulation presents the total project cost including construction and technical services.

TABLE 8.4				
SELECTED ALTERNATIVES				
Project Component	Construction Services	Professional Services	Acquisition of Land and Easements	Total Cost
Transmission System (Alternative 2)	$ 14,050,750.00	$2,600,000.00	$ -	$ 16,650,750.00
Treatment System (Alternative 2)	$ 6,438,000.00	$ 906,500.00	$ -	$ 7,344,500.00
Discharge System (Alternative 3)	$ 6,763,000.00	$ 1,244,000.00	$ 525,000.00	$ 8,532,000.00
TOTAL PROJECT COST				$ 32,527,250.00
Design Loan (0.421% APY, 10-years)				
Proposed Design Fees (Engineering and Surveying)				$ 3,365,500.00
RESTORE Act funding for Transmission Phase I-A (projected)				$ 330,000.00
Loan Service Fee (2%)				$ 60,710.00
Total SRF Design Loan Amount				$ 3,096,210.00
Maximum Anticipated Semiannual Payment				$ 158,251.34
Construction Loan (0.000% APY, 20-years)				
Proposed Construction Costs (includes professional construction services)				$ 28,636,750.00
RESTORE Act funding for Transmission Phase I-A				$ 2,884,000.00
Loan Service Fee (2%)				$ 515,055.00
Total SRF Construction Loan Amount				$ 26,267,805.00
Maximum Anticipated Semiannual Payment				$ 656,695.13
**Maximum Anticipated Bi-Annual Payment based on full loan funding by SRF with no additional grants obtained by County. Due to phasing of projects, this amount will be experienced after all phases have been funded. Furthermore, the County anticipates receipt of RESTORE Act and other grants to partially fund proposed projects.*				

8.5 Consistency with the Comprehensive Plan

The proposed project improvements are consistent with the City's Comprehensive Plan.

8.6 Proposed Rate Structure and Study

A utility rate and impact fee study is currently underway for the system by Raftelis Financial Consultants, Inc. This study was planned prior to the creation of this Facilities Plan. The findings of this Facilities Plan are to be included in their rate study. Furthermore, the County plans to aggressively pursue grants and other funding sources to offset the local contribution required for the completion of the proposed projects. It is anticipated that the maximum debt service presented in this report will be greatly minimized through these efforts. A copy of the Raftelis study can be made available, upon request, once completed in early 2021.

Section 9 - Implementation and Compliance

9.1 Public Hearing / Dedicated Revenue Hearing

A public hearing was held at Wakulla County Commission Chambers on December 14, 2020, to explain the wastewater system improvements projects and the financial impact to affected parties. Following the public hearing, the Wakulla County Board of County Commissioners passed a resolution approving the facilities plan and authorizing the implementation of the recommended improvements. The public hearing notification proof of publication, public hearing minutes, and adopting resolution can be found in Appendix J.

9.2 Regulatory Agency Review

To qualify for a subsidized loan from the State Revolving Fund, the following governmental agencies will be provided copies of the Facilities Plan for review and comments.

- Florida Department of Environmental Protection
- Northwest Florida Water Management District
- State Clearing House

9.3 Financial Planning

The Florida Department of Environmental Protection's State Revolving Fund is expected to be the primary financing source for the project. Other grants and funding opportunities will be aggressively pursued by the County in an attempt to offset the capital required to complete the proposed projects. Pledged revenues for debt payments are the County's monthly wastewater income. Residential customers currently make up 89% of the County's annual revenues. The remaining 11% consists of commercial customers. The current average monthly sewer bill is $47.00 for a residential connection with typical water consumption. Potential rate increases are currently being reviewed through the Raftelis utility rate and impact fee study. This Facilities Plan will be included in their review to determine if any rate adjustments are necessary to ensure the projects and operations are sufficiently funded. A copy of this report can be made available by request upon completion (anticipated January 2021). A business plan has been prepared to determine the financial impact the wastewater system improvements will have on the County's sewer customers. Wakulla County's business plan, which includes a schedule of actual revenues, projected revenues and prior liens, is in Appendix G.

9.4 Implementation

Wakulla County has the sole authority to implement the recommended facilities proposed in this document. There are no inter-local agreements necessary for the County to provide services throughout the project planning area.

9.5 Implementation Schedule

A project implementation schedule is provided in Attachment 17.

9.6 Compliance

The Wakulla County wastewater system projects will be designed, constructed and operated in accordance with all applicable local, state, and federal requirements and standard engineering practices including:

- The Wakulla County Comprehensive Plan
- Civil Rights Act of 1964 – Title 42 U.S.C. 2000d
- The Americans with Disabilities Act of 1990 – Title 42 U.S.C. 12101
- Age Discrimination Act of 1975 – Title 42 U.S.C. 6101
- The Florida Department of Environmental Protection

The following list identifies the anticipated permits and approvals required for the project construction and operation.

<u>State of Florida:</u>

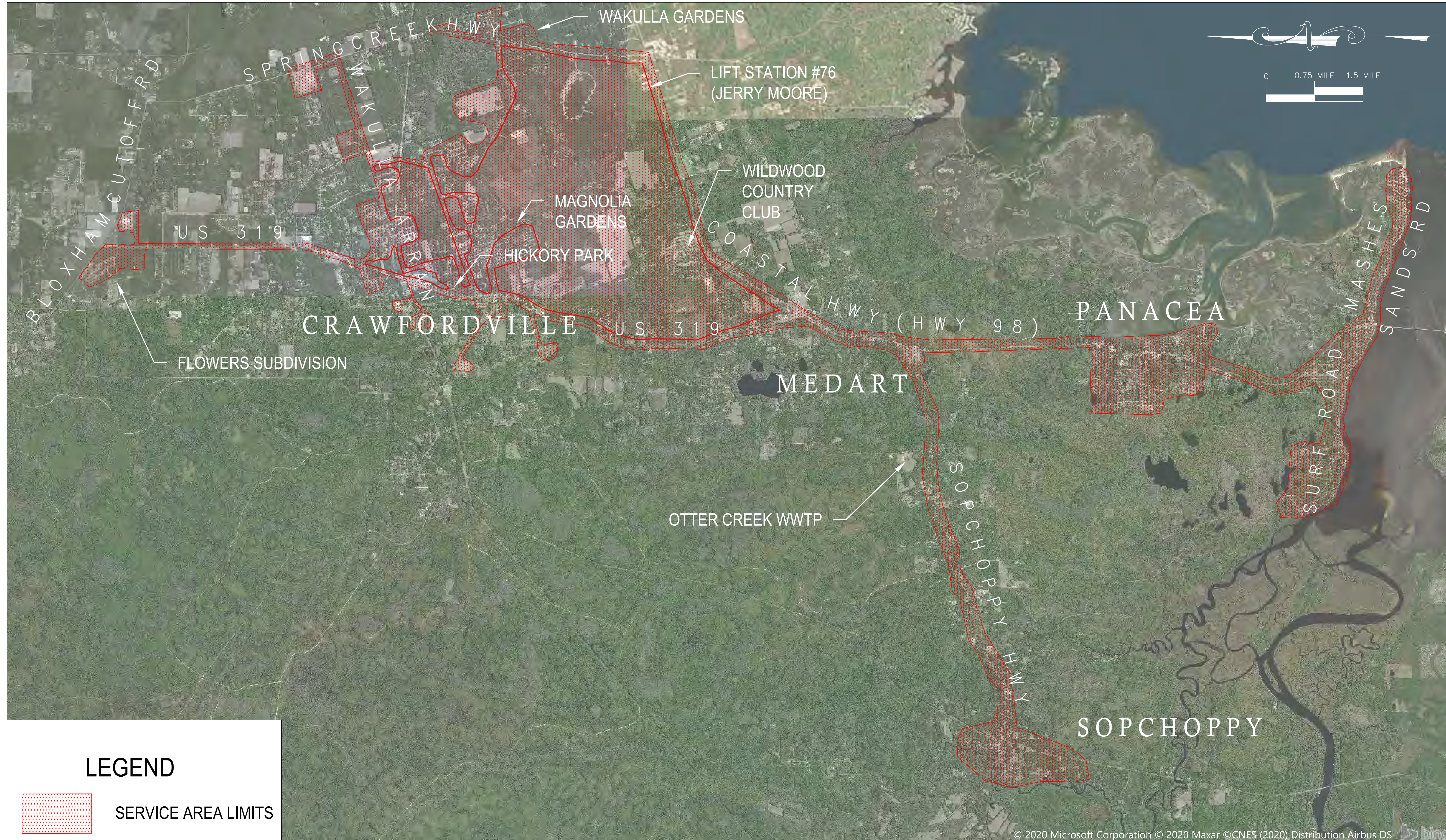
- FDEP – Form 62-604.300(8)(a), F.A.C, Notification/Application for Constructing a Domestic Wastewater Collection/Transmission System
- FDEP – Form 62-604.300(8)(b), F.A.C, Request for Approval to Place a Domestic Wastewater Collection/Transmission System Into Operation
- FDEP – Form 62-620.910(1&2), F.A.C., Wastewater Permit Application for Domestic Wastewater Facilities
- FDEP – Form 62-620.910(12), F.A.C, Notification of Completion of Construction for Wastewater Facilities or Activities
- FDEP – Notice of Intent to use NPDES Generic Permit for Stormwater Discharge from Large and Small Construction Activities
- FDOT - Right of Way Use Permit
- State Clearing House Environmental Review Approval

<u>Federal:</u>

- National Park Service easement

Attachment 1

Wastewater Service Area Map



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WAKULLA COUNTY SEWER SERVICE AREA
APPROXIMATE LIMITS

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020	PROJECT NO. 50124954
SCALE: #########	
DRAWN: R. JERNIGAN	SHEET 1
CHECKED: T. BURCH	

November 10, 2020 (12:48:37 EST)
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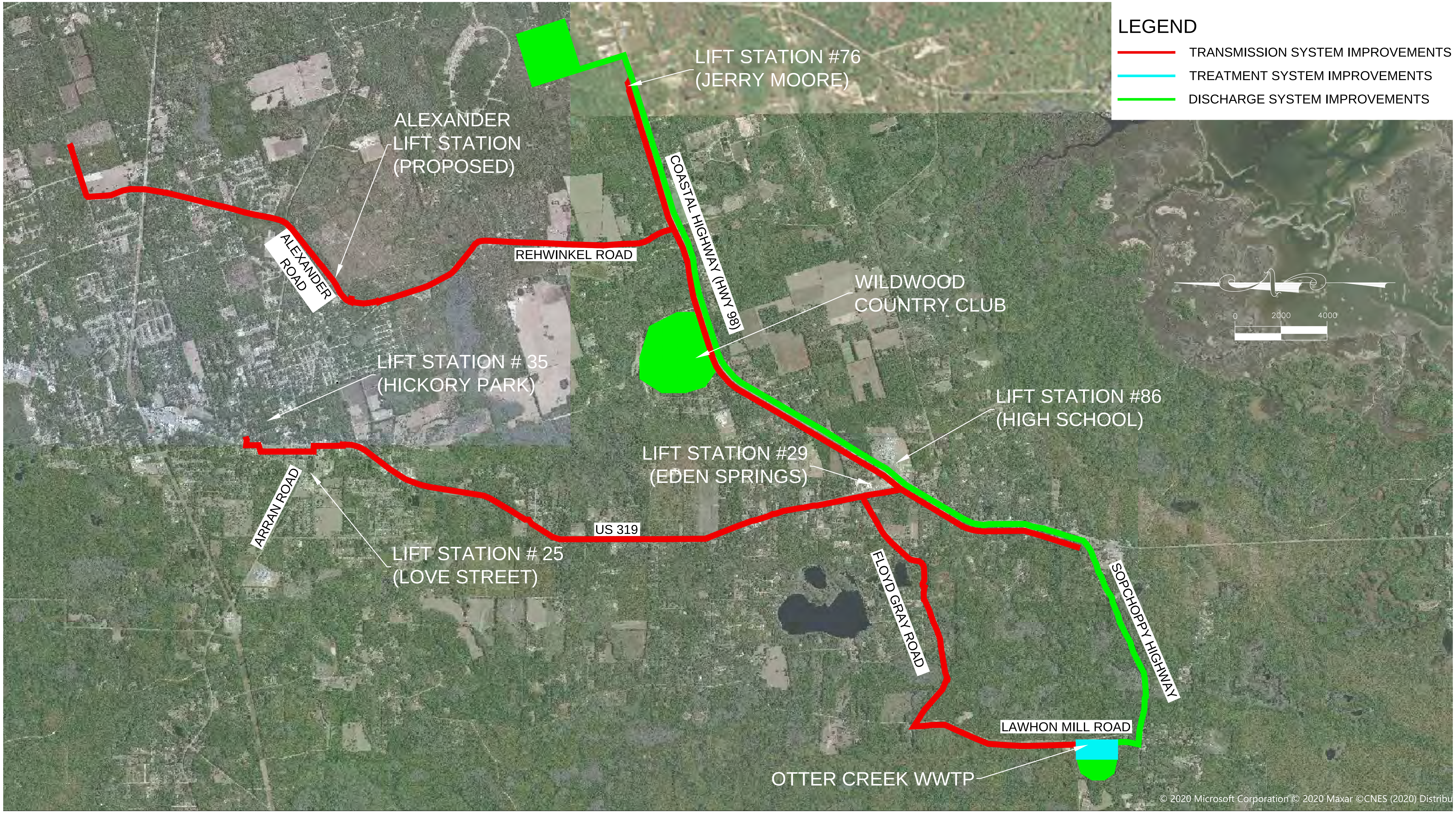
Attachment 2

Project Location Map

November 20, 2020 (10:55:34 EST)
P:_RANDALL JERNIGAN\STUFF FOR TREVOR B\WAKULLA COUNTY WASTEWATER SYSTEM IMPROVEMENTS FACILITIES PLAN\PROJECT LOCATION MAP - OVERALL.DWG



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WASTEWATER SYSTEM IMPROVEMENTS
PROJECT LOCATIONS

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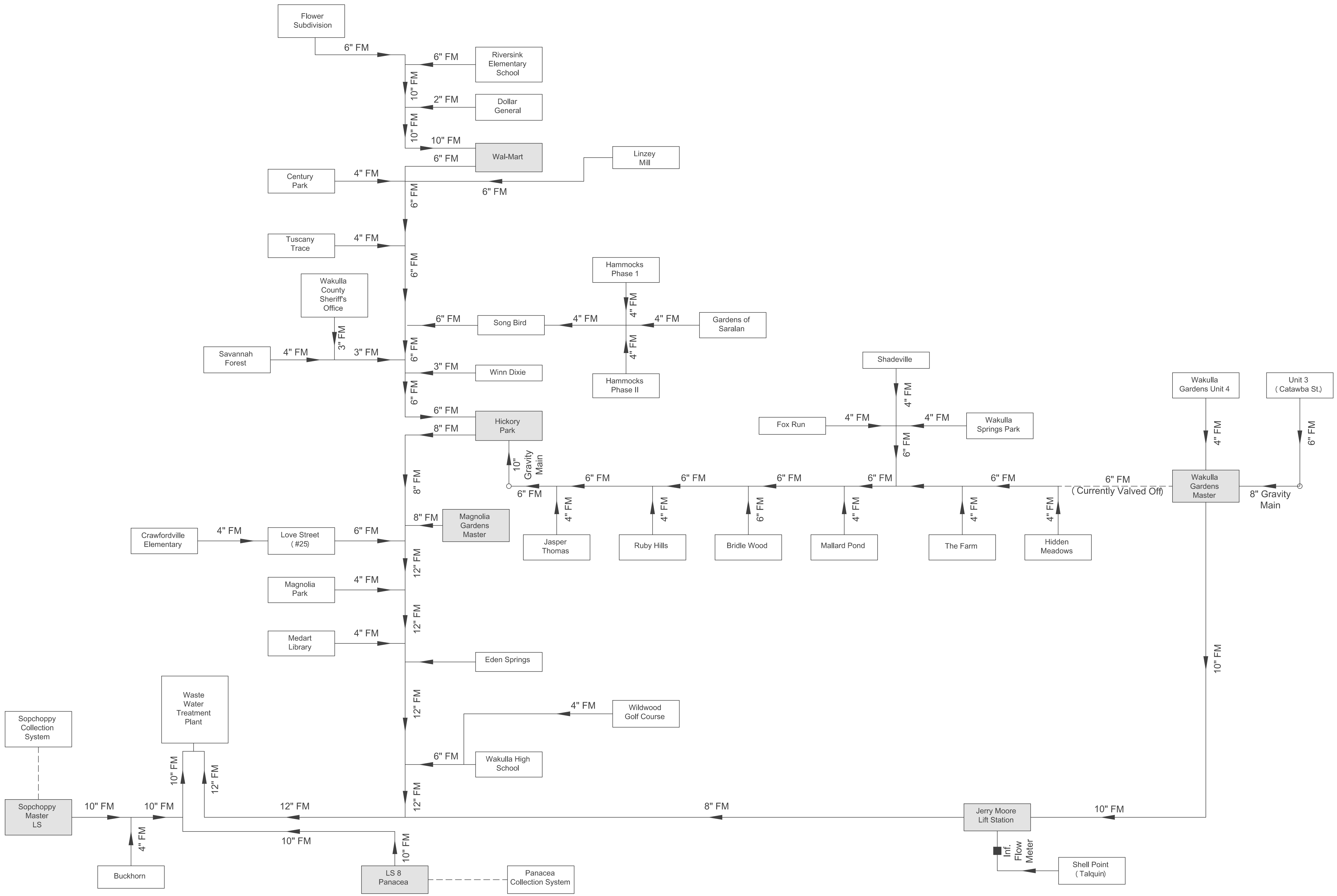
WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020	PROJECT NO. 50124954
SCALE: 1" = 4000'	
DRAWN: R. JERNIGAN	SHEET 1
CHECKED: T. BURCH	

Attachment 3

Transmission System – Alternative One Line Diagram and Map



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LINE DIAGRAM - EXISTING

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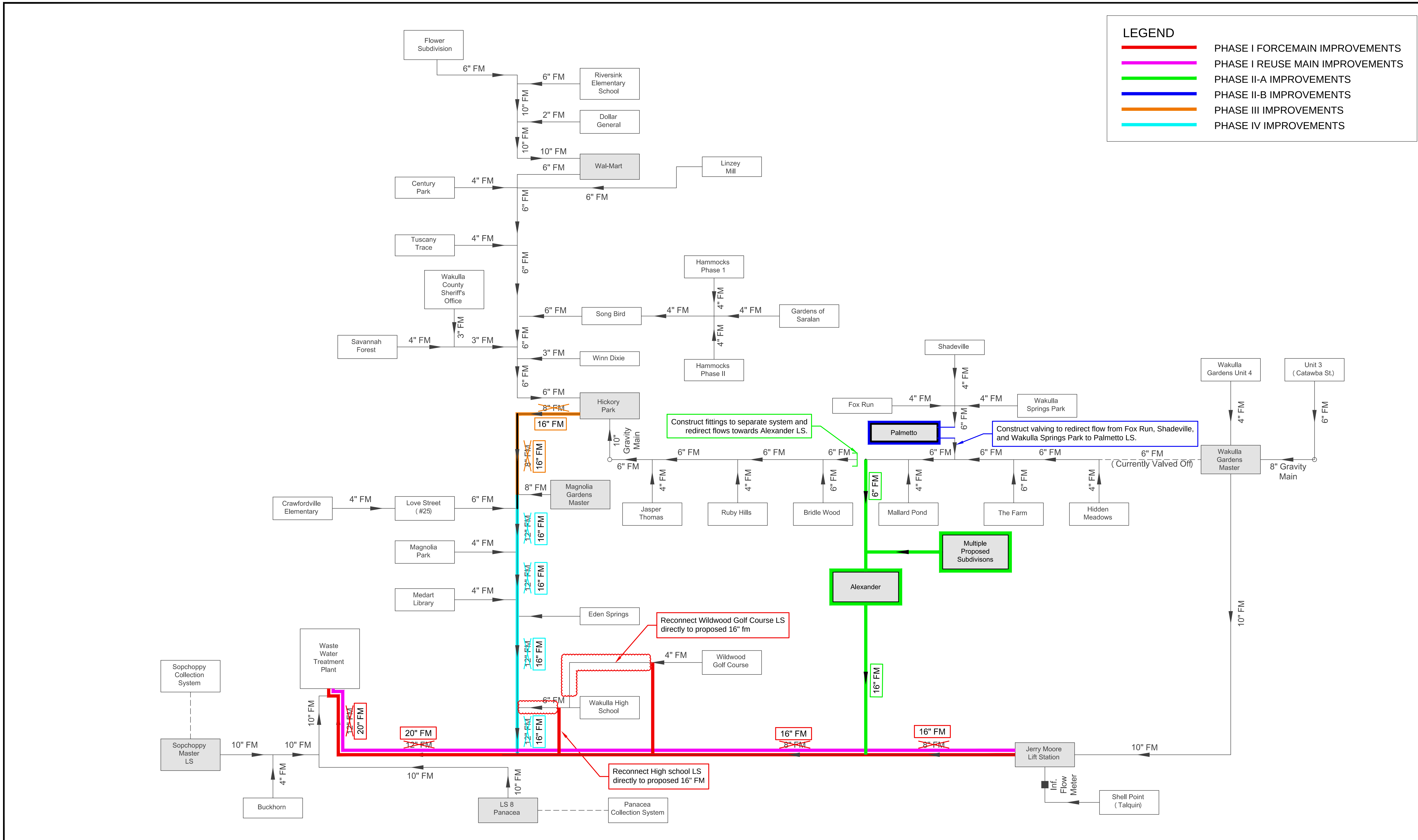
WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
DRAWN: R. JERNIGAN
CHECKED: T. BURCH
PROJECT NO. 50124954
SHEET 1



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LINE DIAGRAM
TRANSMISSION SYSTEM
ALTERNATIVE 1

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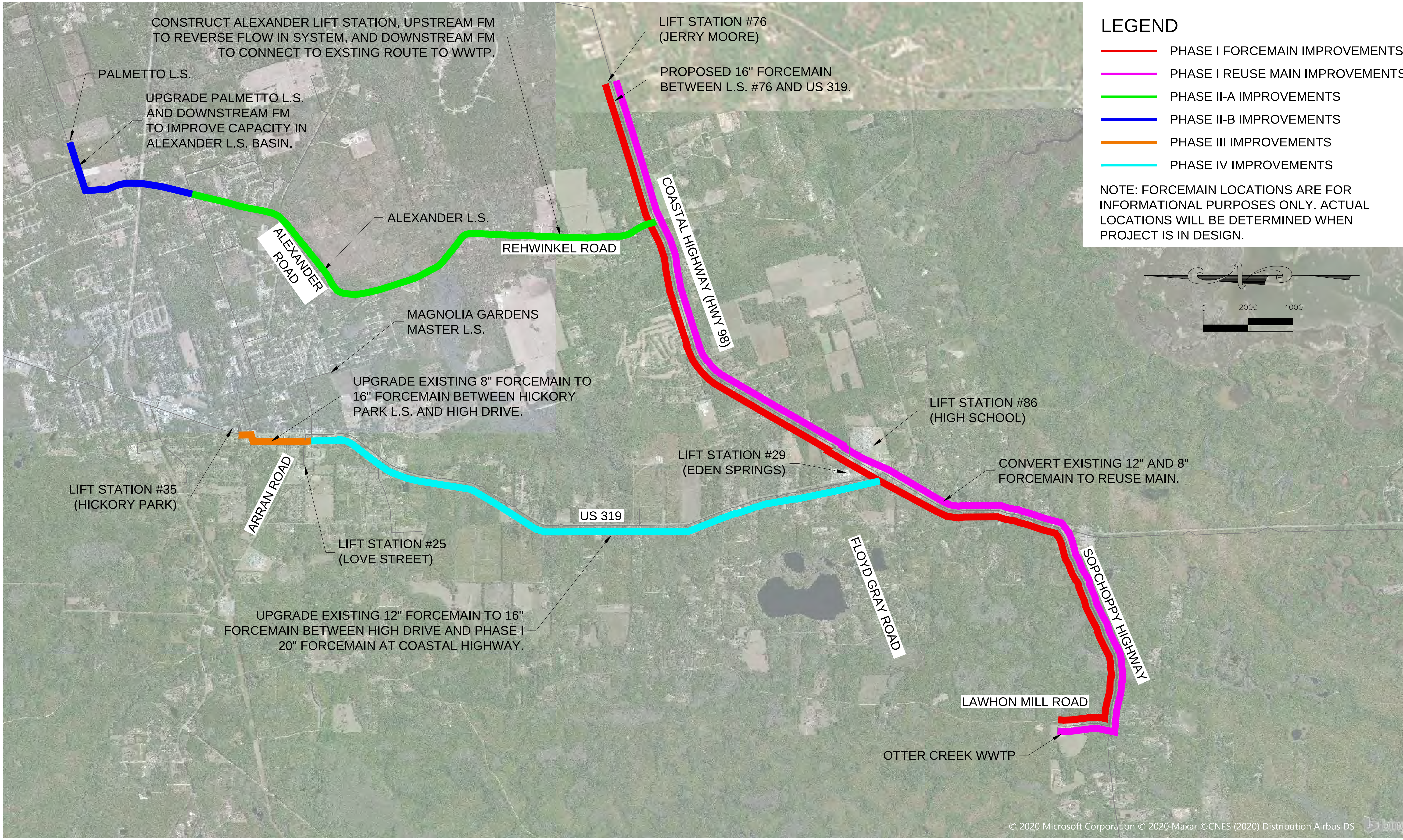
WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
DRAWN: R. JERNIGAN
CHECKED: T. BURCH
PROJECT NO. 50124954
SHEET 2



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November 20, 2020 (11:27:55 EST)
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TRANSMISSION SYSTEM ALTERNATIVE 1

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WASTEWATER SYSTEM IMPROVEMENTS FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: As Shown
DRAWN: R. JERNIGAN
CHECKED: T. BURCH

PROJECT NO. 50124954

SHEET 1

Attachment 4

Transmission System – Alternative One
Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 1

