FLAGLER COUNTY, FLORIDA

PLANTATION BAY UTILITY SYSTEM
CONDITION ASSESSMENT

PREPARED FOR:

CITY OF BUNNELL AND FLAGLER COUNTY

PREPARED BY:

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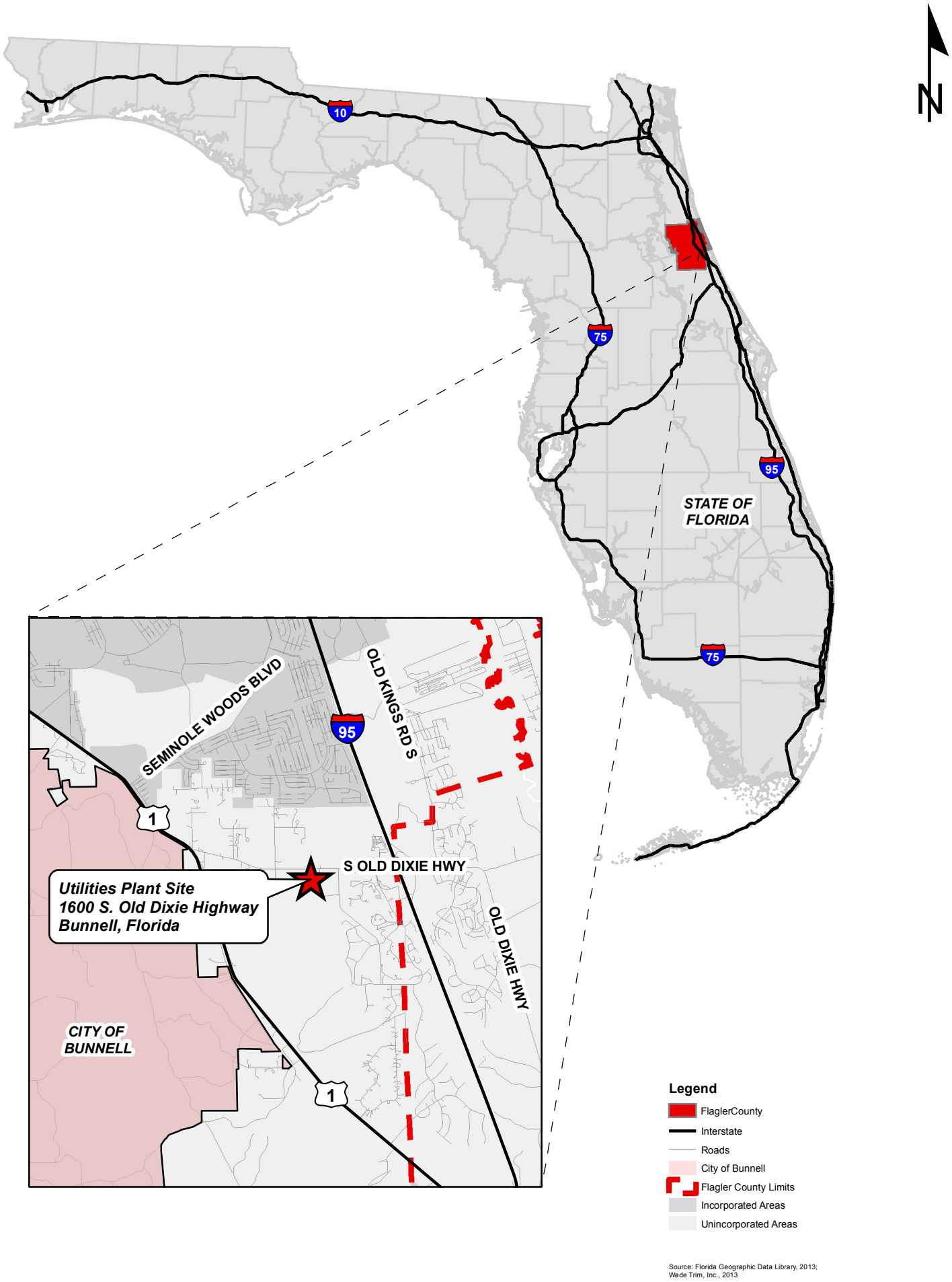
1.0 INTRODUCTION

1.1 Objective and Background

This report has been prepared for the City of Bunnell and Flagler County to assist with the potential purchase of the Plantation Bay Utility (Utility) and presents an analysis of the water and wastewater utility assets owned and operated by the Plantation Bay Utility Company in Flagler County. This report compiles data obtained from the Utility, visual inspections of the systems' facilities, and review of pertinent operating and compliance records. As a result, a detailed list of recommended capital improvement projects have been identified which are needed for the Utility to comply with current regulatory requirements as well as existing equipment in need of replacement are presented for the City of Bunnell's and Flagler County's consideration.

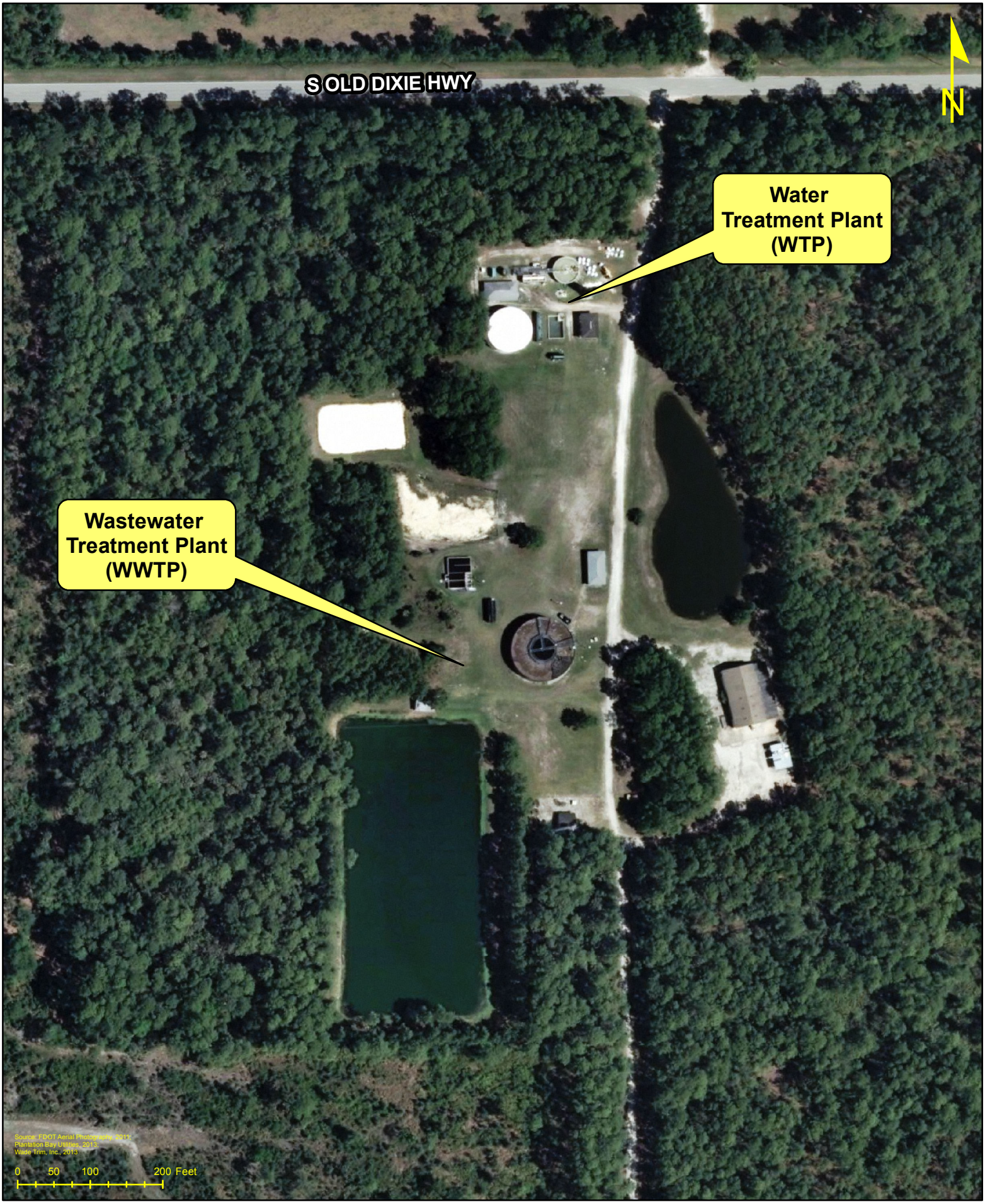
The Utility serves the Plantation Bay residential community and nearby residential and commercial properties and is currently owned by the developer. The Utility's initial water and wastewater systems were constructed circa 1985 with the treatment plants located at 1600 S. Old Dixie Highway as shown in **Figure 1-1**.

To prepare this report, Wade Trim engineers performed visual inspections of major above ground structures, buildings and equipment, including the water and wastewater facilities, storage tanks, water pumping stations, wastewater lift stations, and potable water supply wells at the locations shown on **Figure 1-2** and **Figure 1-3**. Wade Trim engineers also reviewed reports on file at the Florida Department of Environmental Protection (FDEP), the St. Johns River Water Management District (SJRWMD), and utility maintenance records prepared by the Utility.



