TOWN OF JUPITER

WATER & STORMWATER MASTER PLAN

2017 UPDATE

2017 Water and Stormwater Utility Master Plan Update
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Acknowledgement

This document was prepared by multiple authors consisting of Town staff and its highly talented team of professional consultants. Content was provided in a manner to capitalize on each author's expertise. This long range planning strategy utilizing a complete team approach has and will continue to work well for the Town going forward.

The following is a listing of the contributing authors:

- Hazen and Sawyer
- Kimley-Horn & Associates, Inc.
- JLA Geosciences, Inc.
- Howard C. Osterman
- Public Resources Management Group, Inc.
- RosTek Associates, Inc.
- Duranceau Consulting Services, Inc.
- Federico, Lamb and Associates, Inc.

Whenever possible, the contributing author(s) are called out within the individual text pages on the page header.

Executive Summary

The prudent exercise of routinely updating the utility business plans once again is providing heightened confidence in the system's ability to address future challenges while ensuring the community's safety maintaining the reliability of the highly critical infrastructure operated by both the Water and Stormwater Utilities.

Since the last update to the plans in 2012, the Water Utility has continued to progress into a slow growth, maturity phase in its 38th year under the Town's ownership. Growth in connections has been slightly higher than anticipated in recent years yet there exists a limited ability for additional service expansions looking forward. Capital planning is now primarily a rather complex study of the potential capabilities of existing assets to safely meet all demands of our customers and all future regulatory mandates. The water system has a long standing history of being safe, reliable and environmentally friendly; is known to utilize the most technologically advanced treatment to produce a high quality drinking water while also doing so at a very low rate for service.

Looking ahead, the more prevalent issues that the water system must address relate to raw water supply. Adequacy and quality of our utility's raw water supply is highly critical. With the exception of seawater, which has a much higher cost to treat, raw water sources are very limited and highly regulated. Should the utility not properly plan for sustainability of its source waters, future prosperity in the region would be jeopardized. Two primary source water concerns are addressed thoroughly within this plan update:

- Degradation of Floridan Aquifer raw water quality which supplies the Town's Reverse Osmosis Treatment System
- Potential impacts of sea level rise and salt water intrusion on the local Surficial Aquifer raw water which supplies the Town's Nanofiltration Treatment System

Neither of these problems were just recently discovered. Since the Floridan Aquifer wellfield was initially constructed beginning in 1990, the utility has been monitoring water quality trends and adjusting production to minimize withdrawal impacts to the aquifer. Within this plan update, recommendations provide for an operational strategy known as "spreading out the footprint" of aquifer withdrawals while also evaluating cost effective ways to adjust our reverse osmosis treatment system to address the changing raw water quality. Meanwhile, climate change and resulting sea level rise add to the risk South Florida communities face relative to salt water intrusion with coastal fresh water aquifers. This plan sets forth an adaptation

strategy to help minimize this risk through relocation and consolidation of aquifer withdrawals away from tidal waters.

Financially, the water utility remains in a good position and the overall recommendation is to simply "stay the course" relative to long-standing financial policies related to rate maintenance (annual indexing) and replenishment of renewal and replacement reserves to ensure future rate stability.

As you review the document as it relates to the plans for the Stormwater Utility, it is important to note the vast accomplishments the relativey small enterprise has achieved during its first two decades. With some of the lowest rates for service in the region, the Stormwater Utility has actively leveraged grant opportunities and completed numerous projects which have minimized the risk of flooding while also worked to enhance stormwater runoff water quality. Having always been environmentally focused, the utility system has been a major player in the continuance of the Loxahatchee River Preservation Initiative while endeavoring to lead by example when proactively executing plans to protect the Loxahatchee River.

Total Maximum Daily Load (TMDL) water quality limitations are the most recent regulatory process intended to enhance the quality of Florida's surface waters. The Town's Stormwater Utility, due to its track record and water quality gains to-date, is well positioned but more work will undoubtedly be needed. To address, the Utility is working with other stakeholders in the river basin to develop a Reasonable Assurance Plan (RAP) for submission to the Florida Department of Environmental Protection. It is hoped that the RAP will allow for the entire Jupiter/Tequesta community to collectively establish a suite of future projects which effectively achieve compliance with water quality goals for the river within a realistic time frame for completion.

Pending water quality regulations and sea level rise are also prevailing themes of the recommendations offered by the 2017 Update to the Stormwater Master Plan. Although not immediate, climate change impacts are becoming more noticeable. "Sunny day flooding" is often witnessed in many of the Town's low lying coastal areas during high tides. With sea level rise anticipated to be as much as 14" to 26" by 2060, the Utility recommends that incremental steps be taken to minimize future impacts. To this end, the plan offers proactive planned, phased infrastructure improvements and code changes to increase resiliency. If actions are not taken at this time, the likelihood is that the Town will experience economic damages due to flooding damage, reductions in property value and increased capital cost for improvements due to the lack of pre-planning.

The Stormwater Utility Fund is considered a smaller financial entity and as such its long term fiscal planning is significantly impacted by relatively small changes in fiscal policy and capital

requirements. During prior business plan updates, it was noted that the advancement of capital spending on behalf of the Inlet Village Redevelopment and other Town projects would burden future cash flows. Similarly, it was forecasted that the transference of responsibility to the Stormwater Utility of Neighborhood Equity Program infrastructure without appropriate renewal and replacement contributions would also lead to financial stress. Both of these issues coupled with the need to fund and construct significant capital projects to address water quality regulations and sea level rise will now lead the Stormwater Fund to take on further debt to meet its needs. This will necessitate a phased rate increase above routine indexing. To minimize cost to our customers, it is recommended that the debt be financed by the Water Enterprise Fund so that the financing cost can be minimized and the terms made flexible to best suit the fund's future cash flow availability.

All in all, both the Water and Stormwater Utilities remain well positioned for the future. Both systems remain proactive, provide a high level of service and are efficient with rates for service predicted to remain well below that charged by other utilities in the region.

PART 1

WATER UTILITY

Chapter 1: Existing Condition

I. Jupiter Water System History

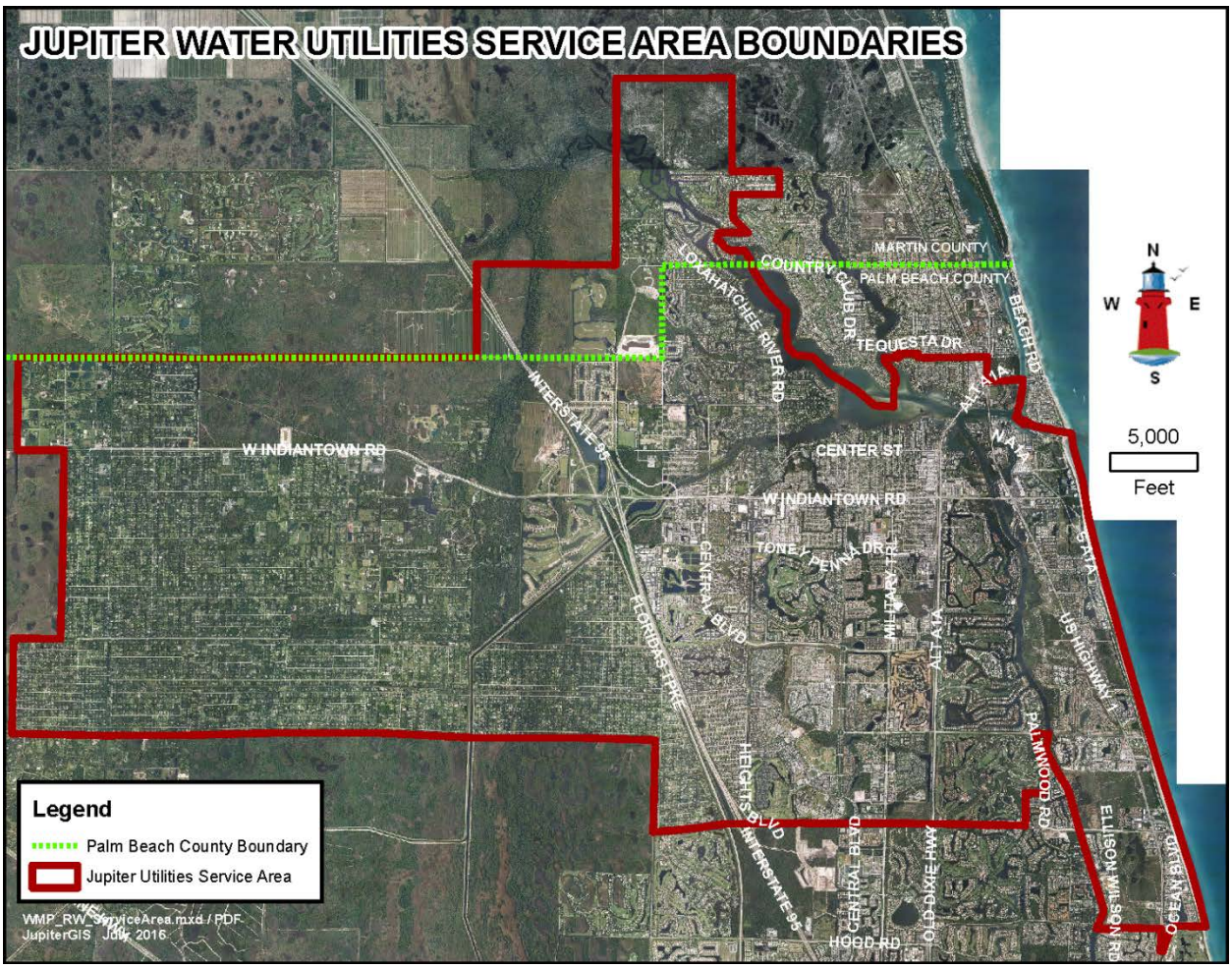
The Jupiter Water System has existed since approximately 1963, and it has expanded from a small investor owned utility to the present regional utility of today. The following is a brief chronological summary of major milestones and capital expansions during the utility's history:

Approximate Date	Jupiter Water System Milestone	System Treatment Capacity (MGD)
1963	Water system founded as investor owned facility	---
1968	Plant facilities relocated to current Central Boulevard location	---
1973	1.0 MGD Lime Softening Treatment System constructed	1.0
1976	4.0 MGD Lime Softening Treatment added	5.0
1978	Town purchases water system	5.0
1982	8.0 MGD Lime Softening Treatment added	13.0
1985	Original 1.0 MGD Lime Softening unit demolished	12.0
1985	Lime Softening Treatment capacity re-rated to 13.5 MGD	13.5
1990	6.0 MGD Reverse Osmosis (R.O.) Treatment facility constructed	19.5
1996	R.O. Treatment facility expanded to 12 MGD	25.5
1999	Ion Exchange (1.8 MGD) facility constructed	27.3
2006	R.O. Treatment facility expanded to 13.7 MGD	29.0
2010	14.5 MGD Nanofiltration Treatment Plant constructed	30.0
2011	13.5 MGD Lime Softening Treatment System demolished	30.0

II. Service Area, Customer Base and Production Demands

Figure 1.1 shows the existing Town limits as well as the boundaries of Water Utilities Service Area. The service area covers the entire Town limits as well as areas within Juno Beach, and unincorporated Palm Beach and Martin Counties. This service area spans 58 square miles while the utility currently serves a population of approximately 86,000.

Figure 1.1



As of June 30, 2016 the utility served 47,143 equivalent residential connections (ERCs) and there were 2,305 more ERCs reserved through existing water service agreements, not yet in service.

Table 1.1

Existing Water Reserved[1]

	Number of ERCs	Capacity Utilized (MGD-ADF)	Capacity Utilized (MGD-PDF)
Existing ERCs	47,143	16.5	23.10
Reserved ERCs	2,305	0.81	1.13
Subtotal	**49,448**	**17.31**	**24.23**
Allowance for Non-Revenue Water: 13%		2.25	3.14
Total		**19.56**	**27.38**

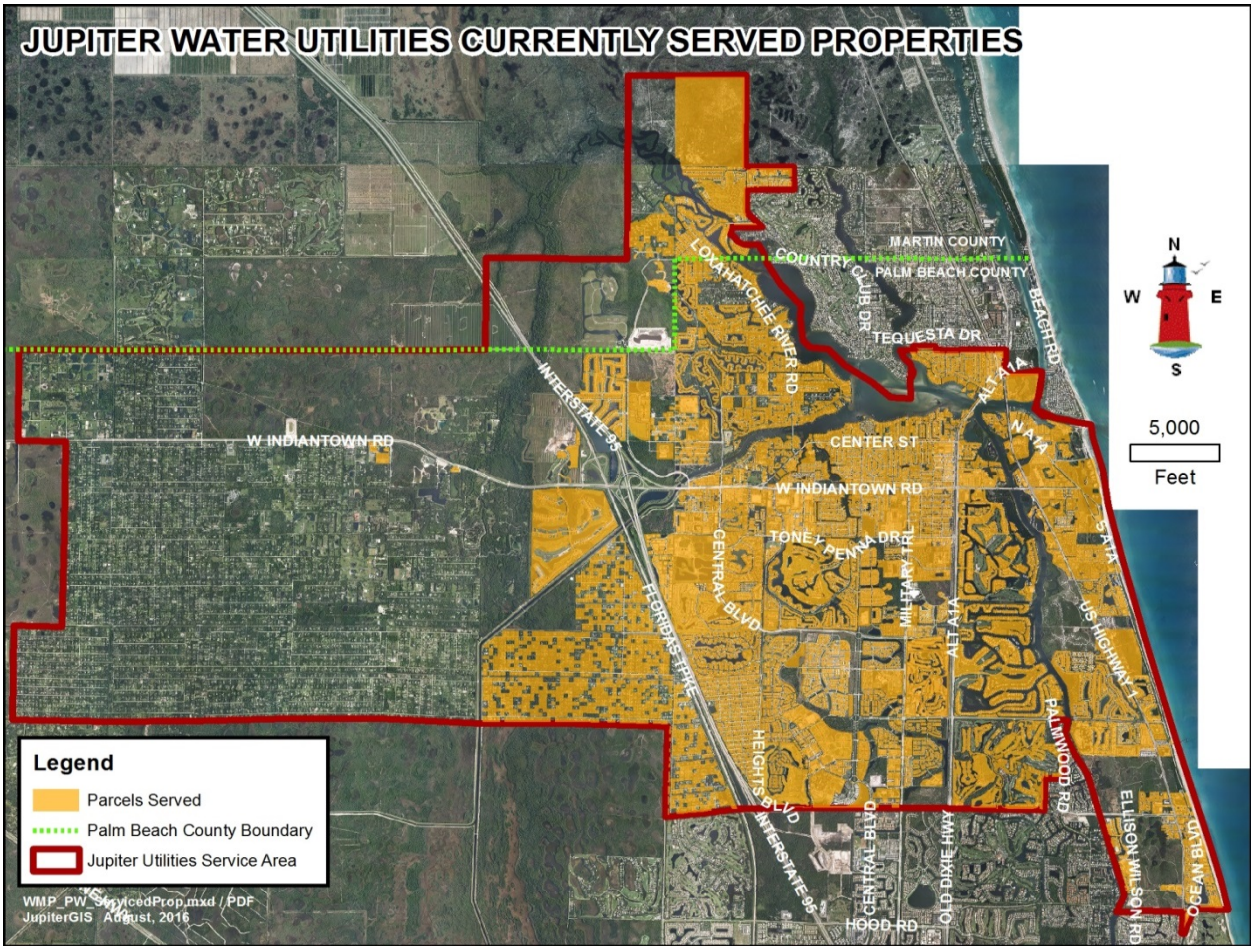
[1]Based on Jupiter Utilities June 2016 Capacity Reservation Report

ADF= Average Daily Flow, PDF- Peak Daily Flow

Assumed 1.40 Peaking Factor

Figure 1.2 illustrates spatially all currently served properties within the Town's Water Service Area.

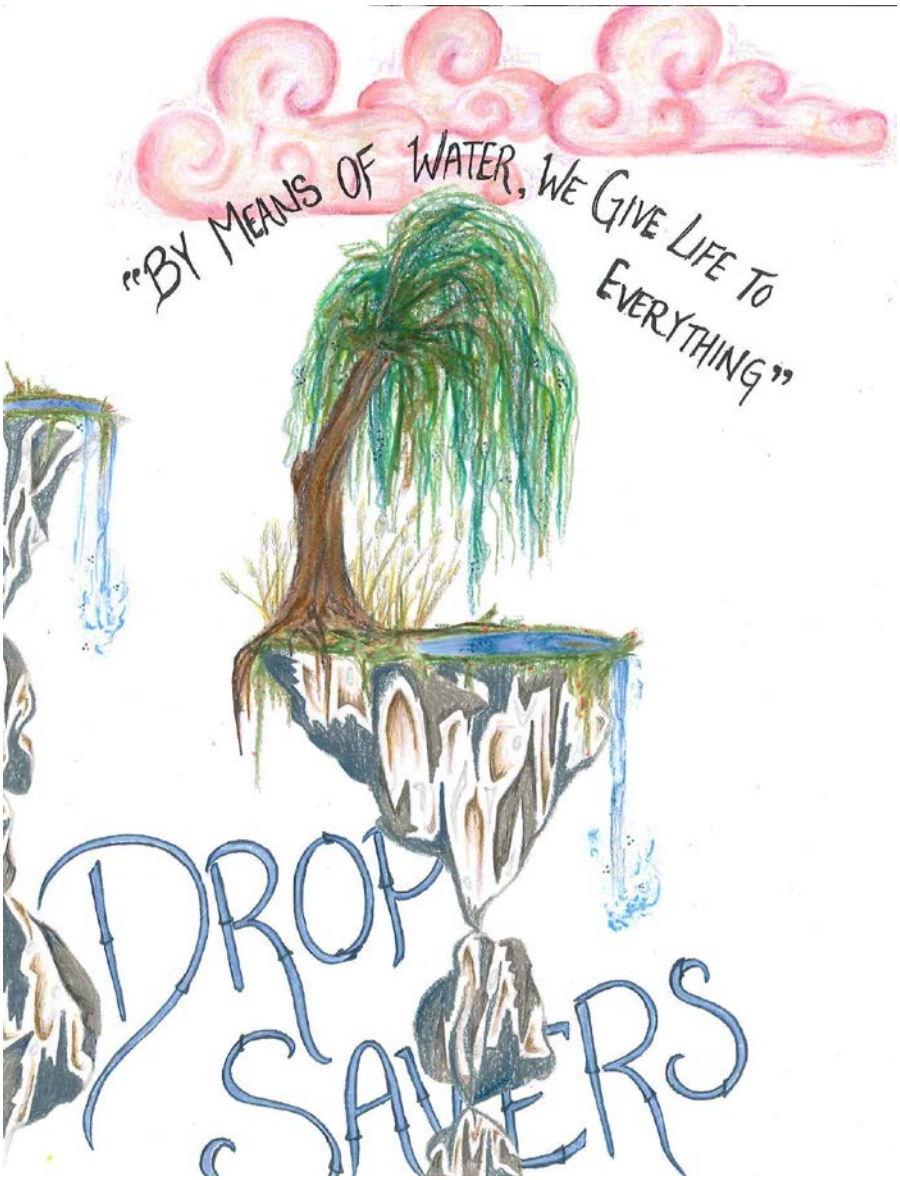
Figure 1.2


JUPITER WATER UTILITIES CURRENTLY SERVED PROPERTIES
MARTIN COUNTY
PALM BEACH COUNTY
COUNTRY CLUB DR
TEQUESTA DR
LOXAHATCHEE RIVER RD
BEACH RD
ALT A1A
N A1A
INTERSTATE 95
W INDIANTOWN RD
CENTER ST
TONE / PENNA DR
CENTRAL BLVD
FLORIDA'S TPKE
MILITARY TRL
US HIGHWAY 1
PALMWOOD RD
HEIGHTS BLVD
ELLISON WILSON RD
OCEAN BLVD
OLD DIXIE HWY
HOOD RD
N
W
E
S
5,000
Feet
Legend
Parcels Served
Palm Beach County Boundary
Jupiter Utilities Service Area
WMP_PW_ServicedProp.mxd / PDF
JupiterGIS August, 2016

III. Conservation Strategies

The Town of Jupiter has always prided itself in being a very environmentally conscious community and this has been exhibited in the manner in which it has taken a leadership role in the restoration of the Loxahatchee River and in the resource-friendly strategies it has implemented during water supply development. Adding to this, the Town has always embraced water conservation. On an annual basis, the utility works with local schools and Jupiter area students to promote resource protection and conservation through a water conservation poster contest. This program has been tremendously successful. **Figure 1.3** below provides an example of the high quality artwork submitted.

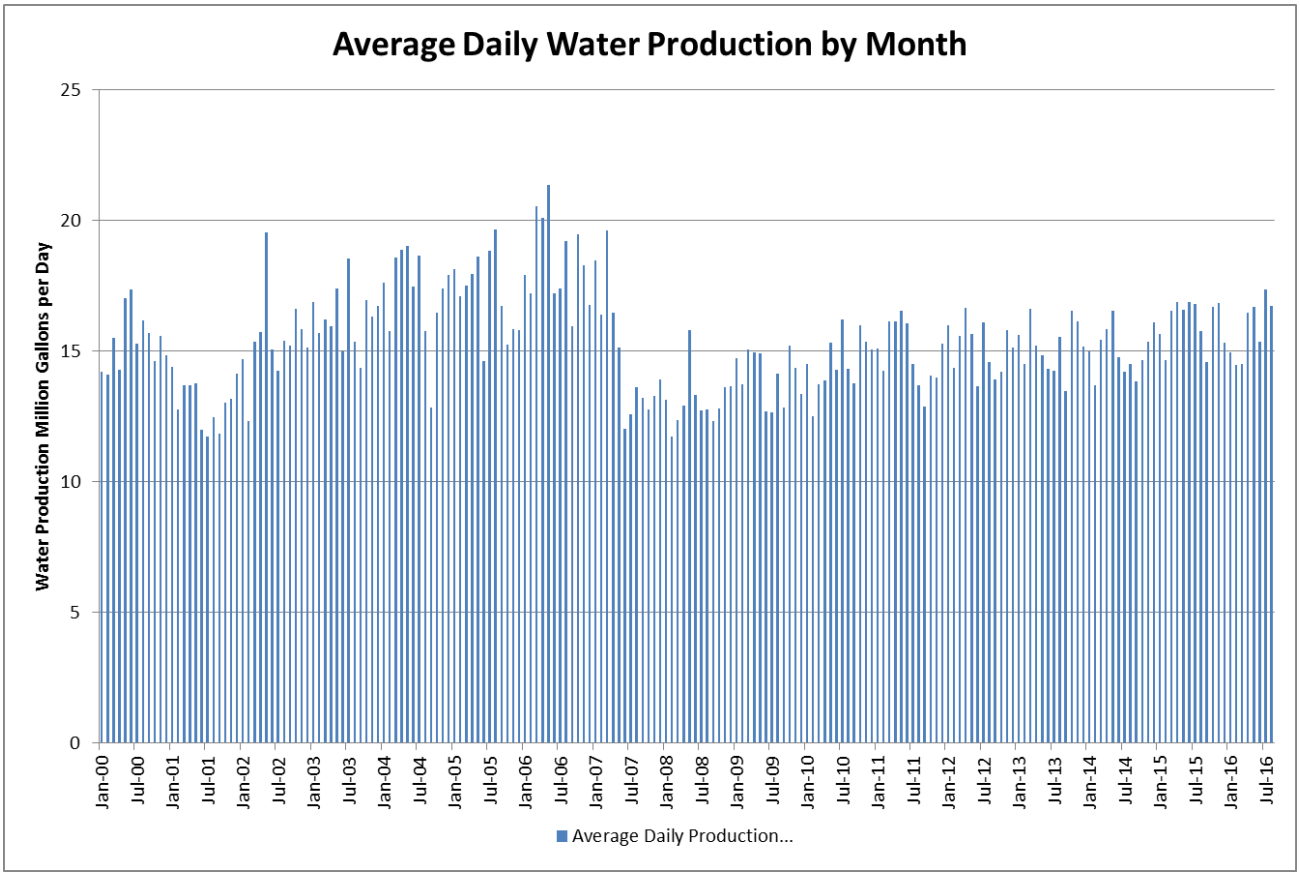
Figure 1.3



Furthermore, the Town utilizes a conservation-based water rate structure which requires a higher unit cost payment for higher consumption levels.