	Description	Quantity	Unit	Unit Price	Extension
PHASE I-A					
1A.01	*16-inch Forcemain*	22,800	*LF*	$ 70.00	$ 1,596,000.00
1A.02	*16-inch Valves and Fittings*	1	*LS*	$ 40,000.00	$ 40,000.00
1A.03	*Conversion of 8-inch forcemain to reuse main*	1	*LS*	$ 65,000.00	$ 65,000.00
1A.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 69,000.00	$ 69,000.00
1A.05	*Pump Station Upgrades (#76)*	1	*LS*	$ 500,000.00	$ 500,000.00
1A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
1A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
				Construction Subtotal	$ 2,724,000.00
1A.08	*Surveying*	1	*LS*	$ 57,000.00	$ 57,000.00
1A.09	*Engineering (10% of Construction)*	1	*LS*	$ 273,000.00	$ 273,000.00
1A.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 490,000.00
				Phase I-A Subtotal	**$ 3,214,000.00**
PHASE I-B					
1B.01	*20-inch Forcemain*	20,000	*LF*	$ 90.00	$ 1,800,000.00
1B.02	*20-inch Valves and Fittings*	1	*LS*	$ 45,000.00	$ 45,000.00
1B.03	*Conversion of 12-inch forcemain to reuse main*	1	*LS*	$ 100,000.00	$ 100,000.00
1B.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 60,000.00	$ 60,000.00
1B.05	*Pump Station Upgrades (#86 and #29)*	1	*LS*	$ 400,000.00	$ 400,000.00
1B.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 241,000.00	$ 241,000.00
1B.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 241,000.00	$ 241,000.00
				Construction Subtotal	$ 2,887,000.00
1B.08	*Surveying*	1	*LS*	$ 50,000.00	$ 50,000.00
1B.09	*Engineering (10% of Construction)*	1	*LS*	$ 289,000.00	$ 289,000.00
1B.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 499,000.00
				Phase I-B Subtotal	**$ 3,386,000.00**
PHASE II-A					
2A.01	*Alexander Lift Station, complete*	1	*LS*	$ 500,000.00	$ 500,000.00
2A.02	*16-inch Forcemain*	15,200	*LF*	$ 70.00	$ 1,064,000.00
2A.03	*16-inch Valves and Fittings*	1	*LS*	$ 27,000.00	$ 27,000.00
2A.04	*Master Lift Station SCADA*	1	*LS*	$ 100,000.00	$ 100,000.00
2A.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 46,000.00	$ 46,000.00
2A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
2A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
				Construction Subtotal	$ 2,085,000.00
2A.08	*Surveying*	1	*LS*	$ 38,000.00	$ 38,000.00
2A.09	*Engineering (10% of Construction)*	1	*LS*	$ 209,000.00	$ 209,000.00
2A.10	*Construction Services (8 months)*	1	*LS*	$ 130,000.00	$ 130,000.00
				Professional Services Subtotal	$ 377,000.00
				Phase II-A Subtotal	**$ 2,462,000.00**
PHASE II-B					
2B.01	*12-inch Forcemain*	15,700	*LF*	$ 35.00	$ 549,500.00
2B.02	*12-inch Valves and Fittings*	1	*LS*	$ 14,000.00	$ 14,000.00

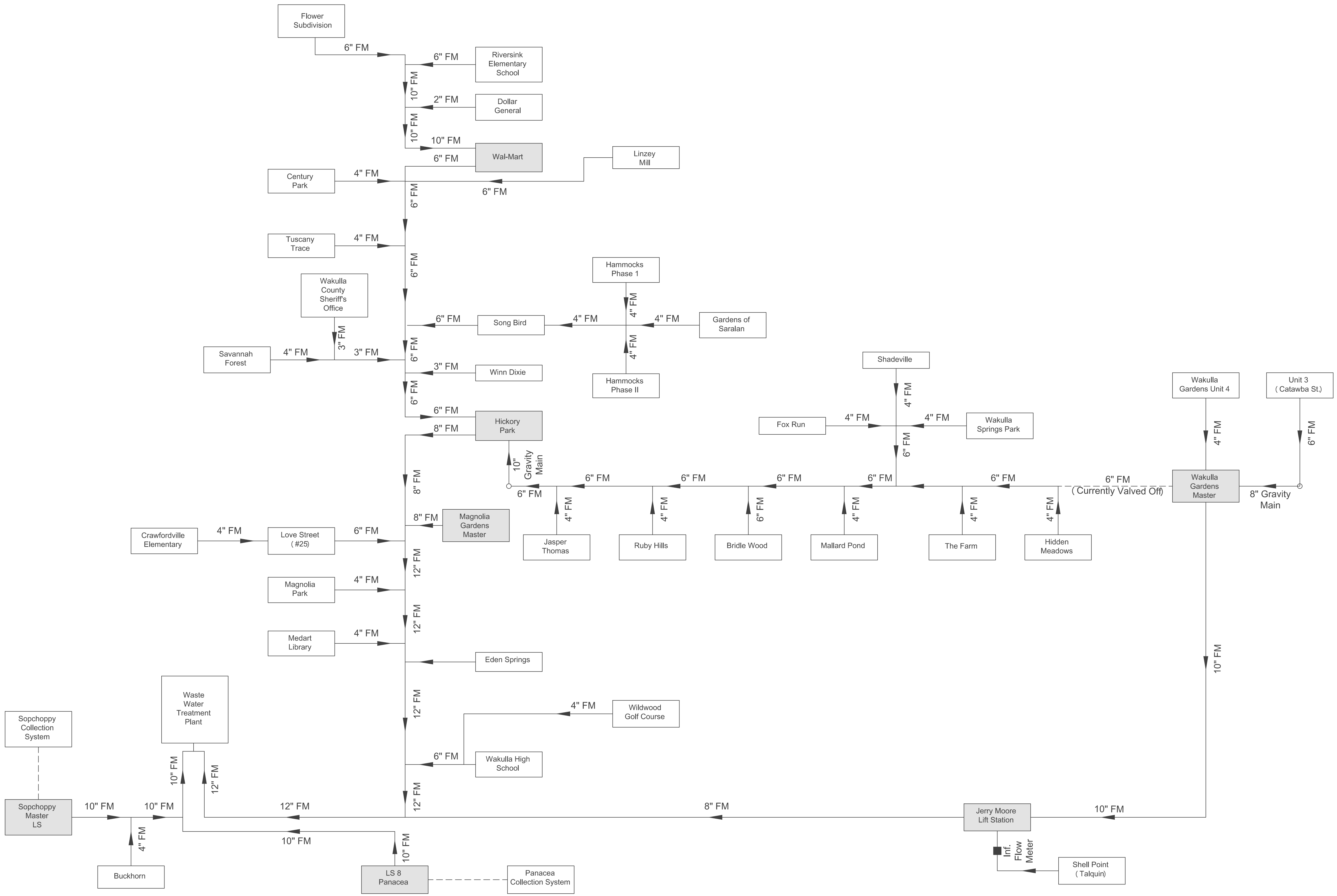
ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 1

2B.03	*6-inch Forcemain*	1,000	*LF*	$ 15.00	$ 15,000.00
2B.04	*6-inch Valves and Fittings*	1	*LS*	$ 2,500.00	$ 2,500.00
2B.05	*Palmetto Lift Station upgrades, complete*	1	*LS*	$ 250,000.00	$ 250,000.00
2B.06	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 51,000.00	$ 51,000.00
2B.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
2B.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
				Construction Subtotal	$ 1,060,000.00
2B.09	*Surveying*	1	*LS*	$ 42,000.00	$ 42,000.00
2B.10	*Engineering (10% of Construction)*	1	*LS*	$ 106,000.00	$ 106,000.00
2B.11	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 248,000.00
				Phase II Subtotal	**$ 1,308,000.00**
PHASE III					
3.01	*16-inch Forcemain*	3,800	*LF*	$ 70.00	$ 266,000.00
3.02	*16-inch Valves and Fittings*	1	*LS*	$ 7,000.00	$ 7,000.00
3.03	*Jack and Bore*	100	*LF*	$ 500.00	$ 50,000.00
3.04	*Remove/Abandon Existing 8-inch Forcemain*	3,900	*LF*	$ 10.00	$ 39,000.00
3.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 20,000.00	$ 20,000.00
3.06	*Pump Station Upgrades (#35)*	1	*LS*	$ 300,000.00	$ 300,000.00
3.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
3.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
				Construction Subtotal	$ 820,000.00
3.09	*Surveying*	1	*LS*	$ 16,000.00	$ 16,000.00
3.10	*Engineering (10% of Construction)*	1	*LS*	$ 82,000.00	$ 82,000.00
3.11	*Construction Services (4 months)*	1	*LS*	$ 65,000.00	$ 65,000.00
				Professional Services Subtotal	$ 163,000.00
				Phase III Subtotal	**$ 983,000.00**
PHASE IV					
4.01	*16-inch Forcemain*	27,500	*LF*	$ 70.00	$ 1,925,000.00
4.02	*16-inch Valves and Fittings*	1	*LS*	$ 49,000.00	$ 49,000.00
4.03	*Remove/Abandon Existing 12-inch Forcemain*	27,500	*LF*	$ 10.00	$ 275,000.00
4.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 83,000.00	$ 83,000.00
4.05	*Pump Station Upgrades (#25)*	1	*LS*	$ 150,000.00	$ 150,000.00
4.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 249,000.00	$ 249,000.00
4.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 249,000.00	$ 249,000.00
				Construction Subtotal	$ 2,980,000.00
4.08	*Surveying*	1	*LS*	$ 69,000.00	$ 69,000.00
4.09	*Engineering (10% of Construction)*	1	*LS*	$ 298,000.00	$ 298,000.00
4.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 527,000.00
				Phase IV Subtotal	**$ 3,507,000.00**
				Subtotal Construction Costs	**$ 12,556,000.00**
				Subtotal Professional Services	**$ 2,304,000.00**
				Total Estimated Cost	**$ 14,860,000.00**

Attachment 5

Transmission System – Alternative Two
Line Diagram and Map



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LINE DIAGRAM - EXISTING

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
DRAWN: R. JERNIGAN
CHECKED: T. BURCH

PROJECT NO. 50124954
SHEET 1

November 9, 2020 (22:11:30 EST)
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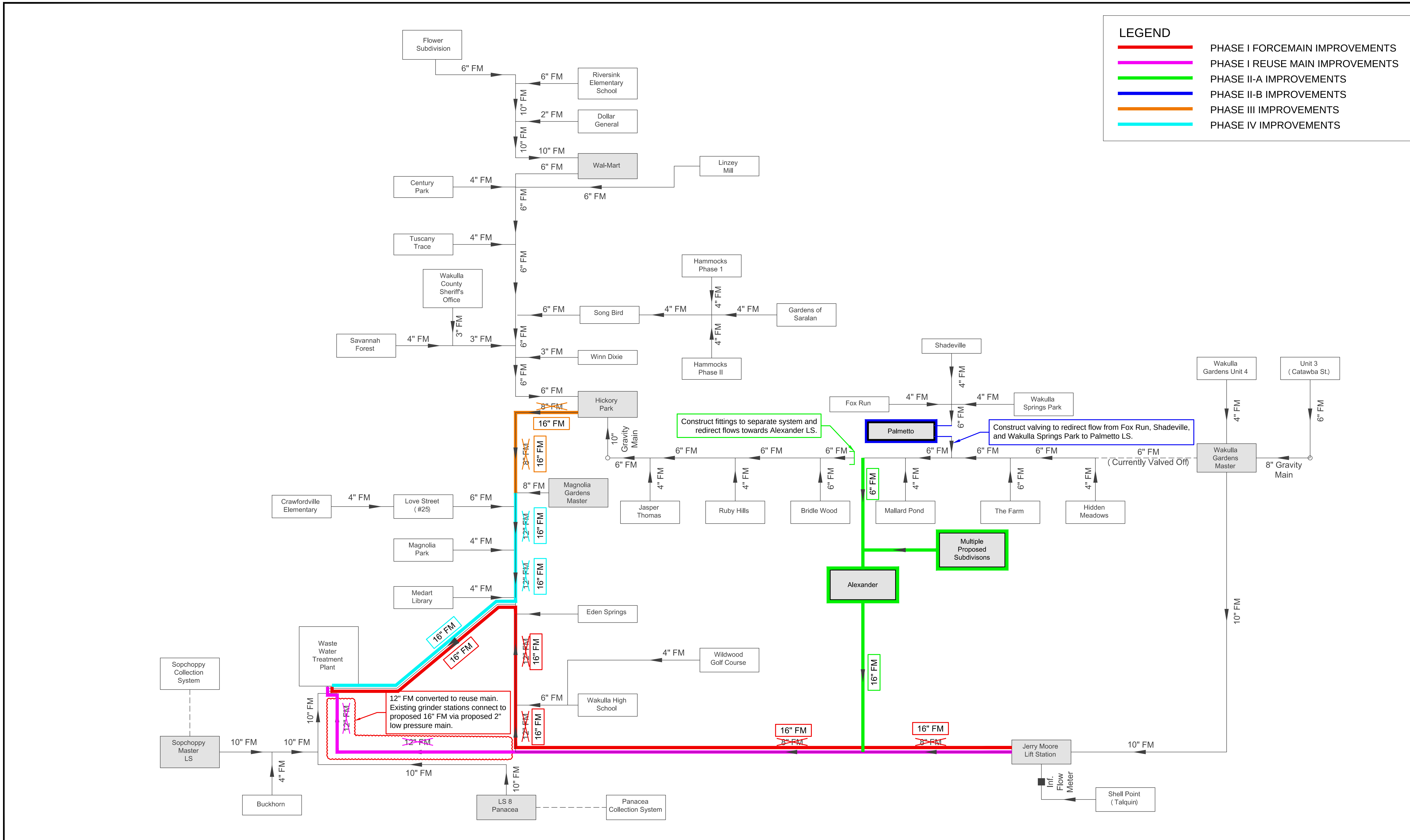

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LINE DIAGRAM
TRANSMISSION SYSTEM
ALTERNATIVE 2

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
DRAWN: R. JERNIGAN
CHECKED: T. BURCH
PROJECT NO. 50124954
SHEET

November 9, 2020 (22:11:30 EST)
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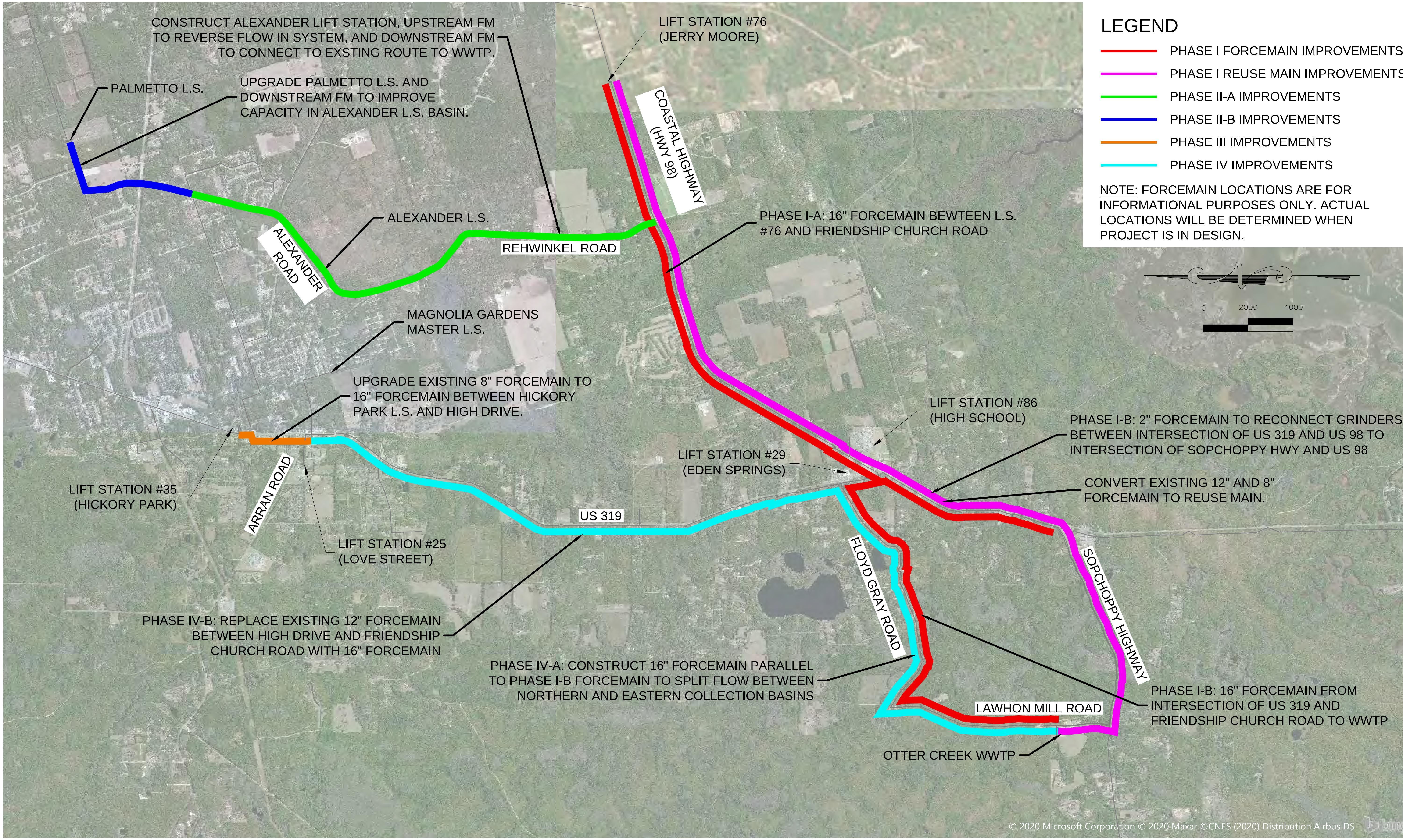

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TRANSMISSION SYSTEM ALTERNATIVE 2

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: As Shown
DRAWN: R. JERNIGAN
CHECKED: T. BURCH
PROJECT NO. 50124954
SHEET 2

November 20, 2020 (11:27:43 EST)
P:_RANDALL JERNIGAN\STUFF FOR TREVOR B\WAKULLA COUNTY WASTEWATER SYSTEM IMPROVEMENTS FACILITIES PLAN\FORCEMAIN ALTERNATIVES-2.DWG

Attachment 6

Transmission System – Alternative Two Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 2

	Description	Quantity	Unit	Unit Price	Extension
PHASE I-A					
1A.01	*16-inch Forcemain*	22,800	*LF*	$ 70.00	$ 1,596,000.00
1A.02	*16-inch Valves and Fittings*	1	*LS*	$ 40,000.00	$ 40,000.00
1A.03	*Conversion of 8-inch forcemain to reuse main*	1	*LS*	$ 65,000.00	$ 65,000.00
1A.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 69,000.00	$ 69,000.00
1A.05	*Pump Station Upgrades (#76)*	1	*LS*	$ 500,000.00	$ 500,000.00
1A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
1A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
				Construction Subtotal	$ 2,724,000.00
1A.08	*Surveying*	1	*LS*	$ 57,000.00	$ 57,000.00
1A.09	*Engineering (10% of Construction)*	1	*LS*	$ 273,000.00	$ 273,000.00
1A.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 490,000.00
				Phase I-A Subtotal	**$ 3,214,000.00**
PHASE I-B					
1B.01	*16-inch Forcemain*	22,200	*LF*	$ 70.00	$ 1,554,000.00
1B.02	*16-inch Valves and Fittings*	1	*LS*	$ 39,000.00	$ 39,000.00
1B.03	*Conversion of 12-inch forcemain to reuse main*	1	*LS*	$ 100,000.00	$ 100,000.00
1B.04	*2-inch low pressure main*	8,700	*LF*	$ 12.50	$ 108,750.00
1B.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 93,000.00	$ 93,000.00
1B.06	*Pump Station Upgrades (#86 and #29)*	1	*LS*	$ 400,000.00	$ 400,000.00
1B.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 230,000.00	$ 230,000.00
1B.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 230,000.00	$ 230,000.00
				Construction Subtotal	$ 2,754,750.00
1B.09	*Surveying*	1	*LS*	$ 78,000.00	$ 78,000.00
1B.10	*Engineering (10% of Construction)*	1	*LS*	$ 276,000.00	$ 276,000.00
1B.11	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 514,000.00
				Phase I-B Subtotal	**$ 3,268,750.00**
PHASE II-A					
2A.01	*Alexander Lift Station, complete*	1	*LS*	$ 500,000.00	$ 500,000.00
2A.02	*16-inch Forcemain*	15,200	*LF*	$ 70.00	$ 1,064,000.00
2A.03	*16-inch Valves and Fittings*	1	*LS*	$ 27,000.00	$ 27,000.00
2A.04	*Master Lift Station SCADA*	1	*LS*	$ 100,000.00	$ 100,000.00
2A.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 46,000.00	$ 46,000.00
2A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
2A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
				Construction Subtotal	$ 2,085,000.00
2A.08	*Surveying*	1	*LS*	$ 38,000.00	$ 38,000.00
2A.09	*Engineering (10% of Construction)*	1	*LS*	$ 209,000.00	$ 209,000.00
2A.10	*Construction Services (8 months)*	1	*LS*	$ 130,000.00	$ 130,000.00
				Professional Services Subtotal	$ 377,000.00
				Phase II-A Subtotal	**$ 2,462,000.00**
PHASE II-B					
2B.01	*12-inch Forcemain*	15,700	*LF*	$ 35.00	$ 549,500.00

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 2

2B.02	*12-inch Valves and Fittings*	1	*LS*	$ 14,000.00	$ 14,000.00
2B.03	*6-inch Forcemain*	1,000	*LF*	$ 15.00	$ 15,000.00
2B.04	*6-inch Valves and Fittings*	1	*LS*	$ 2,500.00	$ 2,500.00
2B.05	*Palmetto Lift Station upgrades, complete*	1	*LS*	$ 250,000.00	$ 250,000.00
2B.06	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 51,000.00	$ 51,000.00
2B.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
2B.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
				Construction Subtotal	$ 1,060,000.00
2B.09	*Surveying*	1	*LS*	$ 42,000.00	$ 42,000.00
2B.10	*Engineering (10% of Construction)*	1	*LS*	$ 106,000.00	$ 106,000.00
2B.11	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 248,000.00
				Phase II Subtotal	**$ 1,308,000.00**
PHASE III					
3.01	*16-inch Forcemain*	3,800	*LF*	$ 70.00	$ 266,000.00
3.02	*16-inch Valves and Fittings*	1	*LS*	$ 7,000.00	$ 7,000.00
3.03	*Jack and Bore*	100	*LF*	$ 500.00	$ 50,000.00
3.04	*Remove/Abandon Existing 8-inch Forcemain*	3,900	*LF*	$ 10.00	$ 39,000.00
3.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 20,000.00	$ 20,000.00
3.06	*Pump Station Upgrades (#35)*	1	*LS*	$ 300,000.00	$ 300,000.00
3.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
3.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
				Construction Subtotal	$ 820,000.00
3.09	*Surveying*	1	*LS*	$ 16,000.00	$ 16,000.00
3.10	*Engineering (10% of Construction)*	1	*LS*	$ 82,000.00	$ 82,000.00
3.11	*Construction Services (4 months)*	1	*LS*	$ 65,000.00	$ 65,000.00
				Professional Services Subtotal	$ 163,000.00
				Phase III Subtotal	**$ 983,000.00**
PHASE IV-A					
4A.01	*16-inch Forcemain*	21,000	*LF*	$ 70.00	$ 1,470,000.00
4A.02	*16-inch Valves and Fittings*	1	*LS*	$ 37,000.00	$ 37,000.00
4A.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 63,000.00	$ 63,000.00
4A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 157,000.00	$ 157,000.00
4A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 157,000.00	$ 157,000.00
				Construction Subtotal	$ 1,884,000.00
4A.08	*Surveying*	1	*LS*	$ 53,000.00	$ 53,000.00
4A.09	*Engineering (10% of Construction)*	1	*LS*	$ 189,000.00	$ 189,000.00
4A.10	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 342,000.00
				Phase IV Subtotal	**$ 2,226,000.00**
PHASE IV-B					
4B.01	*16-inch Forcemain*	25,000	*LF*	$ 70.00	$ 1,750,000.00
4B.02	*16-inch Valves and Fittings*	1	*LS*	$ 44,000.00	$ 44,000.00
4B.03	*Remove/Abandon Existing 12-inch Forcemain*	25,000	*LF*	$ 10.00	$ 250,000.00
4B.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 75,000.00	$ 75,000.00
4B.05	*Pump Station Upgrades (#25)*	1	*LS*	$ 150,000.00	$ 150,000.00

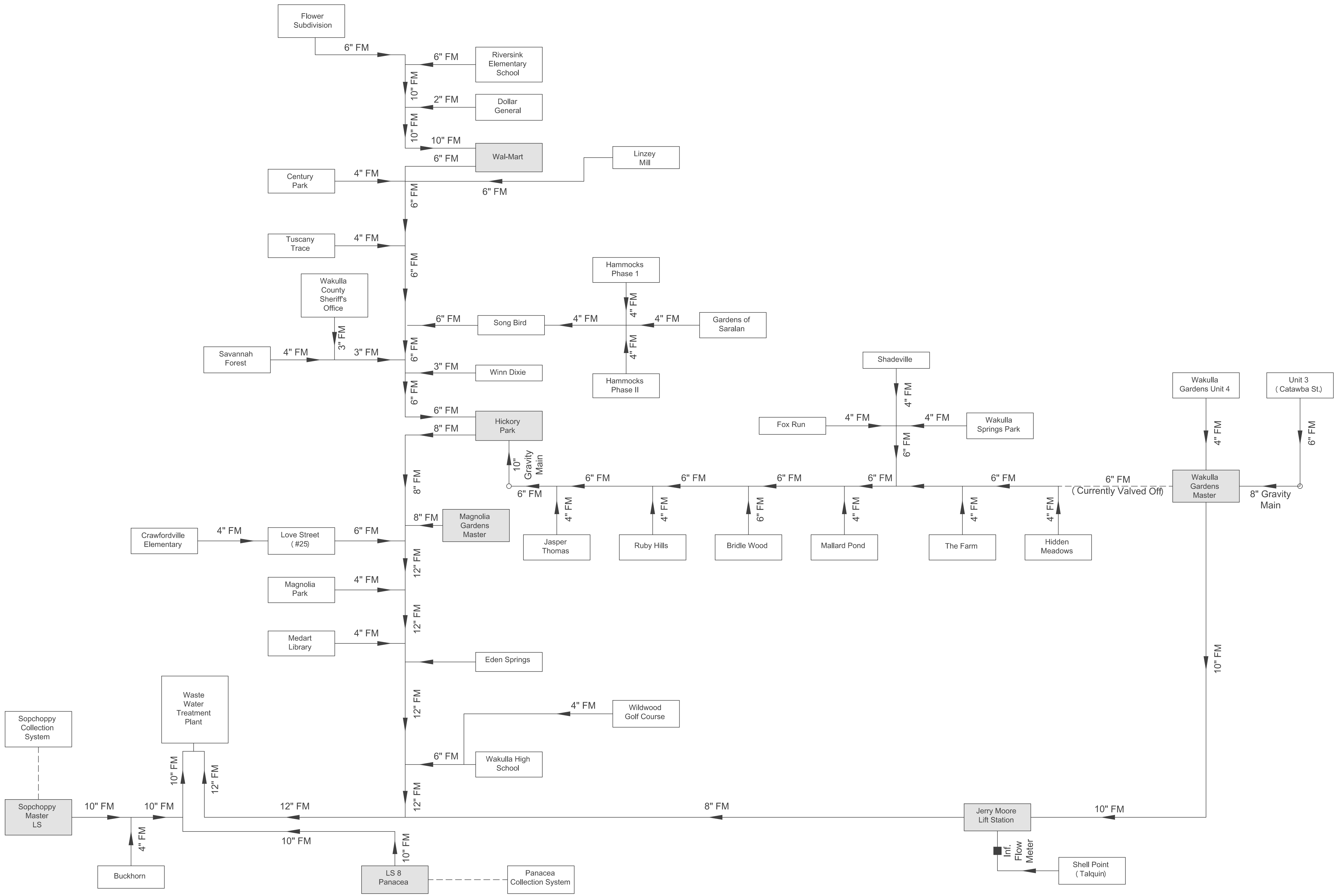
ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 2