WADE TRIM	PLANTATION BAY UTILITIES CONDITION ASSESSMENT	LOCATION OF PLANTATION BAY UTILITIES PLANT SITE	JANUARY 2013
			FIGURE 1-1

WADETRIM	PLANTATION BAY UTILITIES CONDITION ASSESSMENT	AERIAL OF PLANTATION BAY WTP AND WWTP	JANUARY 2013
			FIGURE 1-2



WADE TRIM	PLANTATION BAY UTILITIES CONDITION ASSESSMENT	AERIAL OF PLANTATION BAY WTP AND WWTP (DETAIL)	JANUARY 2013
			FIGURE 1-3

1.2 Service Area

1.2.1 Current Connections

The Plantation Bay Utility Company provides water and wastewater services to the Plantation Bay community located in Flagler and Volusia Counties. In addition, the Utility provides service to three (3) nearby platted residential developments and one (1) commercial development (Dixie Crossings) located on the north side of Old Dixie Highway and directly north of the community. A summary of the Utility customer types and the number of accounts as of December 2011 is presented in **Table 1-1**.

Table 1-1: Summary of Utility Customers as of December 2011

Type	*Number of Water Accounts*	*Number of Wastewater Accounts*
Residential	1,486	1,446
Commercial	25	19
Industrial	0	0
Other	0	0
TOTAL	1,511	1,465

(1) Data taken from the 2011 Annual Report of the Plantation Bay Utility Company submitted to the Florida Public Service Commission Page W-9

The customers identified as commercial include a number of connections associated with the Plantation Bay Golf Club, Old Dixie Park operated by Flagler County Parks and Recreation Department, and the three (3) units of the Dixie Crossings commercial development.

1.2.2 Future Connections

The Plantation Bay community is expected to continue to be developed into the future. According to the Public Service Commission report, as of the end of 2011, there are approximately 1,498 units developed out of a total of 5,791 units allowed under the Development of Regional Impact Development Order (Flagler County Ordnance 2004-125).

Table 1-2 summarizes the current development status within the Plantation Bay community.

Table 1-2: Development Status in the Plantation Bay Community

Areas	Flagler County Units	Volusia County Units	Total Units
Platted			
Developed Units	755	743	1,498
Vacant [2, 3]	229	241	470
Total Platted [4]	**984 [1]**	**984 [1]**	**1,968 [1]**
Unplatted			
Unplatted [5]	587	0	587
Future	3,236	0	3,236
Total Unplatted	**3,823**	**0**	**3,823**
Platted and Unplatted			
Total Platted & Unplatted	**4,807**	**984**	**5,791**

(1) Data obtained from the Plantation Bay Plat Recording Tables
(2) Vacant defined as platted units but entitled to building permits
(3) Vacant Areas include Westlake Unit1/2 (12 units); Westlake Unit 4 (97 units); and Westlake Unit 5(120 units).
(4) Platted units are developed units plus vacant units. Platted units have been reserved water and wastewater system capacity
(5) Unplatted areas include Westlake Unit 6 (73 units); Westlake Unit 7 (204 units); Westlake Unit 8 (87 units); and Westlake Unit 9 (223 units)

Table 1-3 summarizes the current development status of subdivisions adjacent to Plantation Bay that are currently within the Plantation Bay Utility Company service area.

Table 1-3: Development Status of Served Adjacent Subdivisions

Subdivision	Built	Vacant	Platted	Total Units
Platted				
Plantation Estates	0	75	75	75 [2]
Dixie Commons	3	25	28	28
Total Platted	**3**	**100**	**103**	**103**
Unplatted				
Dixie Crossings	0	0	0	5 [3]
Platted and Unplatted				
Total Platted & Unplatted	**3**	**100**	**103**	**108**

(1) Data obtained from Flagler County Development Engineering
(2) PBUC Agreement for 75 Units
(3) The PBUC Agreement in force 1987 to 2007 accounted for 5 units however, none have been platted.

It is assumed that each platted unit within the service area of the Utility has been granted reserved capacity within the utility system and will connect to the system once a certification of occupancy has been provided by the County Building Department. In

addition, unplatted units have not been granted reserved capacity within the Utility system, but have started the process towards being platted.

Table 1-4 shows the number of units within the Utility's service area that are able to connect to the Utility and the number of future utility connections with reserved capacity.

Table 1-4: Projection of Future Utility Connections with Reserve Capacity

Area	Platted Units	Unplatted Units	Future Units
Plantation Bay Residential	*1,968*	*587*	*3,236*
Adjacent Subdivisions	*103*	*5*	*0*
Total	***2,071***	***592***	***3,236***

The number of future utility customers within the service area with reserve capacity is 2,071 or an increase of 573 additional (2,071 – 1,498). If the developer constructs the community to the maximum number allowed by the DRI, including the additional unplatted units and future lots, the maximum number of future utility customers within the service area will be 5,899 (or an increase of 3,828 units above the current level).

1.3 Current Utility Personnel and Functions

The Plantation Bay Utility currently employs an operator to maintain and operate both the water and wastewater treatment plants. Due to influent flows less than 300,000 gallons per day, the FDEP Administrative Order has allowed the Utility to operate with reduced staffing. However, it is recommended that the City/County consider employing one or two additional Class C or higher certified operators to effectively operate and maintain the Utility. As development increases within the Plantation Bay service area and influent flows approach 300,000 gallons per day, the FDEP will eventually require a larger staff.

The Utility also employs a customer service representative to coordinate billing and answer customer questions. It is recommended that the City/County consider the employment of this representative to assist during the transition of Utility ownership.

1.4 Regulatory

1.4.1 Public Service Commission

The Plantation Bay Utility Company provides central water and wastewater service to the residential development of Regional Impact of Plantation Bay. Since its origination in 1985, the Company has grown to approximately 1,500 equivalent residential connections (ERCs) based on the December 31, 2011 Annual Report to the Public Service Commission (PSC). The present system connection capacity based on service area build-out is approximately 6,000 ERCs.

1.4.2 SJRWMD Permit Requirements

Plantation Bay Utility Company was issued Consumptive Use Permit No. 1960 from the St. Johns River Water Management District on March 13, 2001 presented in **Appendix A**. This permit authorizes the Utility to use 139.5 million gallons per year (0.382 mgd average) of groundwater from the Floridan Aquifer for public water supply use and 0.60 million gallons per day for essential use (fire protection). This permit expires on March 13, 2021.

A total of four (4) groundwater wells are used by the Utility for withdrawals under this permit. Three of the four wells were constructed in 1985 while the fourth well was constructed in 2002. The wells vary in depth from 160 to 180 feet below the ground surface. By permit, withdrawals from each of the four wells are not allowed to drop below 4 feet NGVD. The Utility is required to conduct water level monitoring on each well and shut down production should water levels reach the 4 feet NGVD level.

Permitted maximum annual groundwater withdrawals from the Florida Aquifer in million gallons per year (MGY) for public supply type use (which includes household, commercial, water utility, and unaccounted for uses) are identified in **Table 1-5** below.

Table 1-5: Permitted Annual Groundwater Withdrawals from the Floridan Aquifer

Year	*Permitted Maximum Annual Groundwater Withdrawals (MGY)*
2012	99.68
2013	104.64
2014	109.64
2015	114.57
2016	119.57
2017	124.54
2018	129.54
2019	135.50
2020	139.50
2021	139.50

The facility is permitted for slow-rate public access reuse (R-001) which consists of the Plantation Bay Golf Course (75 acres) and the treatment plant's onsite holding pond (1.7 MG). Under the conditions stipulated within this permit, the Utility is required to conduct quarterly sampling and analyses on each of three (3) existing monitoring wells (see **Table 1-6** below) for the following parameters: total dissolved solids (TDS), chlorides, fecal coliform, pH, total sulfates, and total nitrite and nitrates.

Table 1-6: Groundwater Monitoring Wells

Monitoring Well ID	*Monitoring Well Location*	*Depth (feet)*
MWB-1	At northeast corner of WTP	15
MWC-2	At southeast corner of percolation/holding pond at WWTP	17
MWC-3R	Along southern margin of percolation pond at WWTP	17

1.4.3 FDEP Operating Water Permit

The Plantation Bay Utility Water Treatment Plant operates under FDEP Potable Water System (PWS) Identification Number 284251. The operating water permit is presented in **Appendix B**. The treatment plant facility has a design capacity of 756,000 gallons per day with an average day flow of 207,767 gpd and a maximum day flow of 349,000 gpd based on the FDEP Sanitary Survey Report dated March 23, 2012. This survey indicates no monitoring or maximum contaminant level (MCL) violations have occurred at the treatment plant since 2008.

1.4.4 FDEP Operating Wastewater

The Plantation Bay Utility Company operates an existing 0.475 mgd average annual daily flow (AADF) extended aeration wastewater treatment facility which consists of the following process units: one influent bar screen, three aeration tanks, one clarifier, one aerobic digester, one gravity sand filter, a chlorine contact chamber, and a percolation/holding pond. The wastewater operating permit is presented in **Appendix C**.

Residuals are hauled offsite for treatment and disposal. This facility is not required to have a pretreatment program at the present time. The treatment plant facilities are located on 1600 South Old Dixie Highway, Bunnell, Florida and operate under FDEP Permit No. FLA011597. This permit was issued on August 8, 2008 and expires in August 7, 2013.

1.4.5 Regulatory Non-Compliance

According to the FDEP, administrative orders and consent orders are used to formally settle enforcement actions and constitute a final order pursuant to section 120.52(7), Florida Statutes. A consent order binds a party who has violated Florida's environmental laws ('respondent') to perform specific actions within identified timeframes to resolve the violation, sets out FDEP's findings that the respondent violated the law and specifies the terms of settlement. A consent order may be agreed on at any point in the administrative process, including before or after FDEP issues a Notice of Violation. Consent orders are authorized in section 120.57(4), Florida Statutes and are the administrative version of a judicial consent decree or consent final judgment.