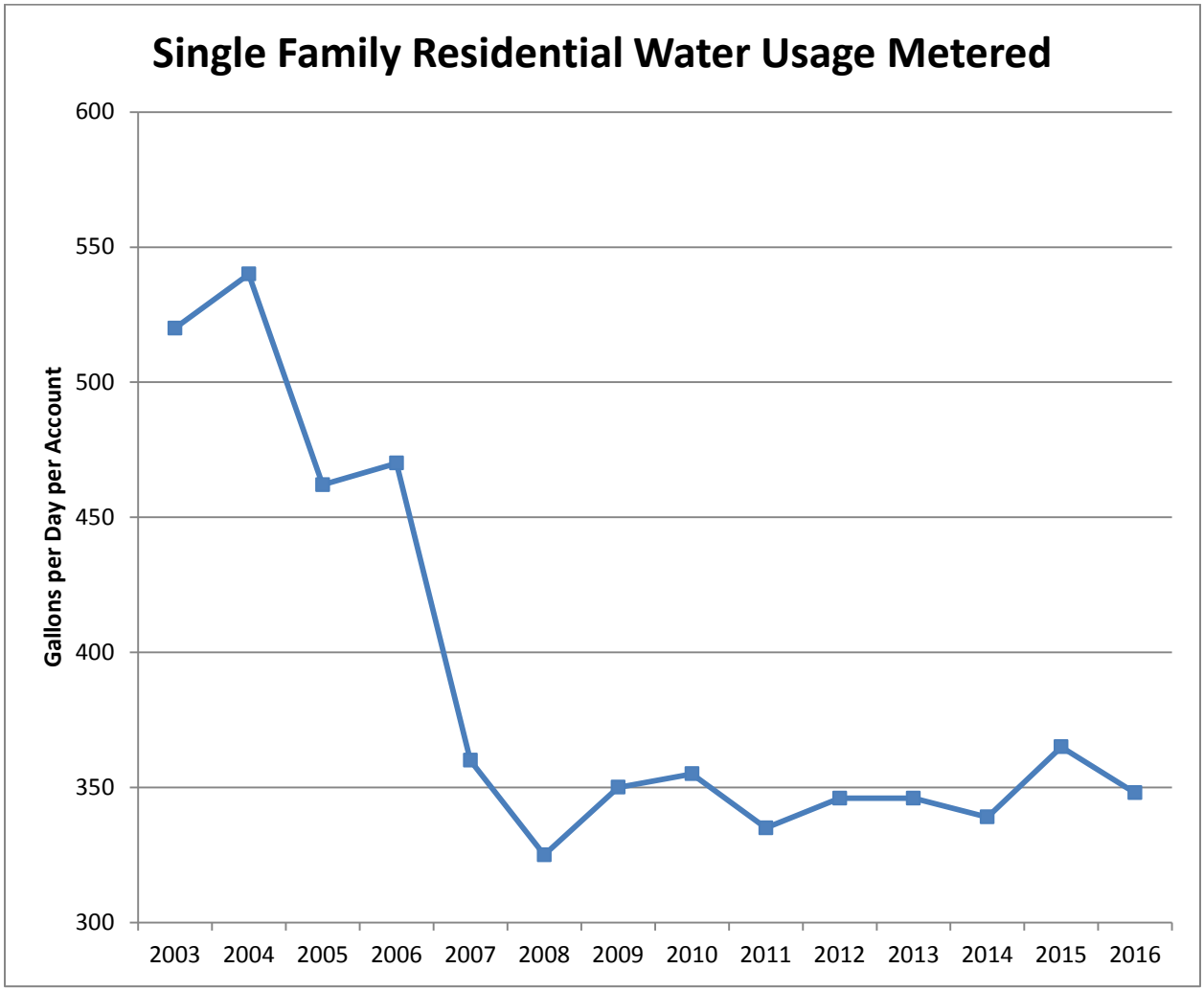
Figure 1.4 below illustrates the significantly reduced water production in direct response to the South Florida Water Management District's (SFWMD) implementation of the Year Round Water Conservation Rule in the spring of 2007.

Figure 1.4



More specifically, **Figure 1.5** below reflects the notable downturn in usage within the utility's single family residential customer class also over the past decade.

Figure 1.5

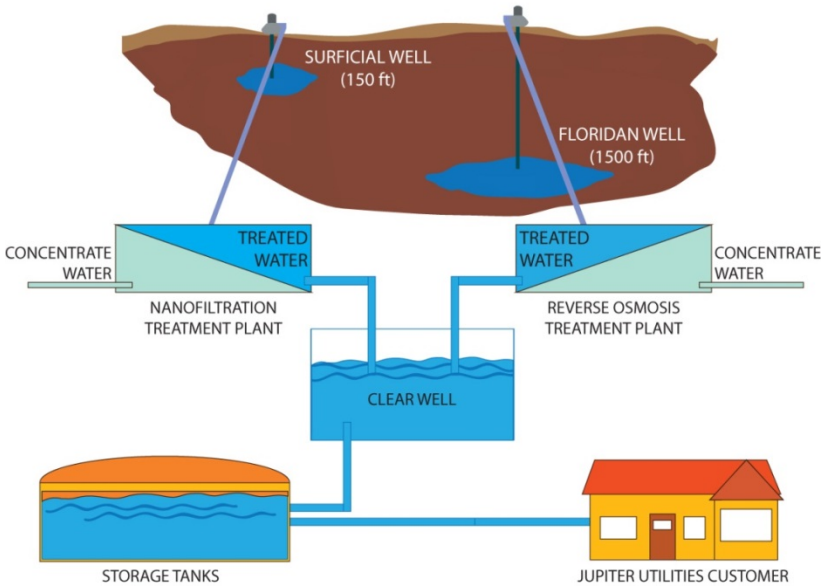


IV. Water Supply

The Town utilizes two separate water supply sources to meet the needs of its water treatment facilities. Reference is made to **Figure 1.6** below. Fresh water from the surficial aquifer is used to supply the Nanofiltration and Ion Exchange Treatment plants, while brackish water from the Floridan Aquifer is used to supply the Reverse Osmosis (RO) Plant. Both water sources are permitted by the South Florida Water Management District. While each source has a permitted maximum withdrawal rate (annual and max month), the total allowable withdrawal rate is less than the sum of the two sources to provide maximum operational flexibility. The Town's general approach to operating the utility is to depend more heavily on the brackish water source (and the RO Plant) during dry periods. This operating approach aids in reducing the impacts on the surficial aquifer and local wetlands, which may be strained during dry times. During wet periods, the Town relies more heavily on the surficial aquifer (Nanofiltration) due to its lower operating costs as compared to RO. The Town's water use permit (WUP) was renewed in 2010 and modified in 2012, and does not expire until September 30, 2030. Allocations authorized by the WUP reflect population projections and raw water demand estimates based on information available prior to the August 2010 permit issuance. More recent projections and demand estimates for 2030 indicate that the WUP allocation should be more than adequate to meet water supply needs. This is based on a recent finished water demand of 19.56 million gallons per day (MGD). The current WUP reflects a 2030 finished average daily water demand of 20.19 MGD.

Figure 1.6

JUPITER'S DUAL AQUIFER SUPPLY SOURCES

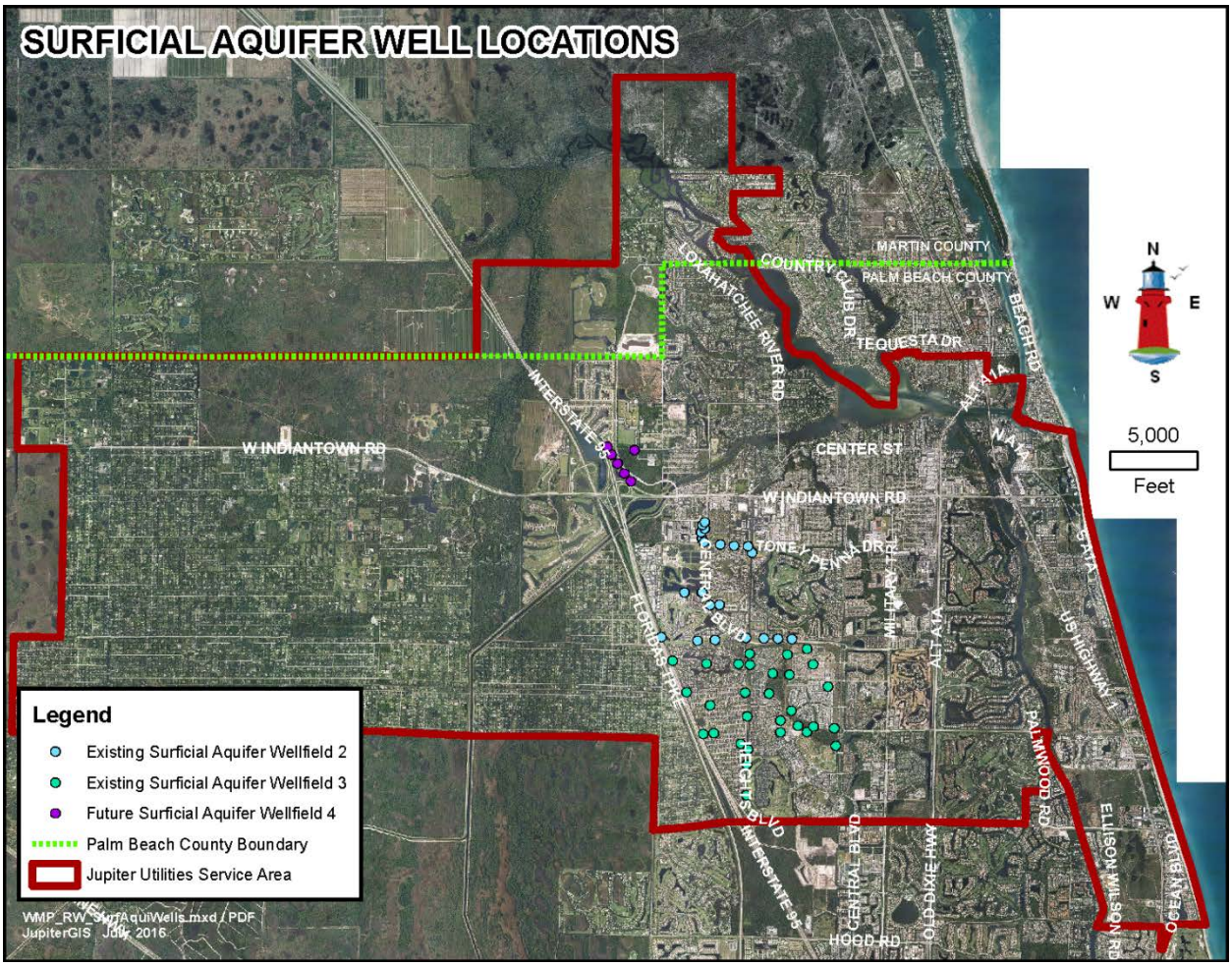


a. Surficial Aquifer Source

Surficial Aquifer Well System Status

The Town of Jupiter's surficial aquifer wellfield includes 53 production wells that have a combined raw water producing capacity of approximately 19,680 gallons per minute (gpm) or 28.3 million gallons per day (MGD). The wells are located throughout the largely residential western areas of the Town; located as far north as Rialto on Island Way and as far south as the Abacoa Golf Course on Heights Blvd. A map showing locations of all the Town's surficial aquifer wells is provided as **Figure 1.7**.

Figure 1.7



As of 2016, ages of the Towns' wells vary from 2 to 42 years. Older wells are found closer to the water treatment plant. The oldest were reportedly installed in 1974. The newest wells, drilled in 2014, are located north of Indiantown Road along the Island Way corridor. These two wells (Wells 60 and 62) are not currently in service as they are awaiting raw watermain and final wellhead construction. The Town's surficial aquifer production wells typically produce between 125 and 800 gpm (0.2 and 1.2 MGD) each with the older wells producing at the lower end of the range and the newer wells producing more.

Semi Annual Wellfield Evaluation

In addition to basic monthly monitoring performed by Town water plant operators, each well undergoes comprehensive performance testing twice per year (during the wet and dry seasons) to evaluate production efficiency and produced water quality. The testing is needed to monitor the water supply for the nanofiltration water treatment plant and to identify problem wells that could produce water problematic for plant operation or even potentially harmful to the membranes. Data from semiannual testing are used to evaluate when well rehabilitation is needed and the type of rehabilitation that may be required to restore lost capacity and/or produced water quality.

A summary of February 2016 Surficial Aquifer Wellfield testing results is provided below within **Table 1. 2**.

Table 1.2

Town of Jupiter Well Age	Number of Wells	Percent of Total Wells	Total GPM	Percent of Total WF Capacity	Avg. Individual Well Capacity (gpm)	Avg. Well Spec. Capacity (gpm/ft)	Avg. Sand Prod. (ppm)	Avg. Silt Density Index (SDI)
0-10 yrs	8	15.1%	4200.0	21.3%	525	55.9	0.4	1.9
11-20 yrs	16	30.2%	7080.0	36.0%	443	35.8	0.2	1.4
21-30 yrs	16	30.2%	4445.0	22.6%	278	23.5	0.0	1.4
31-42 yrs	13	24.5%	3955.0	20.1%	304	23.4	0.0	1.6
Totals	53		19,680 gpm					
			28.3 mgd					

* Max. desired sand production: 1.0 ppm

* Max. desired SDI (nanofiltration): 3.0

New Wells (less than 10 years old)

Of the 53 production wells within the Town's wellfields, the 8 newest wells (constructed within the last 10 years) represent 15% of the Town's surficial aquifer wells. Additionally, the newest wells have the highest average pumping capacity (average of 525 gpm per well). The newest wells also have roughly 2 times the specific capacity (gallons per minute / foot of drawdown while pumping) of 43% of the wellfield. Eventhough sand and silt production from the newer wells is slightly higher than the older wells, the produced water volume is significantly greater and still acceptable for nanofiltration treatment. Wells that have been constructed within the last 10 years have all been constructed of 20-inch diameter PVC casing and open hole completion. The PVC casing is essentially inert and unlike steel, does not corrode. Completion intervals are within the competent rock formation of the aquifer and cavities remain open and water production is consistent. Life expectancy of the PVC constructed wells is projected to be more than 35 years.

Intermediate Age Wells (11-20 years old)

These wells include a group of 16 wells installed in 1997 and 2001. The average specific capacity of this group is 35.8 gpm/ft, that is approximately 60% of the specific capacity of the wells installed after 2001. Wells included in this group have required relatively little rehabilitation. Wells in this group represent 36% of the total wellfield capacity. At this time these wells require minimal rehabilitation to provide reliable service.

Well 45 Installed in 2001

Older Wells (21-40 years old)

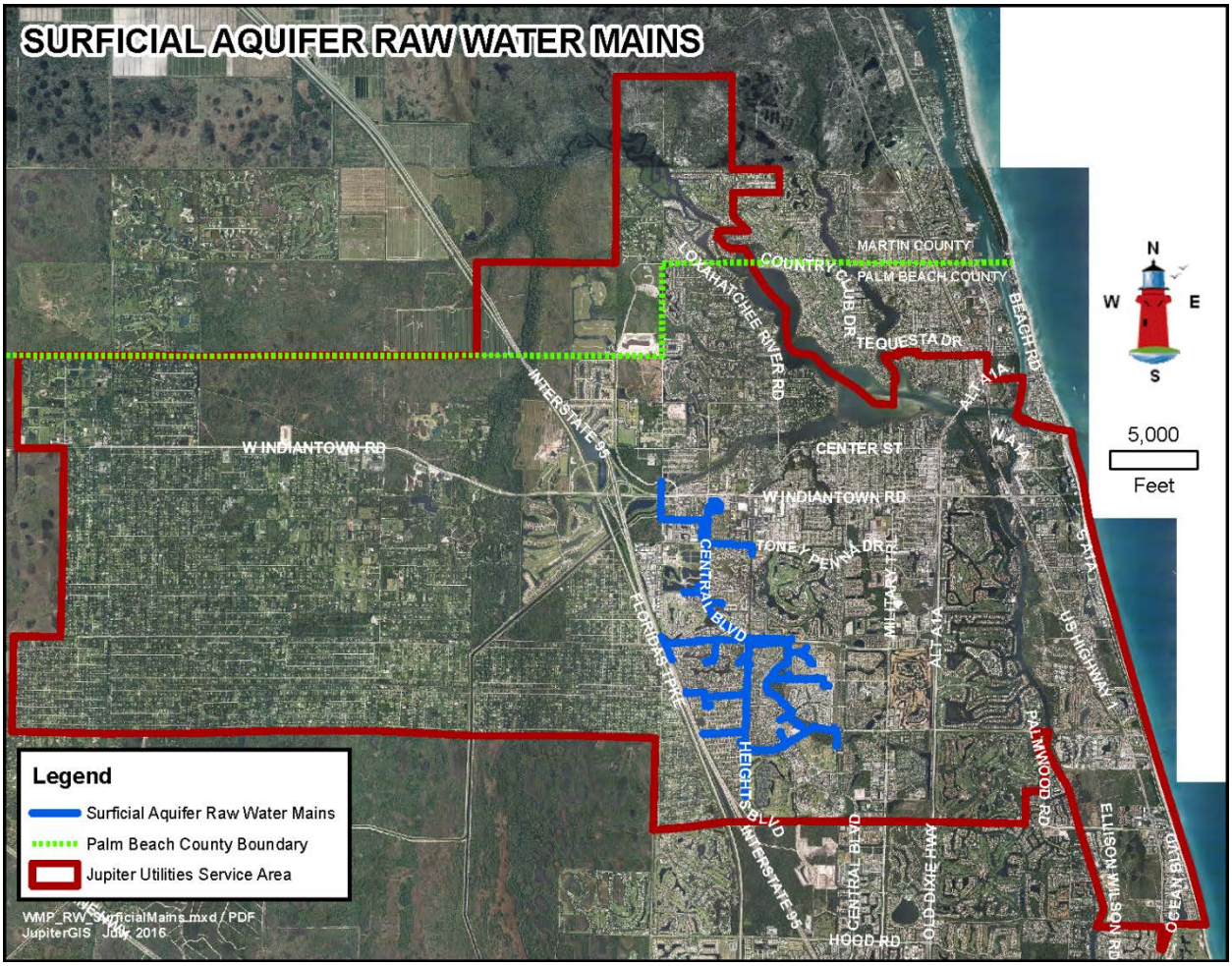
Well 30 Installed in 1989

The Town's older wells are typically lower producing and require more rehabilitation to maintain production rates. The Town's production wells that are older than 20 years are typically 12 inches in diameter, constructed of corrosion prone steel casings. Additionally, some are screened and gravel packed to prevent sand production. Screened wells are typically prone to plugging and require mechanical and chemical rehabilitation to restore lost capacity. The smaller diameter of these wells also limits options for corrective measures. Well failure is typically due to failure of the casing and/or the cement seal causing sand and silt production. Leaking casings may also contribute to undesirable chemical and biological characteristics of the produced water. Steel well casings are dissolved by corrosion over time depending on the corrosiveness of the water and oxygen introduced by the well pumping system. A steel cased well can have a life expectancy of 35 years; however, a number of the Town's wells in the 21 to 30 year age range have already been replaced due to casing and or casing cementing failures.

Wellheads

The visible part of the well includes the surface casing, wellhead piping, electrical conduits, control panels, telemetry communications tower, and security fencing. Wellheads that have been constructed for the Town within the last 25 years, include durable stainless steel piping, stainless steel control panel enclosures and modern well pump control equipment. These materials come at a somewhat higher initial cost but contribute to greater reliability of the well. These materials are typically specified for wells that feed membrane (nanofiltration) plants. As older wells are replaced, the wellheads should also be replaced with equipment consistent with the current Town of Jupiter standard wellhead design. Hidden from view under ground and connecting all the wells to the treatment plant is a network of raw water piping. Routing of the Surficial Aquifer Raw Water Mains is depicted within **Figure 1.8**.

Figure 1.8

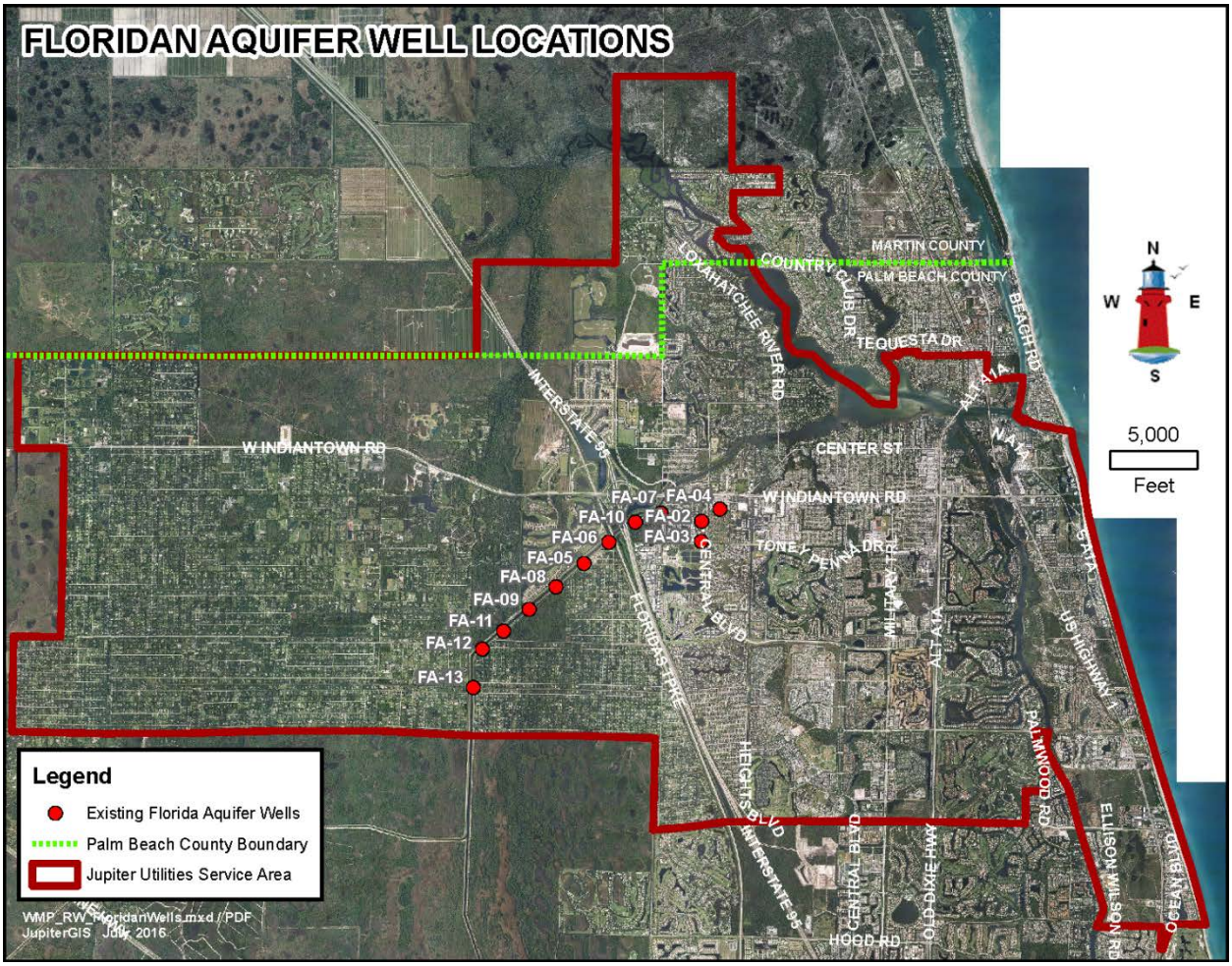


b. Floridan Aquifer Source

The Town of Jupiter's Upper Floridan Aquifer wellfield includes 11 in service production wells (RO-2, RO-3, RO-5, RO-6, RO-7, RO-8, RO-9, RO-10, RO-11, RO-12 and RO-13) that have a combined raw water pumping capacity of approximately 16,300 gallons per minute (gpm) or 23.5 million gallons per day (MGD). Individually these wells produce between 500 and 1,440 gpm. The wells are completed within the Upper Floridan Aquifer at depths between 1,017 feet and 1,825 feet (only one well, RO-6 was drilled this deep, the rest are less than 1,660 feet deep). The wells are located at the Central Blvd Ground Storage Tank and High Service Pumping Facility (RO-2 and RO-3); along the South Indian River Water Control District outfall canal (RO-7 and RO-10), and within the South Florida Water Management District (SFWMD) C-18 Canal Right of Way (RO-5, RO-6, RO-8, RO-9, RO-11, RO-12 and RO-13).

A map showing locations of the Town's Upper Floridan Aquifer production wells is provided as **Figure 1.9**.

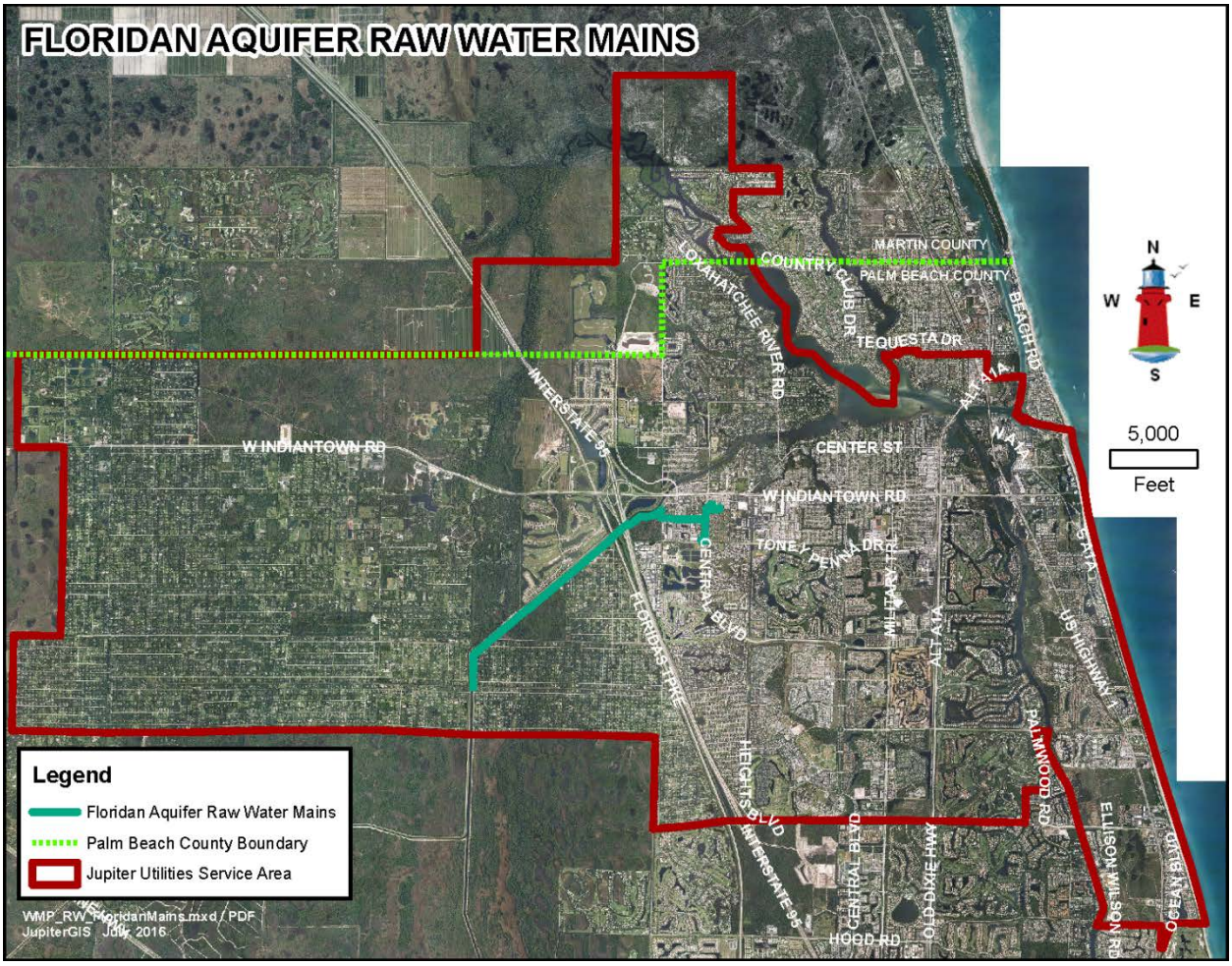
Figure 1.9



As of 2016, ages of the Upper Floridan Aquifer wells are between 12 and 28 years. The wells are constructed with either fiberglass reinforced polyester (FRP) casing or poly vinyl chloride (PVC) casing. The nature of the brackish water produced by the wells dictates use of this type of casing because the water is corrosive. From a physical/structural stand point, these wells typically last 35-50 years.