4B.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
4B.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
				Construction Subtotal	$ 2,723,000.00
4B.08	*Surveying*	1	*LS*	$ 63,000.00	$ 63,000.00
4B.09	*Engineering (10% of Construction)*	1	*LS*	$ 273,000.00	$ 273,000.00
4B.10	*Construction Services (8 months)*	1	*LS*	$ 130,000.00	$ 130,000.00
				Professional Services Subtotal	$ 466,000.00
				Phase IV Subtotal	**$ 3,189,000.00**
				Subtotal Construction Costs	**$ 14,050,750.00**
				Subtotal Professional Services	**$ 2,600,000.00**
				Total Estimated Cost	**$ 16,650,750.00**

Attachment 7

Transmission System – Alternative Three Line Diagram and Map



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LINE DIAGRAM - EXISTING

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
DRAWN: R. JERNIGAN
CHECKED: T. BURCH
PROJECT NO. 50124954
SHEET 1

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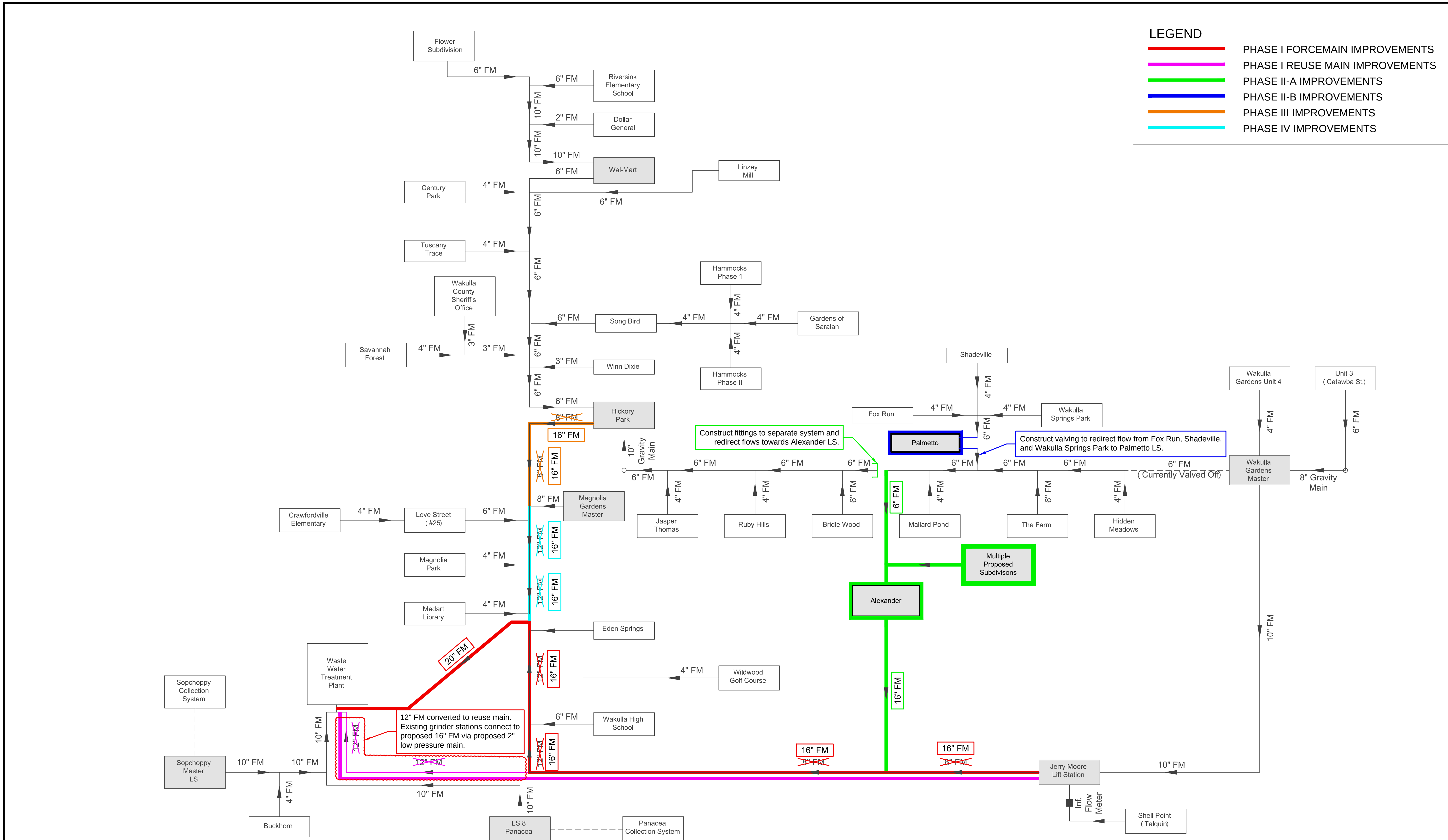

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LINE DIAGRAM
TRANSMISSION SYSTEM
ALTERNATIVE 3

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: N.T.S.
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PROJECT NO. 50124954
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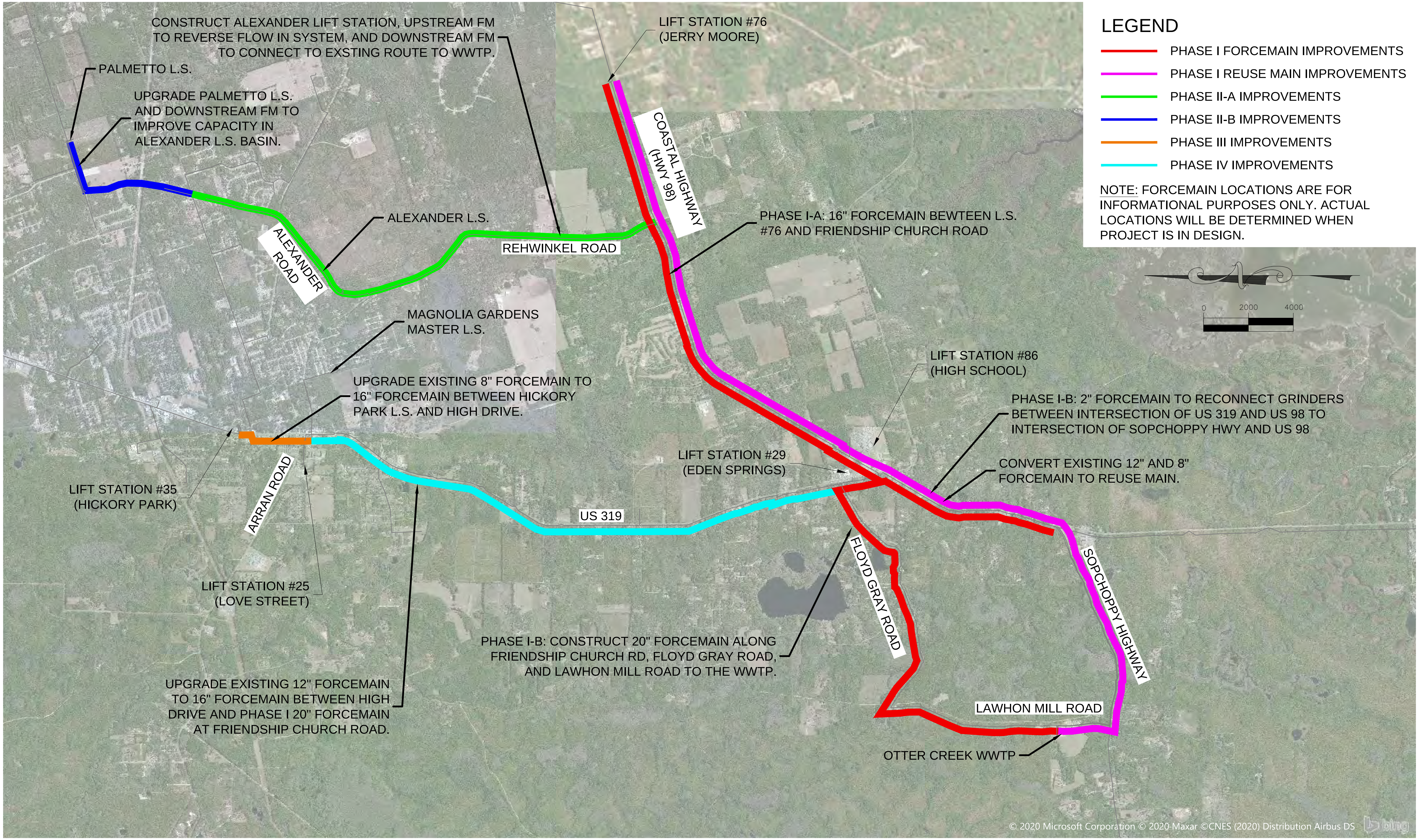

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November 20, 2020 (11:27:11 EST)
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TRANSMISSION SYSTEM ALTERNATIVE 3

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WASTEWATER SYSTEM IMPROVEMENTS
FACILITIES PLAN
WAKULLA COUNTY, FLORIDA

DATE: 11/4/2020
SCALE: As Shown
DRAWN: R. JERNIGAN
CHECKED: T. BURCH

PROJECT NO. 50124954

SHEET 3

Attachment 8

Transmission System – Alternative Three
Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TRANSMISSION SYSTEM - ALTERNATIVE 3

	Description	Quantity	Unit	Unit Price	Extension
PHASE I-A					
1A.01	*16-inch Forcemain*	22,800	*LF*	$ 70.00	$ 1,596,000.00
1A.02	*16-inch Valves and Fittings*	1	*LS*	$ 40,000.00	$ 40,000.00
1A.03	*Conversion of 8-inch forcemain to reuse main*	1	*LS*	$ 65,000.00	$ 65,000.00
1A.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 69,000.00	$ 69,000.00
1A.05	*Pump Station Upgrades (#76)*	1	*LS*	$ 500,000.00	$ 500,000.00
1A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
1A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
				Construction Subtotal	$ 2,724,000.00
1A.08	*Surveying*	1	*LS*	$ 57,000.00	$ 57,000.00
1A.09	*Engineering (10% of Construction)*	1	*LS*	$ 273,000.00	$ 273,000.00
1A.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 490,000.00
				Phase I-A Subtotal	**$ 3,214,000.00**
PHASE I-B					
1B.01	*20-inch Forcemain*	22,200	*LF*	$ 90.00	$ 1,998,000.00
1B.02	*20-inch Valves and Fittings*	1	*LS*	$ 50,000.00	$ 50,000.00
1B.03	*Conversion of 12-inch forcemain to reuse main*	1	*LS*	$ 100,000.00	$ 100,000.00
1B.04	*2-inch low pressure main*	8,700	*LF*	$ 12.50	$ 108,750.00
1B.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 67,000.00	$ 67,000.00
1B.06	*Pump Station Upgrades (#86 and #29)*	1	*LS*	$ 400,000.00	$ 400,000.00
1B.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 273,000.00	$ 273,000.00
1B.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 273,000.00	$ 273,000.00
				Construction Subtotal	$ 3,269,750.00
1B.09	*Surveying*	1	*LS*	$ 78,000.00	$ 78,000.00
1B.10	*Engineering (10% of Construction)*	1	*LS*	$ 327,000.00	$ 327,000.00
1B.11	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 565,000.00
				Phase I-B Subtotal	**$ 3,834,750.00**
PHASE II-A					
2A.01	*Alexander Lift Station, complete*	1	*LS*	$ 500,000.00	$ 500,000.00
2A.02	*16-inch Forcemain*	15,200	*LF*	$ 70.00	$ 1,064,000.00
2A.03	*16-inch Valves and Fittings*	1	*LS*	$ 27,000.00	$ 27,000.00
2A.04	*Master Lift Station SCADA*	1	*LS*	$ 100,000.00	$ 100,000.00
2A.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 46,000.00	$ 46,000.00
2A.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
2A.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 174,000.00	$ 174,000.00
				Construction Subtotal	$ 2,085,000.00
2A.08	*Surveying*	1	*LS*	$ 38,000.00	$ 38,000.00
2A.09	*Engineering (10% of Construction)*	1	*LS*	$ 209,000.00	$ 209,000.00
2A.10	*Construction Services (8 months)*	1	*LS*	$ 130,000.00	$ 130,000.00
				Professional Services Subtotal	$ 377,000.00
				Phase II-A Subtotal	**$ 2,462,000.00**
PHASE II-B					
2B.01	*12-inch Forcemain*	15,700	*LF*	$ 35.00	$ 549,500.00

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

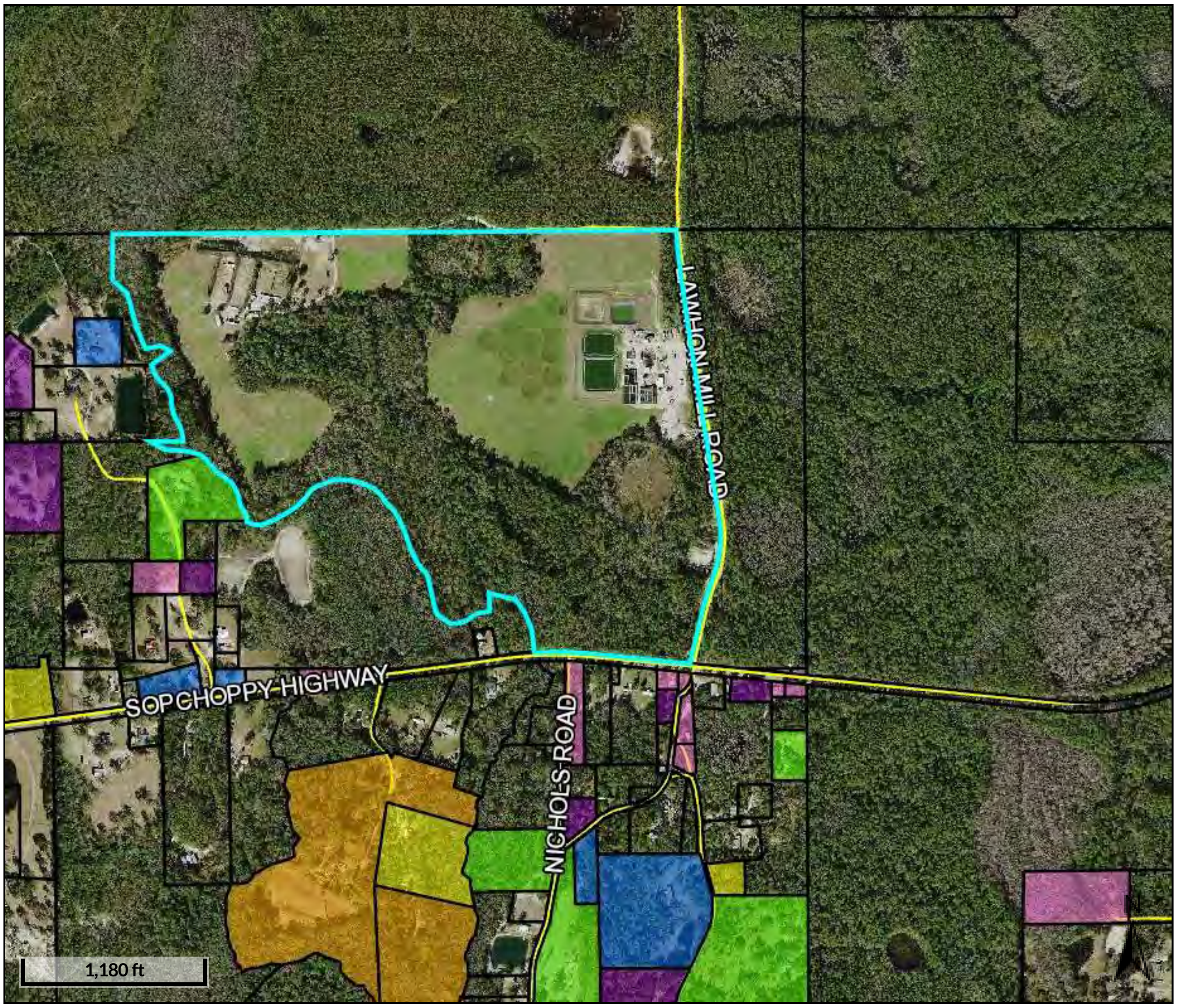
TRANSMISSION SYSTEM - ALTERNATIVE 3

2B.02	*12-inch Valves and Fittings*	1	*LS*	$ 14,000.00	$ 14,000.00
2B.03	*6-inch Forcemain*	1,000	*LF*	$ 15.00	$ 15,000.00
2B.04	*6-inch Valves and Fittings*	1	*LS*	$ 2,500.00	$ 2,500.00
2B.05	*Palmetto Lift Station upgrades, complete*	1	*LS*	$ 250,000.00	$ 250,000.00
2B.06	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 51,000.00	$ 51,000.00
2B.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
2B.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 89,000.00	$ 89,000.00
				Construction Subtotal	$ 1,060,000.00
2B.09	*Surveying*	1	*LS*	$ 42,000.00	$ 42,000.00
2B.10	*Engineering (10% of Construction)*	1	*LS*	$ 106,000.00	$ 106,000.00
2B.11	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 248,000.00
				Phase II Subtotal	**$ 1,308,000.00**
PHASE III					
3.01	*16-inch Forcemain*	3,800	*LF*	$ 70.00	$ 266,000.00
3.02	*16-inch Valves and Fittings*	1	*LS*	$ 7,000.00	$ 7,000.00
3.03	*Jack and Bore*	100	*LF*	$ 500.00	$ 50,000.00
3.04	*Remove/Abandon Existing 8-inch Forcemain*	3,900	*LF*	$ 10.00	$ 39,000.00
3.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 20,000.00	$ 20,000.00
3.06	*Pump Station Upgrades (#35)*	1	*LS*	$ 300,000.00	$ 300,000.00
3.07	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
3.08	*Contingency (10% Construction Cost)*	1	*LS*	$ 69,000.00	$ 69,000.00
				Construction Subtotal	$ 820,000.00
3.09	*Surveying*	1	*LS*	$ 16,000.00	$ 16,000.00
3.10	*Engineering (10% of Construction)*	1	*LS*	$ 82,000.00	$ 82,000.00
3.11	*Construction Services (4 months)*	1	*LS*	$ 65,000.00	$ 65,000.00
				Professional Services Subtotal	$ 163,000.00
				Phase III Subtotal	**$ 983,000.00**
PHASE IV					
4.01	*16-inch Forcemain*	25,000	*LF*	$ 70.00	$ 1,750,000.00
4.02	*16-inch Valves and Fittings*	1	*LS*	$ 44,000.00	$ 44,000.00
4.03	*Remove/Abandon Existing 12-inch Forcemain*	25,000	*LF*	$ 10.00	$ 250,000.00
4.04	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 75,000.00	$ 75,000.00
4.05	*Pump Station Upgrades (#25)*	1	*LS*	$ 150,000.00	$ 150,000.00
4.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
4.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 227,000.00	$ 227,000.00
				Construction Subtotal	$ 2,723,000.00
4.08	*Surveying*	1	*LS*	$ 63,000.00	$ 63,000.00
4.09	*Engineering (10% of Construction)*	1	*LS*	$ 273,000.00	$ 273,000.00
4.10	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 496,000.00
				Phase IV Subtotal	**$ 3,219,000.00**
				Subtotal Construction Costs	**$ 12,681,750.00**
				Subtotal Professional Services	**$ 2,339,000.00**
				Total Estimated Cost	**$ 15,020,750.00**

Attachment 9

Treatment System – Alternative Two Location Map

qPublic.net™ Wakulla County, FL



Legend

- Parcels
- Yearly Sales
  - 2015
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020
- Roads
- City Labels

Parcel ID	03-5S-02W-000-02471-000	**Alternate ID**	02471 000035S 02W000	**Owner Address**	BOARD OF COUNTY COMMISIONERS
Sec/Twp/Rng	3-5S-2W	**Class**	WATER MANA		P O BOX 1263
Property Address	2146 LAWHON MILL RD	**Acreage**	178.257		CRAWFORDVILLE, FL 32326
District	3				
Brief Tax Description	3-5S-2W M-40A				
	(Note: Not to be used on legal documents)				

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Attachment 10

Treatment System – Alternative Two
Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

TREATMENT SYSTEM - ALTERNATIVE 2

	Description	Quantity	Unit	Unit Price	Extension
CONSTRUCTION					
1	*Sitework*	1	*LS*	$ 100,000.00	$ 100,000.00
2	*Master Influent Lift Station Screening*	1	*LS*	$ 340,000.00	$ 340,000.00
3	*Master Influent Lift Station/IEQ Basin*	1	*LS*	$ 470,000.00	$ 470,000.00
4	*0.6 MG AeroMod Train*	1	*LS*	$ 3,200,000.00	$ 3,200,000.00
5	*R-AWT2 Reuse Pump Station*	1	*LS*	$ 280,000.00	$ 280,000.00
6	*Yard Piping/Valves*	1	*LS*	$ 100,000.00	$ 100,000.00
7	*Maintenance and Admin Building*	1	*LS*	$ 750,000.00	$ 750,000.00
8	*Misc. Paving at WWTP*	1	*LS*	$ 125,000.00	$ 125,000.00
				Subtotal	$ 5,365,000.00
				10% Bonds, Insurance, Mobilization, etc.	$ 536,500.00
				Construction Subtotal	$ 5,901,500.00
				10% Contingency	$ 536,500.00
				Engineer's Cost Opinion of Construction Total	**$ 6,438,000.00**
	Survey				$ 45,000.00
	Engineering Design (10% Total Construction Cost)				$ 644,000.00
	Permitting Services				$ 12,500.00
	Environmental Services				$ 10,000.00
	Geotechnical Services				$ 15,000.00
	Construction Services (12 month construction period)				$ 180,000.00
				Total Estimated Cost	**$ 7,344,500.00**

Attachment 11

Treatment System – Alternative Three
Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

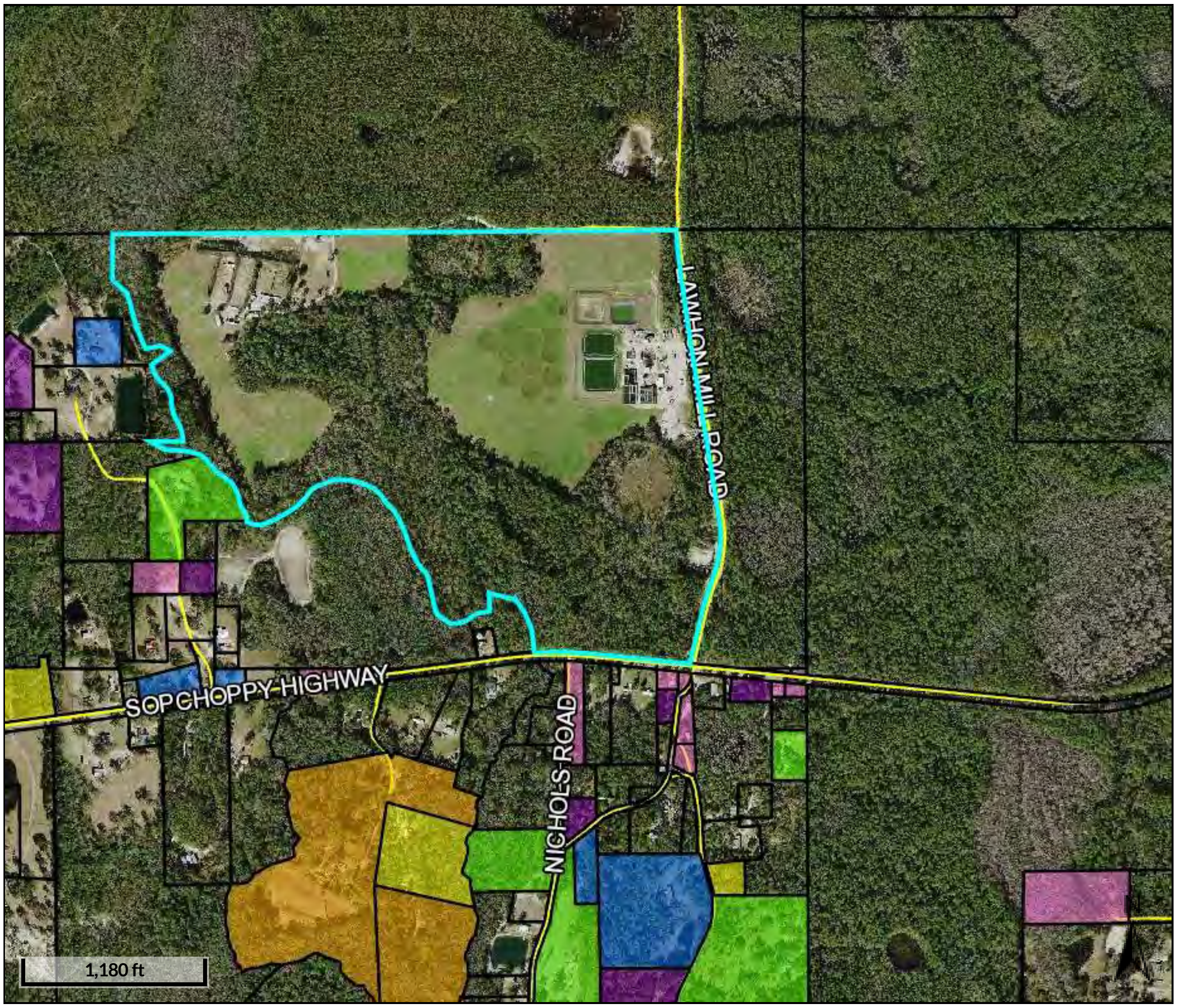
TREATMENT SYSTEM - ALTERNATIVE 3

	Description	Quantity	Unit	Unit Price	Extension
CONSTRUCTION					
1	*Sitework*	1	*LS*	$ 250,000.00	$ 250,000.00
2	*New 0.6 MGD WWTP*	1	*LS*	$ 7,200,000.00	$ 7,200,000.00
3	*Reroute existing system to new WWTP*	1	*LS*	$ 2,500,000.00	$ 2,500,000.00
4	*Connection to existing effluent disposal system*	1	*LS*	$ 2,500,000.00	$ 2,500,000.00
				Subtotal	$ 12,450,000.00
				10% Bonds, Insurance, Mobilization, etc.	$ 1,245,000.00
				Construction Subtotal	$ 13,695,000.00
				10% Contingency	$ 1,245,000.00
				Engineer's Cost Opinion of Construction Total	**$ 14,940,000.00**
	Survey				$ 300,000.00
	Engineering Design (10% Total Construction Cost)				$ 1,494,000.00
	Permitting Services				$ 30,000.00
	Environmental Services				$ 25,000.00
	Geotechnical Services				$ 30,000.00
	Construction Services (24 month construction period)				$ 360,000.00
				Total Estimated Cost	**$ 17,179,000.00**