A review of non-compliance correspondence identified that the FDEP has issued Administrative Order No. AO111NE to the Plantation Bay Utility Company, Inc. on August 8, 2008 and again on August 20, 2010 (**Appendix D**) for the following reasons:

1. The effluent discharge from the WWTF does not consistently meet the limits for total suspended solids within Specific Condition Number I.A.1 of DEP Permit FLA011597.
2. The WWTF does not have the capability to continuously monitor for total residual chlorine, pH, and turbidity within Specific Condition Number I.A.1 of DEP Permit FLA011597.
3. The Plantation Bay Utility Company has not met the construction schedule to upgrade the Plantation Bay WWTF to meet Class I reliability requirements as order by FDEP and as defined by Rule 62-610.100(9)(1), F.A.C.

FDEP's Administrative Order specifically identifies action items that must be completed by defined dates which are presented in **Table 1-7**. Failure to complete these action items on time will result in a Consent Order including fines being issued against the Utility and its owners.

Table 1-7: Administrative Order Compliance Schedule

	Implementation Step	*Completion Date According to 8/8/2008 Administrative Order*	*Completion Date According to 8/20/2010 Administrative Order*	*Current Status*
1	Submit a completed application for a permit to upgrade the wastewater treatment system to meet Class I reliability	January 1, 2010	April 1, 2012	No Known Action
2	Begin Construction	January 1, 2011	October 1, 2012	No Action
3	Submit first report summarizing the construction progress	March 1, 2011	December 1, 2012	No Action
4	Submit second report summarizing the construction progress	September 1, 2011	February 1, 2013	No Action
5	Submit third report summarizing the construction progress	September 1, 2011	April 1, 2013	No Action
6	End Construction	December 31, 2011	June 30, 2013	No Action
7	Operational Level Attained	January 1, 2012	July 1, 2013	No Action

1.5 Project Scheduling Methodology

This report provides recommended capital improvement projects necessary to optimize the operation of the Utility based on information provided by permitting documentation, plant operator, and visual evaluation of the above ground equipment and structures of the water and wastewater supply and treatment systems. A component of the recommendations includes the scheduling prioritization of these projects based on:

- Consent order projects to be initiated within the next 12 months,
- Capital improvement to be performed within years 2013 and 2017, and
- Renewal and replacement projects to be performed mostly within years 2018 and 2022.

Scheduled replacement for identified equipment was based on the existing useful life of system assets as identified in **Table 1-8.** The ranges assume assets have been properly maintained.

Table 1-8: Estimated Life of Common Water System Assets

Asset	*Expected Useful Life (in years)*
Intake Structures	35 - 45
Wells and Springs	25 – 35
Galleries and Tunnels	30 - 40
Chlorination Equipment	10 – 15
Storage Tanks	30 – 60
Pumps	10 – 15
Buildings	30 – 60
Electrical Systems	7 – 10
Transmission Mains	35 – 40
Distribution Pipes	35 – 40
Valves	35 – 40
Blow-off Valves	35 – 40
Backflow Prevention	35 – 40
Meters	10 – 15
Service Lines	30 – 50
Hydrants	40 – 60
Lab and Monitoring Equipment	5 – 7
Office Furniture and Supplies	10
Computers	5
Transportation Equipment	10

(1) Source: Based on USEPA's Asset Management: A Handbook for Small Water Systems

2.0 POTABLE WATER SYSTEM

The Plantation Bay Utility Company's WTP is defined by the FDEP as a Community Category I, Class C Public Water System located west of Interstate 95 and south of Old Dixie Highway in Flagler County, Florida. The system currently serves the Plantation Bay development and adjacent areas with approximately 1,500 service connections and a population of 3,000.

2.1 Historical Flows

The Plantation Bay WTP has a permitted maximum day capacity of 756,000 gallons per day (gpd). **Table 2-1** provides a summary of the average daily flow for the treatment facility for the period 2010 through 2012 as reported to the FDEP.

Table 2-1: Plantation Bay WTP Flows

Year	Annual Average Daily Flow (gpd)	Maximum Month Average Daily Flow (gpd)	Maximum Average Daily Flow (gpd)
2010	199,900	216,000	281,000
2011	206,700	229,000	287,000
2012	192,400	214,200	349,000 [2]

(1) Data obtained from monthly FDEP Daily Monitoring Reports
(2) The increased maximum average daily flow reported is attributed to a water main break in 2012.

2.2 Future Flows

For Utility planning purposes, an equivalent residential connection (ERC) is the amount of utility capacity reserved for use of a typical residential customer. Plantation Bay Utility Company defined an ERC as 220 gallons per day of potable water consumption on the basis of a maximum day flow. Therefore, the Utility should plan to provide water service of 220 gallons per day of potable water supply for each future customer.

The Plantation Bay community and other developments within the service area are expected to experience continued development in the future. It is important for the Utility to plan for the future development to make sure there is adequate capacity to serve these areas as they develop and connect to the utility system. Using the information developed in Section 1.2.2 regarding future utility connections, **Table 2-2** shows a projection of future flows using 220 gallons per day as the reserve capacity for each future customer.

Table 2-2: Projection of Water Demand from Future Development Areas

Development Area	Units	Cumulative Total Units	Max Day Flows (gpd) [1]	Cumulative Total Flow (gpd)
Inside Service Area				
Existing	1,498		329,560	
Platted Units	573 [2]		126,060	
	Subtotal	2,071	Subtotal	455,620
Unplatted Units	592 [3]		130,240	
	Subtotal	2,663	Subtotal	585,860
Future Area	3,236 [4]		711,920	
	Subtotal	5,899	Subtotal	1,297,780

(1) Max day flows based on 220 gpd per number of units
(2) 573 units is the difference between total platted units (Table 1-4) and total developed units (Table 1-2)
(3) Total unplatted units from Table 1-4
(4) Total future units from Table 1-4

If the existing units, platted units, and unplatted units within the service area are considered, then the projected maximum day flow for these areas is 585,860 gallons per day and can be easily accommodated by the current water treatment plant with a capacity of 756,000 gallons per day. The Utility should begin considering water treatment plant expansion as the water demand approaches 80% of its design capacity (604,800 gallons per day). This equates to 2,749 units based on a projected maximum day flow demand of 220 gallons per day per unit.

2.3 Water Supply Wells

Plantation Bay Utility Company holds Consumptive Use Permit Number 1960 issued by the St Johns River Water Management District allowing the withdraw of 139.5 million gallons per year (in 2020) of groundwater from the Floridan aquifer to be used as the source of a public water supply and a maximum of 0.60 million gallons per day for essential fire protection.

The groundwater from the Floridan aquifer is withdrawn from four groundwater wells as listed in **Table 2-3**.

Table 2-3: Summary of Groundwater Supply Wells

Well Name	Well No. 1	Well No. 2	Well No. 3	Well No. 4
Year Drilled	1985	1985	1985	2002
Depth Drilled	160 ft	160 ft	160 ft	180 ft
Length (outside Casing)	90 ft	99 ft	103 ft	Unknown
Diameter	8 in	8 in	8 in	8 in
Casing Material	Steel	Steel	Steel	Steel
Well Contamination History	None as of 2010	None as of 2010	None as of 2010	None as of 2010
Pump Type	Vertical Turbine	Vertical Turbine	Vertical Turbine	Vertical Turbine
Model	5-TLC-4	5-TLC-4	5-TLC-4	5-TLC-4
Manufacturer	Goulds	Goulds	Goulds	Goulds
Rated Capacity	200 gpm	200 gpm	200 gpm	200 gpm
Motor Horsepower	7.5 HP	7.5 HP	7.5 HP	7.5 HP

(1) Taken from March 2012 FDEP Drinking Water Sanitary Survey Page 2.

The Utility is required to file a semi-annual Water Use Report with the St Johns River Water Management District which details the volume of groundwater withdrawn from each well on a monthly basis. A summary of the groundwater withdrawals is shown in **Table 2-4**:

Table 2-4: Summary of Groundwater Withdrawals

Year	Well No. 1	Well No. 2	Well No. 3	Well No. 4	Total [2]
2010	39,085,200	42,553,400	834,500	1,514,600	83,987,700
2011	40,828,000	46,392,000	919,000	1,022,000	89,161,000
2012 Jan-Jun	19,013,000	20,370,000	1,855,000	809,000	42,047,000

(1) Taken from semi-annual Water Use Report (Form No. EN-5) to the St Johns River Water Management District
(2) The Consumptive Use Permit allows for the maximum annual groundwater withdrawals are 89.72 million gallons per year in 2010, 94.68 million gallons per year in 2011, and 99.68 million gallons per year in 2012.

From the data, it is apparent that Well Nos. 1 and 2 are being over pumped and used significantly more than Well Nos. 3 and 4. The groundwater extracted from Well Nos. 3 and 4 contains elevated levels of color that are difficult to remove.

Under Condition 20 of the Consumptive Use Permit, the results of water quality sampling of the groundwater wells are submitted to the water management district semi-annually. The results from the most recent May 2012 sampling event are shown in **Table 2-5**.