Similar to the Surficial Aquifer Wellfield, the Floridan Aquifer Wells also have a network of piping connecting them to the water treatment facility on Central Boulevard. Routing of the Floridan Aquifer Raw Water Piping is depicted within **Figure 1.10**.

Figure 1.10



Floridan Well Rehabilitation

Well RO-4, located at the water treatment plant site, was originally constructed in 1990; however, the well was prone to sand and silt production and has remained unused. In 2016 the well was redeveloped and reevaluated for use by the reverse osmosis plant as a water supply source. The evaluation included the following: mobilization, performance of a preliminary well video and geophysical logging, killing of the well, plumbness and alignment testing, wellhead modifications, installation of a temporary wellhead, well pump and discharge system, well development at approximately 2,000 gallons per minute (GPM), a three (3) step drawdown test, final well video, chlorination, and site restoration.

Results of the rehabilitation indicate that well RO-4 is now suitable for use as an in-service Floridan Aquifer production well at a recommended maximum pumping rate of 1,000 gpm without significant sand and silt production. The well may be pumped up to 1,400 gpm; however, it was determined that at 1,400 gpm (2 MGD) the well produces sand and silt that will have to be managed.

Since construction, most of the Floridan wells have lost specific capacity due to scaling and calcium incrustation of the boreholes. This is a common occurrence in wells that are completed in a limestone aquifer because the groundwater is saturated with calcium and magnesium hardness. The Town has implemented a well rehabilitation program that includes descaling the open hole completion intervals with a temporary addition of mineral acid to the well. The acid dissolves the scale and restores capacity of the well.

Wellfield Water Quality and Pumpage Evaluation

The reverse osmosis plant is capable of producing 13.7 million gallons per day (MGD) of finished water. Considering a 75% recovery rate, 18.27 MGD of raw water is required to meet plant capacity. The current SFWMD WUP permitted maximum allows for a daily withdrawal allocation from the Floridian Aquifer of 18.44 MGD (max month basis).

The anticipated Town of Jupiter Water System finished water need at build out is estimated to be 28.33 MGD on a maximum day; and 20.20 MGD on an average day. The South Florida Water Management District (SFWMD) has estimated slightly higher demands in its 2013 Lower East Coast Water Supply Plan (LECWSP) Update including 22.39 MGD on average and 31.33 MGD maximum (based on an 80% system-wide efficiency). To achieve the desired finished product quality of water, a blend of treated water is produced by nanofiltration (NF) treatment (supplied by surficial aquifer wells) and reverse osmosis treatment (supplied by the

Floridan Aquifer wells) that includes an approximate blend ratio of 55% NF product water and 45% RO product water (conservative but simplified for this discussion).

The Town measures flow and water quality obtained from each Floridan Aquifer well on a monthly basis. These data were reviewed and evaluated for this report. Individual well and total wellfield pumpage data are summarized in **Table 1.3** below.

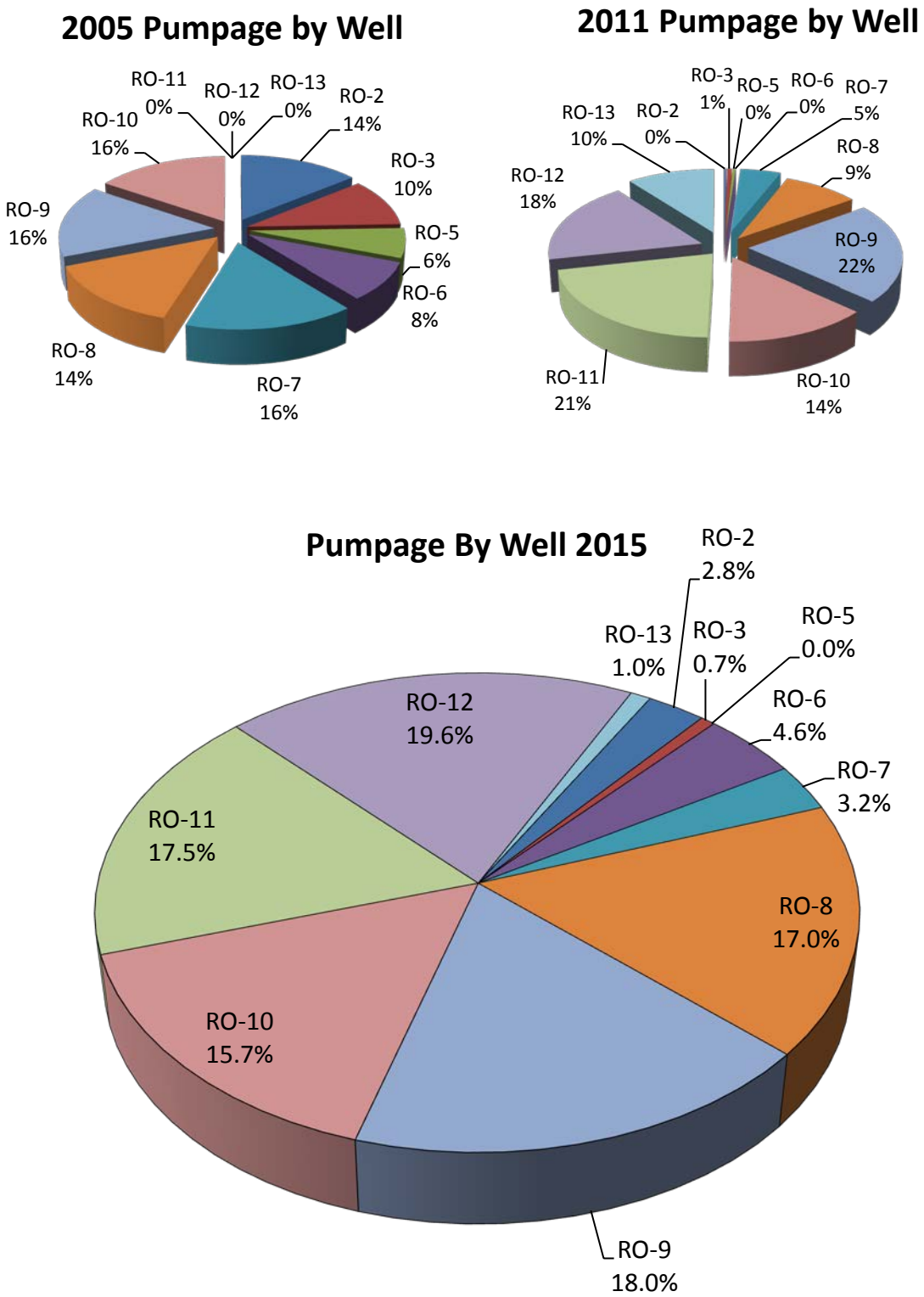
Table 1.3
Floridan Aquifer Well Usage

FA Well Pumpage by Year (in millions of gallons)	RO-2	RO-3	RO-5	RO-6	RO-7	RO-8	RO-9	RO-10	RO-11	RO-12	RO-13	Total	FA Wellfield Average (MGD)
2015	85.4	21.2	0.0	139.6	98.4	521.5	551.3	480.2	537.4	599.0	29.7	3063.9	8.4
2014	50.3	17.8	0.0	58.1	52.4	579.5	521.2	327.0	586.5	545.6	233.0	2971.4	8.1
2013	31.1	31.2	5.9	6.2	367.1	257.5	560.0	560.6	690.0	378.3	601.6	3489.4	9.6
2012	12.5	10.6	14.9	59.4	283.0	577.8	62.6	628.9	706.5	581.1	681.9	3619.1	10.0
2011	10.2	18.3	12.0	0.0	164.1	307.3	740.0	464.3	721.3	614.8	354.2	3406.6	9.3
2010	166.1	57.3	85.9	0.0	362.4	282.3	500.3	388.5	509.3	356.1	376.1	3084.3	8.5
2009	12.2	189.0	70.5	0.0	512.8	379.6	232.6	309.4	187.6	230.7	391.2	2515.6	6.9
2008	131.7	12.4	0.0	0.0	312.3	327.5	118.3	363.4	216.3	215.4	426.7	2123.9	5.8
2007	268.7	95.8	0.1	8.7	624.4	288.9	172.9	410.0	400.6	188.5	412.9	2871.7	7.9
2006	468.6	480.3	56.6	30.6	379.1	363.7	521.4	480.0	146.3	0.0	210.6	3137.1	8.6
2005	369.6	269.3	166.7	216.8	411.3	367.8	405.9	405.9	0.0	0.0	0.0	2613.3	7.2
2004	528.3	167.1	123.2	108.2	515.5	566.2	475.1	387.6	0.0	0.0	0.0	2871.2	7.9

The pumpage data summarized in **Table 1.3** shows how Upper Floridan Aquifer well usage has changed over time as new wells have come on line. Wells RO-11, RO-12 and RO-13 came on line in late 2006-2007 and pumpage was shifted away from the older wells. This is shown as RED values on **Table 1.3**. The available new wells and lower chloride/conductance water allowed the RO plant to operate at lower feed pressure because the new wells produce water with lower chloride (and total dissolved solids) concentrations and has lower specific conductance. In order that no individual well is over stressed, all wells should be utilized equally. Typically, as a Floridan Aquifer well is pumped, the produced water typically increases very slightly in total dissolved solids (TDS) over time. TDS often increases more drastically when a well is pumped at a high rate for an extended amount of time.

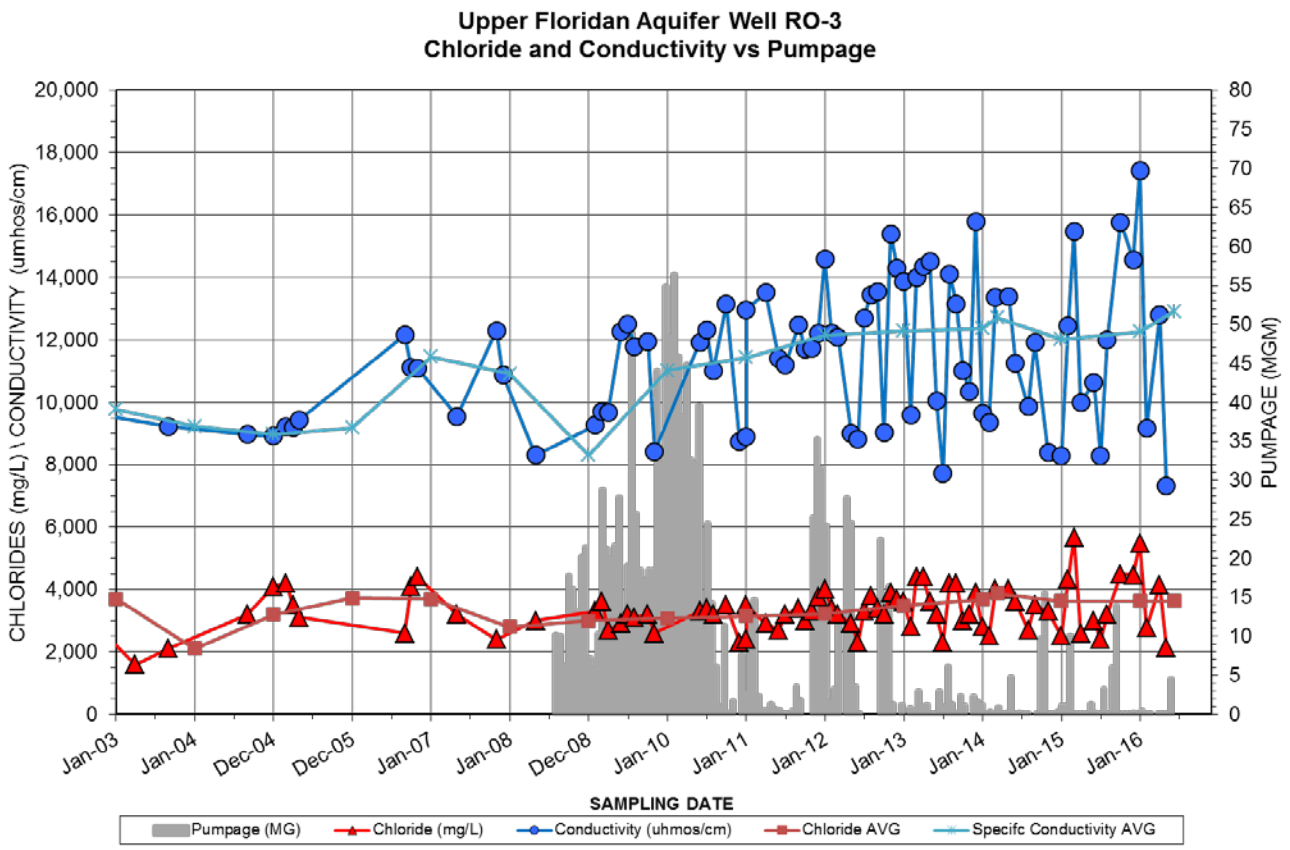
Annual wellfield pumpage (shown on the right side of **Table 1.3** in BLUE) indicate that the wellfield in the last 11 years produced between 5.8 MGD to 10.0 MGD. Since 2010, the average pumpage has been 9.0 MGD with the primary production coming from wells RO-8 through RO-13 (as seen in PURPLE). For each well's respective contribution to total raw water production, please refer to **Figure 1.11**.

Figure 1.11


2005 Pumpage by Well
RO-11 0%
RO-12 0%
RO-13 0%
RO-2 14%
RO-3 10%
RO-5 6%
RO-6 8%
RO-7 16%
RO-8 14%
RO-9 16%
RO-10 16%
2011 Pumpage by Well
RO-3 1%
RO-5 0%
RO-6 0%
RO-7 5%
RO-8 9%
RO-9 22%
RO-10 14%
RO-11 21%
RO-12 18%
RO-13 10%
RO-2 0%
Pumpage By Well 2015
RO-2 2.8%
RO-5 0.0%
RO-6 4.6%
RO-7 3.2%
RO-8 17.0%
RO-9 18.0%
RO-10 15.7%
RO-11 17.5%
RO-12 19.6%
RO-13 1.0%
RO-3 0.7%

In 2004 following rapid increases in chloride and specific conductance in water produced from wells RO-2 and RO-3, the Town implemented, when possible, more equal pumpage from each of the wells. **Figure 1.12** below illustrates the chloride and conductivity increases in RO-3 over time.

Figure 1.12



In 2004, as much as 46% of the water supplying the reverse osmosis plant was being produced from RO-2 and 58% from RO-2 and RO-3. These two wells were producing water with an average chloride of approximately 3,000 mg/L. With the installation of wells RO-11, RO-12 and RO-13, pumpage from RO-2 and RO-3 had been reduced sufficiently to slow the degradation in produced water quality. The slowing of chloride increase in RO-3 is likely the result of reduced stress on the well from a more even distribution of well pumpage and the increased number of wells available for use with the installation of RO-11, RO-12 and RO-13.

The overall increases in pumpage since 2010 to keep up with demand have continued the decline in produced Floridan Aquifer water quality. However, the rate of decline has slowed most likely due to efforts to evenly distribute pumpage among the wells. The chloride and conductivity trends are illustrated on **Figures 1.13** & **1.14** which follow.

Figure 1.13

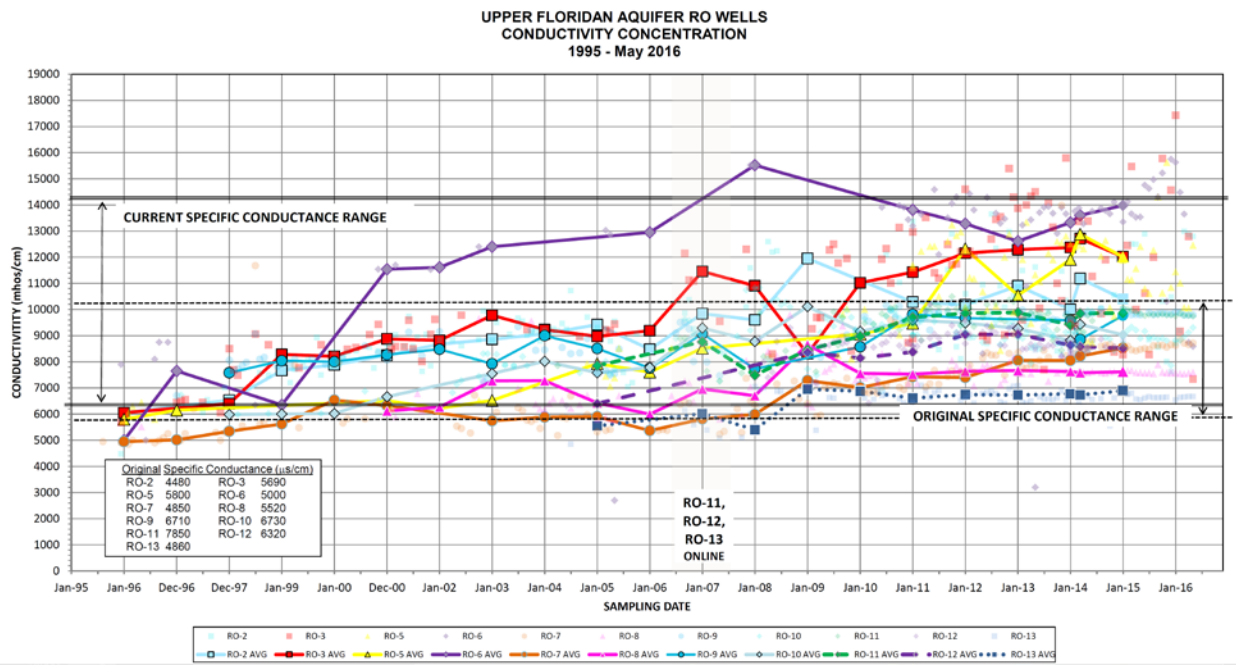
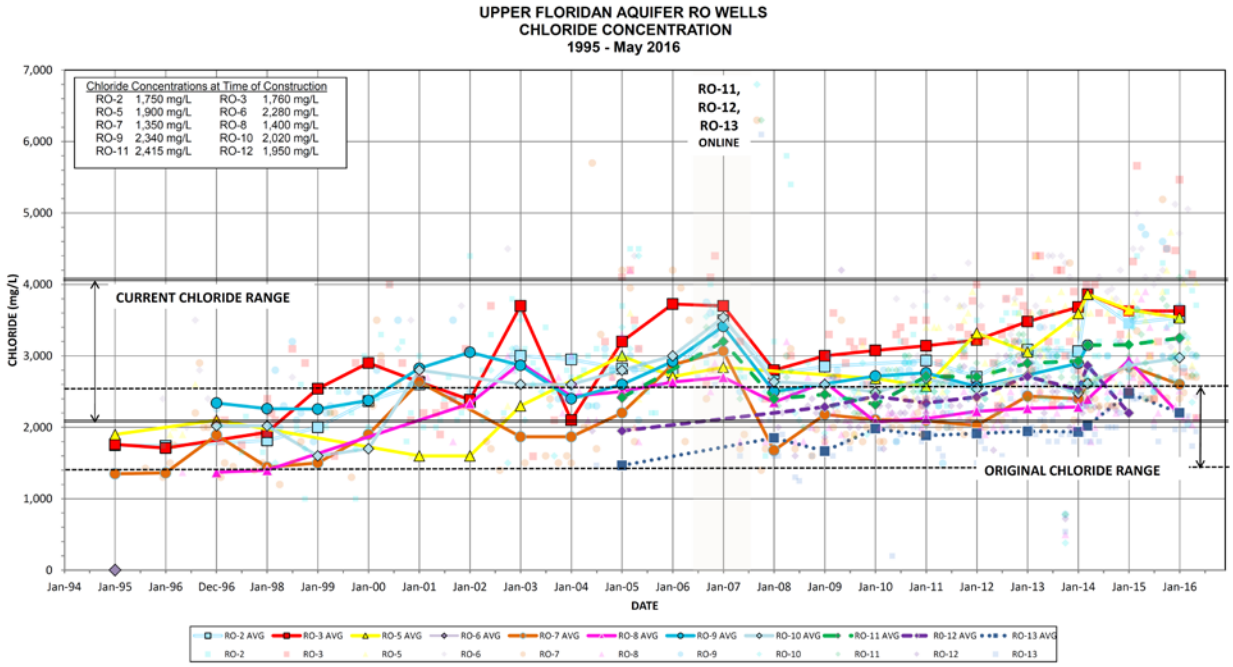


Figure 1.14



From the Floridan well data above, the following conclusions are provided:

- Chloride and conductivity (dissolved solids) increases in the Floridan Aquifer production wells are inevitable with use. The amount of use and the pumping rates may influence the rate of increase of dissolved solids. Higher stress on any one well will increase the rate of dissolved solids increase in the raw water produced by that well.
- Even though attempts have been made to utilize all wells, they are still not being used equally. There has been a greater emphasis on using wells with lower chloride and specific conductance because of water quality limitations of portions of the RO plant. The selective pumpage from wells with better water quality will result in increased degradation of water quality over time. The current wellfield pumpage rates tax the better production wells and are not sustainable. Most of the raw water for the RO plant is being produced by wells RO-8 through RO-13.
- The increases in dissolved solids continue to increase; however, at a slower rate in the last 5 years than previous years.

c. Permitted Aquifer Withdrawals

Raw water allocations authorized by SFWMD Water Use Permit (WUP) No. 50-00010-W, issued August 23, 2010, and subsequently amended via letter modification (Letter Mod) in August 2012, are summarized below in **Table 1.4**.

Table 1.4
Existing Permitted Water Use (MGD)

	Total	Surficial Aquifer System	Floridan Aquifer System
Through September 23, 2030			
Max Month (daily)*	**29.84**	**19.90**	**17.90**
Annual Average (daily)*	**24.41**	**18.80**	**11.71**

**Based on 31 days/month*

It should be noted that the Total column values in **Table 1.4** correspond to WUP limits from the combined sources. Accordingly, these limits equate to 8,909 million gallons per year (MGY), equivalent to 24.41 MGD on average, and 925 million gallons per month (MGM) maximum, equivalent to 29.84 MGD. These total combined limits are less than the sum of specific source limitations from the Surficial Aquifer System (SAS) and Floridan Aquifer System (FAS) identified

in the other two columns in the Table. The higher combined specific aquifer source limitations provide for flexibility needed to adjust production from each resource to economize operations when rainfall conditions allow, and to protect the environment in times of drought by heightened use of the brackish FAS. The August 2012 Letter Mod enhanced operational flexibility by authorizing a 25% increase in annual source limitation from the FAS.

The existing WUP expires in August 2030. Allocations authorized by the WUP reflect population projections and raw water demand estimates based on information available prior to the August 2010 permit issuance. More recent Town projections and demand estimates for 2030 indicate less water should be needed than currently allocated. Based on an estimated 17.91 MGD finished water average, raw water demand would be 22.39 MGD assuming an 80% system-wide efficiency. The max month raw water demand would equate to 27.54 MGD (31 days per month), which assumes a max month to average month peaking factor of 1.23, consistent with that applied for the current WUP.

The Town's current raw water withdrawal facilities' capacities for withdrawals from the SAS and FAS are approximately 26 MGD and 23 MGD respectively. Maximizing redundancy through constructing wellfield capacity beyond permitted allocations is essential to ensure future sustainability of the Utility. Wellfield withdrawals should be extracted spatially and rotated among wells to prolong the useful life of wells and to minimize potential harm to the water resource. Furthermore, history has shown that many existing well facilities will have a limited life expectancy and will ultimately need to be abandoned leaving little, if any, ability for constructing replacement capacity.

d. Excess Surface Water for Aquifer Recharge

Beginning in 1990, the Town has incrementally constructed a system of control structures, flow-ways and salinity barriers intended to increase surface water storage and surficial aquifer recharge utilizing freshwater that would otherwise be wasted to tide.