Attachment 12

Discharge System – Alternative Two Location Map

qPublic.net™ Wakulla County, FL



Overview

Legend

- Parcels
- **Yearly Sales**
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- Roads
- City Labels

Parcel ID	03-5S-02W-000-02471-000	**Alternate ID**	02471 000035S 02W000	**Owner Address**	BOARD OF COUNTY COMMISIONERS
Sec/Twp/Rng	3-5S-2W	**Class**	WATER MANA		P O BOX 1263
Property Address	2146 LAWHON MILL RD	**Acreage**	178.257		CRAWFORDVILLE, FL 32326

District 3

Brief Tax Description 3-5S-2W M-40A

(Note: Not to be used on legal documents)

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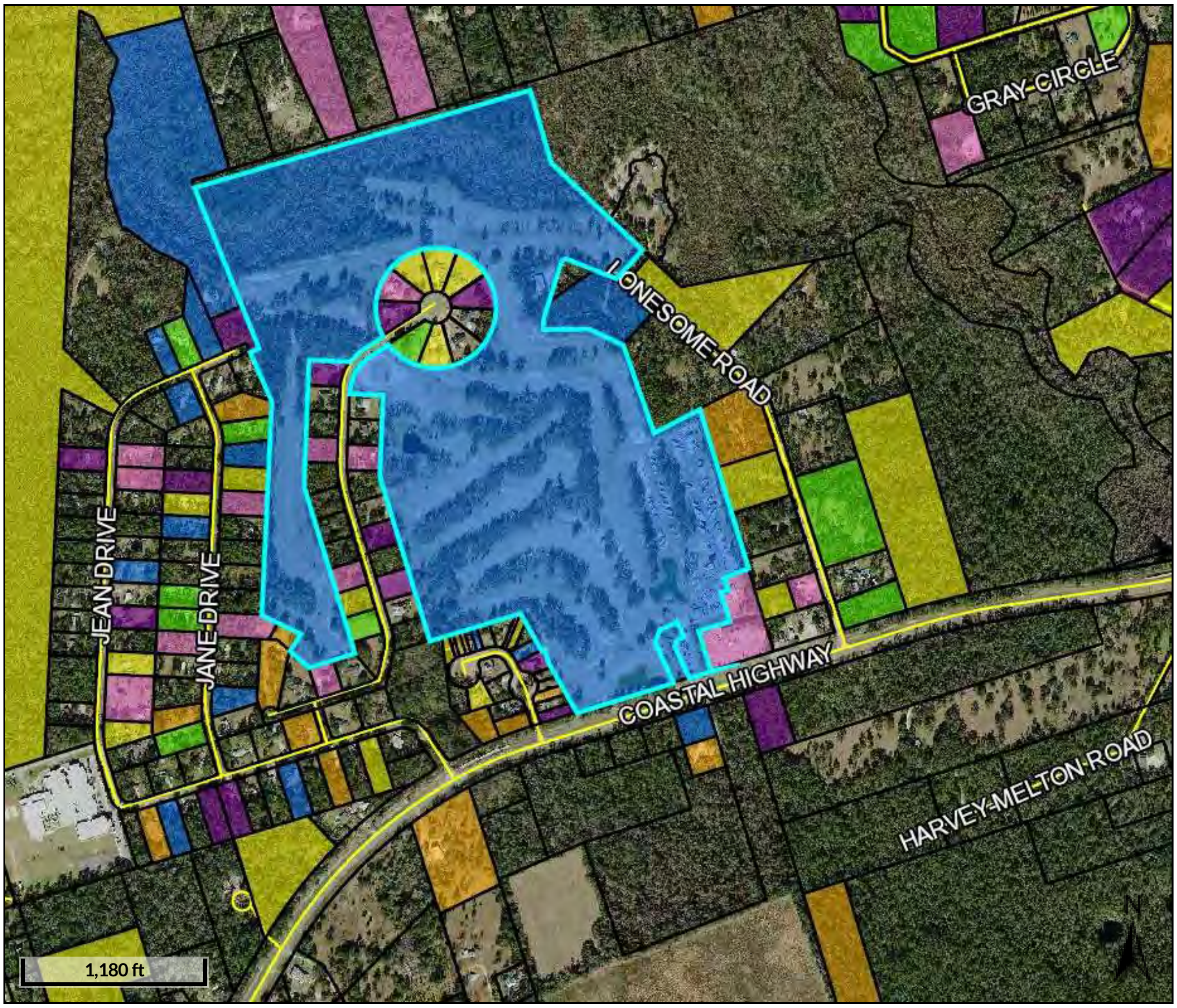

Overview

Legend

- **Parcels**

Yearly Sales

- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- **Roads**
- **City Labels**

Parcel ID	00-00-086-000-11586-000	**Alternate ID**	11586 0000000 086000	**Owner Address**	WILDWOOD COUNTRY CLUB LLC
Sec/Twp/Rng	--86	**Class**	GOLF COURS		3874 COASTAL HWY
Property Address	3874 COASTAL HWY CRAWFORDVILLE	**Acreage**	159.05		CRAWFORDVILLE, FL 32327

District 3

Brief Tax Description LOT 86 HS P-6-M-27

(Note: Not to be used on legal documents)

Date created: 11/10/2020
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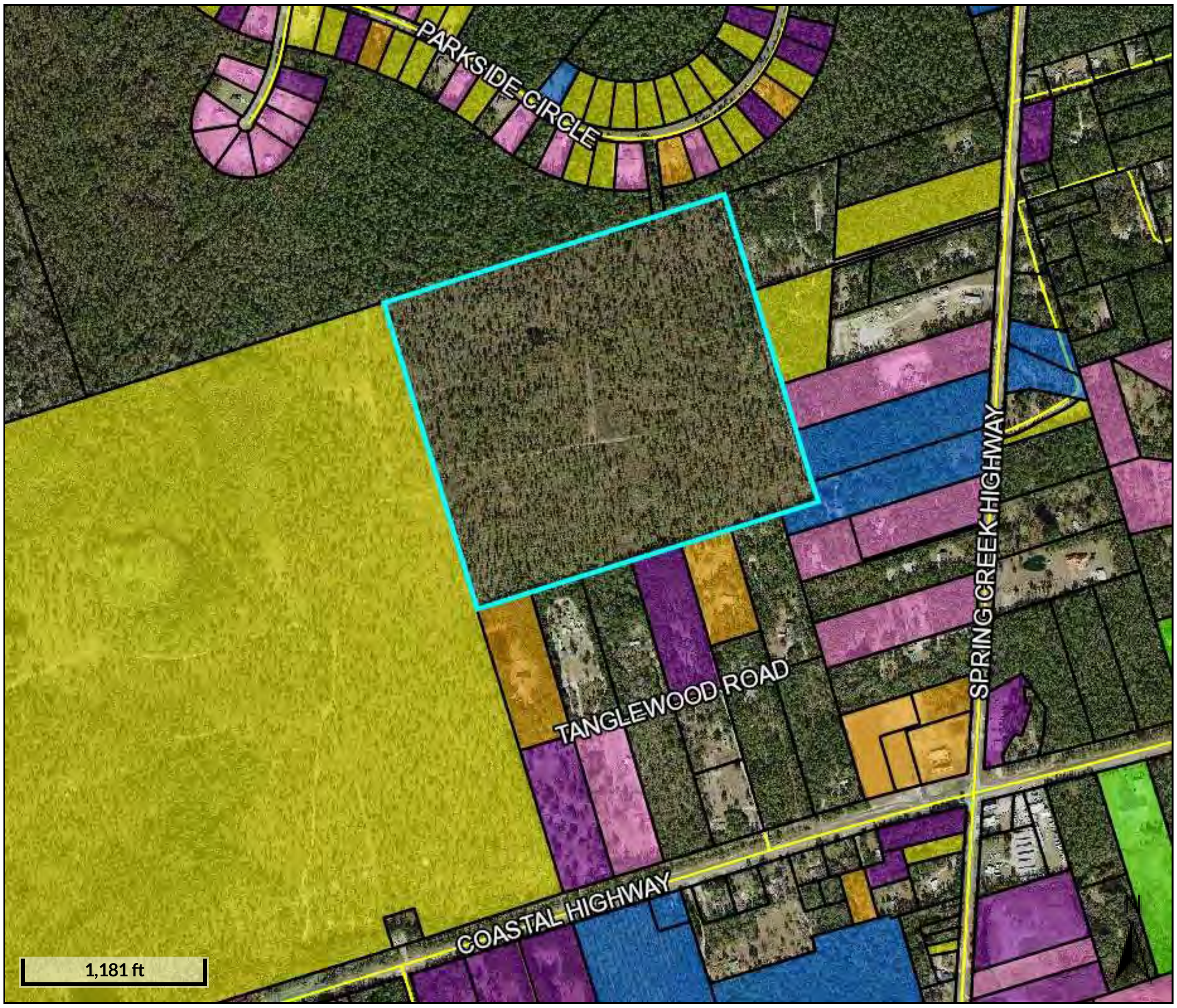

Overview

Legend

- Parcels
- **Yearly Sales**
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020
- Roads
- City Labels

Parcel ID	00-00-050-000-09892-002	**Alternate ID**	09892 0020000 050000	**Owner Address**	JERRY MOORE FLORIDA OPERATIONS LLC
Sec/Twp/Rng	--50	**Class**	TIMBERLAND		PO BOX 457
Property Address	COASTAL HWY	**Acreage**	118.4		PANACEA, FL 32346

District 3
Brief Tax Description LOT 50 HS P-1-2-M-16
(Note: Not to be used on legal documents)

Date created: 11/10/2020
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Attachment 13

Discharge System – Alternative Two Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

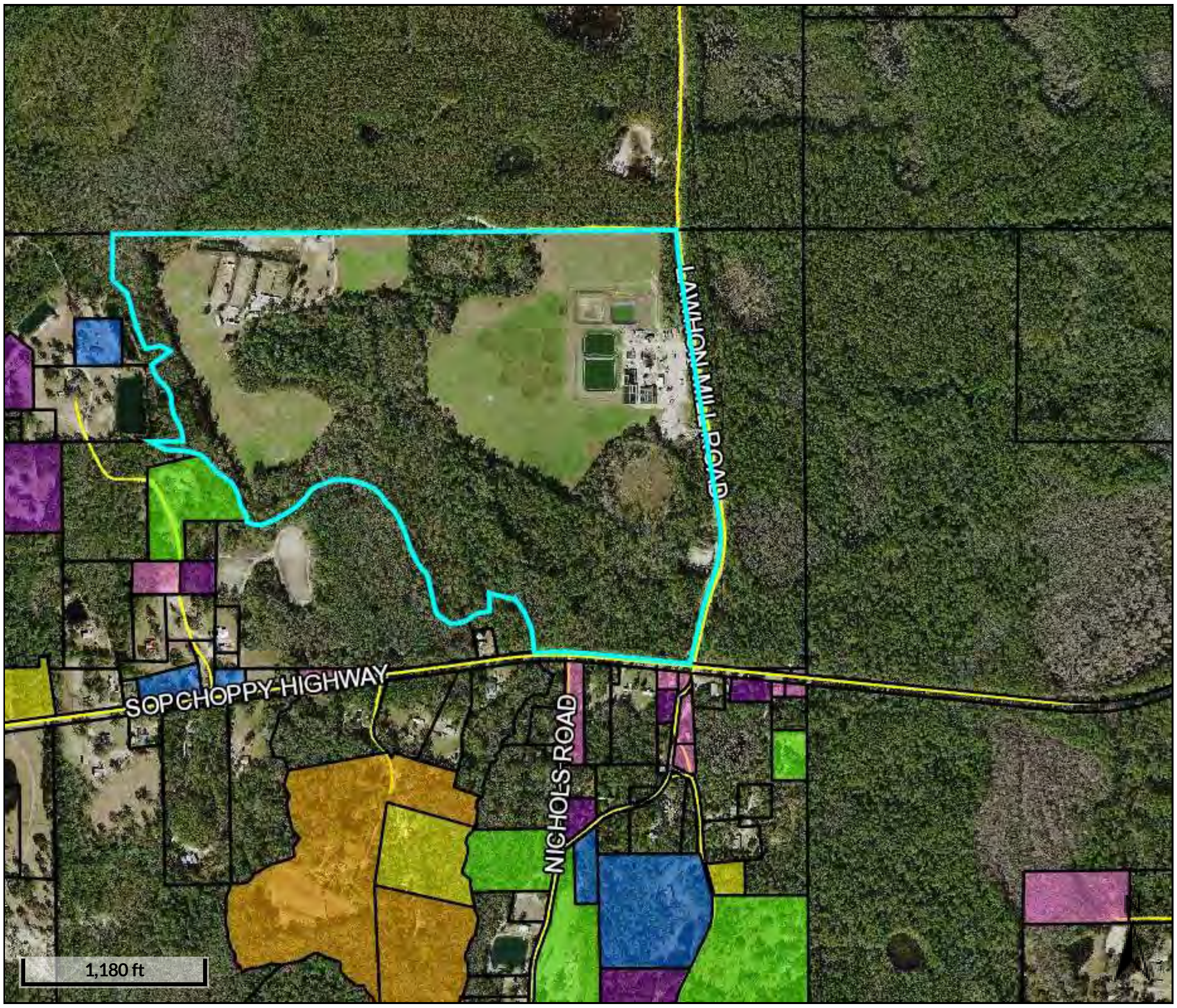
DISCHARGE SYSTEM - ALTERNATIVE 3

	Description	Quantity	Unit	Unit Price	Extension
PHASE I - Additional Effluent Reuse System					
1.01	*1.5 MGD land application system (Jerry Moore site)*	1	*LS*	$ 2,400,000.00	$ 2,400,000.00
1.02	*Effluent pumping station at WWTP*	1	*LS*	$ 350,000.00	$ 350,000.00
1.03	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 275,000.00	$ 275,000.00
1.04	*Contingency (10% Construction Cost)*	1	*LS*	$ 275,000.00	$ 275,000.00
				Construction Subtotal	$ 3,300,000.00
1.05	*Land Purchase of Jerry Moore site (±118 acres)*	1	*LS*	$ 525,000.00	$ 525,000.00
				Other Costs Subtotal	$ 525,000.00
1.06	*Surveying*	1	*LS*	$ 90,000.00	$ 90,000.00
1.07	*Engineering (10% of Construction)*	1	*LS*	$ 330,000.00	$ 330,000.00
1.08	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 580,000.00
				Phase I Subtotal	**$ 4,405,000.00**
PHASE II - Upgraded Piping to Phase II Site					
2.01	*12-inch Reuse Main*	22,800	*LS*	$ 35.00	$ 798,000.00
2.02	*12-inch Valves and Fittings*	1	*LS*	$ 20,000.00	$ 20,000.00
2.03	*Effluent pump station upgrades*	1	*LS*	$ 250,000.00	$ 250,000.00
2.04	*Remove/Abandon Existing 8-inch Reuse Main*	22,800	*LF*	$ 10.00	$ 228,000.00
2.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 69,000.00	$ 69,000.00
2.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 137,000.00	$ 137,000.00
2.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 137,000.00	$ 137,000.00
				Construction Subtotal	$ 1,639,000.00
2.08	*Surveying*	1	*LS*	$ 57,000.00	$ 57,000.00
2.09	*Engineering (10% of Construction)*	1	*LS*	$ 164,000.00	$ 164,000.00
2.10	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 321,000.00
				Phase II Subtotal	**$ 1,960,000.00**
PHASE III - Sprayfield to RIB Conversion					
3.01	*Conversion of existing sprayfield to 0.6 MGD RIB system*	1	*LS*	$ 820,000.00	$ 820,000.00
3.02	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 82,000.00	$ 82,000.00
3.03	*Contingency (10% Construction Cost)*	1	*LS*	$ 82,000.00	$ 82,000.00
				Construction Subtotal	$ 984,000.00
3.04	*Surveying*	1	*LS*	$ 30,000.00	$ 30,000.00
3.05	*Engineering (10% of Construction)*	1	*LS*	$ 99,000.00	$ 99,000.00
3.06	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 229,000.00
				Phase III Subtotal	**$ 1,213,000.00**
				Subtototal Construction Costs	**$ 5,923,000.00**
				Subtotal Professional Services	**$ 1,130,000.00**
				Subtotal Other Costs	**$ 525,000.00**
				Total Estimated Cost	**$ 7,578,000.00**

Attachment 14

Discharge System – Alternative Three Location Map

qPublic.net™ Wakulla County, FL



Legend

- Parcels
- Yearly Sales
  - 2015
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020
- Roads
- City Labels

Parcel ID	03-5S-02W-000-02471-000	**Alternate ID**	02471 000035S 02W000	**Owner Address**	BOARD OF COUNTY COMMISIONERS
Sec/Twp/Rng	3-5S-2W	**Class**	WATER MANA		P O BOX 1263
Property Address	2146 LAWHON MILL RD	**Acreage**	178.257		CRAWFORDVILLE, FL 32326
District	3				
Brief Tax Description	3-5S-2W M-40A				
	(Note: Not to be used on legal documents)				

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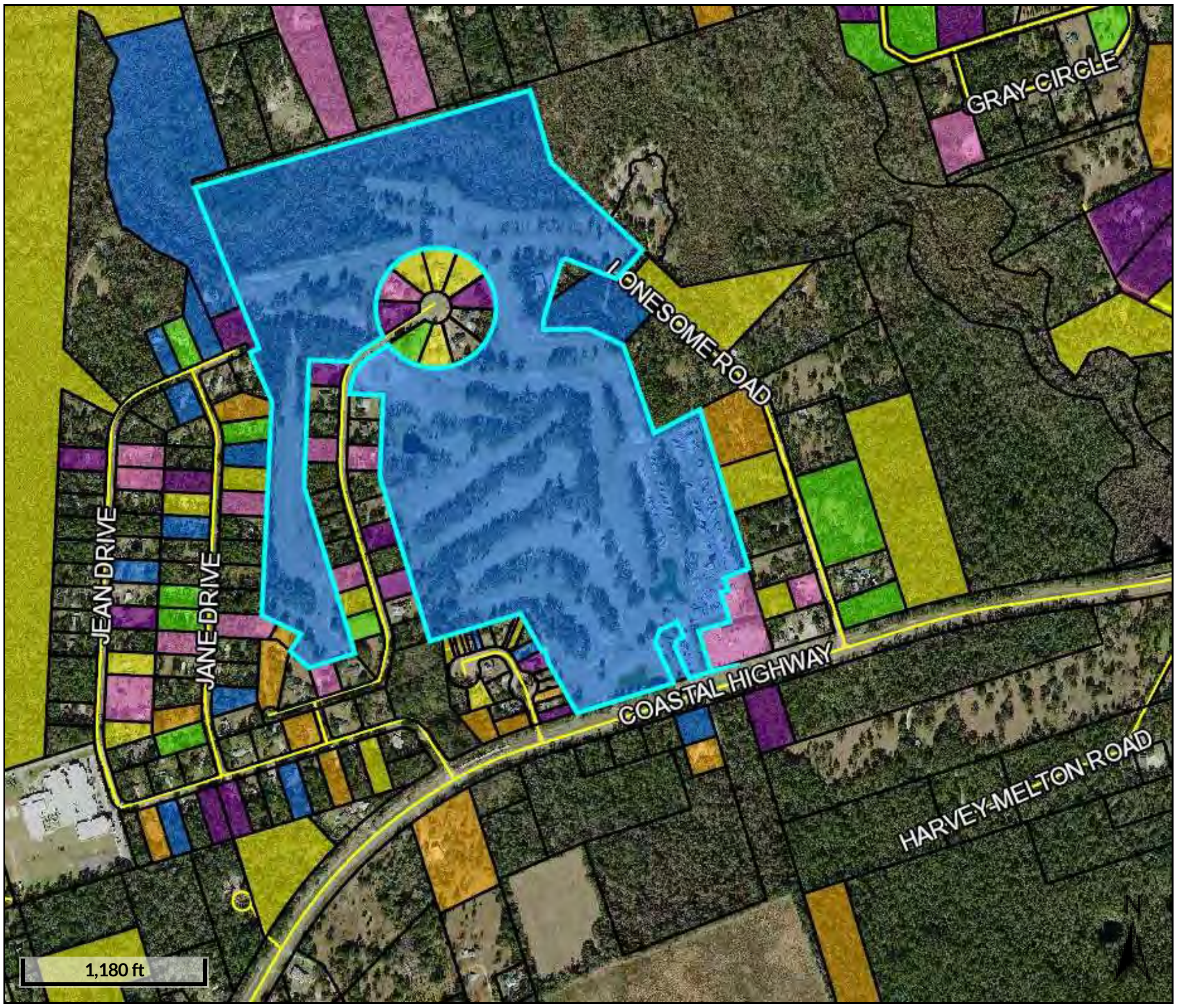

Overview

Legend

- Parcels
- Yearly Sales
  - 2015
  - 2016
  - 2017
  - 2018
  - 2019
  - 2020
- Roads
- City Labels

Parcel ID	00-00-086-000-11586-000	**Alternate ID**	11586 0000000 086000	**Owner Address**	WILDWOOD COUNTRY CLUB LLC
Sec/Twp/Rng	--86	**Class**	GOLF COURS		3874 COASTAL HWY
Property Address	3874 COASTAL HWY CRAWFORDVILLE	**Acreage**	159.05		CRAWFORDVILLE, FL 32327

District 3

Brief Tax Description LOT 86 HS P-6-M-27

(Note: Not to be used on legal documents)

Date created: 11/10/2020
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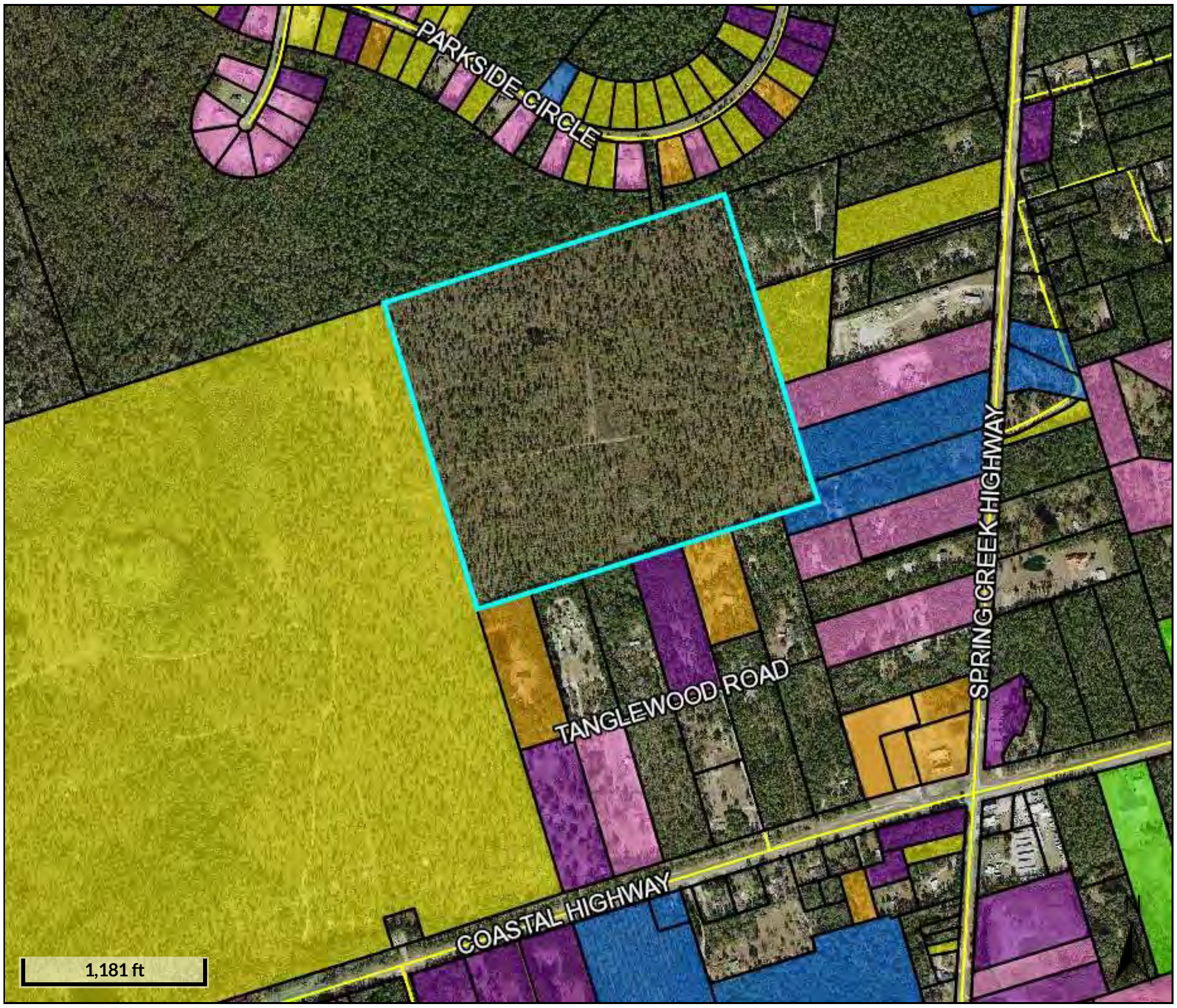
qPublic.net™ Wakulla County, FL



Overview

Legend

Parcels

Yearly Sales

2015

2016

2017

2018

2019

2020

Roads

City Labels

Parcel ID	00-00-050-000-09892-002	**Alternate ID**	09892 0020000 050000	**Owner Address**	JERRY MOORE FLORIDA OPERATIONS LLC PO BOX 457 PANACEA, FL 32346
Sec/Twp/Rng	--50	**Class**	TIMBERLAND		
Property Address	COASTAL HWY	**Acreage**	118.4		

District 3

Brief Tax Description LOT 50 HS P-1-2-M-16

(Note: Not to be used on legal documents)