Table 2-5: May 2012 Groundwater Quality Sampling Results

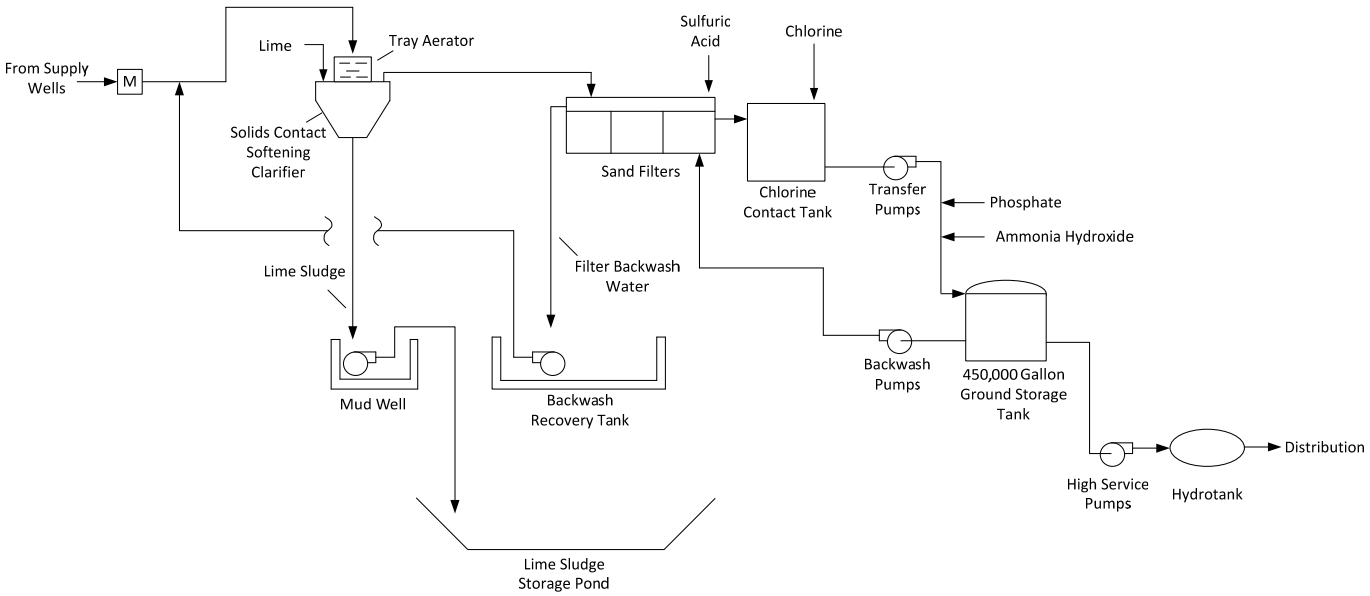
Parameter	Units	Well No. 1	Well No. 2	Well No. 3	Well No. 4
Calcium	mg/L	126	130	124	122
Iron	mg/L	0.18	0.18	0.63	0.82
Magnesium	mg/L	6.3	6.1	5.6	5.6
Potassium	mg/L	1.3	1.3	1.1	1.2
Sodium	mg/L	21.9	17.8	17.7	18.5
Total Hardness	mg/L as CaCO3	341	351	332	328
True Color	mgPt/L	25	35	90	90
Total Alkalinity	mg/L as CaCO3	334	328	317	312
Specific Conductance	umhos/cm	704	671	665	656
Total Dissolved Solids	mg/L	427	413	406	414
Chlorides	mg/L	30.7	23.3	24.2	23.8
Sulfate	mg/L	< 0.25	< 0.25	< 0.25	< 0.25

Currently, the Utility does not withdraw a significant amount of water from Well No. 3 or 4 due to a high level of color in the raw water. The reported color in the water from Well Nos. 3 and 4 is approximately 4 times higher than Well Nos. 1 or 2. Color is imparted into the water from the presence of organics or metals such as iron. The presence of color is an aesthetic water quality concern and is considered a “recommended” standard under the National Secondary Drinking Water Regulations. The standard for color following treatment is 15 mgPt/L.

2.4 Water Treatment Facility

The treatment plant uses a lime softening treatment process within a solids contact clarifier followed by filtration, primary disinfection, finished water storage, and high service pumping. A simplified flow diagram of the Plantation Bay water treatment plant is shown in **Figure 2-1.**

Figure 2-1: Water Treatment Plant Flow Diagram



Groundwater from the four wells is pumped in a 10-inch PVC raw water line from the well field to the treatment plant.

The raw water initially passes through a four tray fiberglass tray aerator. Aeration is a treatment process whereby the raw water is brought into contact with air for the purpose of increasing the oxygen content, reducing the carbon dioxide content, and removing any hydrogen sulfide or any other volatile gases that may be responsible for imparting a bad taste or odor to the water. Aeration of the raw water can also partially oxidize dissolved iron and manganese metals into an insoluble form.

Following aeration, the water flows by gravity into a solids contact softening clarifier where lime slurry and polymer are added to the water. The unit is a 36 ft diameter by 14 ft tall steel tank with inward sloping sidewalls. The interior to the tank has an outward sloping interior baffle with a rotating multi-bladed rotor-impeller driven by a 10 horsepower motor and a reducing speed gear drive unit. The solids contact softening clarifier is an Infilco Degremont Accelator® unit consisting of a circular basin with both a center-feed and flocculation zone employing mechanical mixing in a vertical conically shaped zone. The precipitate which forms from removing the hardness is allowed to recirculate through the tank. An adjustable timer is used to control the flow within three sludge blowoff lines that are used to remove lime sludge from the unit controlling the

sludge concentration and sludge blanket depth within the unit. The unit is sized to provide approximately 20 minutes of flocculation time and 60 to 120 minutes for settling. An acceptable surface loading rate for a solids contact softening clarifier ranges from 1 to 3 gpm per sq ft of surface area. Based upon the size of this unit, the treatment capacity of a properly operated softening clarifier is approximately 1500 gpm.

The sludge from the softening clarifier is conveyed to the Mud Well where a duplex submersible pump is used to pump the sludge slurry to the lime slurry storage pond for drying.

The lime slurry used within the softening treatment process is made up by slaking pebble lime stored within a 40 ft tall lime silo. The silo provides storage for approximately 1600 cubic feet or 48 tons of quick lime. Lime is delivery to the plant in the form of pebble or quick lime (chemical symbol CaO). Lime in this form must be hydrated or mixed with water in the slaker to form a lime slurry (chemical symbol CaOH2). The plant makes use of a 1,000 lbs/hour rated capacity paste type slaker to make-up the lime slurry. The lime slurry is fed to the softening clarifier through two 2-inch feed lines.

The softened water flows by gravity to a rapid sand filter for filtration. The filter unit is a steel tank with three filter cells each 8 ft by 10 ft by 10 ft deep containing a filter bed with an underdrain, 14 inches of gravel, 3 inches of sand, and charcoal. These filters are rated at 5 gpm per square foot. The filters are backwashed at 1,700 gpm after a 48 hour filter run. The ground storage tank is the source of the backwash water and is pumped using one of two 15-horsepower Aurora centrifugal pumps. The backwash pumps are located within Pump Station building. The filter backwash flows by gravity into a 20 ft wide by 30 ft long by 10 ft deep (9 ft side water depth) below-grade Backwash Recovery Tank providing storage for approximately 40,000 gallons. Two 5-horsepower Aurora vertical turbine backwash return pump, rated for 350 gpm, are used to return the stored backwash flow to the softening clarifier.

Following filtration, the filtered water flows by gravity into a small 10 ft diameter by 10 ft tall covered steel Chlorine Contact Tank (CCT) with a volume of approximately 5,300 gallons capacity. The CCT serves as the primary disinfection contact volume within the treatment process. Chlorine is added to the flow within the CCT where free chlorine is the primary disinfectant.

The flow is pumped from the CCT to the Above Ground Storage Tank (AGST) using three 3-horsepower 175 gpm or 350 gpm rated centrifugal Aurora pumps located in the Pump Station building. A 10-inch line is used to draw treated water from the CCT and convey the water to the AGST.

The AGST is a 60 ft diameter by 19 ft side wall height constructed with a prestressed composite wall system (steel shell/shotcrete). The tank has a capacity of 450,000 gallons. The water stored within the AGST serves as the source of supply for the filter backwash pumps and the high service pumps.

The finished water is pumped into the distribution system using three high service pumps. Two pumps are Aurora Model 411-BF centrifugal 25-horsepower, rated for 300 gpm at 190 ft total dynamic head. The large fire flow pump is an Aurora Model 411-BF centrifugal 50-horsepower, rated for 500 gpm at 190 ft total dynamic head. The pumps discharge into a 12-inch header that serves to transmit the finished water out into the distribution system. The facility utilizes currently one hydrotank to aid in maintaining system pressure minimizing water hammer. It is recommended to add a second hydrotank to provide redundancy during periods of scheduled maintenance or failure of the operating hydrotank.

Chlorine for disinfection is supplied by a 150 pound gaseous chlorine cylinder and a Regal 150 pound per day chlorinator. The plant operator reported using approximately 25 to 30 pounds of gaseous chlorine per day.

Following primary disinfection using free chlorine within the CCT, ammonia hydroxide is added following the CCT to convert the free chlorine into chloroamines or sometimes called combined chlorine. The ammonia hydroxide is added to the flow using a 10 gallon per day Stenner chemical metering pump.

The addition of sulfuric acid following filtration is used to lower the pH of the treated water to approximately 8.5.

A corrosion inhibitor, in the form of Aquamag, is added to the flow going into the Ground Storage Tank. The corrosion inhibitor is added the flow using a using a 3 gallon per day Stenner chemical metering pump.