SFWMD S-46 Control Structure on the C-18 Canal in Jupiter Discharging Surplus Stormwater Runoff to Tidal Reaches of the Loxahatchee River

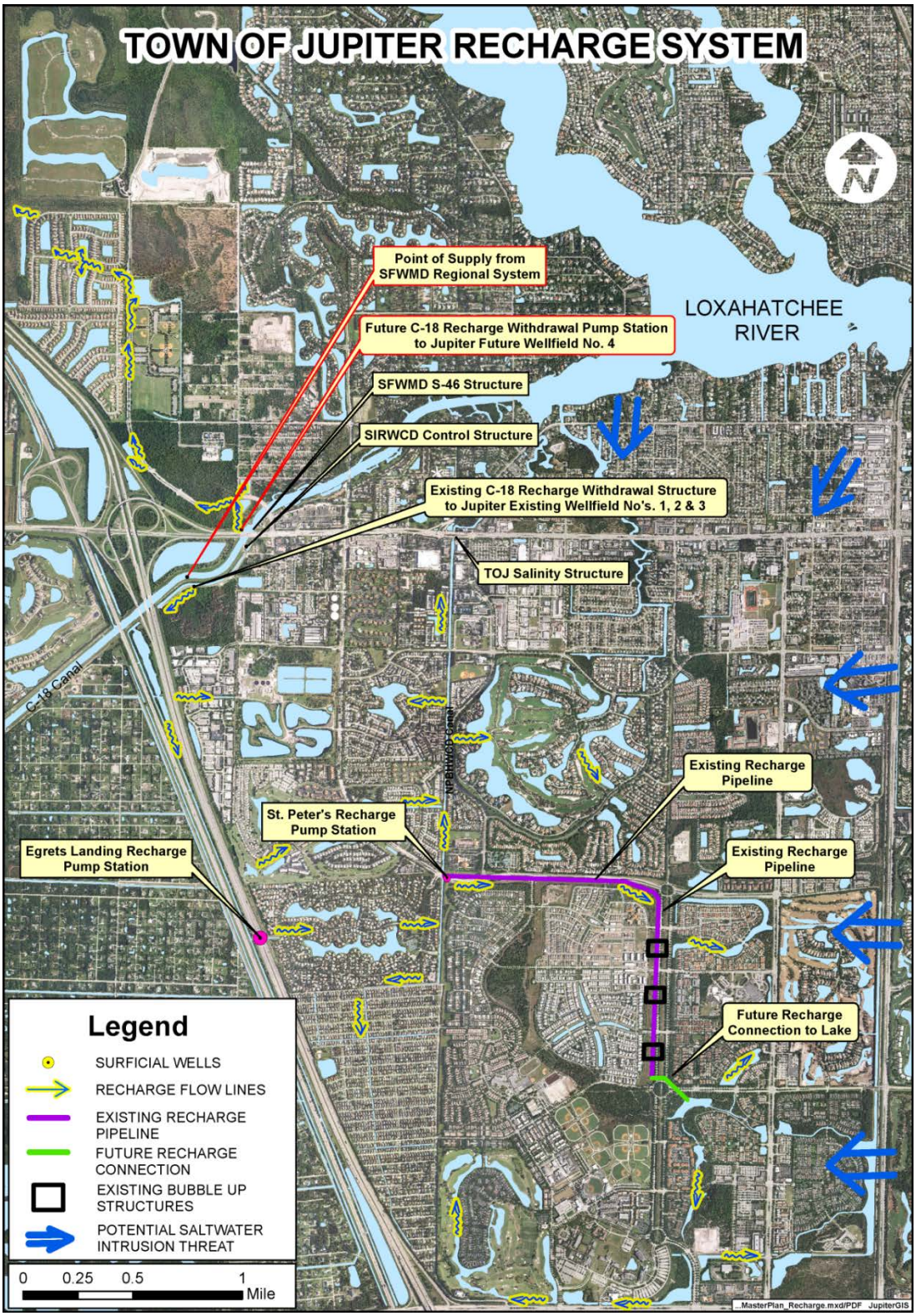
In general, surplus runoff is captured and channeled into existing surface water storage areas in an effort to maintain these systems at their designed control elevations. The recharge system, when fully developed, is expected to offset some of the effects of urban groundwater withdrawals by replenishing the resource, thereby minimizing the risk of environmental harm, including wetland drawdowns and saltwater intrusion. The recharge system is seen as a prudent insurance policy for Jupiter's water supply given its susceptibility to impacts. The long-term sustainability of the region's water resources and fresh water environment will be greatly enhanced through operation of this system.

Currently, interlocal agreements for the operation of this recharge system are in place amongst all effected agencies which include the Town of Jupiter, Loxahatchee River District, South Indian River Water Control District (SIRWCD), Northern Palm Beach County Improvement District, North Palm Beach Heights Water Control District and numerous homeowners associations.

It should be noted that a consumptive use permit (CUP) for withdrawal from the C-18 Canal and supplied to the recharge system has been in place since 1989 for a flow rate of approximately 12 cfs; recharge of the Surficial Aquifer in Jupiter and the immediate vicinity is provided from the C-18 Canal as authorized by Water Use Permit 50-01584-W. However, existing permit operational provisions are very stringent and thus prevent diversional flows during dry periods when the local environment needs them the most. Withdrawals are restricted to stages in C-18 above 14 ft NGVD during the wet season (14.5 ft NGVD in dry season) and when stages in the South Indian River Water Control District (SIRWCD) canals are below 10.5 ft NGVD.

A schematic of the system as it exists and as it is envisioned to expand in the future is provided as **Figure 1.15**.

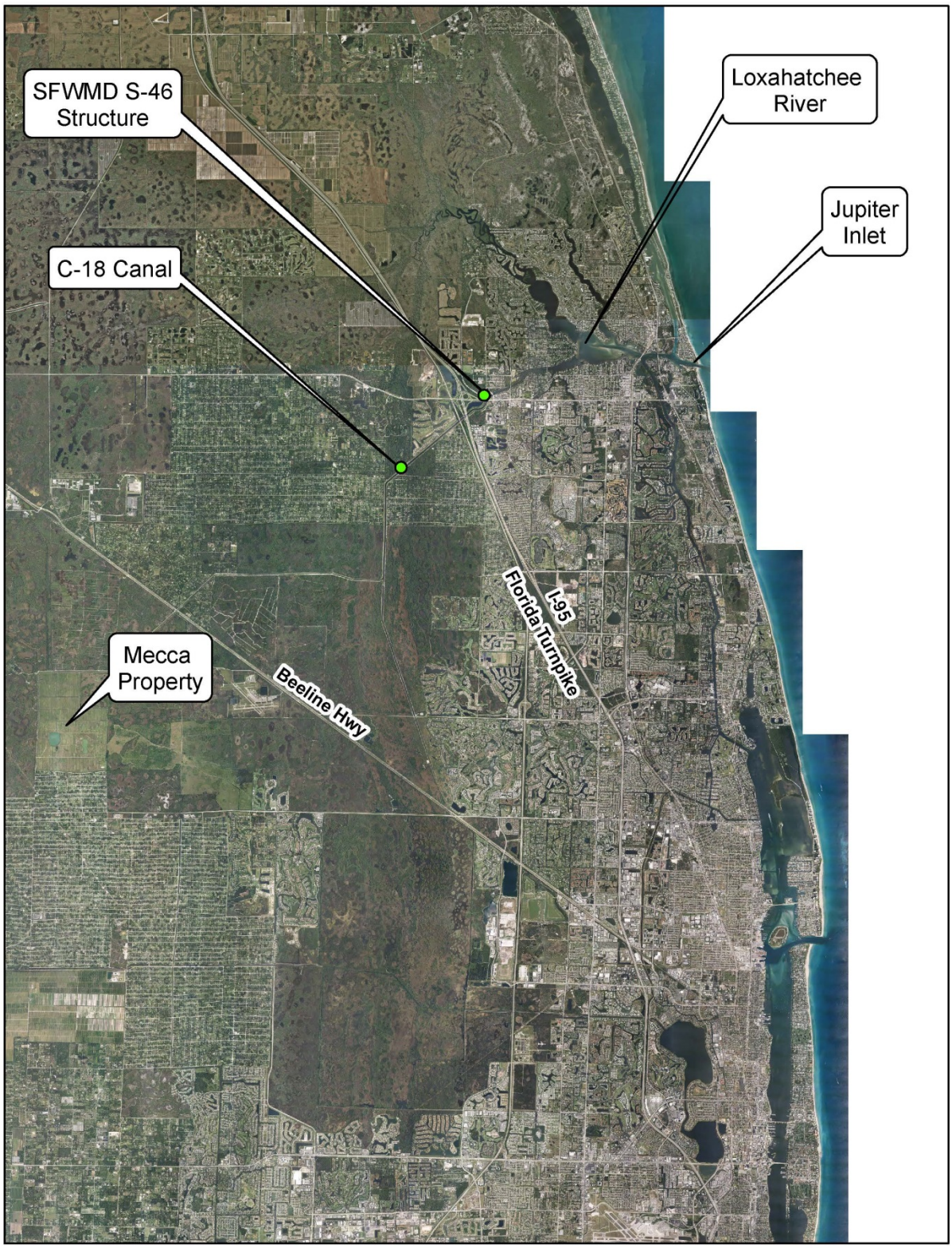
Figure 1.15


TOWN OF JUPITER RECHARGE SYSTEM
LOXAHATCHEE RIVER
Point of Supply from SFWMD Regional System
Future C-18 Recharge Withdrawal Pump Station to Jupiter Future Wellfield No. 4
SFWMD S-46 Structure
SIRWCD Control Structure
Existing C-18 Recharge Withdrawal Structure to Jupiter Existing Wellfield No's. 1, 2 & 3
TOJ Salinity Structure
C-18 Canal
Indiantown Road
Existing Recharge Pipeline
St. Peter's Recharge Pump Station
Egrets Landing Recharge Pump Station
Existing Recharge Pipeline
Future Recharge Connection to Lake
Legend
SURFICIAL WELLS
RECHARGE FLOW LINES
EXISTING RECHARGE PIPELINE
FUTURE RECHARGE CONNECTION
EXISTING BUBBLE UP STRUCTURES
POTENTIAL SALTWATER INTRUSION THREAT
0 0.25 0.5 1 Mile
..MasterPlan_Recharge.mxd/PDF JupiterGIS

e. Loxahatchee River Restoration Project (f.k.a. CERP: Northern Palm Beach County Regional Water Management Plan)

In 2000, the Comprehensive Everglades Restoration Plan (CERP) provided for the restoration of the North Fork of the Loxahatchee River as a component in restoring the Everglades. The projects within this component included the L-8 Reservoir as a storage feature and 50 cubic feet per second (cfs) recharge for the coastal areas. This recharge component was to maintain coastal canal levels to offset salt water intrusion and reduce seepage from the Loxahatchee River. In 2010, the Army Corps of Engineers tentatively selected an alternative that included the 50 cfs recharge for these functions. The Town, in renewing the recharge permit from the C-18 Canal, entered into discussions with the SFWMD to begin design of the pumps with the intent of implementing the recharge based on the tentatively selected plan. Work on the tentatively selected plan was stopped in 2011 as the SFWMD repurposed the L-8 Reservoir for water quality purposes for Conservation Area 1 and further action on renewal of the permit was postponed. In 2016, the Loxahatchee River Restoration Plan was reinitiated by the Corps and SFWMD but this time with its focus on the restoration of the Loxahatchee River.

In response, a local preferred option for restoration of the Loxahatchee River was put forth by the Palm Beach County Water Task Force to not only provide restoration flow to the river, but also to enhance the Loxahatchee Slough, reduce freshwater flows to the Lake Worth Lagoon, provide flood protection for the western communities, and enhance water supplies for utilities. This alternative includes a reservoir in the L-8 basin (replacing the repurposed L-8 Reservoir) and deliveries to Northern Palm Beach County to provide recharge to the surficial aquifer. Storage within the C-18 basin or the L-8 basin is intended to provide flows to the Loxahatchee River and would provide recharge to the C-18 Canal as water is conveyed to the Lainhart Dam. The local preferred alternative provides for a 25 cfs discharge at Limestone Creek and C-18 for Jupiter's Recharge System and a second 25 cfs discharge in the Seacoast service area. The Loxahatchee River Restoration CERP program has accepted this alternative as one of five that will be evaluated during the summer of 2016 with the identification of a tentatively selected plan by April 2017. SFWMD has agreed to provide an evaluation of the local preferred alternative. The evaluation will identify the benefits the option provides relative to meeting the federal objectives on restoring the river as well as the storage required to meet the local preferred option's objectives. Indications from the Army Corps reflect that the non-federal objectives cost for implementing the needed infrastructure will need to be borne by the SFWMD and/or local governments.



Aerial View of the Loxahatchee River Watershed

The final array of alternatives being evaluated in the C-18 basin are as follows:

- C-18 impoundment proposed on the Mecca property to capture excess water from the western C-18 basin (west of the C-18 weir at the Bee Line)
- Supplementation of storage through implementation of aquifer storage and recovery wells adjacent to the C-18 impoundment, and the
- Creation of a "natural flow way" over the Mecca property

Supplemental water to meet restoration targets in the river in the natural flow way alternative is provided through storage facilities in the L-8 basin. Stages in the C-18 Canal will be augmented by discharges from these potential restoration facilities to provide flows to the Northwest Fork of the Loxahatchee River. No changes to operation of the C-18 Canal basin or SIRWCD are being proposed by the restoration project. However, it is expected that wasteful flows to tide at the S-46 structure will be reduced depending on the final selected alternative.

The Town again is patiently awaiting the SFWMD's conclusion of this water resource and supply development process. The Town remains hopeful that the regional system will become reliable enough to concurrently deliver needed restorative water flows to the Loxahatchee River and recharge flows to Jupiter's Surficial Aquifer Wellfield to insure its future sustainability.

V. Water Treatment Facilities

The Town's existing water treatment facilities, located at 17403 Central Boulevard, consists of three separate processes; reverse osmosis, ion exchange and nanofiltration. Each of the processes is permitted by the Florida Department of Environmental Protection (FDEP) and have rated treatment capacities as shown in **Table 1.5**.

Table 1.5

Existing Rated Plant Capacities

Facility	FDEP Permitted Treatment Capacity (MGD)
Reverse Osmosis	13.7
Ion Exchange	1.8
Nanofiltration	14.5
Total	**30.0**

The reverse osmosis plant is capable of producing 13.7 MGD of finished water. The Utility has a permitted (by SFWMD) daily withdrawal allocation from the Floridian Aquifer of 17.90 MGD (max month basis), which allows the R.O. plant the ability to produce 13.7 MGD of product water at the 75% recovery rate of the process.

Reverse Osmosis Treatment Trains

In 1999, a 1.8 MGD ion exchange treatment plant was constructed. The ion exchange plant utilizes Surficial Aquifer water to produce water of increased alkalinity and low color which when blended with the R.O. permeate waters improves the chemical and aesthetic characterisitics of the total blended finish water.

Ion Exchange Treatment Plant

In 2010, the Town commissioned a 14.5 MGD Nanofiltration (Nano) Water Treatment Facility. The plant utilizes raw water from the surficial aquifer, which is the same source used by the ion exchange plant.

The Utility has a permitted (by SFWMD) daily withdrawal allocation from the surficial aquifer of 19.90 MGD (max month basis), which allows the ion exchange plant to operate in conjunction

with the nanofiltration plant. The nanofiltration plant produces 14.5 MGD of product at a 85% process recovery rate.

Nanofiltration Treatment Plant

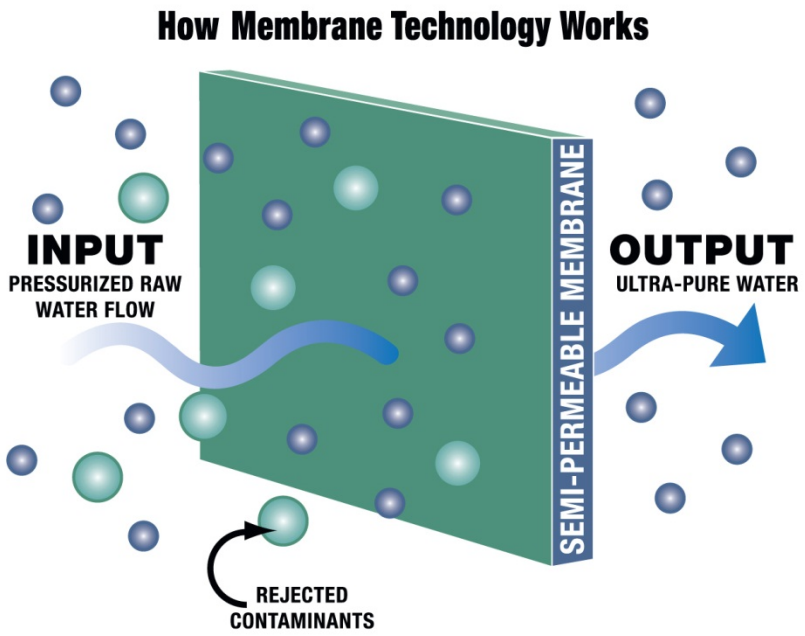
Jupiter's customers demand high water quality and sensitivity to the environment. As a coastal, South Florida community, Jupiter is in a region with limited fresh water supplies, and often experiences drought conditions during the dry season. Jupiter's nationally designated "wild and scenic" Loxahatchee River, which runs right through the middle of the community, is subject to environmental harm if local freshwater supplies are depleted or damaged. If use of the shallow, fresh water aquifer in the Jupiter area is excessive, it can experience salt water intrusion from the nearby Atlantic Ocean.

To ensure a stable supply of drinking water for the area, Jupiter has become one of the first large communities in the United States to employ only state of the art membrane water treatment technologies. Using innovative new processes, Jupiter is able to supply the highest quality drinking water while achieving environmental sustainability of the local water resources.

Nanofiltration Process Room

Jupiter uses two membrane treatment processes to treat its water: brackish Floridan Aquifer water desalination through reverse osmosis and nanofiltration treatment of the fresh Surficial Aquifer water supply. The product of these two treatment processes are combined to create high quality finished water that is distributed to the Jupiter region. These membrane water treatment processes produce drinking water that surpasses all existing and foreseeable future quality standards. They also provide a way for Jupiter to produce ultra-pure water from drought-resistant, alternative water supplies in a way that is not harmful to the environment.

Figure 1.16



Both the reverse osmosis and nanofiltration processes operate by forcing pressurized, raw water through a semi-permeable membrane that separates contaminants from the water. See **Figure 1.16**. The chemical and physical properties of the membrane, combined with applied pressure, remove unwanted substances from the groundwater. Membrane treatment also provides a barrier against viruses, bacteria and many other harmful contaminants found in raw water.

The nanofiltration process treats the fresh water from the shallow Surficial Aquifer, and the reverse osmosis process treats the brackish water from the deep Floridan Aquifer. The Surficial Aquifer rests about 150 feet below the ground's surface, and the Floridan Aquifer is a layer of water some 1,500 feet below the ground. Because it is very deep beneath the ground's surface,

the Floridan Aquifer is drought-resistant, and wells connected to this supply are not at risk of being contaminated by ocean water during severe droughts.

Nanofiltration Treatment Trains

In summary, the water treatment facility currently consist of three (3) separate processes (reverse osmosis, ion exchange, and nanofiltration) that treat raw water from two aquifer sources to meet current production demands. The freshwater treatment system is capable of treating 14.5 MGD through the use of nanofiltration and 1.8 MGD through the ion exchange plant. The brackish water reverse osmosis treatment system is capable of producing 13.7 MGD. All facilities are operated from a centralized plant control room and the treated water from each of the three plants is blended before being pumped to storage or distributed to Jupiter's water customers. The Water Treatment Plant is currently capable of producing a total of 30.0 MGD of finished water for distribution.

VI. Water Storage, Transmission and Distribution Facilities

Existing System Description

The existing water storage, distribution and transmission system consists of approximately 467 miles of pipelines. **Table 1.6** identifies the approximate length of pipeline by diameter.

Table 1.6

Transmission/Distribution Pipeline Data

Pipe Diameter (Inches)	Length (Feet)	Length (Miles)
2	91,409	17.31
3	7,594	1.44
4	98,455	18.65
6	643,208	121.82
8	1,042,630	197.47
10	143,620	27.20
12	265,594	50.30
14	1,288	0.24
16	105,576	19.98
18	22,402	4.24
20	2,318	0.44
24	44,650	8.46
30	697	0.13
Total	2,469,441	467.69

Based upon discussions with utility staff, together with the review of available system pressure records and hydraulic modeling performed, the system appears to maintain adequate pressure

throughout most of the service area under current conditions. However, areas with the most noted pressure deficiencies still remain relative to the system's established minimum level of service pressure of 45 psi in the Bluff's Area (south to Juno Beach). Mitigation of these pressure issues are currently being accomplished through various ongoing and planned renewal and replacement related capital projects.

Juno Beach Water Storage and Repumping Facility

Pipelines

The distribution system includes pipe segments made of primarily four types of materials – ductile iron (DIP), C-900 polyvinyl chloride (PVC), high density polyethylene (HDPE) and asbestos cement (AC). In general, asbestos cement pipe was installed from approximately 1957 to 1970, C-900 PVC from approximately 1971 to present, ductile iron pipe from approximately 1958 to present, and HDPE, primarily used for service connections and subaqueous crossings, from approximately 1971 to present. Pipe sizes range from 2 to 30 inches in diameter. The distribution system originates at the Town's water treatment plant and extends in all directions.

Riverbend Water Storage and Repumping Facility

There are four subaqueous crossings of the Intracoastal Waterway (ICW) and C-18 Canal, as follows:

Location	Pipe Size/Type
• Indiantown Road/ICW	10 inch diameter HDPE
• Indiantown Road/ICW	16 inch diameter HDPE
• Frederick Small/Marcinski Roads/ICW	One – 18 inch diameter ductile iron pipe
	One – 16 inch diameter ductile iron pipe

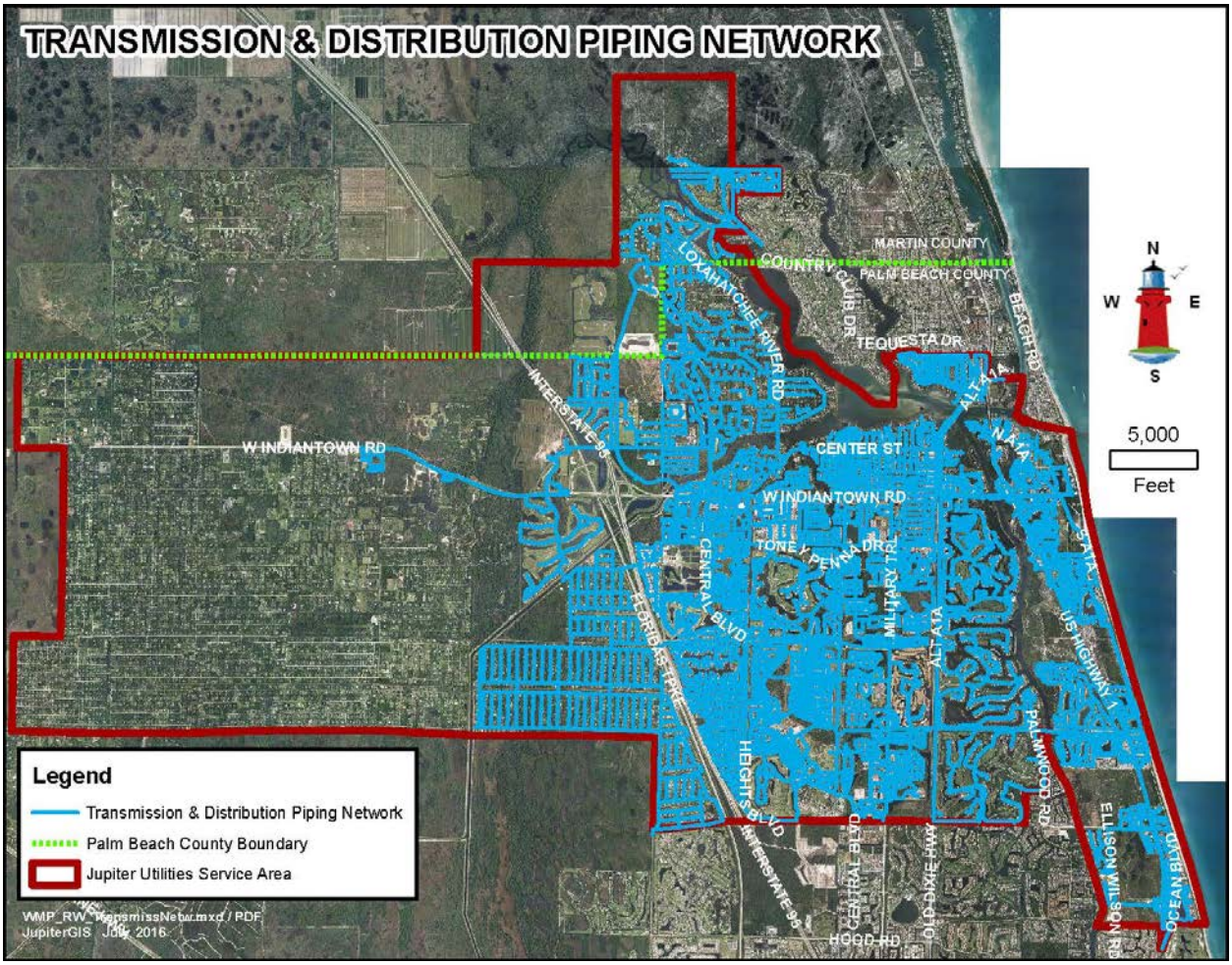
• US1/ICW	10 inch diameter HDPE
• C-18 Canal at Riverbend P.S.	18 inch diameter HDPE

There are also five aerial crossings of various branches of the Loxahatchee River and the C-18 Canal, as follows:

Location	**Pipe Size/Type**
• Alternate A1A (Loxahatchee River)	20 inch diameter ductile iron pipe
	20 inch diameter steel pipe
• Island Way (NW Fork Loxahatchee River)	12 inch diameter ductile iron pipe
• Island Way (C-18 Canal)	18 inch diameter ductile iron pipe
• Loxahatchee River Road (SW Fork Loxahatchee River)	12 inch diameter ductile iron pipe
• Central Boulevard (C-18 Canal)	24 inch diameter ductile iron pipe

The Town's water distribution network has grown steadily over the years to provide service to the Town's growing population and expanding business community. The full extent of the Town's water transmission and distribution system is depicted within **Figure 1.17** below.