Date created: 11/10/2020

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Attachment 15

Discharge System – Alternative Three
Cost Opinion

ENGINEER'S COST OPINION FOR
WAKULLA COUNTY SEWER INFRASTRUCTURE IMPROVEMENTS

DISCHARGE SYSTEM - ALTERNATIVE 3

	Description	Quantity	Unit	Unit Price	Extension
PHASE I - Additional Effluent Reuse System					
1.01	*1.5 MGD land application system (Jerry Moore site)*	1	*LS*	$ 2,400,000.00	$ 2,400,000.00
1.02	*0.6 MGD land application system (Wildwood Country Club)*	1	*LS*	$ 700,000.00	$ 700,000.00
1.03	*Effluent pumping station at WWTP*	1	*LS*	$ 350,000.00	$ 350,000.00
1.04	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 345,000.00	$ 345,000.00
1.05	*Contingency (10% Construction Cost)*	1	*LS*	$ 345,000.00	$ 345,000.00
				Construction Subtotal	$ 4,140,000.00
1.06	*Land Purchase of Jerry Moore site (±118 acres)*	1	*LS*	$ 525,000.00	$ 525,000.00
				Other Costs Subtotal	$ 525,000.00
1.07	*Surveying*	1	*LS*	$ 120,000.00	$ 120,000.00
1.08	*Engineering (10% of Construction)*	1	*LS*	$ 414,000.00	$ 414,000.00
1.09	*Construction Services (10 months)*	1	*LS*	$ 160,000.00	$ 160,000.00
				Professional Services Subtotal	$ 694,000.00
				Phase I Subtotal	**$ 5,359,000.00**
PHASE II - Upgraded Piping to Phase II Site					
2.01	*12-inch Reuse Main*	22,800	*LS*	$ 35.00	$ 798,000.00
2.02	*12-inch Valves and Fittings*	1	*LS*	$ 20,000.00	$ 20,000.00
2.03	*Effluent pump station upgrades*	1	*LS*	$ 250,000.00	$ 250,000.00
2.04	*Remove/Abandon Existing 8-inch Reuse Main*	22,800	*LF*	$ 10.00	$ 228,000.00
2.05	*Restoration (sod, seed and mulch, driveway repair, etc.)*	1	*LS*	$ 69,000.00	$ 69,000.00
2.06	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 137,000.00	$ 137,000.00
2.07	*Contingency (10% Construction Cost)*	1	*LS*	$ 137,000.00	$ 137,000.00
				Construction Subtotal	$ 1,639,000.00
2.08	*Surveying*	1	*LS*	$ 57,000.00	$ 57,000.00
2.09	*Engineering (10% of Construction)*	1	*LS*	$ 164,000.00	$ 164,000.00
2.10	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 321,000.00
				Phase II Subtotal	**$ 1,960,000.00**
PHASE III - Sprayfield to RIB Conversion					
3.01	*Conversion of existing sprayfield to 0.6 MGD RIB system*	1	*LS*	$ 820,000.00	$ 820,000.00
3.02	*Bonds, Insurance, Mobilization, etc. (10% Construction Cost)*	1	*LS*	$ 82,000.00	$ 82,000.00
3.03	*Contingency (10% Construction Cost)*	1	*LS*	$ 82,000.00	$ 82,000.00
				Construction Subtotal	$ 984,000.00
3.04	*Surveying*	1	*LS*	$ 30,000.00	$ 30,000.00
3.05	*Engineering (10% of Construction)*	1	*LS*	$ 99,000.00	$ 99,000.00
3.06	*Construction Services (6 months)*	1	*LS*	$ 100,000.00	$ 100,000.00
				Professional Services Subtotal	$ 229,000.00
				Phase III Subtotal	**$ 1,213,000.00**
				Subtototal Construction Costs	**$ 6,763,000.00**
				Subtotal Professional Services	**$ 1,244,000.00**
				Subtotal Other Costs	**$ 525,000.00**
				Total Estimated Cost	**$ 8,532,000.00**

Attachment 16

Sprayfield-to-RIB Study
by AAI and BDI

Engineering Evaluation for
Proposed Conversion of
Otter Creek Wastewater Treatment Facility
Sprayfield to Rapid Infiltration Basin System
Wakulla County, Florida

March 15, 2016

Ardaman & Associates, Inc.

OFFICES

Orlando, 8008 S. Orange Avenue, Orlando, Florida 32809, Phone (407) 855-3860
Alexandria, 3609 Mac Lee Drive, Alexandria, Louisiana 71302, Phone (318) 443-2888
Bartow, 1525 Centennial Drive, Bartow, Florida 33830, Phone (863) 533-0858
Baton Rouge, 316 Highlandia Drive, Baton Rouge, Louisiana 70884, Phone (225) 752-4790
Cocoa, 1300 N. Cocoa Blvd., Cocoa, Florida 32922, Phone (321) 632-2503
Fort Myers, 9970 Bavaria Road, Fort Myers, Florida 33913, Phone (239) 768-6600
Miami, 2608 W. 84th Street, Hialeah, Florida 33016, Phone (305) 825-2683
Monroe, 1122 Hayes Street, West Monroe, Louisiana 71292, Phone (318) 387-4103
New Orleans, 1305 Distributors Row, Suite I, Jefferson, Louisiana 70123, Phone (504) 835-2593
Port St. Lucie, 460 Concourse Place NW, Unit 1, Port St. Lucie, Florida 34986, Phone (772) 878-0072
Sarasota, 78 Sarasota Center Blvd., Sarasota, Florida 34240, Phone (941) 922-3526
Shreveport, 7222 Greenwood Road, Shreveport, Louisiana 71119, Phone (318) 636-3673
Tallahassee, 3175 West Tharpe Street, Tallahassee, Florida 32303, Phone (850) 576-6131
Tampa, 3925 Coconut Palm Drive, Suite 115, Tampa, Florida 33619, Phone (813) 620-3389
West Palm Beach, 2200 N Florida Mango Road, Suite 101, West Palm Beach, Florida 33409, Phone (561) 687-8200

MEMBERS:
A.S.F.E.
American Concrete Institute
ASTM International
Florida Institute of Consulting Engineers

Ardaman & Associates, Inc.

Geotechnical, Environmental and
Materials Consultants

March 15, 2015
File Number 15-13-0118

Baskerville-Donovan, Inc.
449 W Main Street
Pensacola, FL 32502

Attention: Mr. Richard W. Delp, CSI, CDT
Project Manager

Subject: Engineering Evaluation for Proposed Conversion of Otter Creek Wastewater Treatment Facility Sprayfield to Rapid Infiltration Basin System, Wakulla County, Florida

Gentlemen/Ladies:

As requested and authorized by Baskerville-Donovan, Inc. (BDI), Ardaman & Associates, Inc. (Ardaman) has completed an engineering evaluation for the proposed conversion of an existing 41-acre sprayfield to a rapid infiltration basin (RIB) system at the Otter Creek Wastewater Treatment Facility (WWTF) in Wakulla County, Florida. The primary objectives of our study were to evaluate the technical feasibility of converting the existing sprayfield to a RIB system for treated effluent disposal, and to discuss nitrogen removal from the treated effluent by operation of a RIB system. Operation of the Otter Creek WWTF, including the sprayfield, is authorized by the Florida Department of Environmental Protection (FDEP), with a permitted capacity of 0.6 million gallons per day (mgd).

As part of our scope of work, Ardaman has reviewed the Jones Edmunds & Associates, Inc. (JEA) report titled “Land Application Engineering Report, Wakulla County Wastewater Treatment Facility, Otter Creek, Crawfordville, Florida,” dated July 1998, which was prepared in support of the original permit application for the sprayfield, and the Kimley-Horn and Associates, Inc. (KHA) report titled “Ground Water Modeling Report, Otter Creek Treatment Facility, Crawfordville, Wakulla County, Florida,” dated February 2014, which was prepared in support of increasing the application rate on the sprayfield. In addition, Ardaman has reviewed the effluent flow rates, groundwater elevations, and groundwater quality data documented from 2005 to 2015, and subsurface data contained in two Ardaman reports dated September 11, 2014 and November 3, 2015.

Although the KHA study demonstrated that the Otter Creek sprayfield is capable of accepting an increased flow rate of 1.2 mgd, we understand that Wakulla County no longer considers increasing the flow rate at this time because elevated nitrate-nitrogen concentrations have been observed in some of the onsite monitor wells since 2012. Instead, Wakulla County has proposed to replace the sprayfield by a RIB system, with the effluent flow rate maintained at the permitted capacity of 0.6 mgd.

To accomplish the project objectives, Ardaman reviewed the historical data, made a site visit to observe the site condition and sprayfield operation, and performed computer modeling to simulate the operation of a RIB system at a flow rate of 0.6 mgd. Specifically, Ardaman has reviewed the hydrogeological information contained in the JEA report, and the modeling parameters and assumptions documented in the KHA report. No data collection effort that specifically catered to the design and construction of a RIB system was performed by Ardaman for this study.

Ardaman has prepared this report for the exclusive use of BDI and Wakulla County for specific application to evaluate the technical feasibility of converting the existing sprayfield to a RIB system for disposal of treated effluent from the Otter Creek WWTF at the permitted capacity of 0.6 mgd in accordance with generally accepted geotechnical and hydrogeological engineering practice. No other warranty, expressed or implied, is made.

Site Location

The Otter Creek WWTF is located southwest of the intersection of State Roads 98 and 319, and north of Sopchoppy Highway, as shown on the highway map in Figure 1. The site boundary, as superimposed on the United States Geological Survey (USGS) quadrangle map, is depicted in Figure 2. The facility is surrounded mostly by undeveloped areas, as shown on a 2014 aerial photograph in Figure 3.

Otter Creek Wastewater Treatment Facility

The Wakulla County Otter Creek WWTF has been in operation for more than 10 years, and consists of a wastewater treatment system, a 41-acre sprayfield that comprises eleven spray zones, and two lined storage ponds with areas of approximately 0.83 and 0.24 acres. It currently operates under FDEP Permit FLA010225-009-DW1P/NR dated November 23, 2010, with a permitted annual average flow rate of 0.6 mgd. The facility serves several industrial and commercial establishments, primarily seafood processors, and the local county landfill.

Prior to land application on the sprayfield, the treated effluent is stored in the two lined storage ponds, which have a combined capacity of approximately 2 million gallons, corresponding to more than 3 days of flow at the permitted capacity of 0.6 mgd. It is our understanding that application of treated effluent on the eleven spray zones rotates on a regular basis. At a given time, treated effluent is applied on three spray zones while the remaining eight zones are resting.

As shown in Figure 2, the natural land surface elevations within the Otter Creek WWTF property ranged from below +25 feet (NGVD) to above +35 feet (NGVD). The 41-acre sprayfield has an average land surface elevation above +30 feet (NGVD). Groundwater level readings obtained from onsite monitor wells between 2010 and 2014 indicated that groundwater elevations in the surficial aquifer beneath the sprayfield area ranged from approximately +22.69 feet (NGVD) to +28.32 feet (NGVD), and averaged +25.21 feet (NGVD), which corresponds to an average water table depth of greater than 5 feet below land surface.

Jones Edmunds Study

Prior to the JEA study in 1998, Wakulla County operated a 0.2-mgd activated sludge WWTF on the property for treatment of domestic wastewater and a slow-rate land application system with a spray area of approximately 18 acres for disposal of the treated effluent. The JEA study provided technical justification to expand the WWTF capacity from 0.2 to 0.495 mgd, with a corresponding increase of the spray area from approximately 18 to 41 acres. Key points in the JEA report that are relevant for our study are as follows:

- The lithology at the project site consisted of three primary units: an unconfined surficial aquifer, a confining unit, and a confined aquifer. The surficial aquifer was composed mostly of fine to medium-grained quartz sands from land surface to a depth of 15 to 30 feet, and the confining unit was composed primarily of clayey sand or sandy clay, with a thickness of 10 to 20 feet. The confined aquifer beneath the confining unit was a friable, quartz sand, fossiliferous limestone unit that forms the Upper Floridan aquifer.

- Field slug tests performed by JEA indicated that the surficial aquifer had a horizontal hydraulic conductivity of 0.3 to 21.3 feet per day.

- A steady-state groundwater flow model was developed by JEA using the USGS MODFLOW model, with the Groundwater Modeling System (GMS) software as the graphical user interface.

- The model area covered the entire Otter Creek WWTF property and extended approximately 500 feet beyond the northern property boundary.

- The hydraulic conductivity of the surficial aquifer (which governs groundwater movement within the surficial aquifer) and the leakance of the confining unit (which governs groundwater movement between the surficial aquifer and the underlying confined aquifer) were established based on calibration of the groundwater flow model to match the simulated groundwater elevations to known groundwater elevations. Through the calibration process, JEA estimated the hydraulic conductivity of the surficial aquifer and the leakance of the confining unit to be 20 feet per day and 0.0028 per day, respectively.

- The net rainfall recharge to the surficial aquifer under natural condition was estimated by JEA to be 10 inches per year, based on an annual rainfall of 59 inches, an annual evapotranspiration of 39 inches, and an annual surface runoff of 10 inches.

- With the proposed spray irrigation rate of 0.495 mgd, JEA predicted that the groundwater elevations in the surficial aquifer would rise to approximately +22 feet (NGVD) in the area near the northwestern corner of the facility to approximately +30 feet (NGVD) in the area west of the storage ponds.

Kimley-Horn Study

In 2004, KHA completed a study to provide technical justifications for increasing the capacity of the Otter Creek WWTF from 0.6 to 1.2 mgd, which corresponds to increasing the average hydraulic loading rate from 3.8 to 7.5 inches per week over the 41-acre sprayfield, respectively. Key points in the KHA report that are relevant for our study are as follows:

- KHA drilled three shallow soil borings within the sprayfield areas to a depth of approximately 6.5 feet below land surface, and encountered mostly loose fine sand with silt that has a fine content (i.e., percent by dry weight of materials passing the U.S. No. 200 standard sieve) in the typical range of 5 to 10 percent.

- Results of a double-ring infiltration test performed by KHA indicated that the infiltration rate at the sprayfield surface was approximately 21 inches per day.

- The prevailing groundwater flow direction in the surficial aquifer was from the northwest to the southeast.

- The USGS MODFLOW model, with the Groundwater Vista software as the graphical user interface, was used by KHA to support increasing the disposal capacity of the sprayfield from 0.6 to 1.2 mgd.

- The groundwater flow model covered an area of approximately 275,000 acres, and used a grid spacing of 1,000 feet except within the sprayfield areas where the grid spacing was reduced to 125 feet, apparently to increase the resolution of the output.

- The groundwater flow model used by KHA consisted of two layers: the surficial aquifer and the Upper Floridan aquifer. The surficial aquifer and the Upper Floridan aquifer were considered to have thicknesses of approximately 55 and 475 feet, and hydraulic conductivities of 30 and 250 feet per day, respectively.

- The net rainfall recharge to the surficial aquifer under natural condition was considered to be 10 inches per year.

- KHA simulated groundwater mounding beneath each spray area (i.e., approximately one third of the total spray area) using three times the average hydraulic loading rate (i.e., without considering the effects of groundwater level decline during the resting period).

- Based on numerical modeling, KHA predicted that the groundwater beneath each operating area would mound to a peak elevation of approximately +24 feet (NGVD) under a hydraulic loading rate of 11.4 inches per week (i.e., 3 x 3.8 inches per week), and to a peak elevation of approximately +25.4 feet (NGVD) under a hydraulic loading rate of 22.5 inches per week (i.e., 3 x 7.5 inches per week).

- KHA stated that the groundwater level beneath the site would increase by approximately 1.5 feet as a result of increasing the hydraulic loading rate from 0.6 to 1.2 mgd (i.e., from 3.8 to 7.5 inches per week).

Site Visit by Ardaman

Messrs. Francis K. Cheung, P.E., and Dr. Shimelies Aboye of Ardaman visited the Otter Creek WWTF on January 22, 2016 to interview operation personnel, and to observe the topographic and drainage conditions of the sprayfield area. We also performed five shallow hand auger borings and obtained water level readings in selected monitor wells. Items that we learned from the site visit are as follows:

- The treated effluent to the sprayfield was sampled every Tuesday, and the samples were sent to an analytical laboratory every Wednesday for analyses. The groundwater in the monitor wells was sampled quarterly.

- The two lined ponds served as holding ponds for temporary storage of treated effluent prior to application on the sprayfield rather than wet-weather storage ponds, and have a combined volume of approximately 2 million gallons, which provides more than 3 days of storage at the permitted capacity of 0.6 mgd. The two ponds are hydraulically connected, with the water levels in the two ponds having approximately the same elevation.

- The land surface within each sprayfield area was generally flat. However, some elevation changes across the entire property were noticeable.

- The sprayfield was remarkably well-drained. Except for a small area that is located north of the northwestern corner of the storage ponds, no puddle or standing water was observed on the date of our site visit, even after the ferocious storm that just passed through Tallahassee the morning of January 22, 2016, and spraying of treated effluent most of that afternoon.

- Our hand auger borings revealed that the shallow soils consisted mostly of a light brown to brown medium to fine sand with silt.

- The water table depth at the five hand auger locations ranged from approximately 3.6 to 8.8 feet below land surface (see Appendix 1).

- The monitor wells at the site were installed in clusters, with one shallow well screened in the surficial aquifer and one deep well screened in the Upper Floridan aquifer at each location.

- As shown in Table 1, the groundwater levels in the surficial aquifer monitor wells (MW-2S, MW-3S, MW-6S, and MW-7S) ranged from 1.2 to 10.4 feet below land surface, and the piezometric levels in the Upper Floridan aquifer monitor wells (MW-2D, MW-3D, MW-6D, and MW-7D) ranged from 2.9 to 14.9 feet below land surface.

- The downward head difference between the surficial aquifer and the Upper Floridan aquifer ranged from approximately 1.4 to 4.5 feet, and averaged 2.3 feet, which suggests the presence of a semi-confining or confining layer between the surficial aquifer and the Upper Floridan aquifer.

- Considering an average historical effluent flow rate of 0.5 mgd over 41 acres, an annual rainfall of 59 inches, and an annual increased evapotranspiration of 60 inches, the vertical hydraulic conductivity of a 25-foot thick confining layer was calculated to be on the order of 0.4 feet per day ($1.4x10^{-4}$ cm/sec). This hydraulic conductivity is relatively high for a clay, which suggests that the confining layer is composed predominantly of a silty to clayey fine sand, or a clay deposit that is highly fissured or breached.

Model Selection and Setup

Ardaman evaluated the technical feasibility of converting the existing Otter Creek sprayfield to a RIB system for treated effluent disposal using the USGS MODFLOW model, with the GMS software as the graphical user interface. These were the same programs used by JEA in their 1998 study. MODFLOW is a groundwater modeling software and is available in the public domain. GMS is a pre- and post-processor to the MODFLOW input and output files, and is available commercially.

MODFLOW is a modular three-dimensional finite-difference numerical model capable of simulating groundwater flow in an aquifer system, under either steady-state or transient condition.

It was originally developed by McDonald and Harbaugh (1988)[1] of the USGS, and has been improved and updated by the USGS and other software developers over the years. The MODFLOW model is very versatile. It can handle a variety of boundary conditions and utilize various modules to represent rivers, drains, wells, streams, recharge, etc., at a particular site. MODFLOW computes the hydraulic head in each grid cell by iterating inflow, outflow, head, and storage requirements until both Darcy's Law (which governs groundwater flow in an aquifer) and the continuity equation are satisfied for each grid cell at the specified time steps. Inputs to the model include geometric and hydraulic properties of the aquifer system, recharge rates, hydrogeologic boundary conditions, etc. Outputs from the model include piezometric heads, water level drawdowns, cell-to-cell flow rates, etc.

The model area selected by KHA was also used by Ardaman. It spans approximately 160,000 feet in the east-west direction and 75,000 feet in the north-south direction, covering an area of approximately 275,000 acres. The model area was discretized by a 1,000-foot square grid except on the Otter Creek WWTF property where the grid spacing was reduced to 125 feet to improve the output resolution on piezometric elevations. The model boundary and grid system used for our study are depicted in Figure 4.

The cells along the Gulf of Mexico, and the Ochlockonee and Wakulla Rivers were assigned a "Drain" boundary condition with the head elevation at +0 feet (NGVD) and a conductance of 50,000 square feet per day. A "No Flow" boundary condition was assigned to the cells that are in the Gulf of Mexico. The net rainfall recharge under natural condition was considered to be 10 inches per year.

Model Calibration

Before the model was used for predictive simulations of groundwater behaviors under operation of a RIB system, it was calibrated to replicate known conditions under operation of the existing sprayfield. Model calibration is a process in which numerical simulations are performed using a trial-and-error procedure in an attempt to match simulated results to field observations.

The groundwater flow model was calibrated to replicate the piezometric elevations obtained from 12 surficial aquifer and Upper Floridan aquifer monitor wells between March 2013 and December 2014, under an average treated effluent flow rate of 0.53 mgd from 2013 to 2014. As shown in Table 2, the average piezometric elevations in the surficial aquifer monitor wells ranged from +23.8 to +28.5 feet (NGVD), and the average piezometric elevations in the Upper Floridan aquifer monitor wells ranged from +21.3 to +26.5 feet (NGVD).

A total of nine simulations were performed to calibrate the groundwater flow model, with one simulation using a two-layer model that consisted of the surficial aquifer and the Upper Floridan aquifer (i.e., without a confining unit), and the remaining eight simulations using a three-layer model that consisted of the surficial aquifer, a confining unit, and the Upper Floridan aquifer. As part of the calibration process, the hydraulic conductivity of the surficial aquifer and, if applicable, the leakance of the confining unit, were varied within reasonable ranges of values until a good match between simulated and observed groundwater elevations was achieved.

Results of the model calibration indicated that the groundwater system in the model area is best represented by a three-layer model. The first or uppermost layer represents the unconfined

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[1] McDonald, M. G. and Harbaugh, A. W. (1988). A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model. Techniques of Water-Resources Investigations of the U.S. Geological Survey, Modeling Techniques, Chapter A1, Book 6.

surficial aquifer which consists of Quaternary-age, undifferentiated sediments of mostly sands and silts with a horizontal hydraulic conductivity ranging from 20 to 30 feet per day. The second layer represents a confining unit with a vertical hydraulic conductivity on the order of 0.03 to 0.3 feet per day (i.e., 10^{-4} to 10^{-5} cm/sec). The third or bottommost layer represents the confined Upper Floridan aquifer which comprises mostly of a friable quartz sand and fossiliferous limestone with a horizontal hydraulic conductivity of 250 feet per day. Table 3 provides a summary of the aquifer properties in the calibrated model.

The simulated groundwater elevation contours in the surficial aquifer generated from the calibrated model are displayed in Figure 5. A comparison between simulated and observed groundwater elevations at the monitor well locations is presented in Figure 6. As shown, the discrepancy between simulated and observed groundwater elevations was typically less than 1 foot.

Proposed Rapid Infiltration Basin

In accordance with Chapter 62-610, F.A.C., a RIB system is considered a rapid-rate land application system whereas a sprayfield is considered a slow-rate land application system. A RIB system generally consists of one or more shallow ponds that are designed to percolate treated effluent through permeable soils into the underlying aquifer(s). Compared to a sprayfield, a RIB system "concentrates" the flow volume over a much smaller area. Therefore, a groundwater mound created by artificial recharge through a RIB system is generally more pronounced but has a smaller radius, when compared to a groundwater mound created by artificial recharge through a sprayfield.

For operation of a RIB system for treated effluent disposal, Chapter 62-610, F.A.C., requires that, on an annual average basis, the initial loading rate should be limited to 3 inches per day. An increased rate of up to 9 inches per day may be requested with proper justification provided to the FDEP. Chapter 62-610, F.A.C., further requires that a RIB system should have at least two ponds to allow alternate periods of loading and resting for optimal nitrogen removal.

For conversion of the Otter Creek sprayfield to a RIB system, Ardaman proposes the construction of three ponds at the locations shown in Figure 7. Each pond should have a relatively flat bottom and should be surrounded by an earthen perimeter dike. Considering an average initial hydraulic loading rate of 3 inches per day, the required total pond bottom area for disposal of 0.6 mgd of treated effluent would be approximately 7.5 acres (i.e., each of the three ponds would have a bottom area of approximately 2.5 acres). The three ponds can be rotated to allow alternate periods of loading and resting. Alternatively, each of the three ponds can be divided into two equal compartments by a partition dike to allow all three ponds to operate at the same time by alternating compartments.

Engineering Evaluation

The piezometric elevations documented in the surficial aquifer and the Upper Floridan aquifer monitor wells between 2005 and 2015 are displayed in Figures 8 and 9, respectively. As shown in Figure 8, excluding the outlier reading reported for MW-2S in 2014, the piezometric elevations in the surficial aquifer monitor wells ranged from +19.7 to +30.0 feet (NGVD), and averaged +25.4 feet (NGVD). As shown in Figure 9, the piezometric elevations in the Upper Floridan aquifer monitor wells ranged from +18.8 to +27.9 feet (NGVD), and averaged +23.1 feet (NGVD). The downward head difference between the surficial aquifer and the Upper Floridan aquifer averaged approximately 2 to 3 feet, which is consistent with the groundwater level readings obtained during our site visit on January 22, 2016.

Using the calibrated model, Ardaman performed computer simulations for the following three scenarios:

- Scenario A represents the pre-development condition before operation of the Otter Creek WWTF.
- Scenario B represents the condition with the Otter Creek sprayfield operating at the permitted capacity of 0.6 mgd.
- Scenario C represents the condition with the proposed RIB system operating at 0.6 mgd.

The simulation for Scenario A was performed to establish the natural groundwater elevations prior to operation of the Otter Creek WWTF. The pre-development groundwater elevations were used as a baseline reference to estimate groundwater mound height created by artificial recharge of treated effluent to the groundwater system. Under this scenario, the entire model area was assigned a natural net rainfall recharge rate of 10 inches per year. As shown in Figure 10, the simulated pre-development groundwater elevations in the surficial aquifer ranged from approximately +20.6 feet (NGVD) near the southeastern corner of the property to approximately +22.6 feet (NGVD) near the northwestern corner. The predominant groundwater flow direction occurred from the northwest to the southeast towards the Gulf of Mexico, under an average flow gradient on the order of 0.0005. Considering a flow gradient of 0.0005, a hydraulic conductivity of 30 feet per day, and an aquifer porosity of 0.35, the groundwater seepage velocity in the surficial aquifer was calculated to be approximately 16 feet per year.

The simulation for Scenario B was performed to estimate the groundwater elevations with a natural net rainfall recharge rate of 10 inches per year over the entire model area and an average artificial recharge rate of 3.8 inches per week over the 41-acre sprayfield area. As shown in Figure 11, the simulated groundwater elevations in the surficial aquifer beneath the sprayfield areas typically ranged from +26 to +27 feet (NGVD). The peak groundwater elevation was slightly above +27 feet (NGVD), corresponding to a groundwater mound height of approximately 5 feet.