2.5 Water Distribution System

Finished water from the water treatment plant leaves the facility through a 12-inch pipe and is routed easterly along South Old Dixie Highway to the Plantation Bay customers. According to the Utility operator, there have been various water line breaks in the distribution system which has resulted in public water boil notices. However, according to the operator, the line breaks are a result of cars hitting fire hydrants and not of piping integrity.

2.6 Regulatory Compliance

Operation of the Plantation Bay Water System is regulated by the FDEP under Public Water System Identification Number 2184251.

A review of the FDEP records for the period January 2010 through December 2012 was conducted to determine if this facility has been in compliance with FDEP rules and regulations. A review of FDEP public access records for the plant shows a Sanitary Survey inspection of the plant was conducted on April 1, 2010 and March 23, 2012 respectively. A routine Compliance Inspection was conducted on February 22, 2011.

The February 2011 Compliance Inspection identified three deficiencies requiring corrective action by the Utility including 1) the Chlorine Contact Tank cover developed

a hole to atmosphere due to corrosion; 2) leaking of Transfer Pump No. 2; and 3) cracking of the pad for Well No. 2. Via an April 2011 correspondence with the FDEP, the Utility reported making necessary repairs to address the leaking pump and the cracked well pad, but requested one year to complete the repairs to the Transfer Tank.

Other than these issues, the routine Sanitary Survey and Compliance Inspection did not identify any other deficiencies requiring corrective action.

As a requirement of the FDEP, the Utility routinely collects samples of the finished water and performs laboratory analysis of the samples to monitor the quality of the potable water supplied to the Plantation Bay community. The quality of the potable water is shared with the community annually when the Utility distributes its Annual Drinking Water Quality Report or otherwise called the Consumer Confidence Report. As needed, the Utility may issue public notices to its customers upon receiving unsatisfactory sampling results.

Under Chapter 62-550 Florida Administrative Code, all public water systems collect samples and perform chemical analysis for a group of common undesirable chemical byproducts of chlorine disinfection called “disinfection by-products”. These chemicals are a concern because they are formed by the reaction between chlorine and naturally occurring organics within the groundwater and are known to be carcinogenic. The concentration of specific classes of disinfection by-products called trihalomethanes (THMs) and Haloacetic acids (HAA5s) are regulated by the FDEP and the USEPA. In the United States, the limits for total concentration of the four chief constituents (chloroform, bromoform, bromodichloromethane, and dibromochloromethane), referred to as total trihalomethanes (TTHMs), is 80 parts per billion in treated water. Likewise, the limit for concentration of HAA5s is 60 parts per billion in treated water.

The Plantation Bay water system samples for disinfection by-products on an annual or quarterly basis depending on the results of their historical sampling. In the fall of 2011, a set of routine samples tested high for TTHMs and HAA5s. The Utility was therefore required by the FDEP to make the public aware of the issue via the issuance of a Public Notice and was required to initiate collecting more frequent samples. Increased sampling continued through 2012 and additional Public Notices were issued throughout the year until January 2013 when the FDEP notified the Utility they were able to return to annual routine sampling for disinfection by-products. Since the elevated TTHM/HAA5 sample results in the fall of 2011, all subsequent sample results have been well below the standard established by the FDEP and EPA to be protective of public health.

2.7 Condition Assessment

On January 8, 2013, an inspection of the Plantation Bay Utility water supply and treatment infrastructure was conducted. The following sections provide a description of the various water supply wells and water treatment unit processes examined.

2.7.1 Water Supply Wells

Wells 1 and 2 are the primary operating wells and provide a combined approximate flow of 330 gallons per minute of raw water to the water treatment facility. Wells 3 and 4 are rarely used due to a high coloration of the water produced, but are each capable of supplying approximately 150 gpm. Each well is housed in a concrete block pitched roof structure. The concrete structures each appeared to be in good condition. Each well is installed at a depth of approximately 160 feet.

The main power supply is provided to Well 3 and is then distributed to the other wells. Only Wells 1 and 2 are controlled from the treatment plant through the use of an above ground CAT5 cable which travels through the tree lines. This was noted to be an area of concern should the cable be damaged in a storm event and result in a loss of remote operation control. The future installation of a radio transmitting unit (RTU) will mitigate this concern. Wells 3 and 4 must be started manually by the operator should additional water be needed. The construction of additional water supply wells is recommended to prevent the over pumping of wells 1 and 2. In addition, a water supply well quality study is recommended to determine the source and solution to remove color from water produced from Wells 3 and 4. This water will be needed as platted lots in Plantation Bay become populated and water demands increase.

2.7.2 Water Treatment Plant

The following sections discuss the unit processes observed during the site visit conducted at the Water Treatment Plant facility.

Lime Softening

The water treatment plant is equipped with a lime slaker manufactured by US Filter, housed in a painted steel silo which contained corroded sections but appeared to be structurally sound. The slaker does not functional properly and is in need of replacement. The facility has resorted to hydrated lime in recent years to keep its water softening process operational. Associated slaker components such as the exhaust fan, lime grit remover, dust collector, and electrical components are recommended for replacement due to their age.

Solids Contact Softening Clarifier

Precipitates from the water softening process are removed in the solids contact clarifier through settling. Inspection of the clarifier structure discovered that the clarifier mixer is not operable and must be replaced. A large amount of calcium buildup was observed due to improper operation and maintenance of the clarifier. The supernatant from this structure was not clear and appeared milky. The structure showed obvious signs of corrosion.

Filter

The filter system was rebuilt in 2012 and was recently painted. According to the operator, the filter media composed of sand, rock, and charcoal were replaced during this modification.

Chlorine Transfer Tank

The chlorine transfer tank is a steel tank and according to the operator was recently interiorly cleaned. Top portions of the tank were corroded and a chlorine odor was evident. A redundant transfer tank should be constructed due to the age of the existing steel tank and the existing tank be refurbished.

Pump Station

The distribution pumps, transfer pumps, and backwash pumps are housed in a concrete block structure. All pumps are manufactured by Aurora Pump and are the original pumps installed when the facility was originally constructed. Although the pumps are operational, it is recommended that the pumps be replaced over the course of the next five years due to the fact that these pumps are past their useful life and require replacement.

Above Ground Storage Tank (AGST)

The facility is equipped with an 450,000 gallon AGST which was interiorly cleaned three years ago. Normal maintenance of storage tanks requires cleaning every five years. The next schedule cleaning for this tank is 2015.

Emergency Generator

According to the plant operator, the generator runs well; however this is the original generator installed at the time the plant was originally constructed (1985). The generator is currently on an automatic exercising schedule and is tested regularly. Since this generator has been in operation for 28 years and is the key component to maintaining the operation of the facility during emergency loss of power conditions, it is recommended that the generator be replaced within the next 5 years.

2.7.3 Water Distribution System

No components of the water distribution system were reviewed as part of the condition assessment.

3.0 WASTEWATER TREATMENT

3.1 Historical Flows

The Planation Bay WWTF is a defined by the FDEP as a Category III, Class C located west of Interstate 95 and south of Old Dixie Highway in Flagler County, Florida. The WWTF currently serves the Plantation Bay development and adjacent areas with approximately 1,465 wastewater service connections.

The Plantation Bay WWTF has a permitted annual average daily treatment and disposal flow capacity of 475,000 gallons per day (gpd). **Table 3-1** provides a summary of the average daily flow for the treatment facility for the period 2010 through 2012 as reported to the FDEP.

Table 3-1: Plantation Bay WWTF Flows

Year	Annual Average Daily Flow (gpd)	Maximum Month Average Daily Flow (gpd)	Maximum Average Daily Flow (gpd)
2010	123,300	150,000	261,000
2011	103,800	115,000	161,000
2012	111,300	122,200	241,000

(1) Data obtained from monthly FDEP Discharge Monitoring Reports

The Plantation Bay WWTF is currently operating using approximately 23 percent of its current rated permitted treatment capacity (475,000 gpd) based on the annual average daily flow for 2012.

3.2 Future Flows

For Utility planning purposes, an equivalent residential connection (ERC) is the amount of utility capacity reserved for use of a typical residential customer. Plantation Bay Utility Company defined an ERC as 220 gallons per day of wastewater flow on the basis of an average daily flow. Therefore, the Utility should plan to provide wastewater treatment capacity of 220 gallons per day of wastewater flow for each future connection.

The Plantation Bay community and other developments within the service area are expected to experience continued development in the future. It is important for the Utility to plan for the future development to make sure there is adequate capacity to serve these areas as they develop and connect to the utility system. Using the information developed in Section 1.2.2 regarding future utility connections, **Table 3-2** shows a projection of future wastewater flows using 220 gallons per day as the reserve wastewater capacity for each future customer.

Table 3-2: Projection of Wastewater Flows from Future Development Areas

Development Area	*Units*	*Cumulative Total Units*	*Ave Day Flow (gpd)* [1]	*Cumulative Total Flow (gpd)*
Inside Service Area				
Existing	1,498		329,560	
Platted Units	573 [2]		126,060	
	Subtotal	2,071	Subtotal	455,620
Unplatted Units	592 [3]		130,240	
	Subtotal	2,663	Subtotal	585,860
Future Area	3,236 [4]		711,920	
	Subtotal	5,899	Subtotal	1,297,780

(1) Average day flows based on 220 gpd per number of units.
(2) 573 units is the difference between total platted units (Table 1-4) and total developed units (Table 1-2)
(3) Total unplatted units from Table 1-4
(4) Total future units from Table 1-4

The treatment plant has a permitted capacity of 475,000 gallons per day. Under FDEP rules, the Utility can utilize up to 80% of the permitted capacity before being required to closely monitor available capacity by submitting annual Capacity Analysis Reports or beginning planning for a treatment plant expansion. Therefore, the Plantation Bay WWTF has plant capacity up to approximately 380,000 gpd before FDEP will require annual Capacity Analysis Reports or a facility expansion will be necessary.