Figure 1.17


TRANSMISSION & DISTRIBUTION PIPING NETWORK
MARTIN COUNTY
PALM BEACH COUNTY
COUNTRY CLUB DR
TEQUESTA DR
LOXAHATCHEE RIVER RD
INTERSTATE 95
W INDIANTOWN RD
CENTER ST
ALT A1A
N A1A
BEACH RD
CENTRAL BLVD
TONY PENNA DR
MILITARY TRL
FLORIDA'S TPKE
HEIGHTS BLVD
US HIGHWAY 1
PALMWOOD RD
ELLISON WILSON RD
OCEAN BLVD
OLD DIXIE HWY
HOOD RD
N
W
E
S
5,000
Feet
Legend
Transmission & Distribution Piping Network
Palm Beach County Boundary
Jupiter Utilities Service Area
WMP_RW_TransmissNetw.mxd / PDF
JupiterGIS July 2016

Water Storage Facilities

The Town's water storage system consists of seven ground storage tanks located at the Water Treatment Plant, Central Boulevard Repumping Station, Riverbend Repumping Station and Juno Beach Repumping Station.

Central Boulevard Water Storage and Pump Station

Water is delivered from the water treatment plant site across Central Boulevard to the ground storage tanks at the Central Boulevard High Service Pump Station via a dedicated 30-inch diameter main. **Table 1.7** summarizes the finished water storage volume available at each facility.

Table 1.7
System Water Storage Capacity

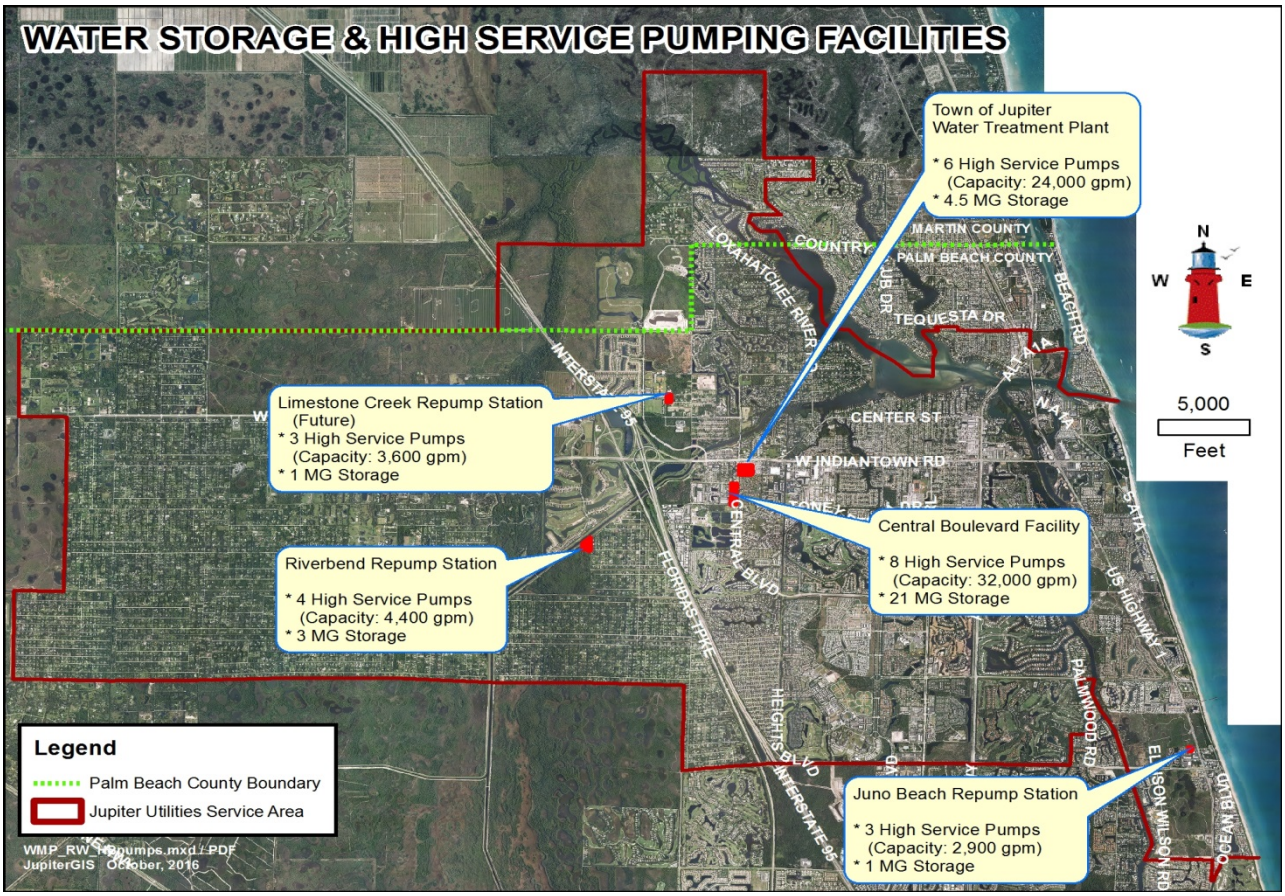
Water Treatment Plant (2 tanks)	1.5 MG
	3.0 MG
Central Boulevard Repumping Station (3 tanks)	5.0 MG
	8.0 MG
	8.0 MG
Riverbend Repumping Station	3.0 MG
Juno Beach Repumping Station	1.0 MG
Total	**29.5 MG**

High Service/Repump Facilities

Finished water is supplied to the transmission and distribution system through high service pump systems located at the water treatment plant and the Central Boulevard High Service Repumping Facility. In general, pumps are operated automatically, that is, started, stopped and speeds adjusted by the water treatment plant's control system. **Figure 1.18** illustrates the capabilities of the Town's high service pumping facilities.

Central Boulevard Water Storage and Repumping Facility

Figure 1.18

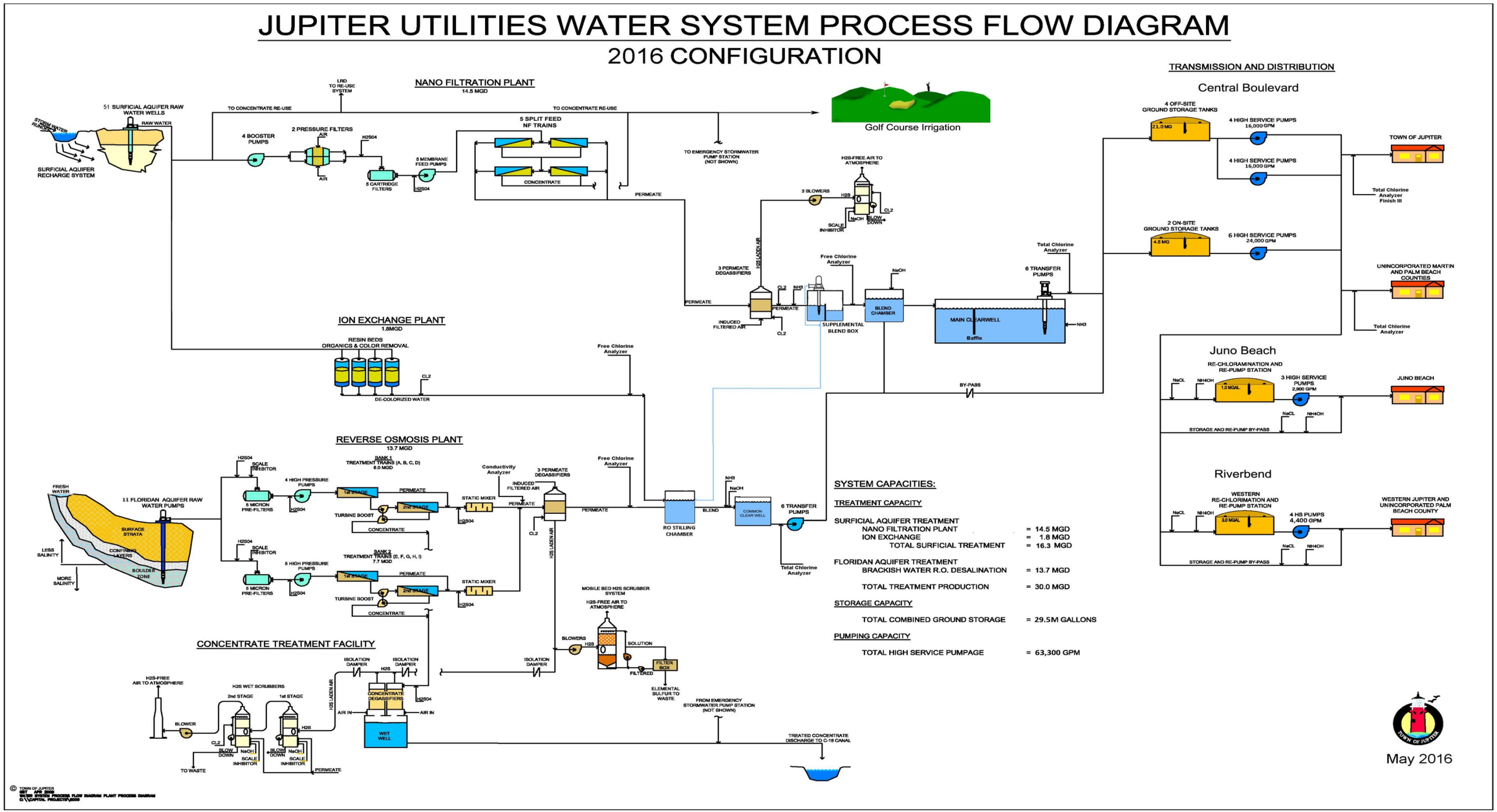


The water treatment plant has an array of six high service pumps with 200 hp motors and variable frequency drives (VFDs) for speed control. The Central Boulevard Storage/High Service Facility includes two high service pump stations. The north station has four 4,000 gpm pumps with 200 hp motors and VFDs. The south station has four 4,000 gpm pumps with 200 hp motors, two with VFDs. There is a project planned for 2017 to equip the other two motors with VFDs.

High Service Pumping

The Riverbend Repump Facility has four 1,100 gpm high service pumps with motors each rated at 75 hp and equipped with VFDs for speed control. The Juno Beach Re-pump Facility has three high-service pumps, two with capacities of 1,200 gpm and one at 500 gpm. All three pumps are equipped with 75 hp motors and VFDs. All high service pumps in the system are controlled automatically by control logic associated with programmable logic controllers located at each facility and can also be operated manually from the water treatment plant control room. Each pumping facility's control system is set to maintain a service pressure of 75 psi and operate independently from one another. The Riverbend Repump Facility is the exception and operates at a service pressure of 78 psi. **Figure 1.19** identifies the full process flow components of the Town's Water Utility from raw water supply to the transmission and distribution systems.

Figure 1.19


JUPITER UTILITIES WATER SYSTEM PROCESS FLOW DIAGRAM
2016 CONFIGURATION
NANO FILTRATION PLANT
14.5 MGD
TRANSMISSION AND DISTRIBUTION
Central Boulevard
Golf Course Irrigation
51 SURFICIAL AQUIFER RAW WATER WELLS
SURFICIAL AQUIFER RECHARGE SYSTEM
TO CONCENTRATE RE-USE
4 BOOSTER PUMPS
2 PRESSURE FILTERS
5 CARTRIDGE FILTERS
5 MEMBRANE FEED PUMPS
5 SPLIT FEED NF TRAINS
CONCENTRATE
PERMEATE
TO EMERGENCY STORMWATER PUMP STATION (NOT SHOWN)
3 BLOWERS
3 PERMEATE DEGASSIFIERS
SUPPLEMENTAL BLEND BOX
BLEND CHAMBER
MAIN CLEARWELL
6 TRANSFER PUMPS
4 OFF-SITE GROUND STORAGE TANKS
4 HIGH SERVICE PUMPS 16,000 GPM
2 ON-SITE GROUND STORAGE TANKS
6 HIGH SERVICE PUMPS 24,000 GPM
TOWN OF JUPITER
UNINCORPORATED MARTIN AND PALM BEACH COUNTIES
ION EXCHANGE PLANT
1.8MGD
RESIN BEDS ORGANICS & COLOR REMOVAL
DE-COLORIZED WATER
BY-PASS
Juno Beach
RE-CHLORAMINATION AND RE-PUMP STATION
3 HIGH SERVICE PUMPS 2,900 GPM
JUNO BEACH
STORAGE AND RE-PUMP BY-PASS
REVERSE OSMOSIS PLANT
13.7 MGD
11 FLORIDAN AQUIFER RAW WATER PUMPS
BANK 1 TREATMENT TRAINS (A, B, C, D) 6.0 MGD
BANK 2 TREATMENT TRAINS (E, F, G, H, I) 7.7 MGD
RO STILLING CHAMBER
COMMON CLEAR WELL
Riverbend
WESTERN RE-CHLORIMATION AND RE-PUMP STATION
4 HS PUMPS 4,400 GPM
WESTERN JUPITER AND UNINCORPORATED PALM BEACH COUNTY
CONCENTRATE TREATMENT FACILITY
MOBILE BED H2S SCRUBBER SYSTEM
H2S WET SCRUBBERS
WET WELL
TREATED CONCENTRATE DISCHARGE TO C-18 CANAL
SYSTEM CAPACITIES:
TREATMENT CAPACITY
SURFICIAL AQUIFER TREATMENT
NANO FILTRATION PLANT = 14.5 MGD
ION EXCHANGE = 1.8 MGD
TOTAL SURFICIAL TREATMENT = 16.3 MGD
FLORIDAN AQUIFER TREATMENT
BRACKISH WATER R.O. DESALINATION = 13.7 MGD
TOTAL TREATMENT PRODUCTION = 30.0 MGD
STORAGE CAPACITY
TOTAL COMBINED GROUND STORAGE = 29.5M GALLONS
PUMPING CAPACITY
TOTAL HIGH SERVICE PUMPAGE = 63,300 GPM
May 2016

VII. Pending Regulatory Issues

Concentrate Disposal Operational Permits

The water plant facilities, including RO treatment and nanofiltration treatment, each have a permit for disposal of concentrate by-product from the treatment processes. The concentrate disposal permit for the RO plant is considerably longer tenured than the permit for the nanofiltration treatment plant, and includes provisions for accommodating the nanofiltration concentrate under limited circumstances. The primary disposal method for the nanofiltration concentrate is by delivery and sale of the concentrate flow to the Loxahatchee River District for blending and distribution as part of its irrigation quality water reuse system.

Location of RO Concentrate Discharge

The RO concentrate is disposed of through surface discharge to the C-18 Canal approximately 2,000 feet north of the water plant site. The outfall was originally permitted in 1989 and has operated continuously as the RO concentrate disposal means since 1990. The permitting history for the RO concentrate discharge includes a renewal issued in 2004 which included an increase in the permitted discharge volume from 4.0 MGD to 4.6 MGD to accommodate an expansion of the RO treatment facility. A permit renewal application was filed in 2008 and is currently pending issuance. In 2009, a permit revision was issued by FDEP which allowed for disposal of nanofiltration concentrate through the RO concentrate outfall for up to 30 days per year and established a mixing zone for acute toxicity in accordance with newly adopted FDEP regulations regarding acute toxicity in membrane concentrates that are predominantly due to major seawater ion imbalance.

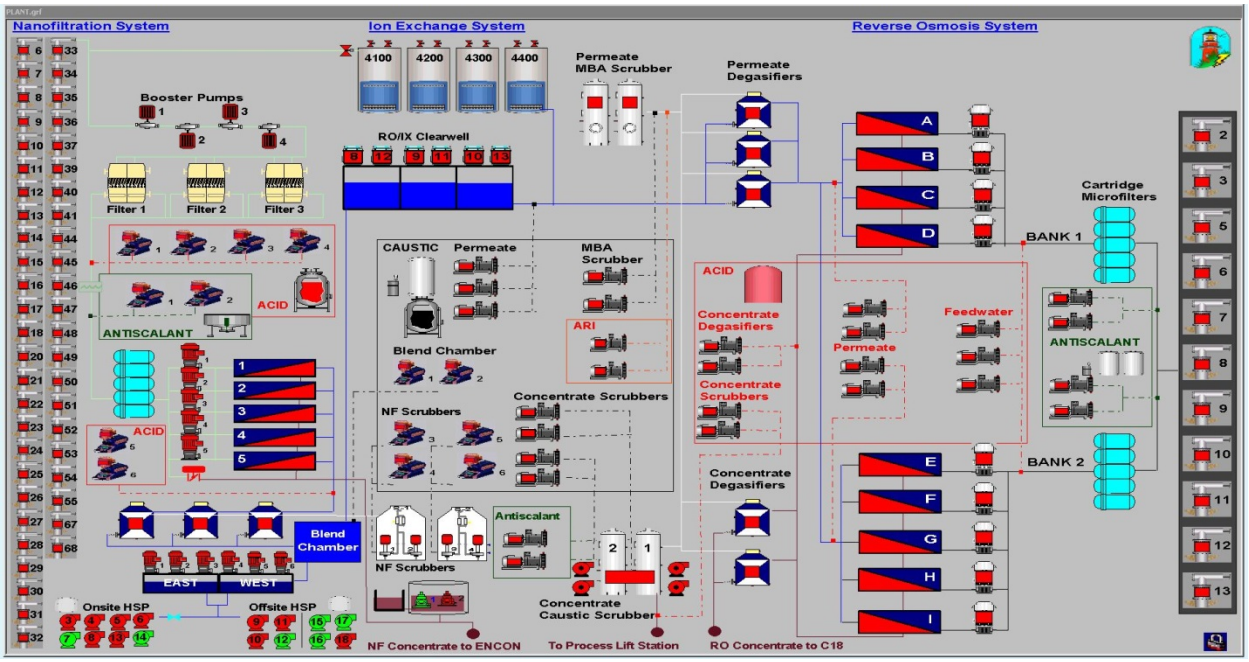
VIII. Business and Information Systems

"Automation or automatic control is the use of various control systems for operating equipment such as machinery, processes in factories…and other applications with minimal or reduced human intervention. Some processes have been completely automated.

The biggest benefit of automation is that it saves labor; however, it is also used to save energy and materials and to improve quality, accuracy and precision."

– Wikipedia (2016/07/08 - https://en.wikipedia.org/wiki/Automation)

At the Town of Jupiter Water Treatment Facility, operational efficiencies are constantly being sought to reduce process related costs and to improve overall system reliability. The following outlines the present operational systems as well as prospective technologies intended to further this key business goal.



Control Panel – Water Treatment Systems

Operations Technology (OT) Background

Industrial automation employs a wide gamut of interactive technologies designed to control a particular process. The system used to monitor such process is commonly referred to as a Supervisory Controls and Data Acquisition or SCADA network. The design, the implementation and the support of a SCADA network encompasses an emerging field known as Operations Technology (OT).

Instrumentation Returning Values to a PAC

In its basic form, a SCADA network involves the exchange of discrete and analog data between instrumentation and some process decision maker such as a programmable automation controller (PAC). The decision maker or PAC processor then relays that information to qualified personnel through a software-based, human-to-machine interface (HMI) (e.g., a personal computer, tablet or cell phone).

Modern SCADA networks incorporate specialized forms of Information Technology (IT) equipment. While these OT components are built much in the same way as their IT counterparts, oftentimes they are hardened to handle harsh industrial environments and enhanced with software unique to running a 24 hour/day, 7 day/week manufacturing facility. These adaptations recognize the adverse economic impact of production downtime.

OT equipment is also illustrative of an ever-widening, knowledge base essential to the support of SCADA networks. The overlap between IT and Process Controls requires an understanding, not only of the engineered process and its use of instrumentation, but also areas of study such as data networking, programming, client/server administration, database management and, in some newer environments, cloud-based computing.

Several years ago, the Town of Jupiter Utilities set forth three goals for the future of its SCADA network. These goals were as follows:

1) **Reliability**: To build a reliable network employing modern, recognized technology and maintainable, modular componentry

2) **Redundancy**: To create redundancy in those systems critical to facility operations while providing greater access to plant data where needed

3) **Security**: To ensure the protection of critical systems from both physical and cyber threats

In keeping with these goals, the facility's SCADA network employs industry standard hardware and software in a failover, redundant configuration. A campus-wide, fiber optic backbone allows communication between the SCADA Servers and process instrumentation. This data pipeline also allows touchscreen HMIs and wireless mobile devices to be used near plant subsystems where such assistance is deemed useful. Meanwhile, improvements to FCC licenses and spread spectrum radios have translated into greater wireless bandwidths to remote sites such as wells and repump stations.

Touchscreen HMI at Point of Application

Acting in concert with the SCADA servers, a historian server provides trending of process instrumentation and automated reporting, while a firewall and web server allow administrative staff to securely and remotely review real-time, plant information. The result of such technologies is a SCADA network that controls and monitors over 8,000 points of data as well as a wide range of processes including:

- 60+ Surficial and Reverse Osmosis Well Sites
- A Nanofiltration Water Treatment Plant
- A Reverse Osmosis Water Treatment Plant
- An Ion Exchange Water Treatment Plant
- Onsite and Remote Distribution and Repump Stations
- Backup Emergency Electrical Generators
- Stormwater and Recharge Sites
- Security and Building Safety Systems
- Inter-Organizational Data Exchanges

Enhancements to the existing SCADA system are already being evaluated. Consideration is being given to the incorporation of elements outlined in a new industry-wide, HMI design standard known as *High Performance HMI.* This methodology employs universal symbols and animation limitations to clarify complicated processes and assist personnel in their systems analysis and troubleshooting efforts.

In addition, the virtualization of SCADA server operating systems will significantly reduce the physical footprint of computing hardware and the costs of such replacement. Using virtualization's built-in migration and high availability tools, production downtime associated with equipment upgrades or the restoration of failed equipment will be minimized.

Lastly, plans to replace existing client computers with less expensive, thin clients will allow for increased mobility by staff and enhanced security in open areas.

These proposed additions as well as improvements to both the intelligence and the networking of existing instrumentation intend to further the department's mission to reduce costs and enhance overall operational efficiencies.

Customer Information (CIS), Utility Billing & Work Order Systems

The Town's current CIS, utility billing (billing system) and work order systems were installed in 2015/2016 and are considered leading technologies in their respective areas. The Town Utility recognized the importance of providing its' customers superior customer service by providing additional tools and systems to manage and improve the services its customers receive. A strong focus on customer satisfaction and ease of use with customer-friendly access and convenience have become the industry standard and are embodied in the Town's systems. With over 29,400 customer accounts currently served, the Town Utility continues to improve its customer service offerings while simultaneously improving the efficiency of its billing processes.

The following is an account of the CIS, utility billing and work order systems currently utilized by Jupiter Utilities.

Meter Reading

Current meter reading systems are 99.4% radio-frequency reading technologies. Using cloud-based data storage, radio frequency readings are captured by a laptop in the Field Representative's vehicle while driving through the meter reading routes and uploaded to the internet based cloud. A receiver on the laptop picks up the meter readings from a transmitter on each of the meters. Approximately 169 of 29,500 meter readings, or .6%, are captured manually by the Town's Utility Field Representatives by physically visiting the meters, removing the cover and hand keying the reading into the meter reading device. All acquired meter readings are pulled from the cloud on a personal computer in the office and are uploaded to the billing system.

Data Log

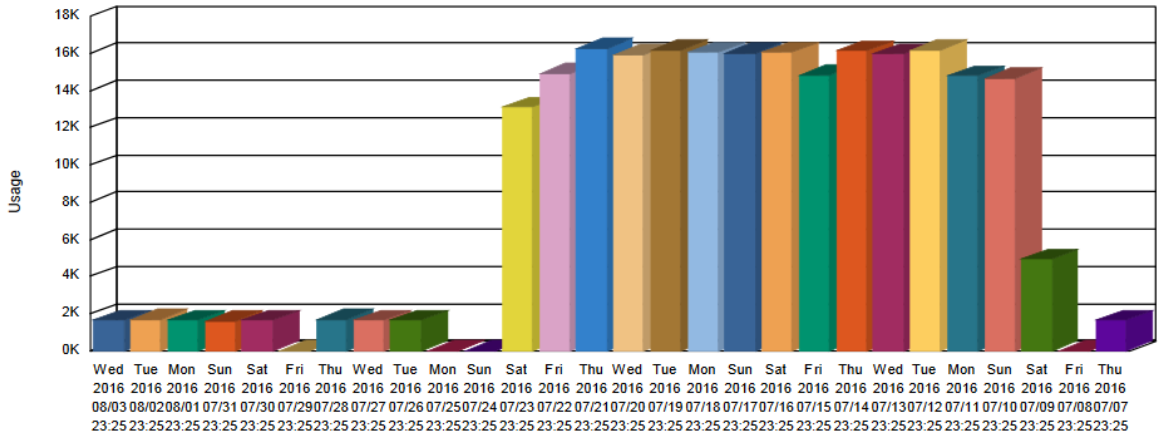
Electronic ID: 10263049

Serial Number: 9284039 WT

Name:

Address: 0123 NORTH RIVER DR E

Location Number: 0000332



Reading Date	Reading	Factor	Calculated	Status	Consumption
Wed 2016 08/03 23:25	34858	10	348580	OK	1640
Tue 2016 08/02 23:25	34694	10	346940	OK	1700
Mon 2016 08/01 23:25	34524	10	345240	OK	1630
Sun 2016 07/31 23:25	34361	10	343610	OK	1620
Sat 2016 07/30 23:25	34199	10	341990	OK	1650
Fri 2016 07/29 23:25	34034	10	340340	OK	0
Thu 2016 07/28 23:25	34034	10	340340	OK	1690
Wed 2016 07/27 23:25	33865	10	338650	OK	1680
Tue 2016 07/26 23:25	33697	10	336970	OK	1660
Mon 2016 07/25 23:25	33531	10	335310	OK	0
Sun 2016 07/24 23:25	33531	10	335310	OK	0
Sat 2016 07/23 23:25	33531	10	335310	OK	13130
Fri 2016 07/22 23:25	32218	10	322180	OK	14910
Thu 2016 07/21 23:25	30727	10	307270	OK	16250
Wed 2016 07/20 23:25	29102	10	291020	OK	15930
Tue 2016 07/19 23:25	27509	10	275090	OK	16190
Mon 2016 07/18 23:25	25890	10	258900	OK	16070
Sun 2016 07/17 23:25	24283	10	242830	OK	16020

Reading Date	Reading	Factor	Extended Reading	Status	Consumption
7/4/2016 11:25 PM	10838	10.00	108380	OK	0
7/5/2016 11:25 PM	11004	10.00	110040	OK	1660
7/6/2016 11:25 PM	11160	10.00	111600	OK	1560
7/7/2016 11:25 PM	11325	10.00	113250	OK	1650
7/8/2016 11:25 PM	11325	10.00	113250	OK	0
7/9/2016 11:25 PM	11821	10.00	118210	OK	4960
7/10/2016 11:25 PM	13286	10.00	132860	OK	14650
7/11/2016 11:25 PM	14765	10.00	147650	OK	14790
7/12/2016 11:25 PM	16384	10.00	163840	OK	16190
7/13/2016 11:25 PM	17978	10.00	179780	OK	15940
7/14/2016 11:25 PM	19593	10.00	195930	OK	16150
7/15/2016 11:25 PM	21077	10.00	210770	OK	14840
7/16/2016 11:25 PM	22681	10.00	226810	OK	16040
7/17/2016 11:25 PM	24283	10.00	242830	OK	16020
7/18/2016 11:25 PM	25890	10.00	258900	OK	16070

Close

Account Data Log – Analyzing Abnormally High Consumption

Work Order System

The current billing system includes a work order system. This system allows for the creation and tracking of work orders by customer account. Exception listings and edits are reviewed after the meter readings are uploaded to the billing system. Work orders are generated for unusual items, i.e., very high readings, no readings, etc. Field service personnel verify information and investigate any unusual items.