The simulation for Scenario C was performed to predict the groundwater elevations with a natural net rainfall recharge rate of 10 inches per year over the entire model area and an average artificial recharge rate of 3 inches per day over the 7.5-acre pond bottom area. As shown in Figure 12, the simulated groundwater elevations in the surficial aquifer beneath the proposed pond areas were typically above +28 feet (NGVD). The peak groundwater elevation was at slightly above +29 feet (NGVD), corresponding to a groundwater mound height of approximately 7 feet.

It should be noted that seasonal variations in natural net rainfall recharge and alternate cycles of loading and resting of the existing spray zones or the proposed ponds or compartments will result in temporal fluctuations of groundwater level and thus will cause the groundwater elevations to be temporarily higher or lower than the simulated elevations. It should further be noted that although Chapter 62-610, F.A.C., allows an initial annual average application rate of 3 inches per day for operation of a RIB system and 2 inches per week for operation of a sprayfield, the hydraulic capacity of a site is governed by the depth to water table, the transmissivity of the surficial aquifer, the vertical leakage to the deep aquifer, and the distance to adjacent groundwater relief areas, not by the method of land application. The use of a RIB system is advantageous only for sites with a high hydraulic capacity (e.g., a site with a high transmissivity and a deep water table) and a limited land application area.

Based on a review of the historical operation data and results of computer simulations, it is our professional opinion that conversion of the Otter Creek sprayfield to a RIB system at the currently permitted capacity of 0.6 mgd is technically feasible. A higher disposal rate can be justified at a later time if future operation data of the 0.6-mgd RIB system confirms that the system performs as simulated and groundwater quality data confirms that operation and management of the RIB system promotes effective nitrogen removal. Therefore, BDI may want to design the RIB system and facility components to accommodate a higher flow rate in the future, perhaps up to 1.0 or 1.2 mgd.

BDI should compare the simulated groundwater elevations shown in Figure 12 to the existing or proposed topographic elevations at the site, whichever is applicable, to make sure that the simulated groundwater mound does not break out in any depressional areas surrounding the proposed ponds.

Prior to design of the proposed RIB system, we recommend the performance of a geotechnical exploration to characterize the surficial aquifer and confining layer at and near the proposed pond locations. Depending on the outcomes of the geotechnical exploration, the groundwater flow model may have to be refined.

Recommendations for Pond Design and Construction

The proposed ponds should have a design bottom elevation above +30 feet (NGVD). The perimeter dike surrounding each pond should have an inside slope no steeper than 3.0 horizontal to 1.0 vertical (3.0H:1.0V), an outside slope no steeper than 4.0H:1.0V, a height of at least 5 feet, and a dike crest width of at least 12 feet if vehicular traffic is expected. For the partition dike between two compartments of a pond, the slopes on both sides should be no steeper than 4.0H:1.0V.

Fill materials required for raising the existing land surface to the design pond bottom elevation or for constructing the dikes should consist of clean sandy soils free of roots, debris, muck, organics or other deleterious materials, and should be properly compacted in level lifts not to exceed 12 inches in thickness prior to compaction. Each lift of fill should be compacted by a vibratory compactor to at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density. The filling and compaction operations should continue in lifts until the final design grade is achieved. Any fill materials placed below the pond bottom should have an in-place saturated hydraulic conductivity of at least 1.0×10^{-3} cm/sec. All dike surfaces and other disturbed areas that are prone to erosion should be grassed.

During construction of the proposed ponds, the in-place densities at the pond bottom and dikes shall be checked at a minimum frequency of once per 850 cubic yards compacted fill (i.e., approximately two tests per acre for each 1-foot thick lift of fill). A geotechnical engineer or his/her designated representative should provide field observation and testing services during construction to document that only suitable soils are used as fill materials and that the fill is properly placed and compacted in accordance with the above recommendations.

The proposed RIB system should comply with the setback distance requirements in 62-610.521. Furthermore, to restrict public access, a chain link fence should be installed around the proposed ponds or the property. A "NO TRESPASSING" warning sign should also be posted at all entrances to the land application system site to discourage site entry by unauthorized personnel.

Nitrogen Removal

Treated effluent from a domestic wastewater treatment facility contains varying levels of nitrogen, mostly in the form of organic nitrogen and ammoniacal nitrogen. Organic nitrogen is unavailable for direct plant uptake and will not leach to groundwater, but can slowly transform to available forms by microbial decomposition through a process known as ammonification. Ammoniacal nitrogen may exist as ammonium ion (NH_4^+) or gaseous ammonia (NH_3).

To preclude groundwater impacts, nitrogen removal is an important consideration in design and operation of a land application system. The ability of a land application system to remove nitrogen from treated effluent is a function of many variables, including the forms and concentrations of nitrogen compounds in the treated effluent, effluent water quality, soil characteristics, weather condition, crop nitrogen uptake and crop management practices in the case of a sprayfield, and pond operation and management in the case of a RIB system.

The nitrogen removal mechanism of a RIB system is different from that of a sprayfield. A RIB system removes nitrogen primarily by nitrification-denitrification under aerobic and anaerobic conditions that occur during the resting and loading cycles, whereas a sprayfield removes nitrogen mostly through crop uptake. Both nitrification and denitrification are accomplished by soil bacteria. For a RIB system, nitrification is the process by which NH_3 is converted into nitrate, and denitrification is the process by which nitrate is converted into nitrogen gas and released to the atmosphere. According to the EPA (2006)[1], soil temperature and pH are the two most important factors for nitrification. For effective nitrogen removal, the optimum soil temperature should be between 86°F and 95°F, and the soil pH should be greater than 5.5 and preferably neutral to slightly alkaline. Nitrogen uptake in a sprayfield depends on crop type and crop management practice, and is typically on the order of 200 to 300 lbs per acre per year.

Chapter 62-610, F.A.C., requires the nitrate-nitrogen concentration in the treated effluent to be less than 12 mg/l unless reasonable assurance can be provided that the nitrate-nitrogen concentrations in any hydraulically downgradient monitor wells located within the zone of discharge will not exceed 10 mg/l or the background level in the receiving groundwater, whichever is less stringent.

The total nitrogen concentrations in the treated effluent between 2010 and 2014 are depicted in Figure 13. As shown, the total nitrogen concentrations ranged from 9 to 75 mg/l, with a noticeable increase in total nitrogen concentration after September 2011. The average total nitrogen concentrations were approximately 12 mg/l between January 2010 and August 2011, 48 mg/l between September 2011 and January 2012, and 29 mg/l between February 2012 and December 2014. We understand that the concentrations of the different forms of nitrogen in the treated effluent were not routinely monitored.

The nitrate-nitrogen concentrations in the surficial aquifer monitor wells between 2010 and 2014 are displayed in Figure 14. As shown, a nitrate-nitrogen concentration of greater than 10 mg/l has been reported since June 2012, with the maximum concentration measured at 17 mg/l in MW-4S in December 2013. Groundwater samples from other surficial aquifer monitor wells also

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1 Environmental Protection Agency (2006). Process Design Manual, Land Application of Municipal Wastewater Effluents. EPA/625/R-06/016.

had nitrate-nitrogen concentrations exceeding 10 mg/l. For MW-2S and MW-13S, the nitrate-nitrogen concentrations were greater than 14 mg/l.

The nitrate-nitrogen concentrations in the Upper Floridan aquifer monitor wells between 2010 and 2014 are presented in Figure 15. As shown, the nitrate-nitrogen concentrations were all less than 7 mg/l prior to January 2013. However, the nitrate-nitrogen concentrations in MW-2D reached 12 mg/l in June 2013 and May 2014. Slightly increasing trends of nitrate-nitrogen concentrations were also observed in MW-4D and MW-7D beginning in 2013, although the measured concentrations remained well below 10 mg/l.

Figure 16 compares the nitrate-nitrogen concentrations in selected surficial aquifer monitor wells (MW-2S, MW-4S, and MW-7S) and treated effluent flow from the Otter Creek WWTF between 2007 and 2015. Similarly, Figure 17 compares the nitrate-nitrogen concentrations in the corresponding Upper Floridan aquifer monitor wells (MW-2D, MW-4D, and MW-7D) and treated effluent flow. As shown, there are indications that the increased nitrate-nitrogen concentrations in the surficial aquifer and the Upper Floridan aquifer that began in 2012 were a direct result of increased treated effluent flow to the sprayfield. Based on these data, if Wakulla County wishes to continue with the existing operation, the treated effluent flow to the sprayfield would need to be limited to 0.4 to 0.45 mgd or the effluent water quality would have to be improved.

If a RIB system is used for disposal of the treated effluent, the design and operation requirements for a RIB system, as outlined in Chapter 62-610, F.A.C., should be followed to achieve optimal nitrogen removal. Specifically, pre-application treatment should be provided such that the treated effluent meets secondary treatment and basic disinfection levels prior to disposal in the RIB system. The nitrate-nitrogen concentration in the treated effluent should not exceed 12 mg/l until there are sufficient data to demonstrate that groundwater quality will not an issue. Furthermore, hydraulic loading and resting cycles should be implemented to restore operating percolation rates of the pond system to design levels by the end of the resting period. As a start, Ardaman recommends hydraulic loading periods of 3 to 7 days, followed by resting periods of 6 to 14 days to dry the cell bottoms and, if needed, to allow scarification or removal of deposited solids at the pond bottoms.

Ardaman appreciates the opportunity of being of service to BDI and looks forward to a continuing relationship. If you have any questions concerning the content of this report, please contact us.

Very truly yours,
ARDAMAN & ASSOCIATES, INC.
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Enclosures

Table 1

Groundwater Level Readings on January 22, 2016

Monitoring Well*	Top of Casing to Water Table (feet)	Top of Casing to Land Surface (feet)	Land Surface to Water Table (feet)	Depth to Well Bottom (feet)	Downward Head between Surficial and Upper Floridan Aquifers (feet)	Average Downward Head between Surficial and Upper Floridan Aquifers (feet)
MW-2S	13.0	2.63	10.4	29.5	4.49	2.3
MW-2D	17.4	2.54	14.9	58.1		
MW-3S	3.8	2.63	1.2	20.2	1.70	
MW-3D	5.5	2.63	2.9	68.6		
MW-6S	7.1	2.67	4.4	24.6	1.38	
MW-6D	8.6	2.75	5.8	53.6		
MW-7S	8.3	2.64	5.7	-	1.50	
MW-7D	9.8	2.64	7.2	-		

* Monitor wells with an “S” suffix are screened in the surficial aquifer, whereas monitor wells with a “D” suffix are screened in the Upper Floridan aquifer.

Table 2

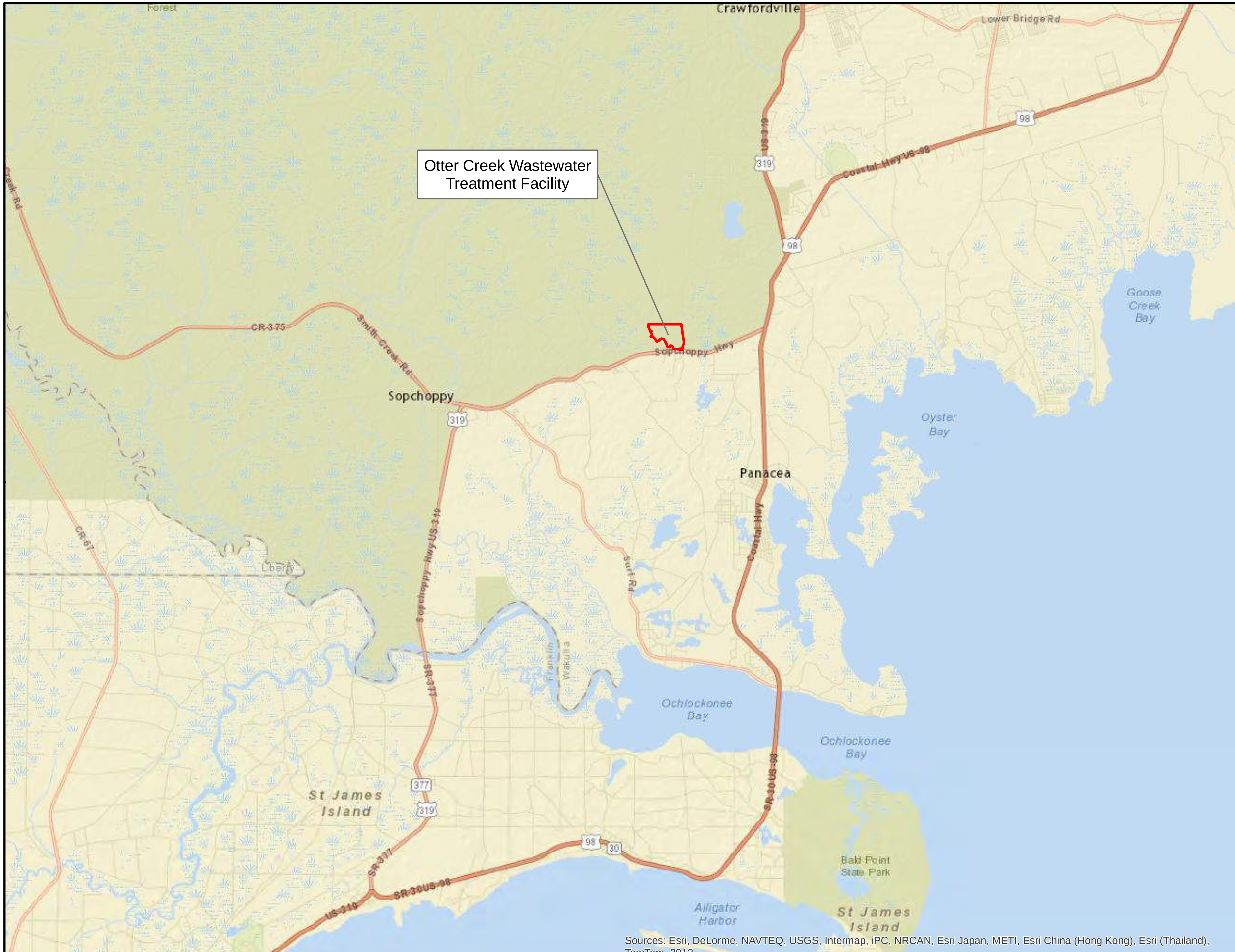
Historical Groundwater Elevations

Monitoring Well	Groundwater Elevations (feet, NGVD)								
	Mar 2013	Jun 2013	Sep 2013	Dec 2013	Mar 2014	Jun 2014	Sep 2014	Dec 2014	Average
MW-1S	+25.41	–	+26.27	–	–	–	+25.21	–	+25.63
MW-2S	–	+25.20	–	+26.55	–	–	+36.25 (?)	+26.45	+26.07
MW-3S	+26.43	–	+26.62	–	+27.84	–	+26.76	–	+26.91
MW-4S	–	+25.45	–	+26.95	–	+26.07	–	+26.60	+26.27
MW-6S	–	+23.46	–	+23.82	–	+24.00	–	+23.99	+23.82
MW-7S	+28.28	–	+28.45	–	+30.07	–	+27.11	–	+28.48
MW-1D	+22.45	–	+23.34	–	+24.48	–	+21.86	–	+23.03
MW-2D	–	+20.55	–	+21.65	–	+21.27	–	+21.57	+21.26
MW-3D	+24.64	–	+25.05	–	+26.14	–	+24.22	–	+25.01
MW-4D	–	+23.60	–	+24.53	–	+23.96	–	+24.39	+24.12
MW-6D	–	+23.02	–	+23.27	–	+23.23	–	+23.41	+23.23
MW-7D	+26.40	–	+26.52	–	+27.90	–	+25.34	–	+26.54

Table 3

Typical Aquifer Properties Used in Groundwater Flow Model

Model Layer	Description	Horizontal Hydraulic Conductivity (feet/day)	Vertical Hydraulic Conductivity (feet/day)	Thickness (feet)	Leakance (/day)
1	Surficial Aquifer	30	35	55	0.63
2	Confining Unit	0.0283	0.66	25	0.026
3	Upper Floridan Aquifer	250	3	475	–



N
W E
S

0 5,000 10,000
Feet

Scale: 1" = 10,000'

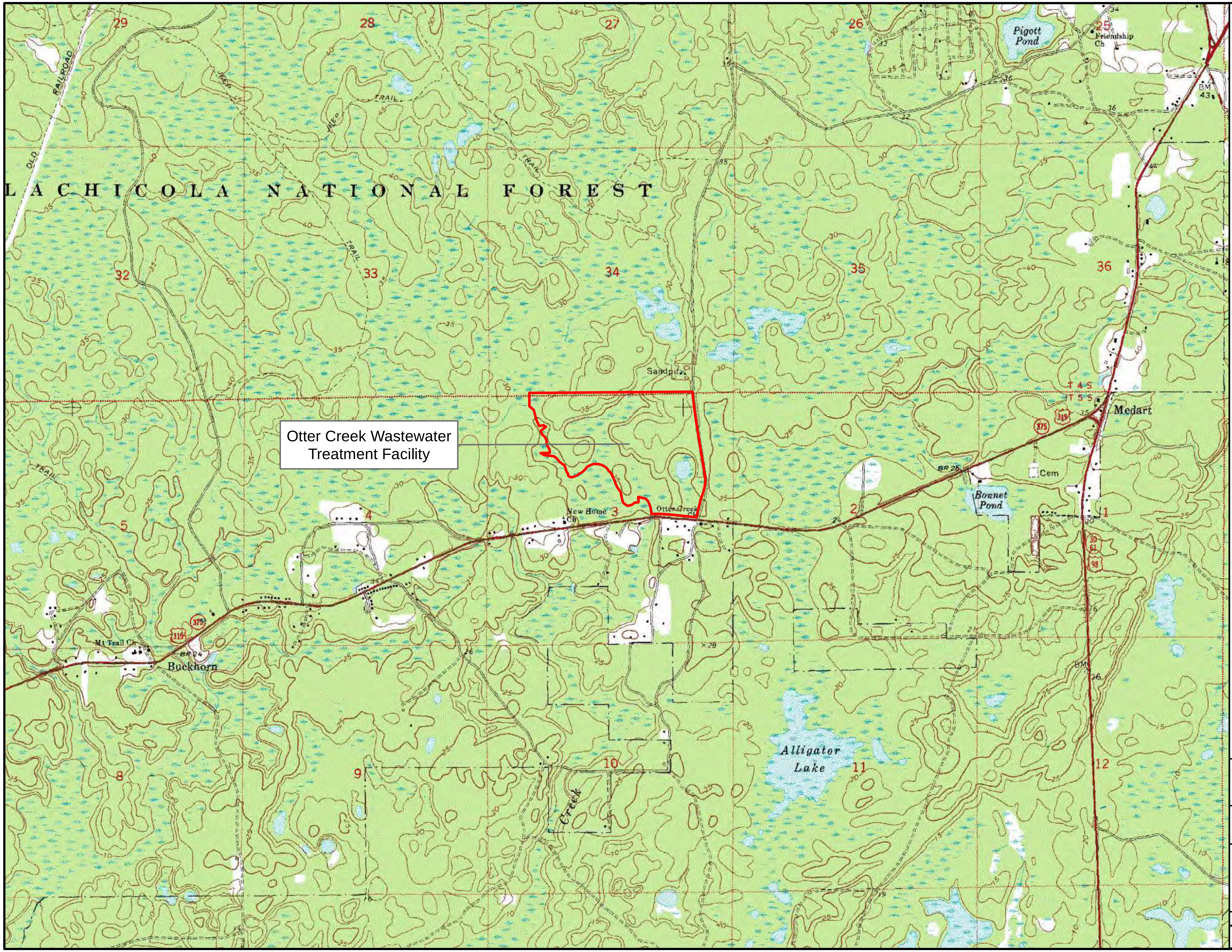
SITE LOCATION MAP

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

DRAWN BY: TJC	CHECKED BY: SA	DATE: 03/14/16
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 1

Y:\Projects\2015\113-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 1 Location.mxd



TOPOGRAPHIC MAP

Ardaman & Associates, Inc.
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OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 2

Y:\Projects\2015\13-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 2 Topographic Map.mxd

N
W E
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0 200 400
Feet

Scale: 1" = 400'

SOURCE: AERIAL PHOTOGRAPH
TAKEN MAY 3, 2014 BY GOOGLE EARTH

AERIAL PHOTOGRAPH

Ardaman & Associates, Inc.
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OTTER CREEK WASTEWATER
TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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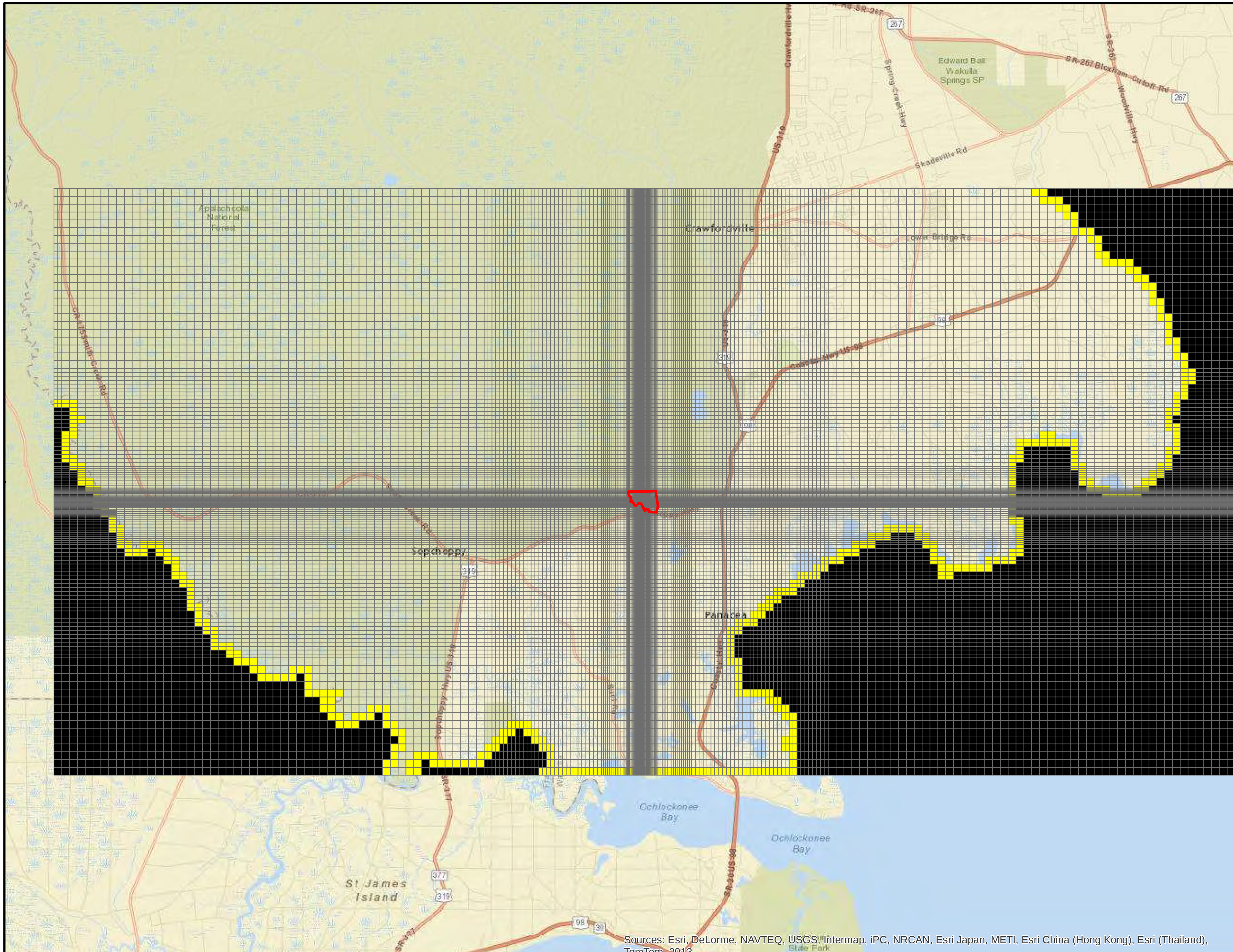
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 3

Y:\Projects\2015\113-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 3 Aerial Photo.mxd



MODEL DOMAIN AND BOUNDARY CONDITIONS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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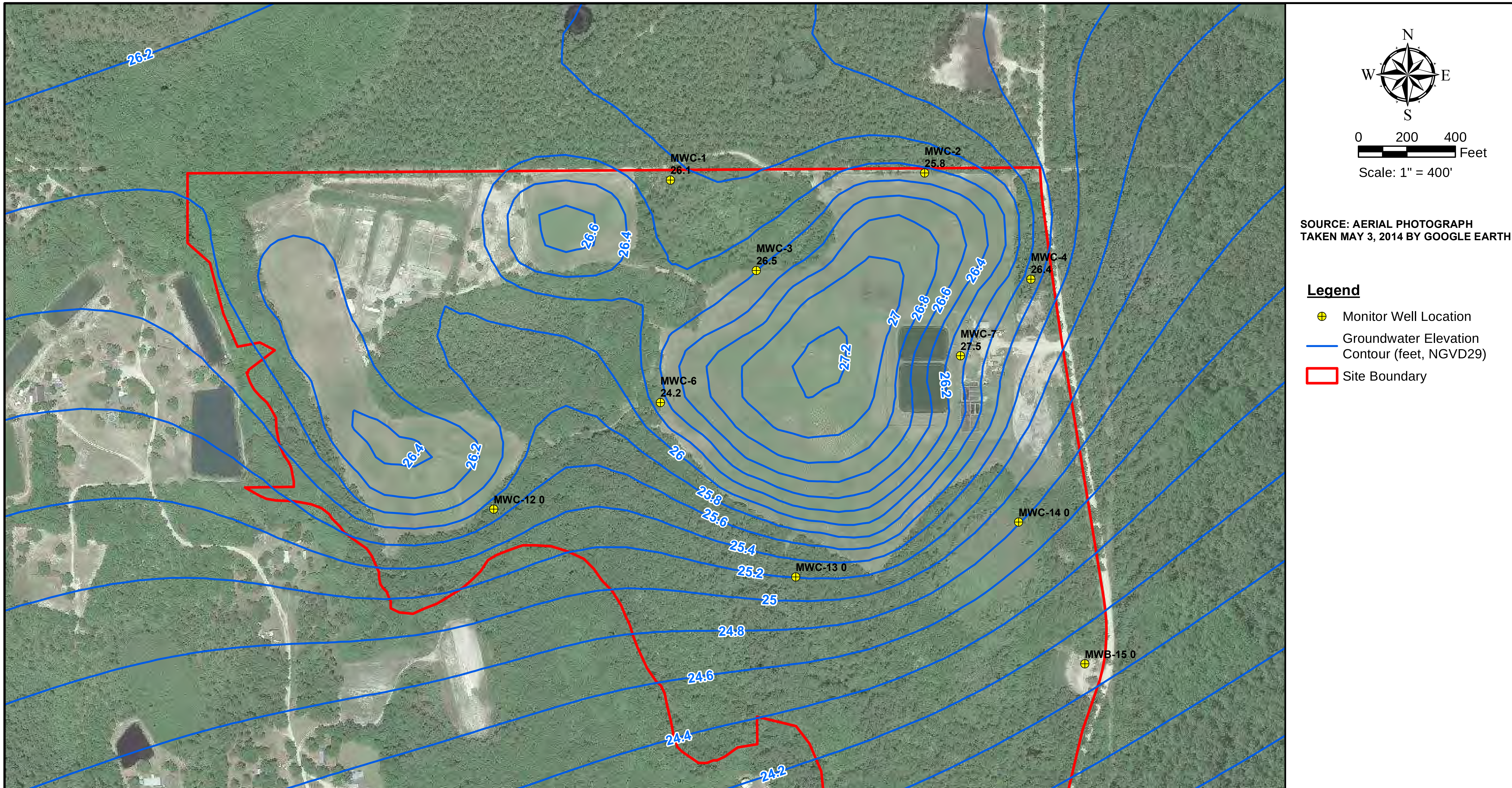
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 4