Based upon a projection of future flows, the projected wastewater flows from the existing develop areas can be treated within the capacity of the existing treatment plant. Approximately 229 of the platted units can be developed before expansion of plant capacity is required.

3.3 Collection System

The wastewater collection system for the Plantation Bay development consists of multiple platted development areas that drain by gravity into a sanitary lift station which pumps the domestic sewage through a force main to the wastewater treatment facility. The wastewater is collected from the service area by fifteen (15) lift stations as shown in **Table 3-3**.

Table 3-3: Plantation Bay Wastewater Lift Stations

Lift Station Identification	*Lift Station Location*	*Service Area*
LS-A	Magnolia Dr	Treetop Cir. Treetop Tr. Magnolia Dr Magnolia Lane Jasmine Run Plantation Point Condo
LS-B	Kingsley Cir.	Landing Lane Kingsley Cir. Long Cove Rd Harbor Town Ln Seabrook Rd Mass Creek Dr Dolphin Head Ln
LS-C	Bay Point Dr.	Bay Point Dr.
LS-D	Gull Lake	Gull Lake Ln. Lakewood Dr. Millstream Ln. Brookridge Ln. Windstream Ln
LS-E	Bay Lake Dr.	Bay Ct. Meadow Brook Ln Villa Lago Ln Bay Lake Dr Bridgewater Ln
LS-F	Hampstead Ln	Hampstead Ln Sudbury Ln
LS-G	Hampstead Ln (South)	Hamostead Ln Oxbridge Ln Castlehawk Ln Dovercourt Ln Redbourne Ln Sunningdale Ln Aldenham Ln Hartbourne Ln Ashbridge Ln Regal Point Ln Crown Point Ln Royal Pointe Ln
LS-H	Aldenham Ln	Aldenham Ln Hansberry Ln Kilkenny Ln Henlow Ln Harwick Ln

Lift Station Identification	Lift Station Location	Service Area
LS-I	Stone Lake Dr	Stone Lake Dr Westwood Dr Lake Bridge Dr
LS-J	Cobblestone Ln	Cobblestone Ln
LS-K	Woodbridge Dr	Woodbridge Dr Wingspan Dr
LS-M	Stone Bridge Dr	Stone Bridge Dr Heatherwood Ct
LS-AA	Dixie Commons	Outside DRI
LS-BB	Plantation Estates	Outside DRI

The lift stations within the community are the wet well mounted type where the pumps are positioned on top of the wet well and use a suction-lift (vacuum priming) to prime the pumps. In most instances, the pumps are located within an above-grade fiberglass enclosure allowing easy access to the mechanical components to perform maintenance. In the case of three lift stations (Kingsley Cir., Hampstead Ln South, and Aldenham Ln), the pumps are located in a recessed below-grade structure located directly above the wet well. This configuration limits the above-grade profile of the station.

Wade Trim did not observe or inspect the below-ground wastewater collection system components, with the exception of select lift stations.

3.4 Wastewater Treatment

The FDEP Domestic Wastewater Facility Permit for the Planation Bay WWTF authorizes the operation of a 475,000 gallon per day annual average daily flow, Category III, Class C extended aeration treatment facility. The plant does not meet Class I reliability and does not provide for continuous total residual chlorine, pH, or turbidity monitoring. The facility is grandfathered from meeting these requirements because the facility was placed into service before these requirements were enacted.

The facility is currently under an Administrative Order (No. AO 111NE, dated August 20, 2010) which provides for an interim permit limits for TSS , interim permit limits for total residual chlorine, and provides for a compliance schedule to construct reliability upgrades by January 1, 2012. There is a draft Consent Order which provides for a continuation of interim limits for TSS and TRC until upgrades to meet Class I reliability standards are completed in April 2015.

The Administrative Order also allows the plant to be operated at a reduced staffing level. The required staffing is as follows:

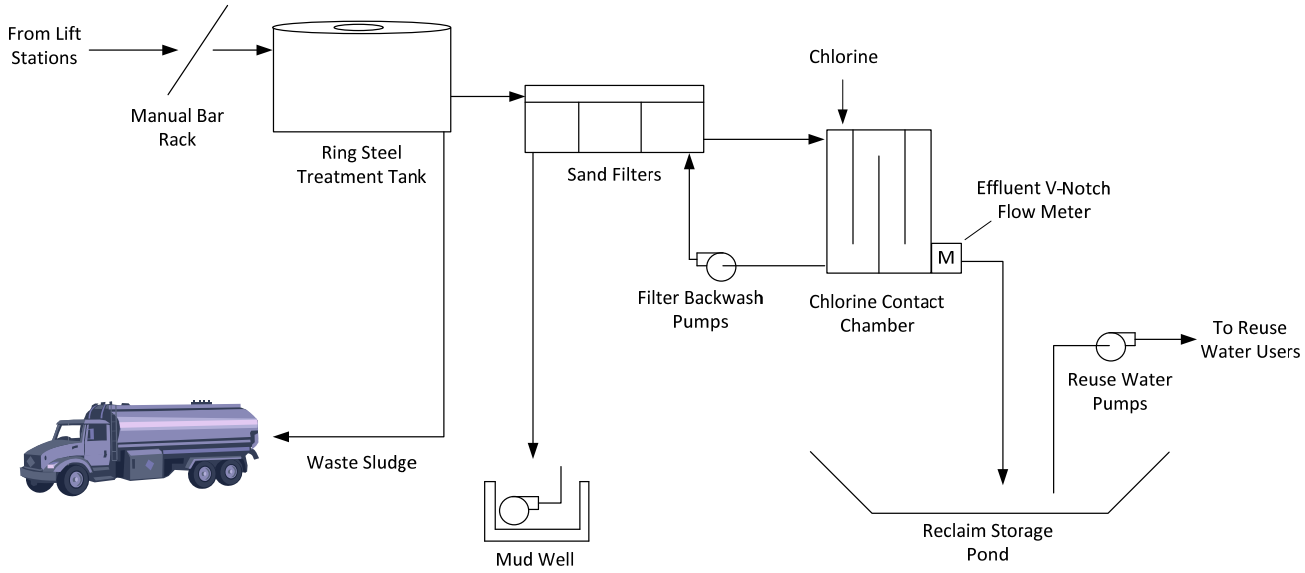
> An operator with a Class C or higher certification must be on the site for 6 hours/day for 5 days/week with one weekend visit. The lead operator must hold a Class C or higher certification.

FDEP has granted this level of reduced operator staffing because the influent flows to the facility are less than 300,000 gallon per day.

Plantation Bay WWTF was granted a permit revision on January 26, 2012 under FDEP File Number FLA 011597-007-DWF which allowed a change in the monitoring location of the reported measured flow through WWTF from the influent to the effluent after disinfection.

The Plantation Bay WWTF is comprised of the following components: ring steel plant, sand filtration, and chlorine contact chamber. A simplified flow diagram of the wastewater treatment plant is shown in **Figure 3-1**.

Figure 3-1: Wastewater Treatment Plant Flow Diagram



Ring Steel Plant and Appurtenances. The 88 foot diameter ring steel plant consists of three aeration zones and an aerobic digester in the outer ring and a clarifier in the inner ring. The total aeration volume is 510,000 gallons. The plant is designed to operate in extended aeration mode. A manual bar screen with overflow is located at the influent end of the tank. The clarifier is approximately 36 feet in diameter and has a volume of 112,500 gallons. There is a scum air-lift pump that pumps the scum collected from the clarifier scum box to the first aeration bay. An air-lift pump is used to return thickened sludge from the clarifier to the first aeration bay. The same air-lift pump is used to convey waste activated sludge to the digester.

The aerobic digester is 56,100 gallons. Supernatant from the digester is conveyed to back to the aeration tank using a supernatant air-lift pump. Liquid sludge is pumped out of the digester into a tanker truck for offsite disposal.

Tertiary Filtration. The secondary effluent from the Ring Steel plant flows by gravity to a steel, package type tertiary filter. The filter consists of three, 80 square foot beds utilizing sand media. The filters are manually backwashed by two 10 horsepower pumps that draw water from the chlorine contact chamber. Spent backwash water is discharged by gravity to a 16,100 gallon mudwell. The flow retained within the mud well is pumped back to the second aeration bay.

Chlorination. Filtered effluent flows by gravity from the filters to a single pass 52,600 gallon Chlorine Contact Chamber. The tank is constructed of three parallel long channels. The gaseous chlorination equipment consists of dual 150 pound gas chlorine cylinders, a gas chlorinator and an automatic switchover devise. The chlorination equipment is housed in a building adjacent to the Water Treatment Plant. Flow through the plant is measured by an over-the-weir type flow meter located at the V-notch weir at the discharge end of the Chlorine Contact Chamber.

Plant Performance. The data reported to the FDEP on the monthly Discharge Monitoring Reports (DMR) for the period January 2010 through December 2012 was reviewed to determine the treatment performance of the Plantation Bay WWTF. The FDEP operating permit requires the plant to collect an 8-hour flow proportional composite sample of the influent wastewater to the plant once every two weeks for CBOD5 and TSS analysis. A summary of these results is shown below in **Table 3-4**.