Utility Billing

The billing system generates billing statement files that are transferred electronically to a private bill print vendor. The vendor prints the billing statements and mails them to customers. The billing system allows for the collection of a wide array of service charges and categories: water service, residential garbage pickup, yard waste pickup, recycling pickup, storm water, fire line, as well as the collection of utility taxes and surcharges and various service charges for late fees, reconnection fees, application fees, etc.

The billing system offers realtime access to information by utility customers using the on-line web portal from the Town's website. This information is updated in realtime to reflect payments, fees and charges, account credits and other adjustments occurring between billing dates, as well as offering single and recurring payment options and usage analysis and comparison tools.

Utility Cash Receipts

Utility collections are received daily from several sources: walk-in payments, drop-boxes, mail-in, phone-in credit cards, bank drafting (ACH transactions), E-pay through third party financial institutions (Online Resources Corporation (ORCC)), interactive voice response (IVR), credit cards, on-line credit cards and on-line ACH.

Paper Check Receipts: The processing of all payment coupons and checks is fully automated using a small scanner and RemitPlus software. The system allows the Utilities' staff to image all payment stubs and checks received and electronically transmit deposits to the Town's bank account on a daily basis. The bank sends a confirmation of receipt by email.

Electronic Payment Remittances: Electronic payments or wire transfer remittances are received on-line from third party on-line payment services. These electronic payments are processed in one of three ways.

1. On-line payments are taken using the utility billing payment portal which is accessed by customers on the Town's website. These payments are

processed by agreement with the Town's merchant service provider and are updated daily by direct integration with the CIS and Utility Billing System.

2. ORCC provides a payment consolidation service to the Town. Other financial institutions transmit utility customer payments to ORCC using Remote Payment and Presentment Service (RPPS). ORCC transmits an electronic payment file to the Town's billing system and makes a daily ACH deposit to the Town's bank account.
3. On-line payment services that do not have an arrangement with the Town and who are not compatible with ORCC using RPPS, send their company's original checks to the Town by mail for each payment made online by the Town's utility customers. These paper checks are processed using the RemitPlus software.

Interactive Voice Response (IVR): IVR is an over-the-phone payment option made available to the Town's utility customers through the Town's merchant service provider. It offers select information to the Town's utility customers including the total amount due and the most recent bill due date. IVR allows the customer to make payment by credit card and by echeck, directly from their bank account. IVR automatically inputs the payment into a cash receipts batch directly in the cash receipting system.

Bank Drafts: Customers submit a signed paper application for bank drafts or request enrollment online through the Town's website. The signed paper application is manually input by a Customer Service Representative into the billing system whereas the online request is automatically entered into the billing system. This information is electronically transmitted to the bank on the scheduled bank draft date.

Accounts Receivable System

The current systems include an accounts receivable system (AR system). This system allows for the tracking and periodic billing of fees under Utility Water Service Agreements and other arrangements.

General Ledger System

The utility billing and AR systems produce general ledger journal entry files. The files are manually updated each morning by Town Finance personnel.

Records Retention

The utility billing system automatically creates electronic copies of billing reports and transactional data required by retention statutes and acts as the central repository for CIS and other utility billing related documentation.

Current System Limitations

The current payment portal accessed by customers through the Town's website does not allow for recurring credit card payments. This functionality is currently in development by the utility billing system vendor and is expected to be ready for testing in early FY2017 and released for implementation shortly thereafter.

In addition, the current billing and cash receipting systems do not have the ability to accept debit card payments, but do allow for pinless debit (credit card) payments. This is expected to remain a permanent system limitation due to the availability of the pinless debit.

Currently, the AR system is not fully integrated with the cash receipting system and requires additional processing by Utilities personnel to maintain systems synchronization. The integration is currently in development by the cash receipting system and financial management system vendors and is expected to be ready for testing in early FY2017 and released for implementation shortly thereafter.

Asset Management

The Town recently purchased and installed software from Harris, specifically, the CIS Infinity and Lucity Enterprise Asset Management (EAM) software packages, for providing billing and customer service operations management as well as management of existing assets. Upgrading the Town's software for customer billing will provide faster bill payments and improved management of customer service through direct integration with the EAM system. The asset management software will assist the Town in maintaining and extending the useful life of the Town's individual assets.

The Town previously utilized the SunGard Public Sector NaviLine Select CIS/Utility Billing and Cash Receipting applications for customer service operations. The Town also previously used Antero by Allmax for the water treatment plant asset management needs and Vue Works for field operational work orders.

The asset management project was divided into three implementation phases:

- Phase One (I) included the implementation of CIS Infinity and the related central cashiering functionality of iNovah.
- Phase Two (II) included the implementation of Lucity Enterprise Asset Management solution including request for service, asset, fleet, equipment, facilities and work order management.
- Phase Three (III) included the integration of iNovah to support cashiering for other Town back end systems.

Phase I was conducted independently of Phases II and III. Phase I provided a transition into the new customer information and central cashiering system with significantly more automation than previous software allowed.

Phase II provided additional mobility functionality and GIS integration for the Town compared to prior generations of asset management software. The Town has completed the data migration, interface with GIS, testing and training. The Town is routinely using the Lucity software to generate work orders, track assets, and schedule assets for replacement.

Now ongoing, the Utility is formulating strategies to utilize Lucity to maximize asset life expectancy in consideration of life cycle cost plus risk of failure in order to ensure exceptional customer service and public safety, health and reliability with the overall intent of serving customers in the most effective and efficient manner. These strategies are being designed to provide for achievement of the following goals:

- Better planning for maintenance and service based on age of individual components installed
- Detailed tracking and analytical reporting of maintenance and operational condition
- Red flag reminders of items approaching and/or past their useful life
- Business risk analysis by individual components and asset groups
- The ability to determine extension of useful life based on historical data analysis within the system
- The ability to analyze and determine if repair cost investment is appropriate given the residual value and/or the replacement cost of the asset
- The ability to capture and determine water quality benefits obtained from asset maintenance and/or improvements
- The ability to use historical data to assist in refining, updating and/or supporting R&R contribution requirements and reserves

Phase III provided the cashiering support services for Energov community development related payments and is proceeding as planned for the TOWN.

Overall, these strategies should allow the Utility to move toward a more proactive approach to asset management while allowing for a reduction in reactionary maintenance.

Geographic Information System

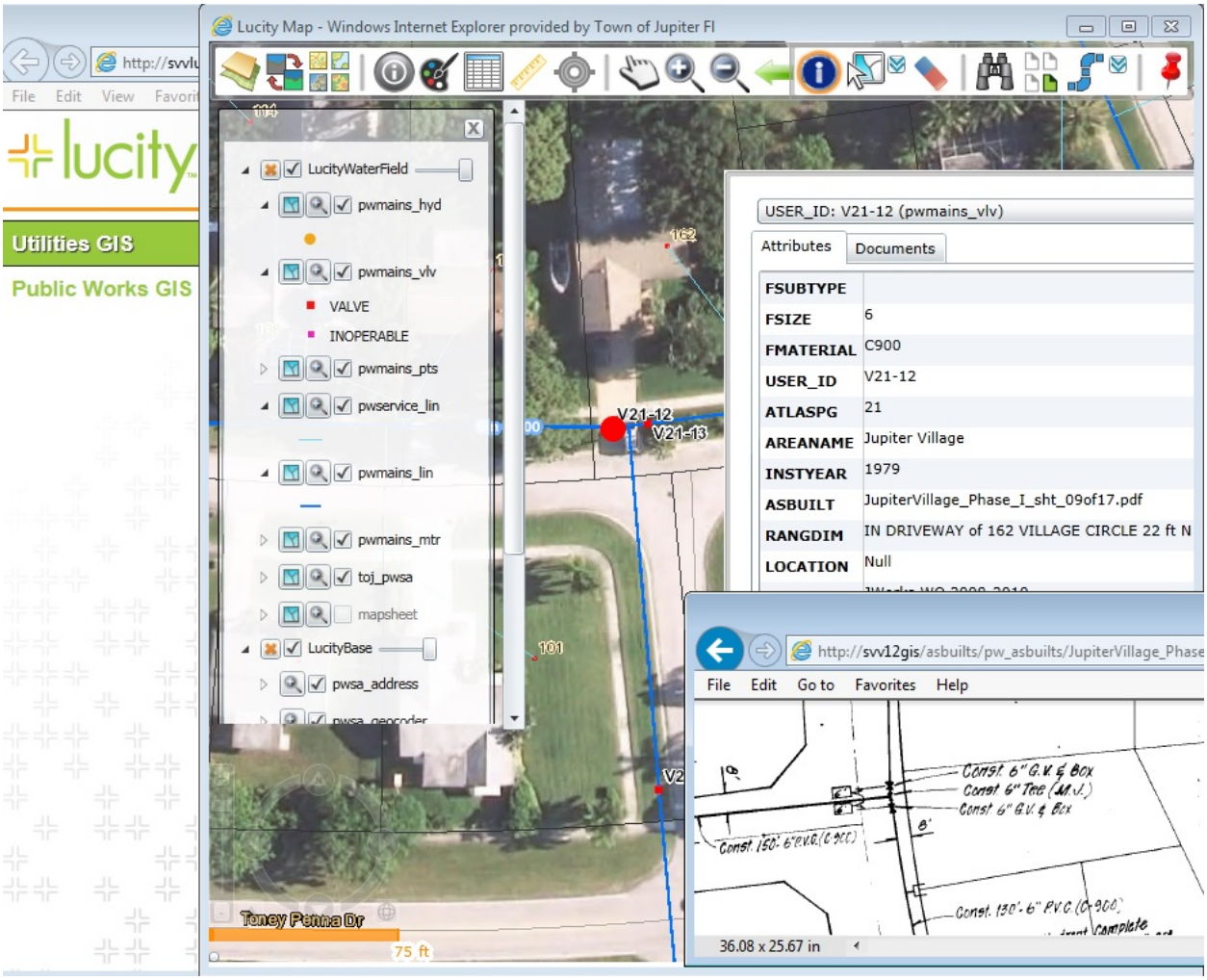
The Utility's Geographic Information System (GIS) has grown with respect to the number of layers maintained, the number of features stored, the amount of detail in attribution, spatial accuracy, and accessibility, and serves as an irreplaceable tool for the Town's potable water production and distribution systems. Over 3,600 hydrants, 8,000 valves, 29,400 water accounts, and many other features are incorporated with nearly 470 miles of pipe into a networked geographic model of the water distribution system.

Utility staff and others access and utilize the GIS in various ways to support critical functions. A full distribution system atlas is published every 2 years along with other maps for a variety of uses. A web-browser with tablet based viewer and asset management system was implemented and provides multiple, easy to use searches, one-click access to feature attributes, maintenance and inspection records, water accounts, and other information, along with the ability to instantly view linked documents such as as-built drawings, as shown in **Figure 1.20**. Another example of an application, shown in **Figure 1.21**, that the Utilities GIS has developed identifies which valves to turn, and which accounts are affected by a line break or scheduled service interruption, with a click of the mouse at the break location. Users output the listed pertinent accounts with phone numbers to an automated call system to provide additional boil water notification beyond door cards. The topologically integrated water distribution GIS network also enables hydraulic modeling, fully representing actual usage, pipe size and material, and other requirements.

Water production wells, mains, recharge system infrastructure, and other information have also been converted and loaded into GIS, to provide mapping and enable inclusion into the viewer and asset management system.

As the Utility has grown, so has GIS. Utilities GIS helps plan, manage, and incorporate additions to the system, and constantly increases the level of detail and accuracy of existing utility infrastructure. Continual needs analysis strives to efficiently assist management of assets, streamline workflows, and provide accountability in order to better serve our growing customer base.

Figure 1.20


Lucity Map - Windows Internet Explorer provided by Town of Jupiter Fl
lucity
Utilities GIS
Public Works GIS
LucityWaterField
pwmains_hyd
pwmains_vlv
VALVE
INOPERABLE
pwmains_pts
pwservice_lin
pwmains_lin
pwmains_mtr
toj_pwsa
mapsheet
LucityBase
pwsa_address
V21-12
V21-13
Toney Penna Dr
75 ft
USER_ID: V21-12 (pwmains_vlv)
Attributes
Documents
FSUBTYPE
FSIZE 6
FMATERIAL C900
USER_ID V21-12
ATLASPG 21
AREANAME Jupiter Village
INSTYEAR 1979
ASBUILT JupiterVillage_Phase_I_sht_09of17.pdf
RANGDIM IN DRIVEWAY of 162 VILLAGE CIRCLE 22 ft N
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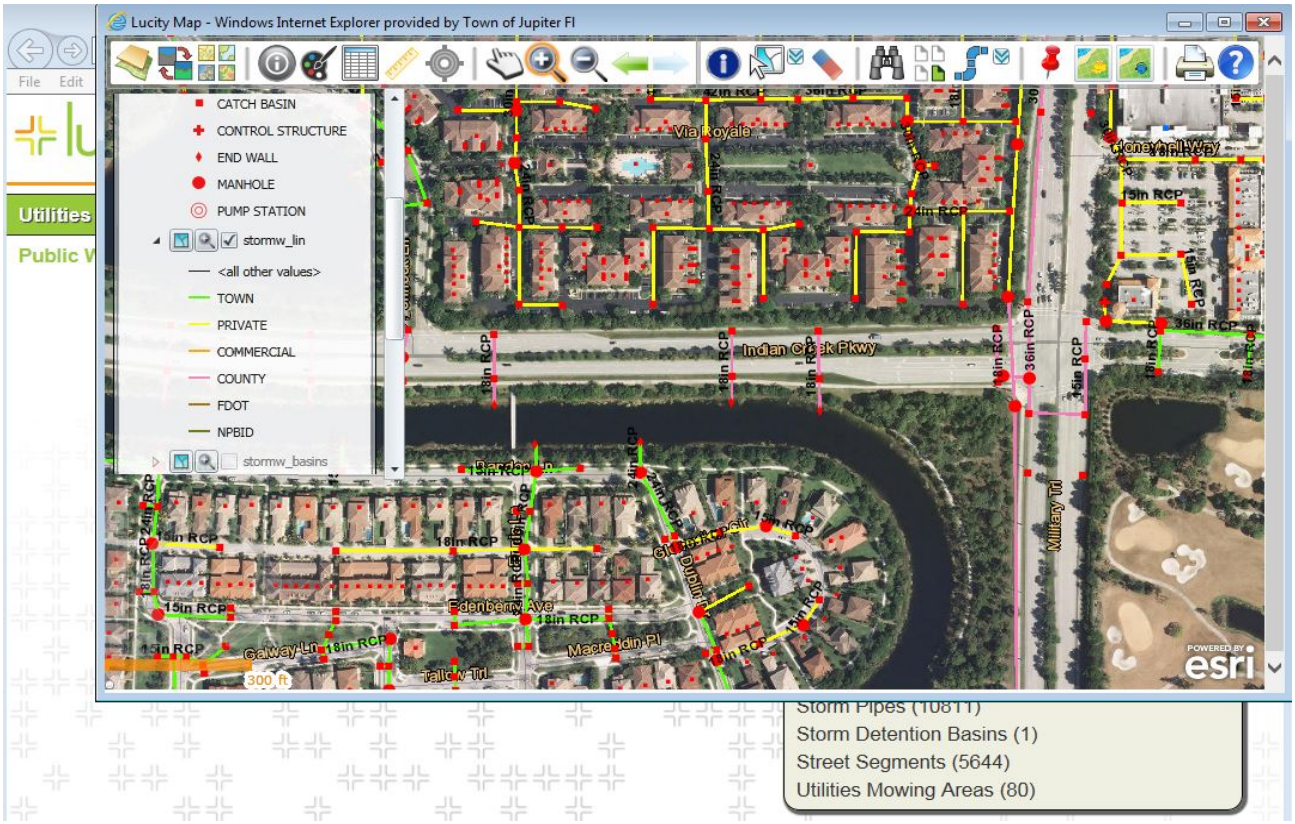
36.08 x 25.67 in

Figure 1.20 (continued)



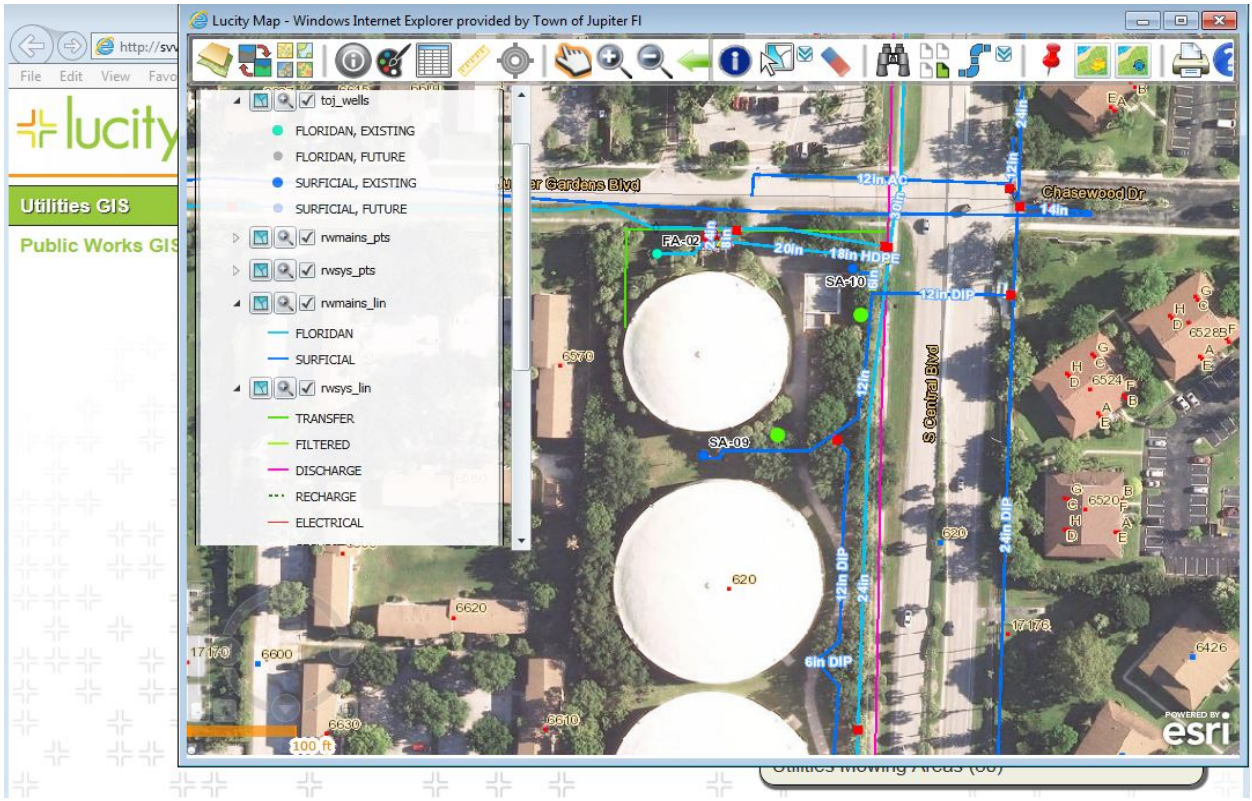
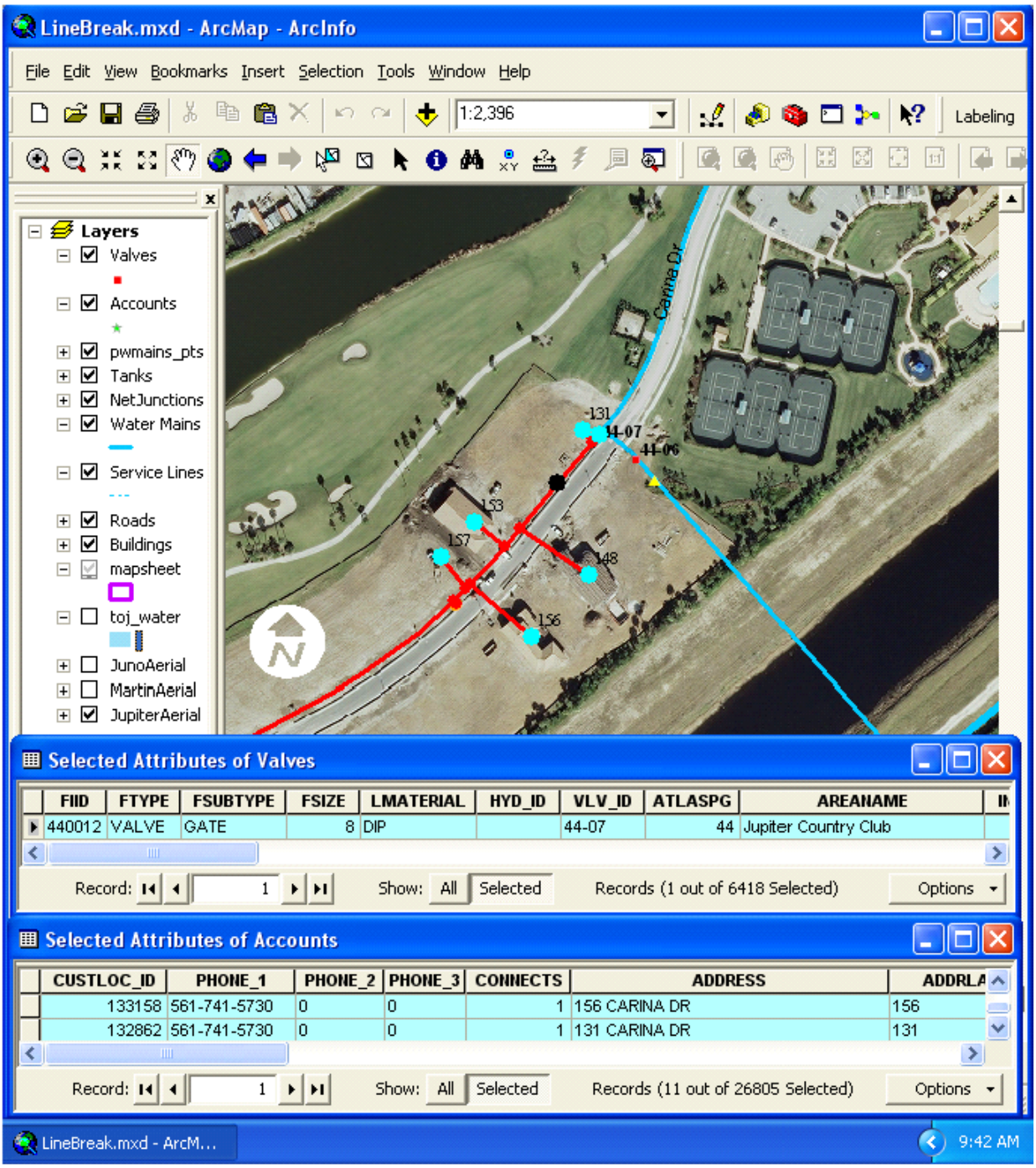


Figure 1.21

SERVICE INTERRUPTION NOTIFICATION



IX. Level of Service

The Jupiter Water Utility is subject to federal, state and local regulation. At the federal level, regulatory jurisdiction is vested in the United States Environmental Protection Agency (EPA). The Florida Department of Environmental Protection (FDEP) is the state agency with authority over water treatment, and at the local level, the Palm Beach County Health Department administers the regulations of the FDEP.

1. **Federal:** The Town's utility is regulated by the EPA under the Safe Drinking Water Act (SDWA). Via the SDWA, EPA has promulgated nationwide drinking water regulations which specify the maximum levels of harmful contaminants allowed in drinking water and which govern the construction, operation and maintenance of water supply systems.

2. **State and Local:** Under the terms of the SDWA, states have primary enforcement responsibility for public water systems if the EPA determines that the state's drinking water regulations are at least as stringent as the federal drinking water regulations. Florida has adopted all of the regulations promulgated by the EPA pursuant to the SDWA as part of its drinking water program. Thus, regulation of the system is primarily under the jurisdiction of the State of Florida. The State of Florida has delegated the administration of its water program to certain qualifying County Health Departments throughout the state. That delegation has taken place in Palm Beach County.