Y:\Projects\2015\113-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 4 Model Domain and Boundary Conditions.mxd



SIMULATED GROUNDWATER ELEVATIONS IN 2013/2014

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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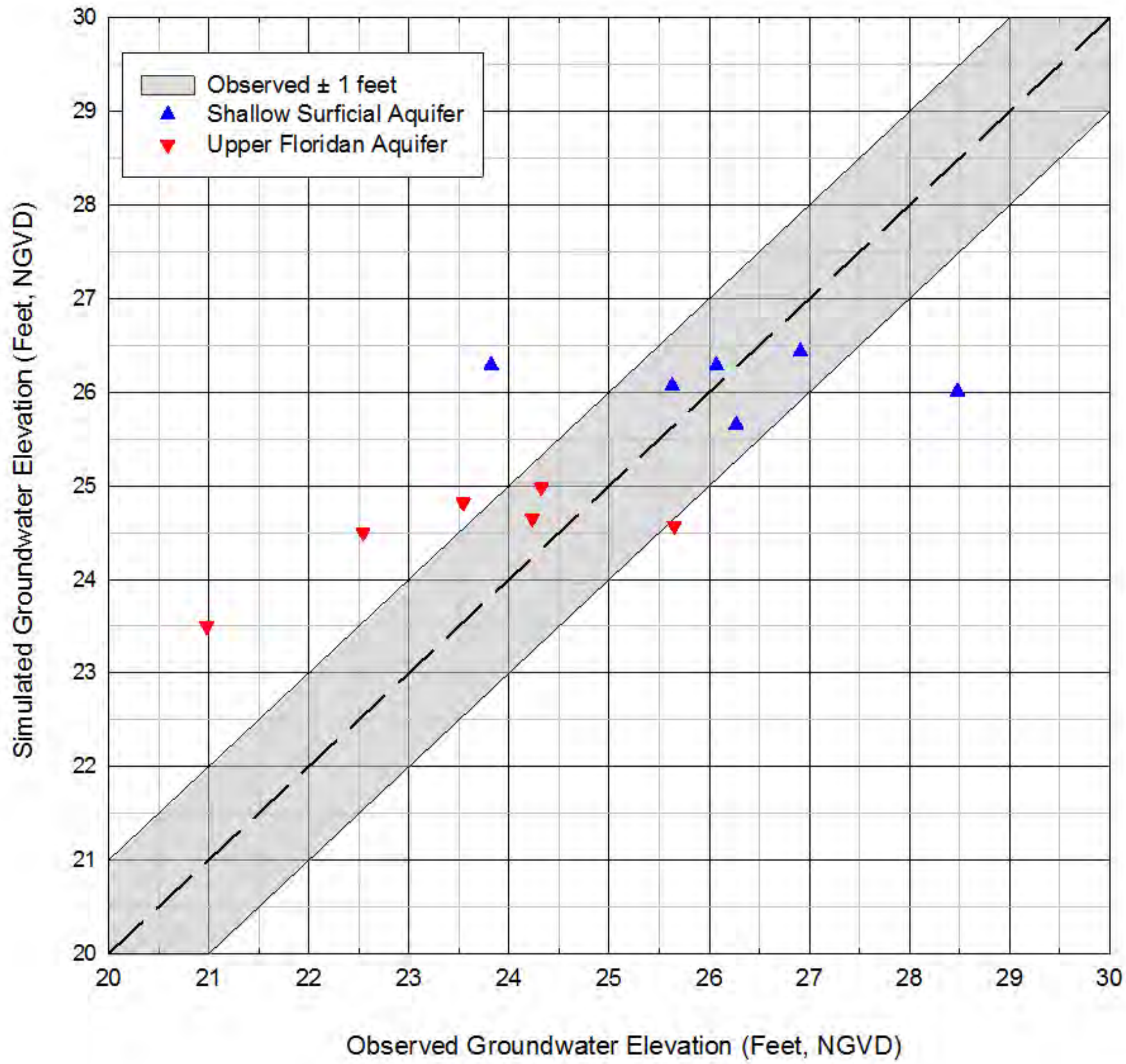
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 5

Y:\Projects\2015\113-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 5- Calibration.mxd



SIMULATED VERSUS OBSERVED GROUNDWATER ELEVATIONS IN CALIBRATED MODEL

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 6

C:\Users\Shimelies Aboye\Desktop\Groundwater Modeling\Report and Power Point

N
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0 200 400
Feet

Scale: 1" = 400'

SOURCE: AERIAL PHOTOGRAPH TAKEN MAY 3, 2014 BY GOOGLE EARTH

Legend

- Monitor Well Location
- Pond Boundary
- Site Boundary

PROPOSED POND LOCATIONS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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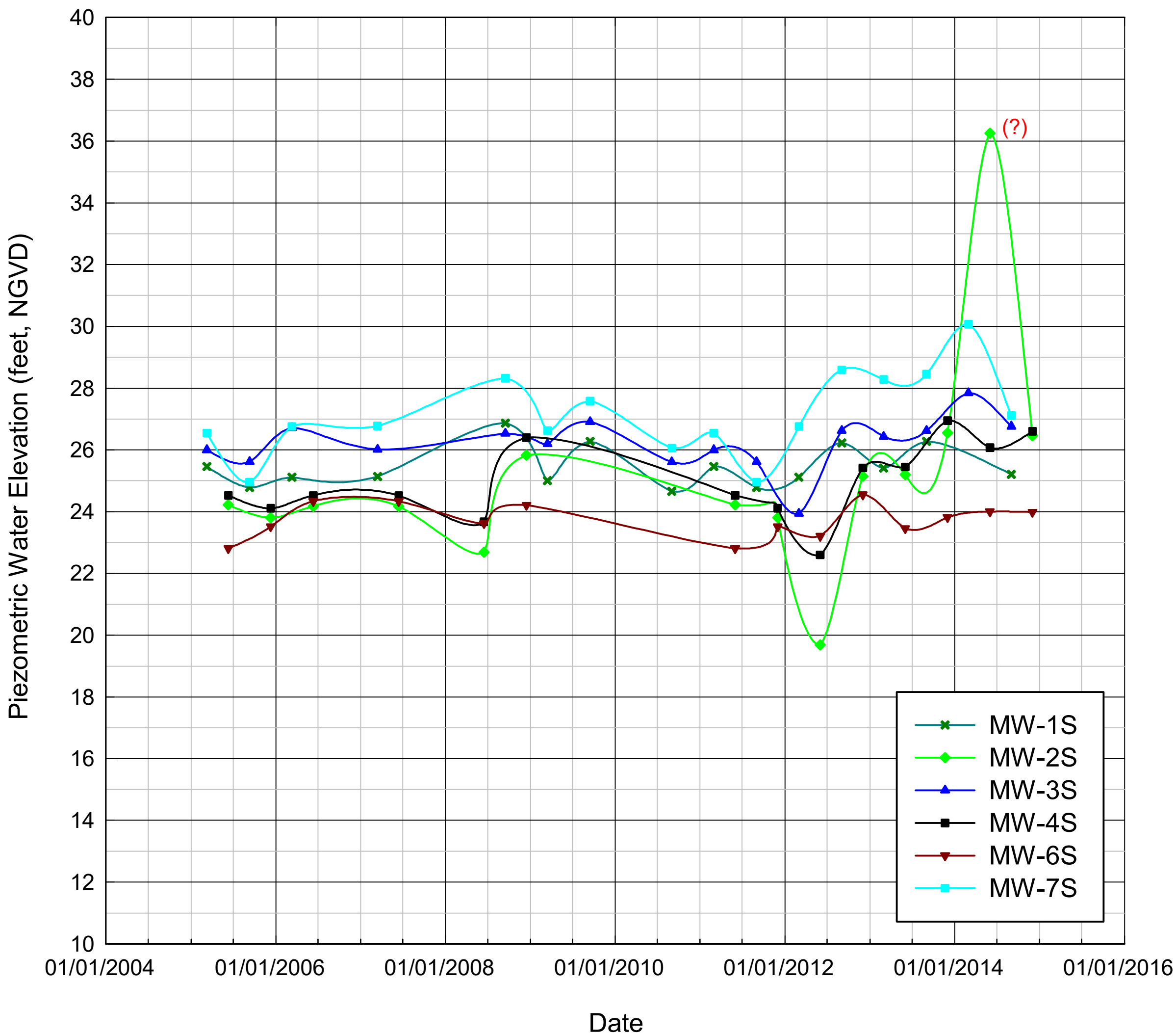
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 7

Y:\Projects\2015\13-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 7 Proposed Location of Ponds.mxd



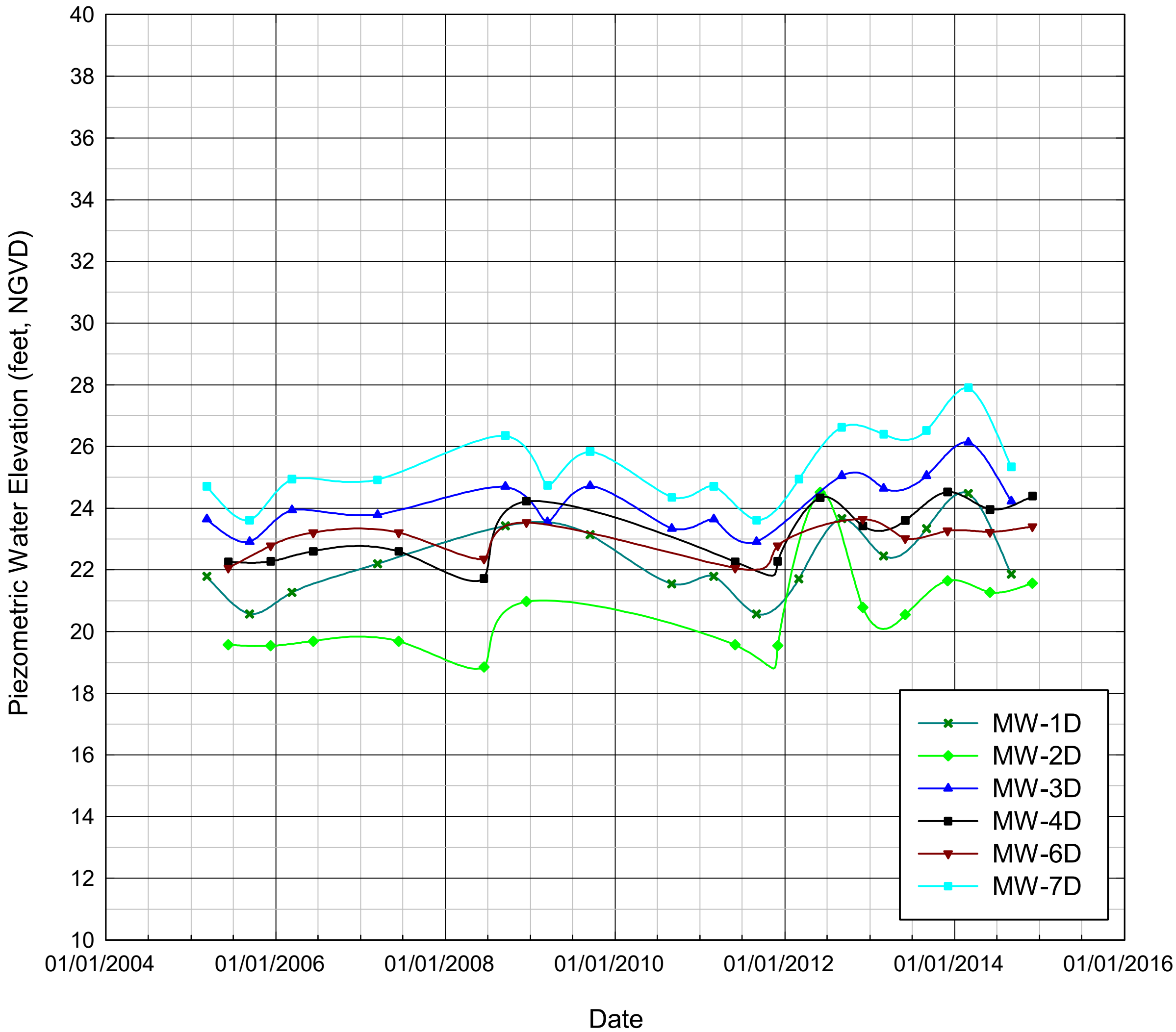
PIEZOMETRIC ELEVATIONS IN SURFICIAL AQUIFER MONITOR WELLS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY WAKULLA COUNTY, FLORIDA

DRAWN BY: **SHA**	CHECKED BY: **FKC**	DATE: **03/14/16**
FILE NO: **15-13-0118**	APPROVED BY: **FKC**	FIGURE: **8**

P:\Shimelies Aboye\15-13-0118_Otter Creek Wastewater Treatment



PIEZOMETRIC ELEVATIONS IN UPPER FLORIDAN AQUIFER MONITOR WELLS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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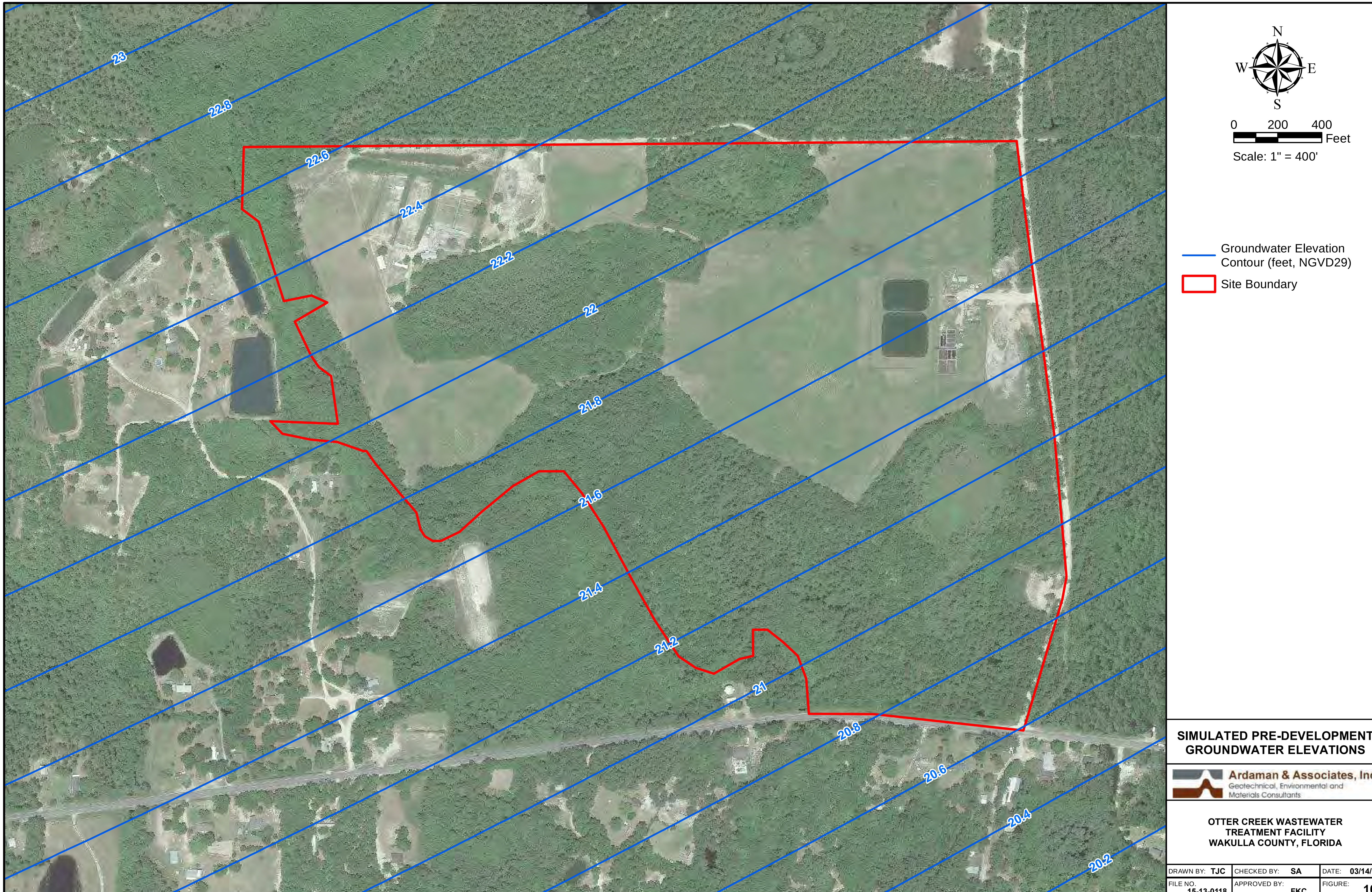
FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 9

P:\Shimelies Aboye\15-13-0118_Otter Creek Wastewater Treatment



SIMULATED PRE-DEVELOPMENT GROUNDWATER ELEVATIONS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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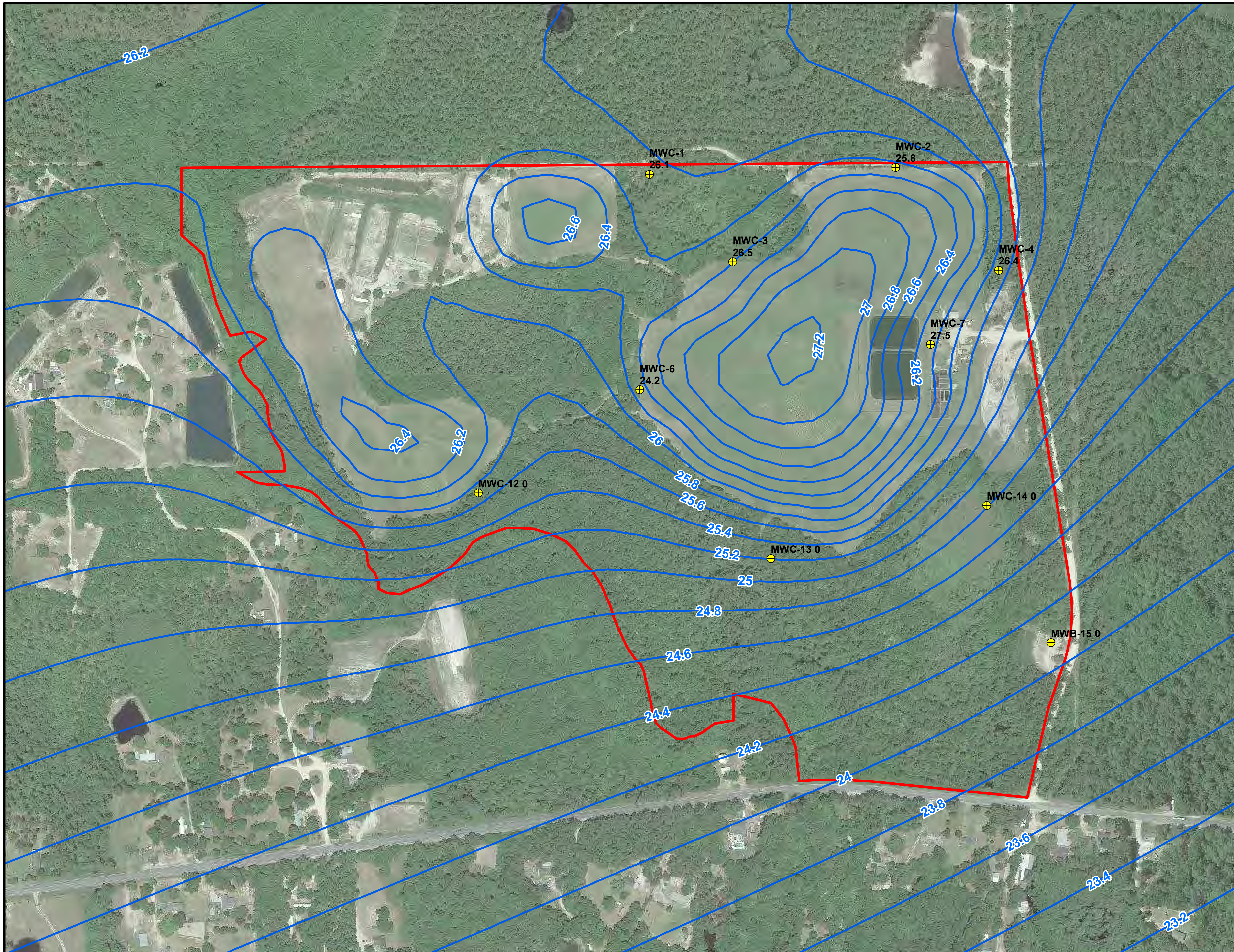
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 10

Y:\Projects\2015\113-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 10 Pre-Development Groundwater Elevation.mxd



N
W E
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0 200 400
Feet

Scale: 1" = 400'

SOURCE: AERIAL PHOTOGRAPH TAKEN MAY 3, 2014 BY GOOGLE EARTH

Legend

- Observation Well Location
- Groundwater Elevation Contour (feet, NGVD29)
- Site Boundary

SIMULATED GROUNDWATER ELEVATIONS WITH 0.6-MGD SPRAYFIELD

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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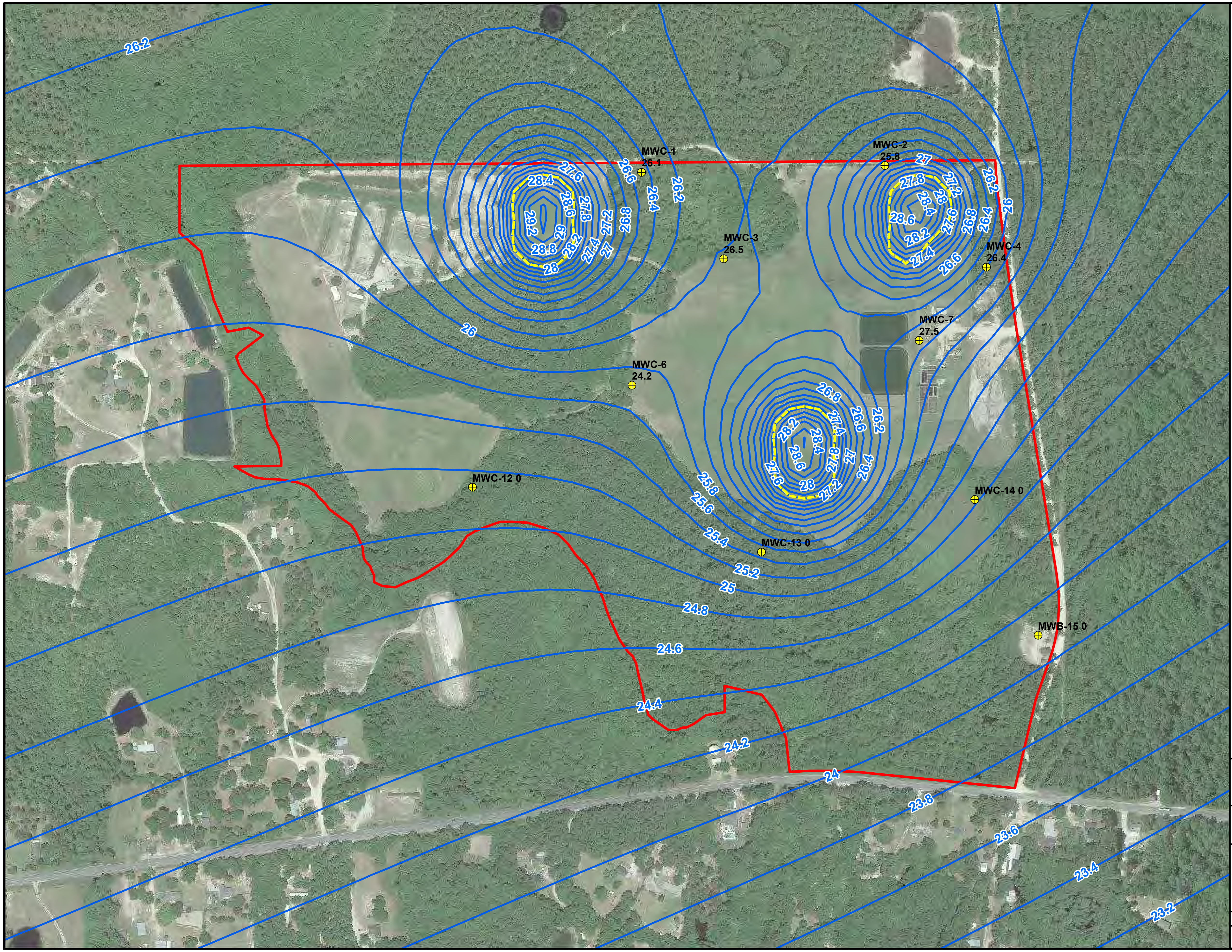
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 11

Y:\Projects\2015\13-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 11 Groundwater Elevation Using Sprayfield 06 mgd.mxd



N
W E
S

0 200 400
Feet

Scale: 1" = 400'

SOURCE: AERIAL PHOTOGRAPH
TAKEN MAY 3, 2014 BY GOOGLE EARTH

Legend

- Monitor Well Location
- Pond Boundary
- Groundwater Elevation Contour (feet, NGVD29)
- Site Boundary