Table 3-4: Plantation Bay WWTF Historical Influent Pollutant Characteristics

Year	*CBOD5 Annual Ave Conc (mg/L)*	*CBOD5 Max Month Conc (mg/L)*	*TSS Annual Ave Conc (mg/L)*	*TSS Max Month Conc (mg/L)*
2010	212	257	181	285
2011	186	243	203	279
2012	187	224	245	341
Typical[1]	**220**		**220**	

(1) Typical for Medium Strength Untreated Domestic Wastewater. Taken from Table 3-16 Wastewater Engineering Treatment, Disposal, and Reuse, Third Edition.

The influent wastewater to the Plantation Bay WWTF has pollutant characteristics typical of medium strength wastewater which originates from a residential development.

The monthly Discharge Monitoring Reports also contains pollutant data on the treated effluent discharged to the reuse pond by the treatment plant. The FDEP operating permit requires the plant to collect an 8-hour flow proportional composite sample of the effluent wastewater from the plant once every two weeks for CBOD5 analysis and a daily grab sample five days per week for TSS analysis. A summary of these results is shown below in **Table 3-5**.

Table 3-5: WWTF Historical Treated Effluent Pollutant Characteristics

Year	CBOD5 Annual Average Conc (mg/L)	CBOD5 Maximum Monthly Ave Conc (mg/L)	CBOD5 Maximum Single Sample Conc (mg/L)	TSS Maximum Weekly Average Conc (mg/L)	TSS Maximum Single Sample Conc (mg/L)
2010	3.5	4.5	5.0	3.5	3.7
2011	3.5	4.2	5.5	1.8	1.8
2012	3.1	4.4	4.9	< 3.8	< 3.8
Permit Limit	**20**	**30**	**60**	**5.0**	**NA**

A comparison of the reported effluent pollutant concentrations as compared to the permitted discharge limit shows the WWTF is producing high quality effluent that is well below the permitted limit.

3.5 Effluent Disposal

The permit authorizes the discharge of treated effluent from the Plantation Bay WWTF to a 475,000 gallon per day AADF slow-rate public access reuse land application system (R-001). The system consists of a 1.7 million gallon holding pond and the 75 acres of Plantation Bay Golf Course. The holding pond has a dual purpose of providing effluent holding for the golf course irrigation and disposal of effluent via percolation. Approximately 85% of the effluent is pumped to the golf course as a source for irrigation water. Effluent is collected in the pond over a three to four day period before being used for one irrigation cycle. The golf course attempts to use reclaimed water for two irrigation cycles per week. The balance of the golf course irrigation needs is met through the use of other surface water taken from the golf course open water lakes.

3.6 Residuals Disposal

The Utility contracts with Rainbow Ranch of Bunnell, FL to provide for the hauling, treatment, and disposal of the liquid wastewater residual from the wastewater treatment process. According to the residuals disposal agreement with Rainbow Ranch dated July 20, 2009, the Utility is charged a fee of $0.12 per gallon for the hauling, treatment, and disposal of approximately 12,000 to 18,000 gallons per week of liquid sludge. The annual expected cost for this effort is approximately $100,000 per year.

3.7 Regulatory Compliance

Operation of the Plantation Bay WWTF is regulated by the FDEP under the Domestic Wastewater Facility Permit No. FLA 011597. The FDEP permit was originally issued on August 8, 2008 with three subsequent revisions on September 4, 2009, January 26, 2010, and May 18, 2010 respectively. While the current permit will expire on August 7, 2013, efforts should commence immediately to renew ther permit. The facility is also subject to requirements contained within Administrative Order No. AO 111 NE.

A review of the FDEP records for the period January 2010 through December 2012 was conducted to determine if this facility has been in compliance with FDEP rules and

regulations. A review of FDEP public access records for the plant show routine compliance evaluation inspections of the facility were conducted last conducted on August 17, 2011 and December 22, 2011. On both occasions, the plant was deemed by the FDEP to be "In Compliance" during the inspections.

A review of the monthly Discharge Monitoring Reports (DMR) as submitted from the Utility to the FDEP did show the plant reporting several violations of the effluent pollutant quality parameters during the period January 2010 through December 2012 as shown in **Table 3-6**.

Table 3-6: Plantation Bay WWTF DMR Reported Effluent Violations

Date	*Parameter*	*Permit Limitation*	*Reported Value*
October 2011	Fecal Coliform	< 25 #/100 mL Single Sample	35 #/100 mL
April 2012	Fecal Coliform	< 25 #/100 mL Single Sample	58 #/100 mL
April 2012	Fecal Coliform	> 75% samples are non-detect	67% samples were non-detect
June 2012	Fecal Coliform	< 25 #/100 mL Single Sample	46 #/100 mL
September 2012	Fecal Coliform	< 25 #/100 mL Single Sample	34 #/100 mL

The operators describe on the DMRs responding to the permit limit exceedance by increasing the chlorine residual as a response to the elevated fecal coliform result.

3.8 Condition Assessment

3.8.1 Lift Stations

An inspection of select lift stations was conducted on January 8, 2013. The condition of the lift station generally correlates to age of the station. Within Plantation Bay, the lift stations were installed as the community was developed so the stations range in age. The stations are generally in fair to good condition. Significant corrosion from exposure to hydrogen sulfide was evident in the wet wells at the Aldenham LN and Hampstead LN South stations. Installation of a coating system to prevent further deterioration is recommended. During our inspection of the Hampstead LN station, we observed one of the pumps was missing. This unit should be replaced to provide the required level of redundancy at this station. Continued maintenance of these lift stations is critical to maintaining a reliable collection system. Utilities maintenance records indicate electrical panels have been replaced at a few lift stations. This replacement will be an on-going occurrence as the stations age. Wade Trim observed that none of the lift stations are equipped with identification signs that provide an emergency contact phone number. It is recommend that such signage to be installed.

3.8.2 Treatment Plant

An inspection of the physical condition of the WWTF was conducted on January 8, 2013.

During the inspection, Wade Trim observed the mechanical screen had not been cleaned for the day and had a significant accumulation of material to cause the screen to be by-passing a significant amount of the influent flow.

Ring Steel Plant

The ring steel plant exhibits evidence of problematic structural concerns and some degree of corrosion due to its age. Some time ago, the Utility performed a leak repair where the exterior wall meets the base slab by placing concrete around the base of the tank. The exterior tank walls show evidence of a deformation at several locations from differential hydrostatic pressure. An interior compartment wall that separates the aeration zone from the digester zone is highly deformed from uneven dewatering of the digester zone. The wall is likely no longer water tight. A small segment of walkway has been damaged as a result of the wall deformation and this section of walkway should be chained-off.

There is a moderate amount of corrosion on most of the metal tank components at or near the water line. The amount of corrosion observed is consistent with the age of the tank. Steps should be taken by the Utility to limit further corrosion to ensure the long-term useful operability of the tank. Additionally, existing corrosion apparent on the structural members of the walkway system should be addressed immediately. Based on observations, the process tank most likely has a significant accumulation of grit/sand at the bottom of the tank that should be removed as part of a rehabilitation project

The secondary biological treatment system appears to be operating well. The aeration diffusers were providing a good rolling mixing pattern. The mixed liquor was well aerated and did not exhibit any unusual offensive odor. There was no significant accumulation of floating scum or foam on the surface of the aeration zone or the clarifier. Pin floc was observed on the surface of the clarifier which typically results from a presence of old sludge. The clarifier weirs need to be cleaned of biological growth to improve the balance of flow. At the time of the site visit, the digester was full and therefore it would not be possible to waste biosolids.

Filters

The filter system appears to be in fair to poor physical condition. The steel tanks show evidence of moderate corrosion that require spot repairs. Complete sand blasting of the steel structure may reveal additional areas requiring spot repairs. The filters are reportedly manually backwashed as the solenoid and valves are no longer functional. The media appears to be in need of replacement as the operator has placed a high level pump in one cell to prevent a high level overflow. It is recommended the ladder to access the tank be replaced with stairs to improve the access to the tank.

Chlorine Contact Tank/Mudwell

The Chlorine Contact Tank/Mudwell concrete structure appears to be in good condition. A slot has been cut in an interior tank wall to allow the filter waste which collects in the mudwell to overflow into the Chlorine Contact Tank. The plant currently does not have on-line pH, turbidity, or chlorine residual monitoring. At the time of the site visit, the treated water within the Chlorine Contact Tank was turbid and exhibited poor clarity for typical reclaimed water.

Percolation/Effluent Storage Pond

The on-site reclaimed water pond was in good condition. The slopes of the bank appear to be adequately stabilized. Control of aquatic weeds is a continuing concern to maintain the operation of the pond.

Blower Building

The Blower Building and the four centrifugal aeration blowers all appear to be in good condition.

4.0 RECOMMENDED WATER CAPITAL IMPROVEMENT PROJECTS

The Capital Improvement Projects (CIP) presented herein includes proposed projects to the Plantation Bay Utility system to:

- Immediately address issues identified in the FDEP consent order and bring the Utility back into compliance;
- Identify capital improvement projects to be performed between years 2013 and 2017 to increase efficiency, optimize performance and upgrade equipment in obvious need of maintenance; and
- Identify Renewal and Replacement (R&R) projects to be performed mostly between years 2018 and 2022 that are recommended for maintenance of the Utility

The projects discussed in the following sections are based on a review of correspondence with permitting agencies, sampling documentation obtained over the past three years, and visual inspection of above ground structures observed during site visits to the Plantation Bay Utility facilities.