The quality of water provided by Jupiter's Water System exceeds all state and federal requirements. Jupiter's Water Utility was awarded the EPA's Safe Drinking Water Act Excellence Award in 1999, 2001, 2008 and 2010, signifying it as the best drinking water facility in the Southeastern United States. In total, the Utility has been honored more than 50 times with various awards related to operations, treatment and drinking water quality.

Jupiter Water System History of Award Winning Service

United States Environmental Protection Agency

1999 Safe Drinking Water Act Excellence Award for the Large Ground Water Public Water Supply- Region 4 (Southeastern United States)

2001 Safe Drinking Water Act Excellence Award for the Large Ground Water Public Water Supply- Region 4 (Southeastern United States)

2008 Safe Drinking Water Act Excellence Award for the Large Ground Water public Water Supply- Region 4 (Southeastern United States)

2010 Safe Drinking Water Act Excellence Award for the Large Ground Water Public Water Supply- Region 4 (Southeastern United States)

Florida Department of Environmental Protection

1977 Best Class B Water Plant in the Southeast District
1978 Best Class B Water Plant in the Southeast District
1983 Honorable Mention Best Plant Award in the Southeast District
1984 Honorable Mention Best Plant Award in the Southeast District
1985 Best Public Water Treatment Plant in Southeast District
1996 Excellence Award – Large Community Water Treatment Plant Southeast District
1997 Excellence Award – Large Community Water Treatment Plant Southeast District
2000 Excellence Award – Large Community Water Treatment Plant Southeast District
2001 Excellence Award – Large Community Water Treatment Plant Southeast District
2008 Excellence Award – Large Community Water Treatment Plant Southeast District
2009 Excellence Award – Large Community Water Treatment Plant Southeast District
2010 Excellence Award – Large Community Water Treatment Plant Southeast District
2013 Excellence Award – Large Community Water Treatment Plant Southeast District
2016 Excellence Award – Large Community Water Treatment Plant Southeast District

Florida Section American Water Works Association

1991 President's Gold Performance Safety Award
1991 Award of Excellence Safety Award
1993 Award of Excellence Safety Award
1997 Award of Excellence Safety Award
1998 Award of Honor Safety Award
2000 Most Outstanding Class A Water Treatment Plant Award
2006 Award of Excellence Safety Award
2007 Most Outstanding Class A Water Treatment Plant Award
2008 Most Outstanding Class A Water Treatment Plant Award

2009 Most Outstanding Class A Water Treatment Plant Award
2010 Most Outstanding Water Distribution System Award (Division IV)
2014 Most Outstanding Class A Water Treatment Plant Award
2016 Most Outstanding Water Distribution System Award (Division IV)

Florida Water & Pollution Control Operators Association

1982 Best Operated Water Distribution System Class A
1983 Best Operated Water Distribution System Class A
1983 Best Operated Water Treatment Plant under 15 MGD Class A
1984 Best Maintained Water Distribution System Class A
1984 Best Operated Water Distribution System Class A
1985 Best Operated Water Distribution System Class A
1986 Best Operated Water Distribution System Class A
1988 Best Operated Water Distribution System Class A
1989 Best Operated Water Treatment Plant under 15 MGD Class A
1991 Best Operated Water Distribution System Class A
1992 Best Operated Water Treatment Plant under 15 MGD Class A
1992 Best Operated Water Distribution System Class A
1993 Best Operated Water Distribution System Class A
1994 Best Operated Water Distribution System Class A
1995 Best Operated Water Treatment Plant under 15 MGD Class A
1996 Best Operated Water Treatment Plant under 15 MGD Class A
1996 Best Operated Water Distribution System Class A
1997 Best Operated Water Distribution System Class A
2004 Best Operated Reverse Osmosis Plant Award
2007 Safety Excellence Award

American Membrane Technology Association

1996 Engineering Excellence Award
1996 Presidential Distinguished Service Award
1998 Presidential Distinguished Service Award
2001 Distinguished Service Award

Southeast Desalting Association

2003 Membrane Plant of the Year Award
2011 Membrane Plant of the Year Award
2012 Outstanding Membrane Plant Award

In addition to having been honored for excellence as noted above, Jupiter's Utility has been a leader and innovator in developing/utilizing alternative water supplies and implementing other measures and programs to preserve fresh water for the critical environmental resources of the region.

X. Costs for Service

a. Retail Rates

Even though Jupiter Utilities now uses the most advanced water treatment technologies to process up to 30 million gallons of water per day, its rates are 22% lower than the average paid in the region spanning from St. Lucie County to Palm Beach County. Reference is made to **Table 1.8** below.

Table 1.8

Regional Water Rate Comparison - All Major Utilities
10,000 Gallons Used

Rank	Utility	Monthly Rate
1	Delray Beach	$24.47
2	Boynton Beach	$30.16
3	Boca Raton	$34.78
4	**Jupiter**	**$34.97**
5	Lantana	$35.72
6	Palm Beach County Utilities	$36.40
7	Highland Beach	$36.50
8	South Martin Regional	$37.05
9	Tequesta	$37.68
10	Martin County Utilities	$38.43
11	Royal Palm Beach	$40.48
12	Seacoast Utility Authority	$41.42
13	Wellington	$42.86
14	Stuart	$44.03
15	Riviera Beach	$44.29
16	Ft. Pierce Utility Authority	$49.08
17	West Palm Beach	$56.54
18	Port St. Lucie	$58.50
19	Lake Worth	$62.03
20	Manalapan	$66.25
21	St. Lucie County	$70.30
Average Rate of Other Utilities		**$44.85**
Jupiter Rate vs. Average Rate of Other Utilities		**-22.0%**

*Survey data obtained from utilities in June 2016.

Table 1.9 evaluates utilities which similarly use advanced treatment technologies and brackish water reverse osmosis which is a more "apples to apples" comparison of similar treatment operations. In this circumstance, Jupiter's rate falls over 26% below the average.

Table 1.9

Regional Water Rate Comparison
Only Utilities Which Utilize RO Treatment
10,000 Gallons Used

Rank	Utility	Monthly Rate
1	**Jupiter**	**$34.97**
2	Palm Beach County Utilities	$36.40
3	Highland Beach	$36.50
4	South Martin Regional	$37.05
5	Tequesta	$37.68
6	Martin County Utilities	$38.43
7	Royal Palm Beach	$40.48
8	Seacoast Utility Authority	$41.42
9	Ft. Pierce Utility Authority	$49.08
10	Port St. Lucie	$58.50
11	Lake Worth	$62.03
12	Manalapan	$66.25
13	St. Lucie County	$70.30
Average Rate of Other Utilities		**$47.84**
Jupiter Rate vs. Average Rate of Other Utilities		**-26.9%**

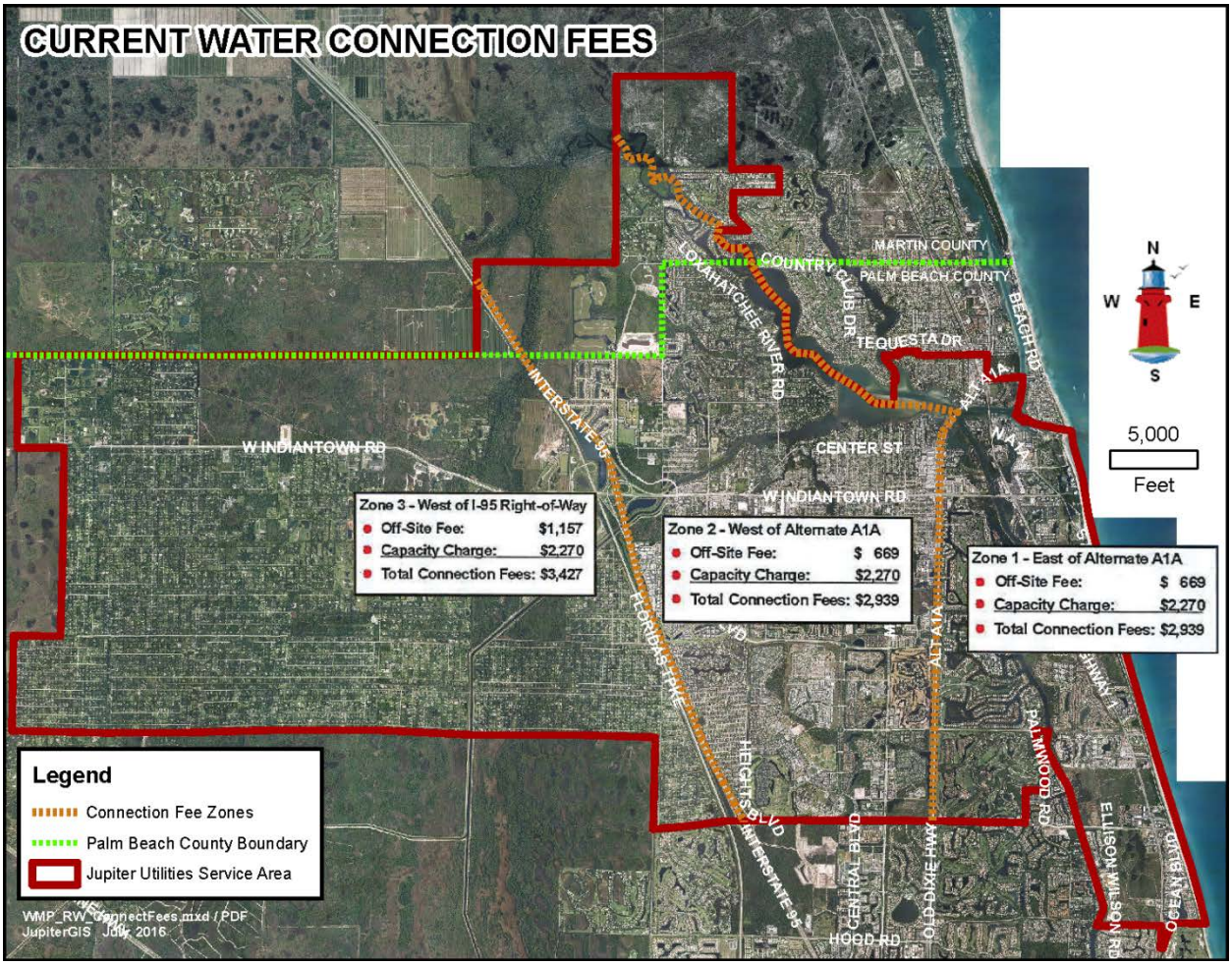
*Survey data obtained from utilities in June 2016.

b. Capital Charges

Connection Charges are capital charges levied against new system customers in order to allocate the cost of new plant facilities required by the average demand the new user proposes to exert upon the system. The current connection charge consists of two components which recover from developers their fair share of the cost of water treatment facilities (plant capacity charges) and the water transmission facilities (off-site transmission fees).

Jupiter's water transmission system has three regions or service zones (as shown in **Figure 1.22**). Generally speaking, Zone 1 encompasses all properties east of Alternate A1A, Zone 2 includes properties west of Alternate A1A but east of I-95, and Zone 3 includes all parcels west of I-95. These separate areas are necessary to more appropriately divide the relative costs of water transmission based on location.

Figure 1.22


CURRENT WATER CONNECTION FEES
MARTIN COUNTY
PALM BEACH COUNTY
COUNTRY CLUB DR
LOXAHATCHEE RIVER RD
TEQUESTA DR
BEACH RD
W INDIANTOWN RD
INTERSTATE 95
CENTER ST
W INDIANTOWN RD
ALT A1A
FLORIDA'S TPKE
HEIGHTS BLVD
CENTRAL BLVD
HOOD RD
OLD DIXIE HWY
PALMWOOD RD
ELLISON WILSON RD
OCEAN BLVD
N
W
E
S
5,000
Feet
Zone 3 - West of I-95 Right-of-Way
Off-Site Fee: $1,157
Capacity Charge: $2,270
Total Connection Fees: $3,427
Zone 2 - West of Alternate A1A
Off-Site Fee: $ 669
Capacity Charge: $2,270
Total Connection Fees: $2,939
Zone 1 - East of Alternate A1A
Off-Site Fee: $ 669
Capacity Charge: $2,270
Total Connection Fees: $2,939
Legend
Connection Fee Zones
Palm Beach County Boundary
Jupiter Utilities Service Area
WMP_RW_ConnectFees.mxd / PDF
JupiterGIS July 2016

When the Town acquired the System in 1978, connection charges were established and collected at the rate of $750.00 for each new single family unit and $528.00 for each multifamily unit. The level of such charges was based upon the cost of conventional water treatment plant facilities. In subsequent years, the Town increased connection charges due to the increased cost of advanced membrane technology treatment facilities and incremental increases in the cost of water transmission, as well as to account for normal inflationary factors. Town Ordinance No. 42-08 contains provisions for the further adjustment of connection charges to account for future inflation or for necessary improvements in treatment technology to ensure regulatory compliance and system reliability.

Table 1.10 shows the current total connection charges for the various service zones.

Table 1.10

System Connection Charges[1]

	Service Zone One	**Service Zone Two**	**Service Zone Three**
Plant Capacity Charge	$ 2,270	$ 2,270	$ 2,270
Off-site Transmission Fee	$ 669	$ 669	$ 1,157
Total Connection Charges	$ 2,939	$ 2,939	$ 3,427

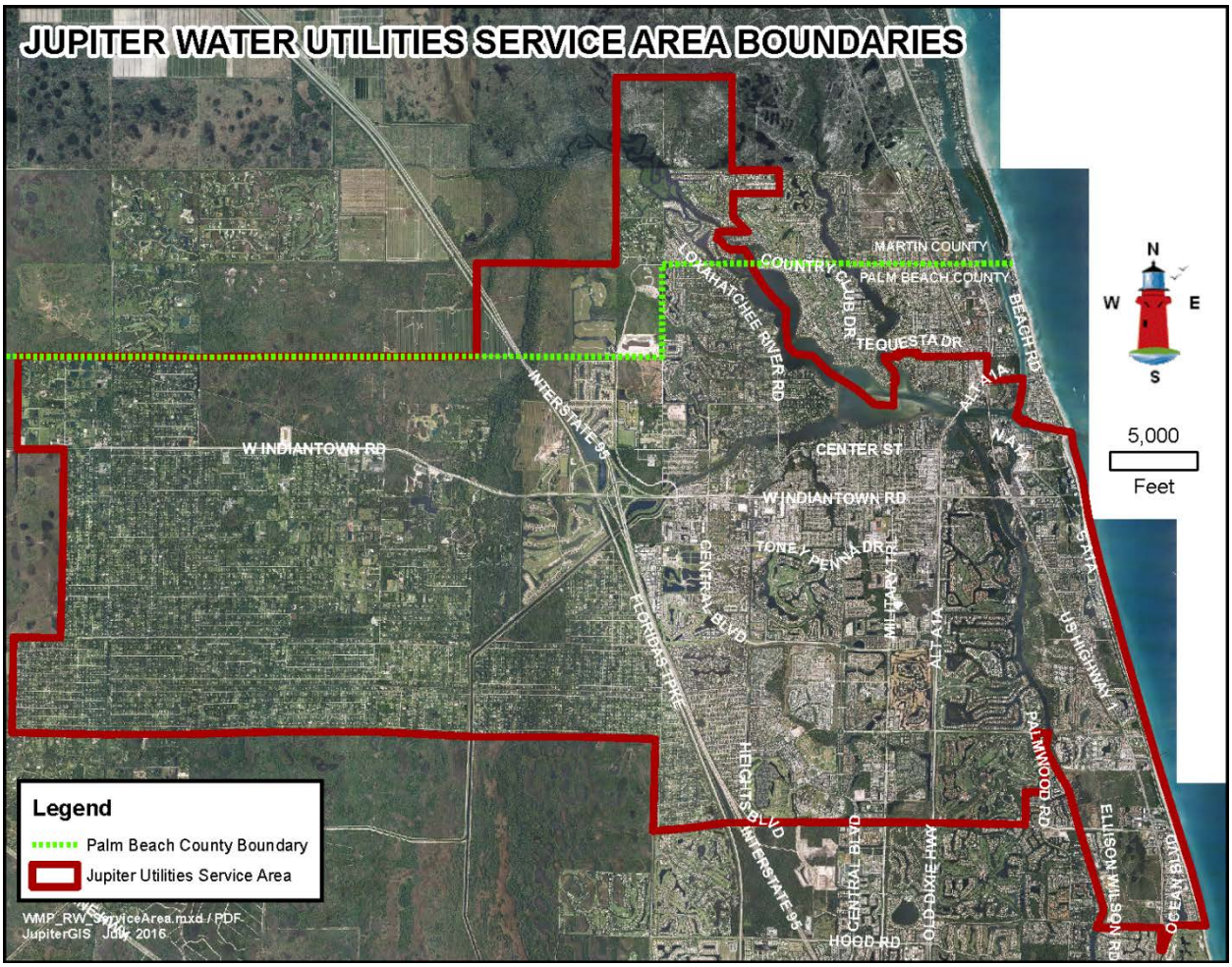
[1] *Amounts shown provided by Town and do not include administrative fees or other fees such as meter installation charges. Charges and fees based on 1.0 ERC.*

Chapter 2: Future Condition Assessment

I. Service Area, Customer Base and Production Demands

Projections for both population and water demand were developed for the Town's potable water service area for the years 2020 through 2035, based on the best available data.

Figure 2.1



Population Projections

Service area population estimates were derived from the 2015 Population Allocation Model, which was developed and is maintained by the Palm Beach County Planning Division. The following is an excerpt from the model developer's metadata:

Each year, the State of Florida, Office of Economic and Demographic Research (OEDR) and the University of Florida's Bureau of Economic and Business Research (BEBR) issue population projections in five-year increments for every Florida County. Palm Beach County has developed a

Population Allocation Model to allocate the countywide figures to smaller geographies called Traffic Analysis Zones (TAZs) throughout the County for localized planning efforts, providing population projections for these TAZs through 2035.

The 2015 Population Allocation Model incorporates:

- *the 2010 Census populations and related information (released in August 2011) such as persons per household, group quartered populations, vacancy and seasonal rates by TAZs. Henceforth the baseline for future population models will be the year 2010.*
- *the latest OEDR projections, released in April 2015. These projections are based on the 2010 Census released in late March of 2011, and the 2014 OEDR population estimates released in the Fall of 2014.*
- *all land use densities changes, approved or expired residential projects, annexations, and 2014 Municipal population estimates, adopted up to April 2015.*
- *the 2010 MPO Traffic Analysis Zones, adding over 500 zones in the urban area and enabling a finer breakdown of geography and calibration of population estimates.*

That the County's population projections are based geographically on TAZ is useful and fully appropriate for application to the Town's service area because portions of the service area extend beyond the Town's boundary into unincorporated Palm Beach County, and into small areas within southern Martin County. Using geographic information system (GIS) data provided by the Town, Palm Beach County and Martin County, service area TAZs were identified to aid in the extraction of data from the Population Allocation Model.

Martin County does not currently support a similar model for spatializing county-wide OEDR/BEBR population projections. Hence, an alternate method was implemented for determining current and future service area population for the relatively small portion of the County falling within the Town's water service area. That area's current population was determined by multiplying the number of existing water service connections by a calculated residents/dwelling value that was based on Town of Jupiter census data (1.85 persons per dwelling unit). Populations for 2020, 2025, 2030 and 2035 were projected by applying this same coefficient to the number of outstanding Equivalent Residential Connections (ERCs) within the Martin County portion of the service area. ERCs were assumed to be converted to population growth evenly within each of the four future time steps.

Current (2015) and projected service area population is presented in **Table 2.1**.

Table 2.1
Projected Service Area Population

	Year				
Service Area	**2015**	**2020**	**2025**	**2030**	**2035**
Palm Beach County	78,736	85,134	87,242	89,505	91,893
Martin County	2,121	2,221	2,322	2,423	2,524
Total Service Area	82,872	89,375	91,589	93,958	96,451

Potable Water Demand Projections

Potable water demand projections for the Town's service area were developed by applying a Town service area per capita consumption coefficient to the projected population estimates shown in **Table 2.1**. The per capita consumption coefficient (gal/day) was computed by dividing average annual consumption (based on customer billing records and water treatment plant operations data) for 2013, 2014 and 2015 by the respective year's service area population, then by taking the average of the three annual results. The per capita consumption coefficient used for projecting demand for 2020, 2025, 2030 and 2035 was 190 gal/day. The projected Town service area average, equivalent residential connections (ERC) served and peak daily finished water demands through 2035 are provided in **Table 2.2**.

Table 2.2
Projected Service Area Potable Water Demand

	Year				
	2015	**2020**	**2025**	**2030**	**2035**
Average Finished Water Demand (MGD)	15.89	16.57	16.99	17.44	17.91
Equivalent Residential Connections Served (ERCs)	45,400	49,314	50,864	51,964	52,402
Peak Finished Water Demand (MGD) – Peaking Factor of 1.4	22.25	23.20	23.79	24.42	25.07
Peak Finished Water Demand (MGD) – Including Non-Revenue Water (13%)	25.14	26.22	26.88	27.59	28.33

Although the water utility service area encompasses the region depicted in **Figure 2.1** it is important to note that all future population/demand forecasts above do not incorporate water service to Jupiter Farms. Service to Jupiter Farms would only be provided if residents request such service and system capacity remains at that point in the future.

Table 2.3

Town of Jupiter Water Utilities
Quarterly Rolling Annual Peak
Finished Water Demand vs Annual Average Finished Water Demand

Month	Year	ADF	PDF	PDF/ADF
Mar	2007	18.11	23.36	1.29
Jun		16.86	21.47	1.27
Sep		16.00	21.47	1.34
Dec		14.60	21.47	1.47
Mar	2008	13.13	19.45	1.48
Jun		13.00	20.73	1.59
Sep		15.30	20.73	1.35
Dec		14.00	20.73	1.48
Mar	2009	14.44	20.73	1.44
Jun		14.60	20.12	1.38
Sep		13.64	20.12	1.48
Dec		13.87	20.12	1.45
Mar	2010	13.64	20.12	1.48
Jun		13.72	19.62	1.43
Sep		14.45	19.91	1.38
Dec		15.13	18.33	1.21
Mar	2011	15.17	22.30	1.47
Jun		16.07	20.28	1.26
Sep		13.39	20.28	1.52
Dec		14.14	20.28	1.43
Mar	2012	15.14	20.28	1.34
Jun		15.15	19.83	1.31
Sep		14.52	19.83	1.37
Dec		14.73	19.83	1.35
Mar	2013	15.57	19.83	1.27
Jun		14.64	18.97	1.30
Sep		14.10	18.97	1.35
Dec		15.62	19.90	1.27
Mar	2014	14.69	19.90	1.35
Jun		15.53	19.90	1.28
Sep		13.86	19.90	1.44
Dec		15.04	18.42	1.23
Mar	2015	15.11	18.42	1.22
Jun		16.60	19.93	1.20
Sep		15.37	20.47	1.33
Dec		15.94	20.47	1.28
Mar	2016	15.14	20.47	1.35
Post Year Round Conservation Rule Avg.:				1.36

* Includes the time period spanning from 10/1/07 to the present.

II. Regulatory Assessment

The Town of Jupiter remains governed by the Safe Drinking Water Act (SDWA), as discussed in the previous updates to the master plan. Under SDWA, the EPA sets legal limits on the levels of certain contaminants in drinking water. To regulate a contaminant, EPA first determines if:

- The contaminant may have an adverse effect on the health of persons.
- The contaminant is known to occur or the likelihood exists that the contaminant will occur in public water systems with a frequency and at levels of public concern.
- Regulation of the contaminant presents a meaningful opportunity for health risk reductions for persons served by public water systems.

The legal limits reflect both the levels that protect human health and the level that water systems can achieve using the best available technology. The rules also establish water-testing schedules and methods that water systems must follow. SDWA also gives the states the ability to establish and enforce their own drinking water standards as long as the standards meet or exceed EPA's standards.

While the previous regulations from the most recent master plan update are still applicable, the following summarizes recent actions related to certain regulatory issues currently affecting the Town.

Groundwater Rule

The Environmental Protection Agency (EPA) published the Ground Water Rule (GWR) in the Federal Register on November 8, 2006. The GWR became effective on December 1, 2009. The Town has been proactive in pursuing 4 log virus inactivation/removal certification through the local Health Department under the Ground Water Rule (GWR) but has not received approval from the Palm Beach Health Department to-date. However, the Town is presently in full compliance with the terms of the GWR by following the "triggered" monitoring approach. By receiving certification, though, the Town will be allowed to follow a separate track which will no longer require immediate public notification upon a single positive test result at a well.

Groundwater systems that are unable (or do not desire) to achieve certification of 4 log inactivation/removal are expected to comply with assessment and triggered source water monitoring requirements while those that are certified follow only the assessment source water monitoring approach. Source water monitoring is "triggered" whenever a utility obtains a total coliform positive (TC+) from a routine distribution system sample under the Total Coliform Rule of FAC Rule 62.550. The utility is then expected to collect at least one ground water source sample per TC+ from each of the production wells in use at the time that the TC+ sample was collected. Samples must be collected and analyzed for fecal indicators within 24 hours of

obtaining the TC+ notification. (Note: For GWR compliance, the requirements for routine assessment source water monitoring are adopted from FAC Rules 62-550.518 and 62-555.315.) If any triggered or assessment source water sample is a positive fecal indicator (FI+), the utility must issue Tier 1 public notice, collect additional samples and initiate corrective action. For utilities with a large number of raw water wells, triggered monitoring can be a timely and costly activity. It can also result in public concern and erosion of consumer confidence in the Town's water supply.

The Town should continue communications with the Health Department until the certification of 4 log virus removal is obtained. The parallel membrane plants each provide 2 log removal under the GWR. The remainder of the credit can be obtained through chlorination. However, with the recent blending box addition, the Town has elected to demonstrate 4 log removal/inactivation solely through the chlorination process. The Town has resubmitted the revised calculations to include the blending box and is presently awaiting approval from the Health Department.