SIMULATED GROUNDWATER ELEVATIONS WITH 0.6-MGD RIB SYSTEM

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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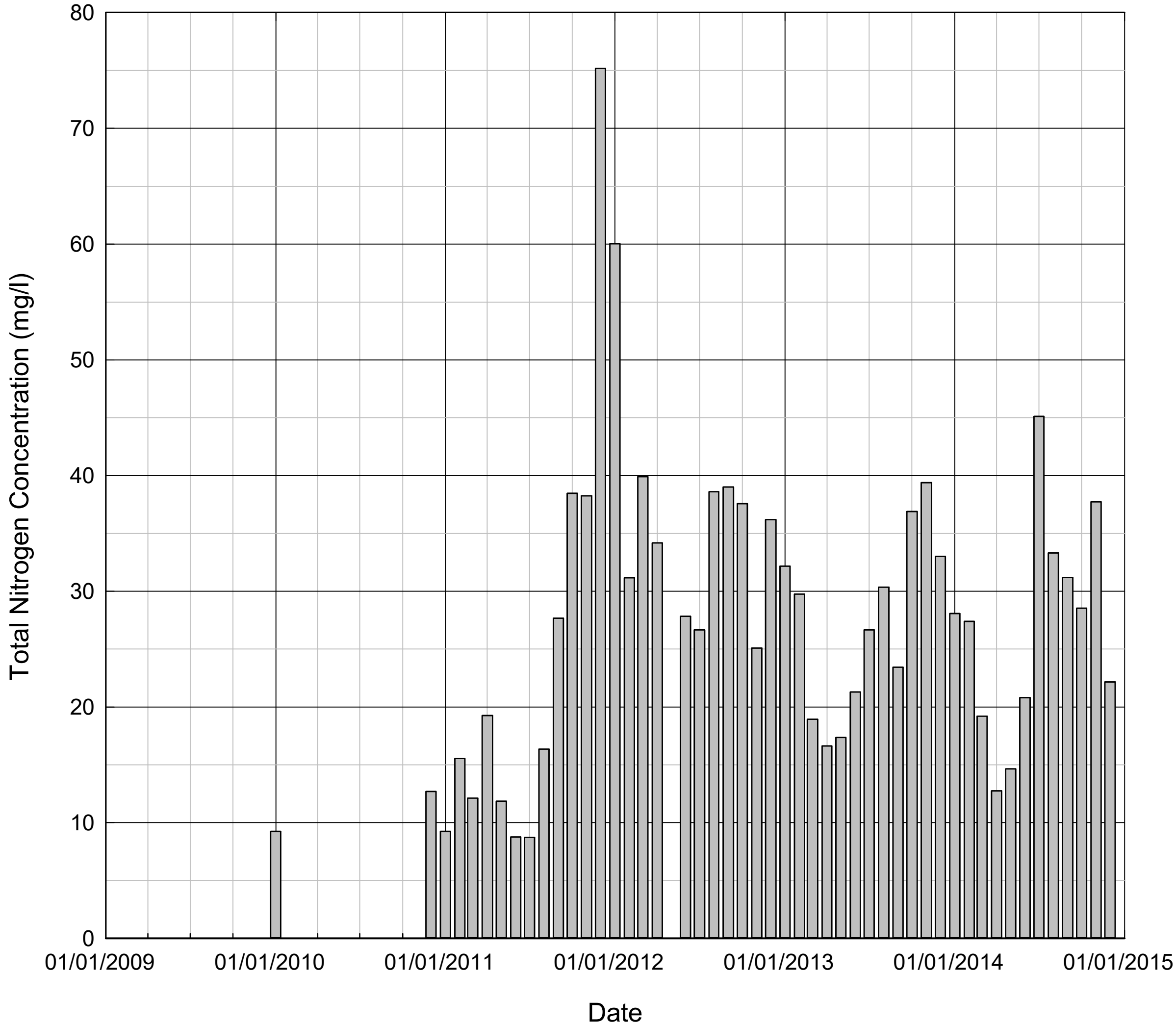
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: 12

Y:\Projects\2015\13-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\Figure 12 Groundwater Elevation Using RIB 05 mgd.mxd



TOTAL NITROGEN CONCENTRATIONS IN TREATED EFFLUENT

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY WAKULLA COUNTY, FLORIDA

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FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 13

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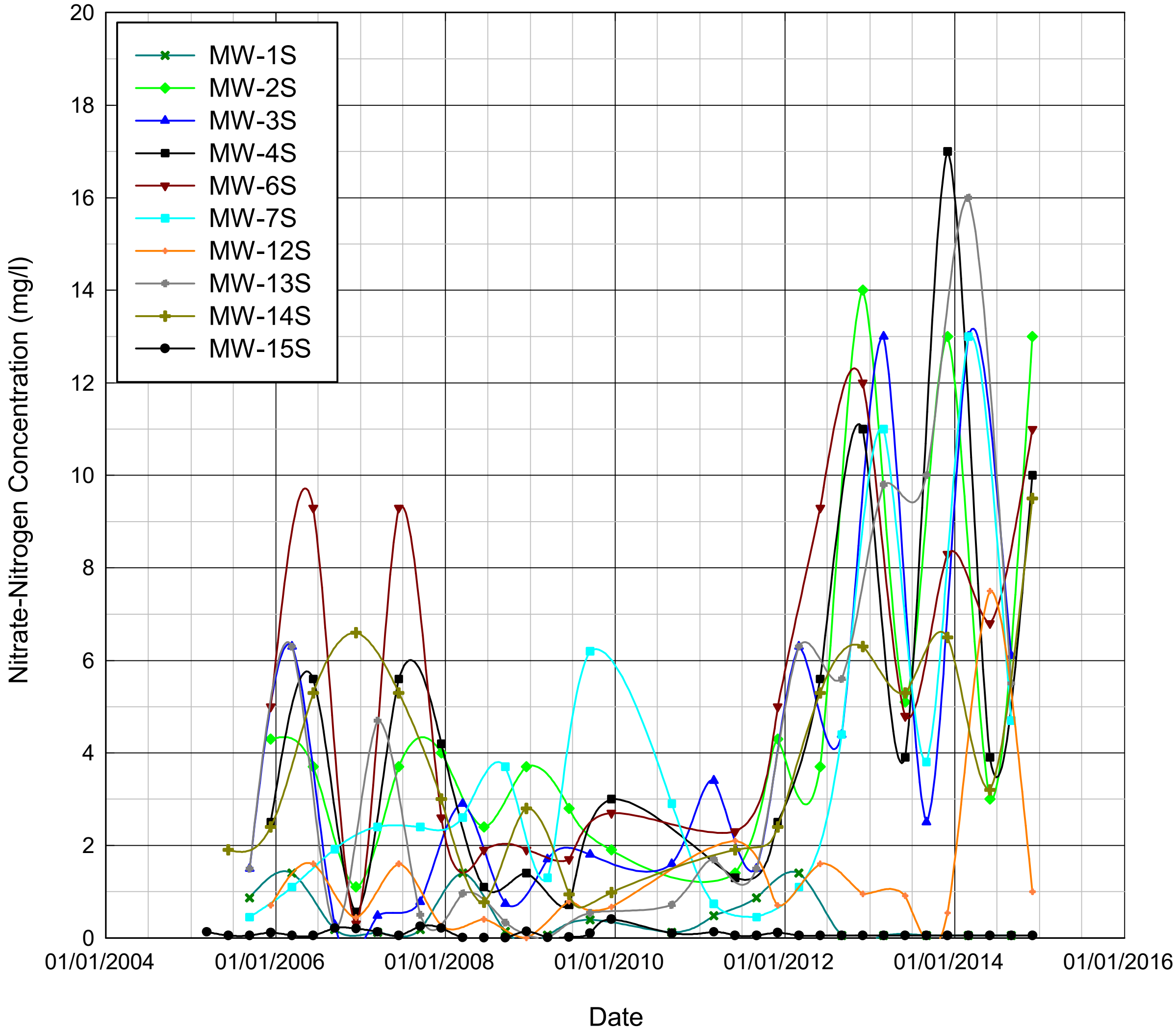

NITRATE-NITROGEN CONCENTRATIONS IN SURFICIAL AQUIFER MONITOR WELLS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 14

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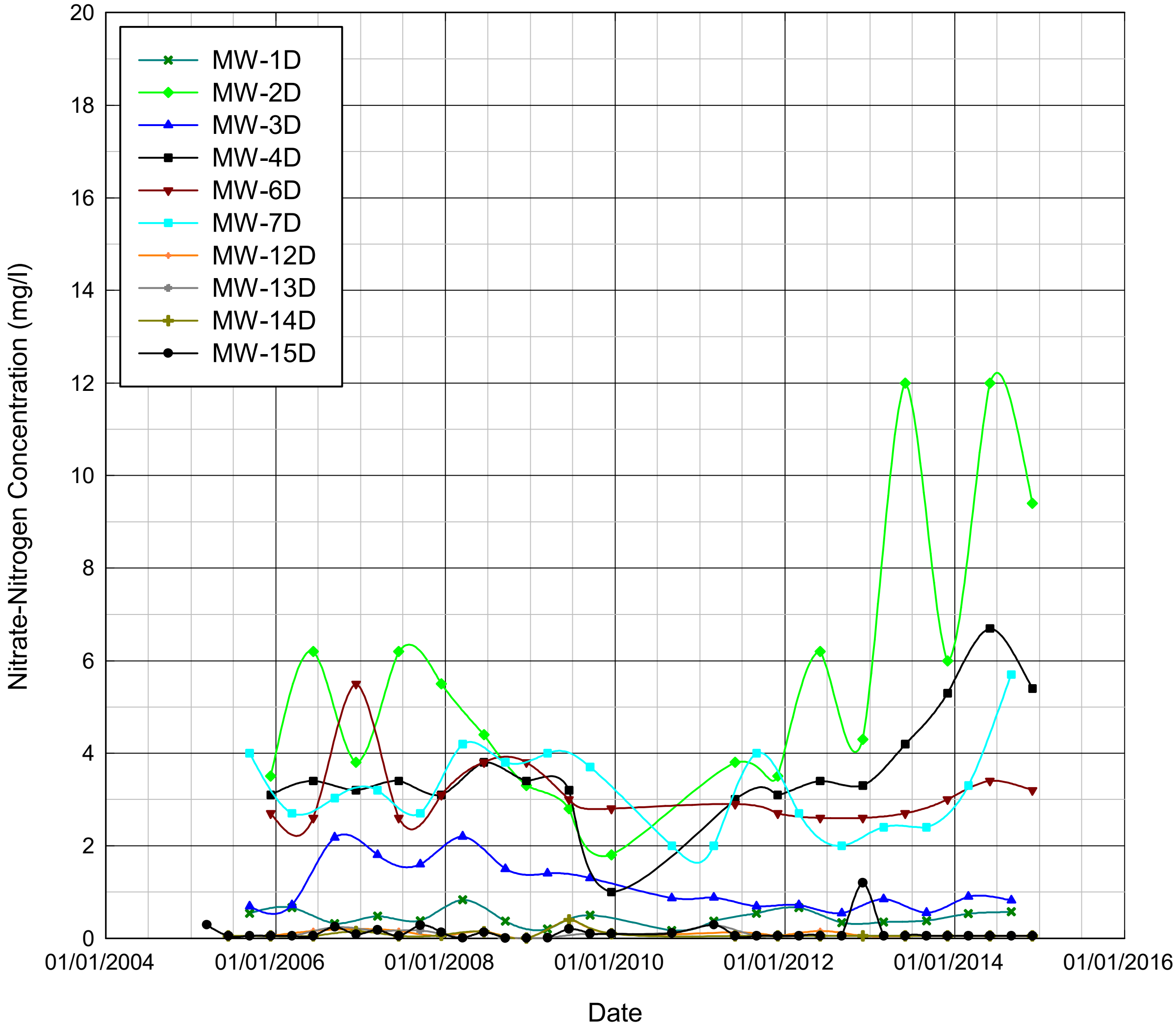

NITRATE-NITROGEN CONCENTRATIONS IN UPPER FLORIDAN AQUIFER MONITOR WELLS

Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 15

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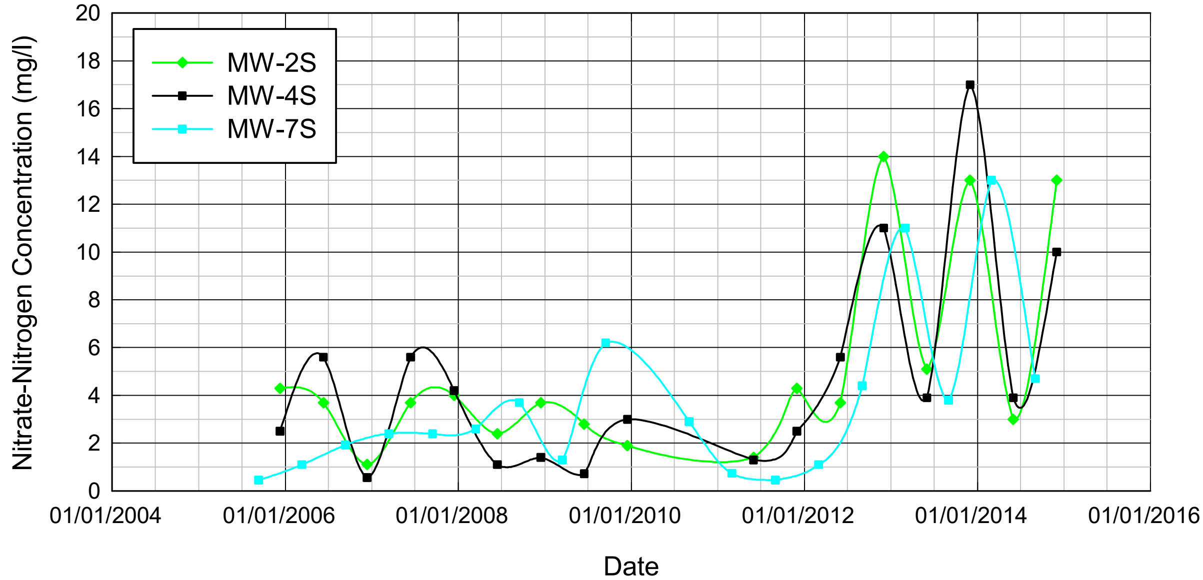
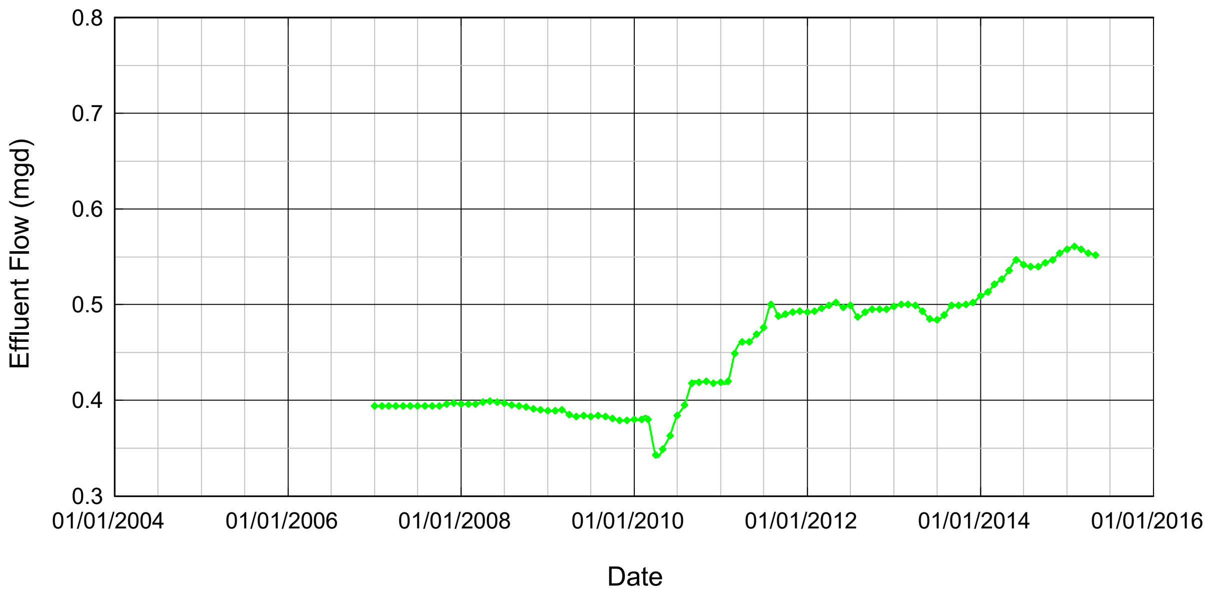




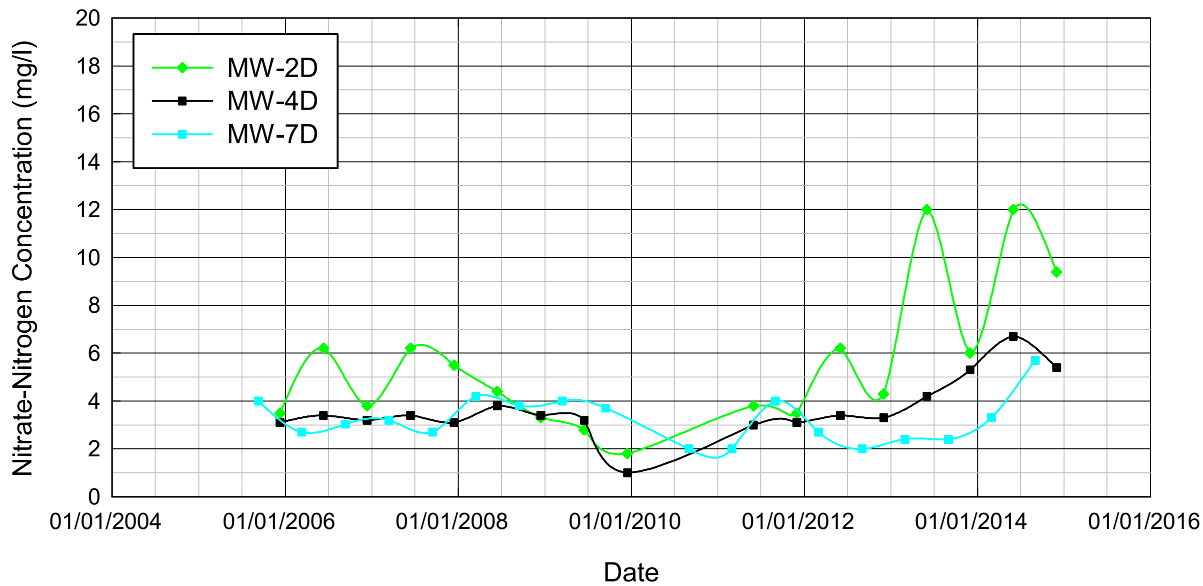
EFFLUENT FLOW AND NITRATE-NITROGEN CONCENTRATIONS IN SURFICIAL AQUIFER MONITOR WELLS

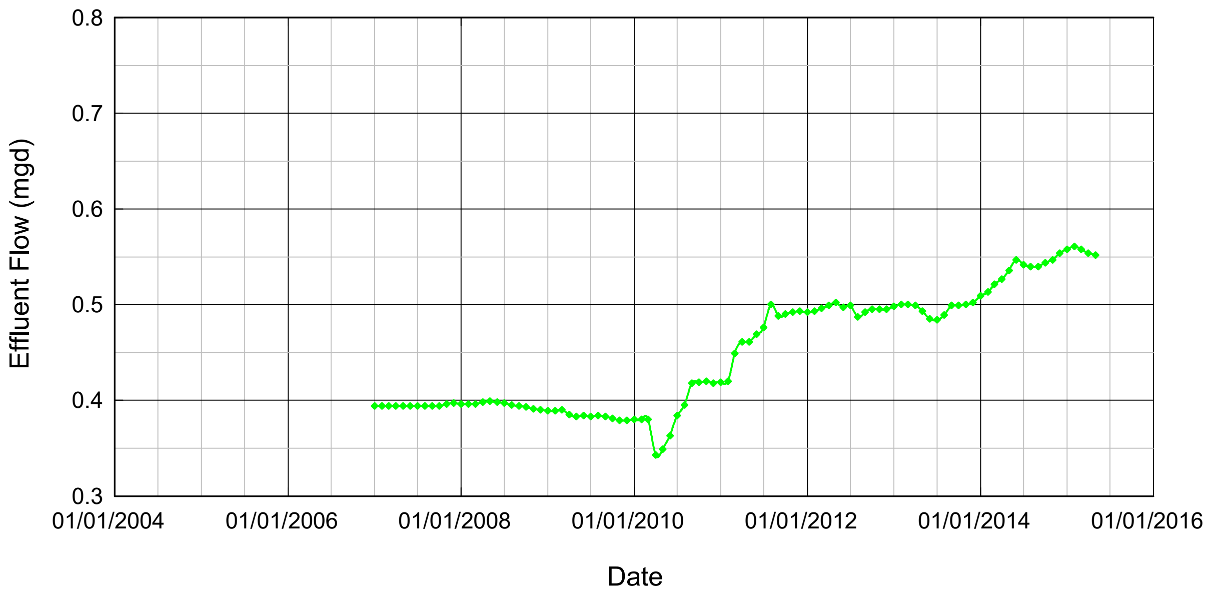
Ardaman & Associates, Inc.
Geotechnical, Environmental and Materials Consultants

OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

DRAWN BY: SHA	CHECKED BY: FKC	DATE: 03/14/16
FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 16

P:\Shimelies Aboye\15-13-0118_Otter Creek Wastewater Treatment





EFFLUENT FLOW AND NITRATE-NITROGEN CONCENTRATIONS IN UPPER FLORIDAN AQUIFER MONITOR WELLS

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OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

DRAWN BY: SHA	CHECKED BY: FKC	DATE: 03/14/16
FILE NO: 15-13-0118	APPROVED BY: FKC	FIGURE: 17

P:\Shimelies Aboye\15-13-0118_Otter Creek Wastewater Treatment

Appendix 1

Depths to Water Table in Hand Auger Borings on January 22, 2016

N
W E
S

0 200 400 Feet

Scale: 1" = 400'

Legend

Site Boundary

Hand Auger Boring Location

HA-1 Boring Location
8.75' Depth to Water Table

DEPTH TO WATER TABLE

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OTTER CREEK WASTEWATER TREATMENT FACILITY
WAKULLA COUNTY, FLORIDA

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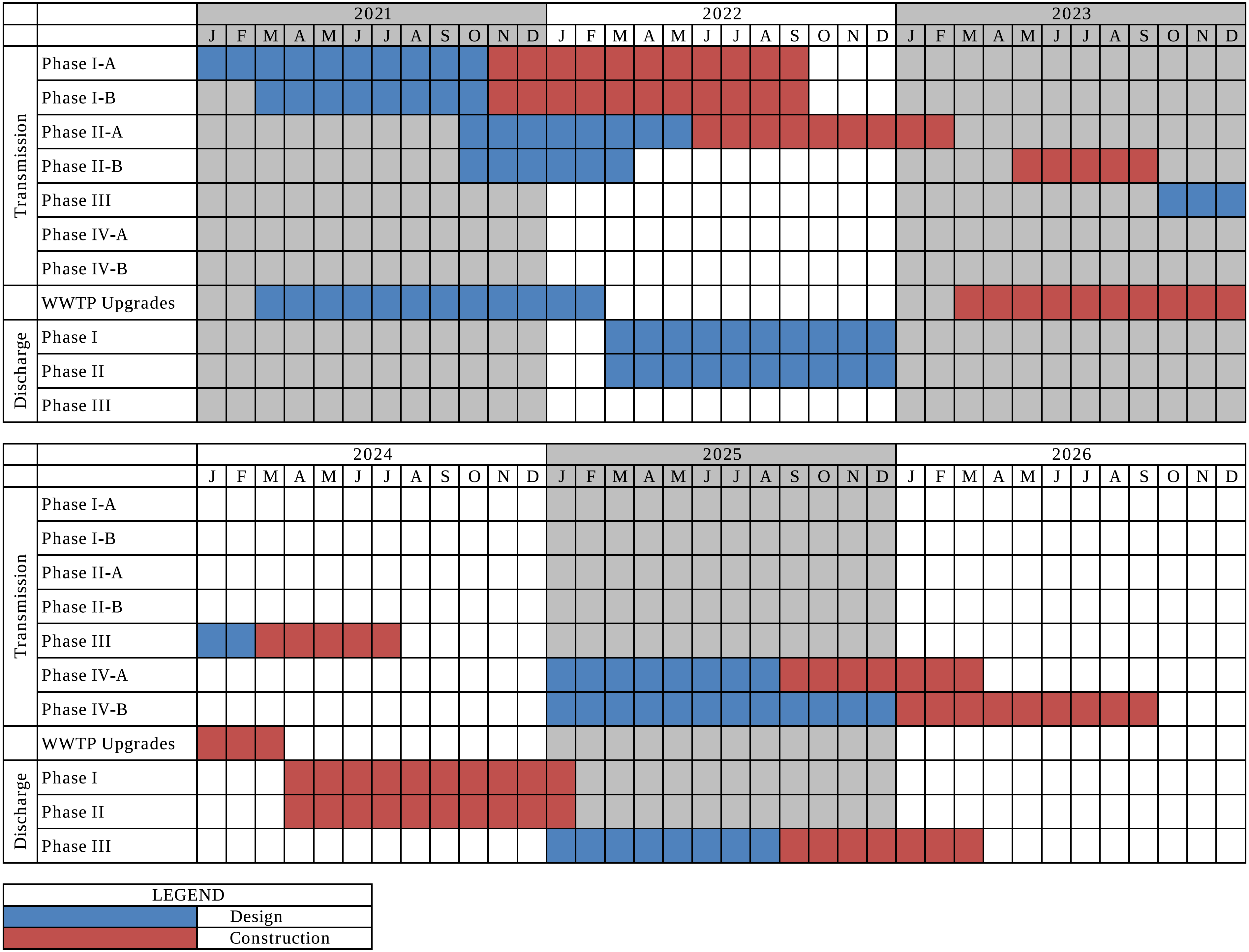
FILE NO. 15-13-0118	APPROVED BY: FKC	FIGURE: A1

Y:\Projects\2015\13-15-13-0118 - Otter Creek\ArcGIS\ArcLayouts\20160314\A1 Hand Auger Depth to Water Table.mxd

Attachment 17

Project Implementation Schedule


2021
2022
2023
J F M A M J J A S O N D
Transmission
Phase I-A
Phase I-B
Phase II-A
Phase II-B
Phase III
Phase IV-A
Phase IV-B
WWTP Upgrades
Discharge
Phase I
Phase II
Phase III
2024
2025
2026
J F M A M J J A S O N D
Transmission
Phase I-A
Phase I-B
Phase II-A
Phase II-B
Phase III
Phase IV-A
Phase IV-B
WWTP Upgrades
Discharge
Phase I
Phase II
Phase III
LEGEND
Design
Construction