4.1 Consent Order Projects

The consent order projects presented in **Table 4-1** are comprised of six projects that address the non-compliance issues identified in the Administrative Orders. It is therefore recommended that the identified consent order projects be given the highest priority and commence immediately to prevent fines and legal action. Due to the effort required by these projects, approximately 12 months to 24 months should be allotted for design and construction. Detailed cost estimation for the consent order projects including engineering and permitting is provided in **Appendix E**.

Table 4-1: Consent Order CIP Projects

CIP No.	Description	Project Type [3]	Estimated Project Cost [1,2]
COP-1	Construction of a new Mechanical Bar Screen Structure	WW	$541,000
COP-2	Construction of Redundant Wastewater Treatment Unit	WW	$1,442,000
COP-3	Rehabilitation of Existing Sand Bed Filters	WW	$321,000
COP-4	Construction of Redundant Chlorine Contact Chamber	WW	$95,000
COP-5	Construction of an Effluent Storage Pond	WW	$866,000
COP-6	Reuse Instrumentation and Control Improvements	WW	$143,000
TOTAL			**$3,408,000**

(1) Pricing based on ENR Construction Cost Index = 9291 (June 2012)
(2) Estimates of probable costs are Class 5 order-of-magnitude estimates as defined by AACE and rounded to the nearest thousand dollars.
(3) Project type abbreviation: Water Related Projects (Water), Wastewater Related Projects (WW)

4.2 Identified CIP Projects

Wade Trim has identified twelve CIP projects in **Table 4-2** relating to the treatment plants as well as the water supply wells. These projects include intricate design, studies, and replacement of critical equipment needed to improve operations and system reliability. It is recommended that the CIP projects identified be performed within the years 2013 and 2017 as these projects are either safety related or provide maintenance to critical equipment in poor condition. Detailed cost estimation for the CIP projects including engineering and permitting is provided in **Appendix F**.

Table 4-2: Identified CIP Projects

CIP No.	*Description*	*Project Type* [3]	*Estimated Project Cost* [1,2]
CIP-1	Installation of New Water Supply Wells	Water	$300,000
CIP-2	Chemical Optimization Study	Water	$44,000
CIP-3	Lime Slaker Replacement	Water	$486,000
CIP-4	Accelator Softener - Mixer Replacement	Water	$49,000
CIP-5	Transfer Tank Contact Time Evaluation	Water	$14,000
CIP-6	Emergency Generator Replacement	Water	$358,000
CIP-7	Transfer Pump Replacement	Water	$97,000
CIP-8	High Service Pump Replacement	Water	$133,000
CIP-9	Backwash Pump Replacement	Water	$76,000
CIP-10	Polymer and Polymer Mixing System Addition	Water	$124,000
CIP-11	Installation of New Recarbonation System	Water	$45,000
CIP-12	Conversion of the Existing Gaseous Chlorine System to Liquid Sodium Hypochlorite	Water	$171,000
CIP-13	Water Supply Well Water Quality Study	Water	$50,000
TOTAL			**1,947,000**

(1) Pricing based on ENR Construction Cost Index = 9291 (June 2012)
(2) Estimates of probable costs are Class 5 order-of-magnitude estimates as defined by AACE and rounded to the nearest thousand dollars.
(3) Project type abbreviation: Water Related Projects (Water), Wastewater Related Projects (WW)

4.3 Identified R&R Projects

Table 4-3 provides a list of ten renewal and replacement (R&R) projects. These projects are routine maintenance and permitting activities that are typically repeated at annual intervals to ensure proper operation of critical components and permits. Detailed cost estimation for the R&R projects including engineering and permitting is provided in **Appendix G**.

Table 4-3: Identified R&R Projects

CIP No.	*Description*	*Project Type* [3]	*Estimated Project Cost* [1,2]
RR-1	Maintenance on Above Ground Storage Tank	Water	$31,000
RR-2	Clean and Re-grade Lime Sludge Storage Pond	Water	$49,000
RR-3	Consumptive Use Permit – Compliance Report	Water	$18,000
RR-4	Consumptive Use Permit Renewal	Water	$130,000
RR-5	Sand Blast and Paint Lime Slaker Silo	Water	$54,000
Water R&R Project Subtotal			**$282,000**
RR-6	Clean and Refurbish Original WWTP	WW	$276,000
RR-7	Replacement of Existing Lift Stations	WW	$1,620,000
RR-8	WWTP Permit Renewal (2013)	WW	$49,000
RR-9	WWTP Permit Renewal (2018)	WW	$49,000
Wastewater R&R Projects Subtotal			**$1,994,000**
R&R Project Combined Total			**$2,276,000**

(1) Pricing based on ENR Construction Cost Index = 9291 (June 2012)
(2) Estimates of probable costs are Class 5 order-of-magnitude estimates as defined by AACE and rounded to the nearest thousand dollars.
(3) Project type abbreviation: Water Related Projects (Water), Wastewater Related Projects (WW)

4.4 Schedule for Recommended Projects

Figure 4-1 provides the recommended schedule for initiating the consent order, capital improvement, and renewal and replacement projects. Prioritization has been given to the consent order projects for the wastewater treatment plant to be back in compliance.

Figure 4-1: Recommended Commencement of Projects

PROJECT NUMBER	TASK	Project Type	Commence Project	Year									
				2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CONSENT ORDER PROJECTS													
COP-1	Construction of a new Mechanical Bar Screen Structure	Wastewater	2013										
COP-2	Construction of Redundant Wastewater Treatment Unit	Wastewater	2013										
COP-3	Rehabilitation of Existing Sand Bed Filters	Wastewater	2013										
COP-4	Construction of Redundant Chlorine Contact Chamber	Wastewater	2013										
COP-5	Construction of an Effluent Storage Pond	Wastewater	2013										
COP-6	Reuse Instrumentation and Control Improvements	Wastewater	2013										
IDENTIFIED CIP PROJECTS													
CIP-1	Installation of New Water Supply Wells	Water	2014										
CIP-2	Chemical Optimization Study	Water	2014										
CIP-3	Lime Slaker Replacement	Water	2014										
CIP-4	Accelator Softener - Mixer Replacement	Water	2013										
CIP-5	Transfer Tank Contact Time Evaluation	Water	2015										
CIP-6	Emergency Generator Replacement	Water	2015										
CIP-7	Transfer Pump Replacement	Water	2015										
CIP-8	High Service Pump Replacement	Water	2016										
CIP-9	Backwash Pump Replacement	Water	2017										
CIP-10	Polymer and Polymer Mixing System Addition	Water	2016										
CIP-11	Installation of New Recarbonation System	Water	2016										
CIP-12	Conversion of the Existing Gaseous Chlorine System to Liquid Sodium Hypochlorite	Water	2013										
CIP-13	Water Supply Well Water Quality Study	Water	2013										
IDENTIFIED R&R PROJECTS													
RR-1	Maintenance on Above Ground Storage Tank	Water	Every 3 Years										
RR-2	Clean and Re-grade Lime Sludge Storage Pond	Water	Every 2 Years										
RR-3	Consumptive Use Permit – Compliance Report	Water	2015										
RR-4	Consumptive Use Permit Renewal	Water	2016										
RR-5	Sand Blast and Paint Lime Slaker Silo	Water	2018										
RR-6	Clean and Refurbish Original WWTP	Wastewater	2015										
RR-7	Replacement of Existing Lift Stations	Wastewater	2015 - 2022										
RR-8	WWTP Permit Renewal (2013)	Wastewater	2013										
RR-9	WWTP Permit Renewal (2018)	Wastewater	2018										

5.0 CONCLUSIONS

In the development of this report, Wade Trim has reviewed available data and reports including, but not limited to:

- All associated FDEP permits, SJRWMD permits, and associated records.
- Public Service Commission (PSC) Reports

In addition, Wade Trim has conducted a physical inspection of the water supply wells, water treatment plant, wastewater treatment plant, and sanitary sewer lift stations in the Plantation Bay Utility system located in Flagler County.

Based on the information reviewed, analyses performed, and assumptions made, the following principle conclusions were drawn with respect to the Plantation Bay Utility system:

- Two repetitive administrative orders have been issued against the wastewater plant for not providing the continuous monitoring. In addition redundant treatment processes and a redundant effluent disposal site is required by the orders to remain in compliance. As of the writing of this report, there appears to have been no action on the part of existing owner to address the orders and time schedule provided by the FDEP in the Administrative Orders. Wade Trim is aware of a draft FDEP consent order identifying penalties and legal action. It is recommended that the consent projects identified in this report commence immediately to bring the wastewater facility into compliance.

- The water and wastewater facilities have been in service approximately 28 years with many major components nearing their useful life. Visual inspection of various treatment structures identified serious corrosion and lack of maintenance. It is recommended that critical equipment identified in this report be replaced or refurbished in a timely manner as shown on the project schedule.

- Half of the installed well fields are unusable due to high color in Wells 3 and 4. The combined water volume supplied by Wells 1 and 2 are not capable of meeting the existing treatment capacity of the water treatment plant. It is recommended that a study of the water supply wells be conducted to either improve the water quality produced from Wells 3 and 4 and install additional wells. As new developments are platted and the Plantation Bay population increases, this effort will help the Utility to stay ahead of future water demands.

- Currently one operator is responsible for the maintenance and oversight of the water treatment plant, wastewater treatment plant, and sanitary sewer lift stations. As plant demands reach 300,000 gallons per day, staffing needs will

increase in accordance with permitting rules. The Utility owner needs to be aware and plan for the required increased staffing.

Recommended improvements related to needed capital improvement projects were presented in Section 4. The improvements include items to resolve non-compliance issues at the wastewater facility and to improve the condition of the various unit processes throughout the Utility for efficient and effective operation.