Contaminants of Emerging Concern

The Town previously identified the concern for the treatment of contaminants of emerging concern (CECs); those chemicals that have been shown to occur widely in water resources and identified as being a potential environmental or public health risk. CECs include detergents, fragrances, prescription and nonprescription drugs, disinfectants, disinfection byproducts, pharmaceuticals, personal care products, pesticides, herbicides, algal toxins, pathogens, and other persistent compounds such as flame retardants and phthalates. CECs, including pharmaceuticals, personal care products (PCPs) and endocrine disrupting chemicals (EDCs) have been detected at low levels in surface water, treated wastewater, and drinking water. While early research suggests that the presence of these compounds in drinking water represents a low risk to human health, knowledge gaps still exist related to occurrence, environmental chemistry, risk to vulnerable populations, treatment effectiveness and data availability. For this reason, the Town conducted research to assess the occurrence of CECs in the surficial aquifer and the ability of the nanofiltration process to remove these constituents since the Loxahatchee River District provides treated wastewater for irrigation within the vicinity of the Town's surficial aquifer supply wellfields.

The Town's initial screening of CECs was conducted in 2008/2009. A total of 32 compounds were analyzed including synthetic and naturally occurring hormones (e.g. estrone), pharmaceutically active compounds (PACs) (e.g. caffeine and antibiotics), personal care products (e.g. bisphenol A (BPA)) and pesticides, herbicides and insecticides (e.g. atrazine and DEET). The Town sampled the surficial aquifer, NF permeate, and the reclaimed water

distributed by the Loxahatchee River District to understand the potential relationship between the reclaimed water and the surficial aquifer as well as the removal abilities of the NF facility.

Of the 32 compounds sampled, 17 compounds were detected in reclaimed water. Only one was a currently regulated compound (atrazine). Atrazine was detected in the reclaimed water at 52 nanograms per liter (ng/L), far below the limit of 3,000 ng/L.

For the surficial aquifer, only three compounds were detected, with values between 5.4 and 100 ng/L. Of these, only one, BPA was detected in the permeate. Based on the data, the Town concluded that few compounds from the reclaimed water were transported into the surficial aquifer and were likely transformed or degraded. Furthermore, the results for BPA were inconclusive because of the presence of plastic in the conveyance system which may have contributed to its detection.

In a separate study, the Town demonstrated the removal ability of the nanofiltration process through the existing pilot plant. Specifically, the Town spiked raw water with the following compounds to determine removal percentages: BPA, caffeine, barbamazepine, N,N-Diethyl-meta-toluamide, estrone, gemfibrozil, naproxen, sucralose, sulfamethoxazole. The compounds were rejected from 69% to 98% through the nanofiltration process. In general, the higher polarity and higher molecular weight compounds were rejected the most.

Since the reverse osmosis is a tighter membrane process, with an inherent higher rejection capability, and since the Floridan Aquifer is better protected by virtue of its natural depth, the experiments were only conducted on the nanofiltration process. If the nanofiltration process can be proven to remove the CECs to acceptable levels, then the reverse osmosis process, as a tighter process, will be proven as well.

The Town continues to sample and monitor the surficial aquifer in order to build a larger CEC database. The Town should continue sampling for both wet and dry seasons, as demand for and application of reclaimed water as well as withdrawal from the surficial aquifer varies during these seasons. Additionally, the Town should sample wells outside of the reclaimed water application areas for comparison.

Pending Regulatory Actions

The Town should furthermore be aware of and prepare for the following pending regulatory actions:

- Long Term Revisions to the Lead and Copper Rule (LT-LCR) – forthcoming revisions to sample site selection criteria and sampling of schools/day cares, etc. These revisions are anticipated to be expedited as a result of the recent crisis in Flint, Michigan.

- PFOA and PFOS – EPA recently released a fact sheet to inform water utilities of the health risks of these chemicals so they can take appropriate protective actions. PFOA and PFOS are fluorinated organic chemicals that have been used in a vast array of consumer products. The health advisory levels were issued by EPA at 70 ng/L for PFOS, for PFOA, and for the sum of both. Utilities are required to monitor for PFOA and PFOS under the third Unregulated Contaminant Monitoring Rule (UCMR 3) in 2012. EPA will monitor the occurrence data from UCMR 3, along with peer reviewed health assessments, to determine whether or not to develop a national primary drinking water regulation.

- Security – The potential exists for future security related requirements for the Public Health Security and Bioterrorism Preparedness and Response Act of 2002. If additional studies are warranted, the Town should consider following AWWA J100-10 (R13) Risk and Resilience Management of Water and Wastewater Systems (RAMCAP) protocol.

III. Future Capital Needs Assessment

The Town's utility system provides heightened emphasis on long-range capital and financial planning in its operation. As part of this effort, a 25 year planning horizon is viewed in which operational and capital finances are projected in order to manage for long term sustainability of the system. The following section contains new capital requirements or programs that have become prevalent in planning efforts including this master plan update.

a. Sea Level Rise Preparatory Surficial Aquifer Raw Water Well Consolidation

The Town is permitted by the SFWMD to withdraw up to a monthly maximum of 19.9 million gallons per day (MGD) from the shallow aquifer system (SAS) for treatment and supply to the region. Roughly half of the Town's water supply is withdrawn from the SAS.

Jupiter's coastal location makes the Town's Surficial Aquifer System wellfields vulnerable to potential impacts from a rising sea level, in particular the threat of saline intrusion. Recognition of such vulnerability is evident from the saline monitoring program the Town has been operating for decades. This section explores issues pertaining to potential risks from sea level rise, including presentation of recent sea level rise (SLR) projections developed for South Florida.

Sea levels throughout the world constantly change, at time periods ranging from hourly tidal variations to rises and falls that occur over millennia, and that for the most part are imperceptible to human experience. When considering SLR as the focus of this discussion it represents long term changes in response to contributions from:

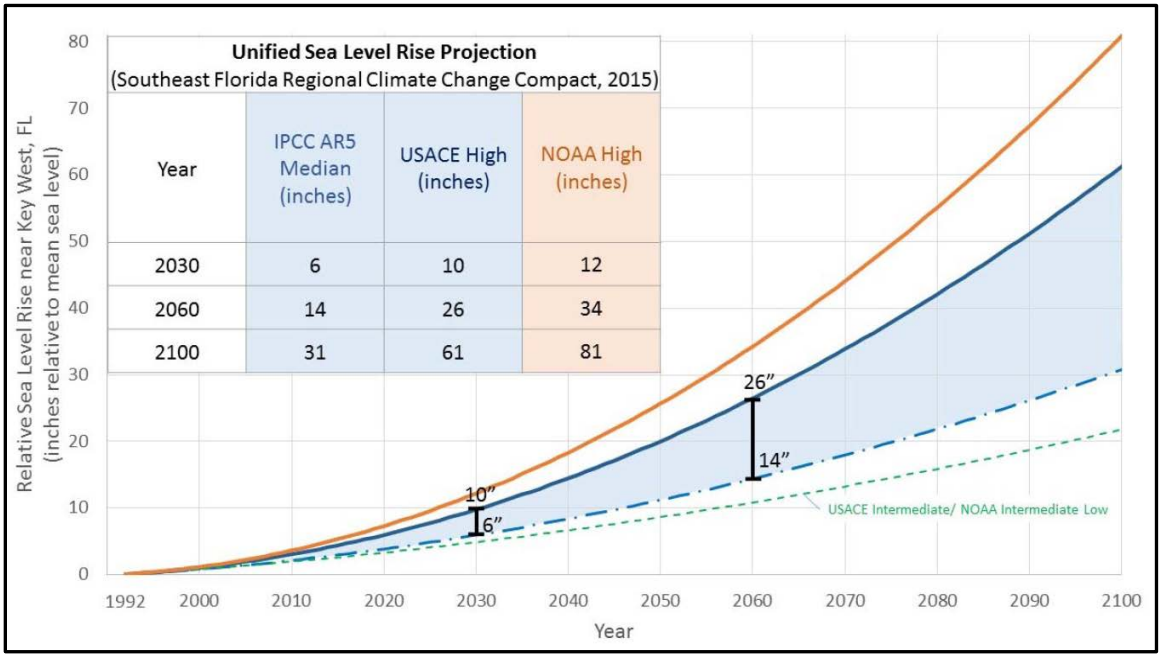
- Expansion or contraction of water and other chemical species due to oceanic temperature changes (steric effects);
- Addition or removal of water from the ocean, such as expanding or melting glaciers, transfer of water from land to sea and vice-versa (eustatic effects); and
- Relative changes in elevation of land and/or the sea floor (isostatic effects).

Interpretation of the relatively recent geologic record indicates that sea levels within the past ~400,000 years have fluctuated periodically over a range estimated to have been from approximately 330 feet (ft) lower to approximately 50 ft higher than present levels. Measurements made at Key West between 1846 and 1992 indicated that sea level rose at a rate of approximately 0.09 inches per year (in/yr), with evidence for a change from approximately 0.07 in/yr before 1925 to approximately 0.11 in/yr afterwards.

The Southeast Florida Regional Climate Change Compact (SFRCCC) represents a collaborative effort entered in January 2010 by Palm Beach, Broward, Miami-Dade, and Monroe Counties to address the challenges faced by the region relative to the impacts of climate change and sea level rise. A goal of this collaboration is to create a unified plan to prepare for potential impacts from rising sea-levels, especially impacts associated with public infrastructure such as water supply facilities. One of the initial objectives of the SFRCCC was to unify the existing local SLR projections to develop a single set of regional SLR projections. The SLR projections would assist the SFRCCC Counties and partners in understanding potential vulnerabilities and to provide a basis for outlining adaptation strategies for the region and allows for increased coordination for mitigation and adaptation activities across county lines.

On December 15, 2015, the Town Council adopted Resolution No. 86-15 endorsing and affirming the SFRCCC's efforts. The SFRCCC published the Unified Sea Level Rise Projection [Southeast Florida Regional Climate Change Compact, 2015], which estimates the rate at which SLR is expected to occur. The estimated rates are highly variable. Based on current greenhouse gas emission rate trends, the rise in 2017 sea levels is expected to range from 2 to 3 inches by 2030, 10 to 22 inches by 2060, and 27 to 54 inches by 2100 (**Figure 2.2**). Due to the high level of uncertainty in the magnitude and timing of the increase, it is recommended that the Town implement a phased approach when addressing the impacts associated with elevated seas.

Figure 2.2
Southeast Florida Regional Compact Sea Level Rise Projections



The potential impacts of climate change and sea level rise will likely cause the Town to be faced with numerous challenges including:

- Localized flooding and resulting property damage due to tidal back flow into low lying areas
- Inland flooding due to reduced drainage capacity
- Property damage coastal erosion
- Salt water intrusion into fresh water aquifers which currently serve as drinking water supplies

The Town's Utility system has been proactive in identifying ways to address impending sea level rise (SLR). Detailed mitigation and adaptation strategies related to drainage systems will be offered in detail later in this plan. While the measures required to combat the effects of sea level rise are expected to be costly, proactively preparing for its effects will allow the Town to approach the issues in a more methodical and cost-effective manner.

In general, it is recommended that the Town begin proactively addressing sea level rise by investing in planning, phased infrastructure improvements, and code changes to increase resiliency and instill confidence within the community. If actions are not implemented in preparation for sea level rise, the Town would likely experience significant economic impacts not only to the Utility, but to the Town as a whole. Examples of the potential economic impacts

include increased flood damage to Town infrastructure, reductions in property values, and increased capital cost for incorporating improvements (relative to the capital cost associated with a phased approach).

With estimates of sea level rise ranging from 14" to 24" by 2060 action to protect the water utility's source water is prudent. Additionally, it should be noted that climate changes expected include greater severity of weather events such as drought. These anticipated changes coupled with the expected increase in the Town's and other's withdrawals from the Surficial Aquifer System (SAS) warrant the establishment of strategies to provide enhanced resiliency from the threat of salt water intrusion. Without such adaptation, withdrawals from the SAS will be exposed to risks including greatly compromised raw water quality and/or the full elimination of the water supply source.

In conjunction with the USGS, every 5 years SFWMD produces an estimate of the position of the saltwater interface by County for the surficial aquifer system. Please refer to **Figure 2.3**. These estimates are important for evaluating the threat of saline intrusion to impact water supply wellfields located near the coast. The figure presents the 2014 estimated location of the saltwater interface, defined by the SFWMD as the 250 milligram per liter (mg/L) "isochlor". The isochlor line represents the inferred location where dissolved chloride (Cl) in the subsurface of the SAS equals 250 mg/L. For comparison, seawater averages approximately 19,000 mg/L; however, there is typically a relatively sharp interface, approximated by the 250 mg/L isochlor, below and seaward of which Cl concentrations increase rapidly over short distances to approach seawater Cl concentrations.

Figure 2.3

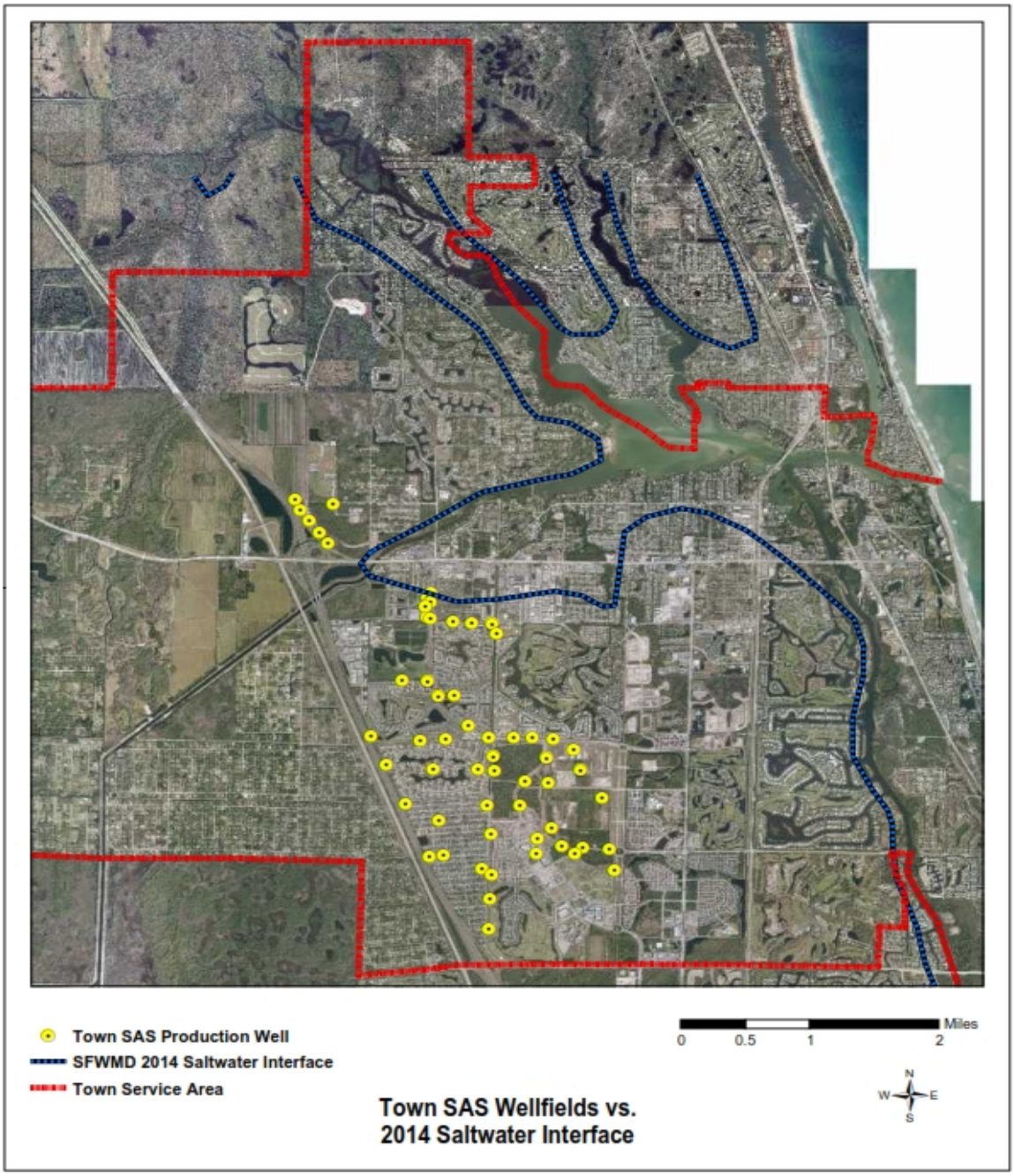


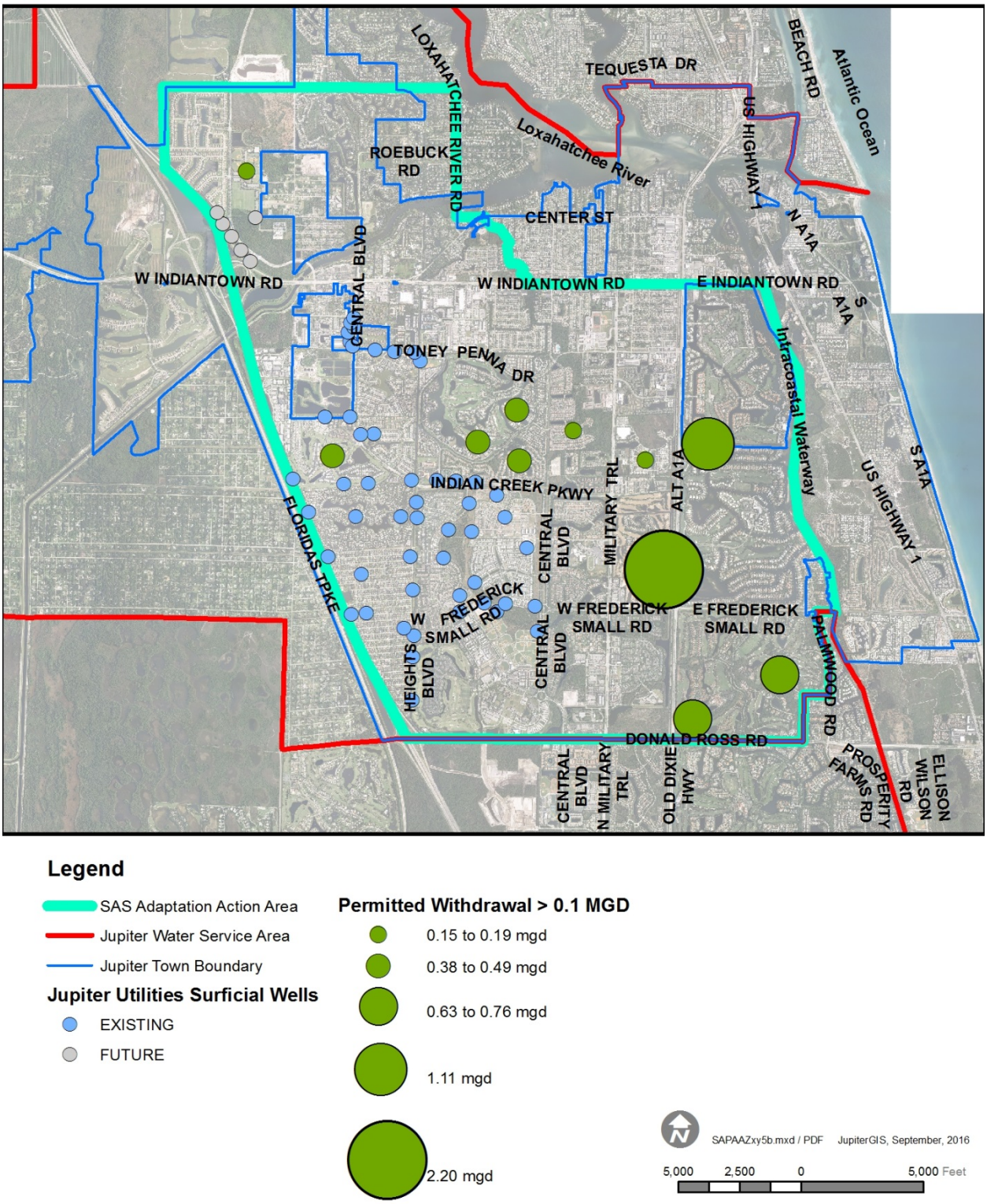
Figure 2.3 above also depicts the location of Town Surficial Aquifer production wells in relation to the 2014 estimate of the saltwater interface. The apparent inland locations of the interface within the central portion of the Town's service area reflects influence from the saline tidal portion of the Southwest Fork of the Loxahatchee River (Southwest Fork). It is important to note that Town monitoring well data suggest that saline water presently occurs mainly at shallow depths adjacent to the Southwest Fork, and that saline intrusion does not yet occur

within the production zone depths where SAS wells are completed as it may appear in the figure.

However, based on the potential threat, it is recommended that the Town strive to eliminate major withdrawals from the SAS which pose a risk to salt water interface migration into the Town's wellfields that serve as a regional water supply source. To accomplish this, it is recommended that the Town target non-Town owned SAS withdrawal facilities with larger permitted withdrawal rates located in the SAS Adaptation Action Area depicted in **Figure 2.4** to cooperatively seek the elimination of the SAS withdrawal facility and subsequent connection to the Town's regional water supply system or the Loxahatchee River District's (LRD) wastewater reuse system.

Figure 2.4

SAS Adaptation Action Area



Transitioning of these privately held withdrawals to connections to the Town's regional water system or LRD's regional reuse system would then minimize risk of SAS salt water contamination in the region including the Town's regional supply wellfields and in the area of the private wells. If implemented, both the Town and the private entity would then have far greater assurances of maintaining a continued future supply of usable high quality water.

The recommended strategy will require significant cooperation amongst the Town, LRD, SFWMD and the applicable private entities. Connection to the LRD's reuse system would be investigated and considered if capacity is readily available and connection is financially feasible.

Understanding that there are higher costs involved with the connection to the regional water system, the Town should consider a potential waiver of the Town's connection fees (in whole or in part) and establishment of a special commodity rate for water to be purchased on a recurring basis.

To limit the capital cost exposure of the program to the Town's water utility, the Town should first consider a limited amnesty period of one (1) year for connection of privately permitted withdrawals greater than 100,000 gallons per day until a maximum program limit of 1 MGD in system capacity is encumbered. Based on the responsiveness and acceptance rate, the Town may then expand the program further provided that a favorable business case can be established.

To maximize financial feasibility potential to the private entity, it is also recommended that the commodity rate to be offered by the Town should be equal to no more than 120% of the variable costs to produce and supply water to the private entity. To address the lack of a capital component in this rate and to maintain equity and fairness amongst all of the utility's rate classes, a payment structure which includes a "take or pay" provision would be appropriate. This would provide stability in the revenue capture generated proportional to the system capacity reserved and committed on the private entity's behalf.

Given that this proposed program would utilize plant capacity already constructed, no further capital investment is required. It is also important to note that if implemented, the program as recommended could produce up to $280,000 in annual operating revenue to the benefit of all existing customers.

b. Floridan Aquifer Wellfield Improvements

As currently planned, existing Floridan Aquifer well RO-4 should be outfitted with a pump and placed into service based on the recommendations associated with the well rehabilitation. If possible the well should be limited to 1,000 gpm maximum pumping rate to minimize sand and silt production. With additional treatment (at the well) to remove suspended sand, the well can be operated up to 1,400 gpm (2 MGD).

Ultimately, the installation of up to four (4) additional Floridan Aquifer wells is recommended to reduce the stress on the existing wellfield by i) lowering the individual pumping rates to at least 1.0 MGD (average condition) and 1.5 MGD under maximum demand condition and; ii) spreading the pumpage over a larger wellfield area. This will provide 19 MGD of raw Floridan Aquifer water and accommodate up to 2 wells out of service. These wells are recommended to be constructed in a phased fashion with the actual number of wells to be ultimately built dependent upon production capacity provided and the actual future rate of TDS degredation in the composite raw water supply to the Town's reverse osmosis plant.

Table 2.4 details an estimated Floridan Aquifer Operating Plan which includes the 4 new wells. This plan allows for the operation of wells RO-5 and RO-6, which have historically high chloride concentrations, to be run at a maximum of 0.5 MGD per well, and up to two (2) wells on standby.

Table 2.4

	Well ID	Max Well Production (MGD)	*Comments*
Existing Wells	RO-2	0.0	*1 of 2 optional Standby Wells*
	RO-3	0.0	*2 of 2 optional Standby Wells*
	RO-4	1.5	
	RO-5	0.5	*Limited by well water quality*
	RO-6	0.5	*Limited by well water quality*
	RO-7	1.5	
	RO-8	1.5	
	RO-9	1.5	
	RO-10	1.5	
	RO-11	1.5	
	RO-12	1.5	
	RO-13	1.5	
New Wells	RO-14	1.5	*Planned well site 2000' south of RO-13*
	RO-A	1.5	*LRD Site*
	RO-B	1.5	*LRD Site*
	RO-C	1.5	*LRD Site*
Total UFA Raw Water Production		**19.0**	

Additional Well Siting Investigation

As previously mentioned, and in addition to completing the renewal and replacement of existing Well RO-4, up to four (4) additional Floridan Aquifer wells are recommended to increase the long-term viability of the Town's reverse osmosis treatment plant's raw water supply. The Town currently has one site dedicated for the construction of an additional well at the southwest corner of Palm Beach Country Estates within the C-18 Canal right-of-way (RO-14). However, as part of this study alternative sites are being investigated to ascertain the most viable and cost effective alternatives to constructing these required capital facilities.

Alternative Well Locations

There follows a description of the location, property ownership, and other relevant information for eleven (11) potential sites for future Floridan Aquifer wells. These well sites are shown on **Figure 2.5** and listed in **Table 2.5**.

Figure 2.5
Potential Floridan Aquifer Well Sites

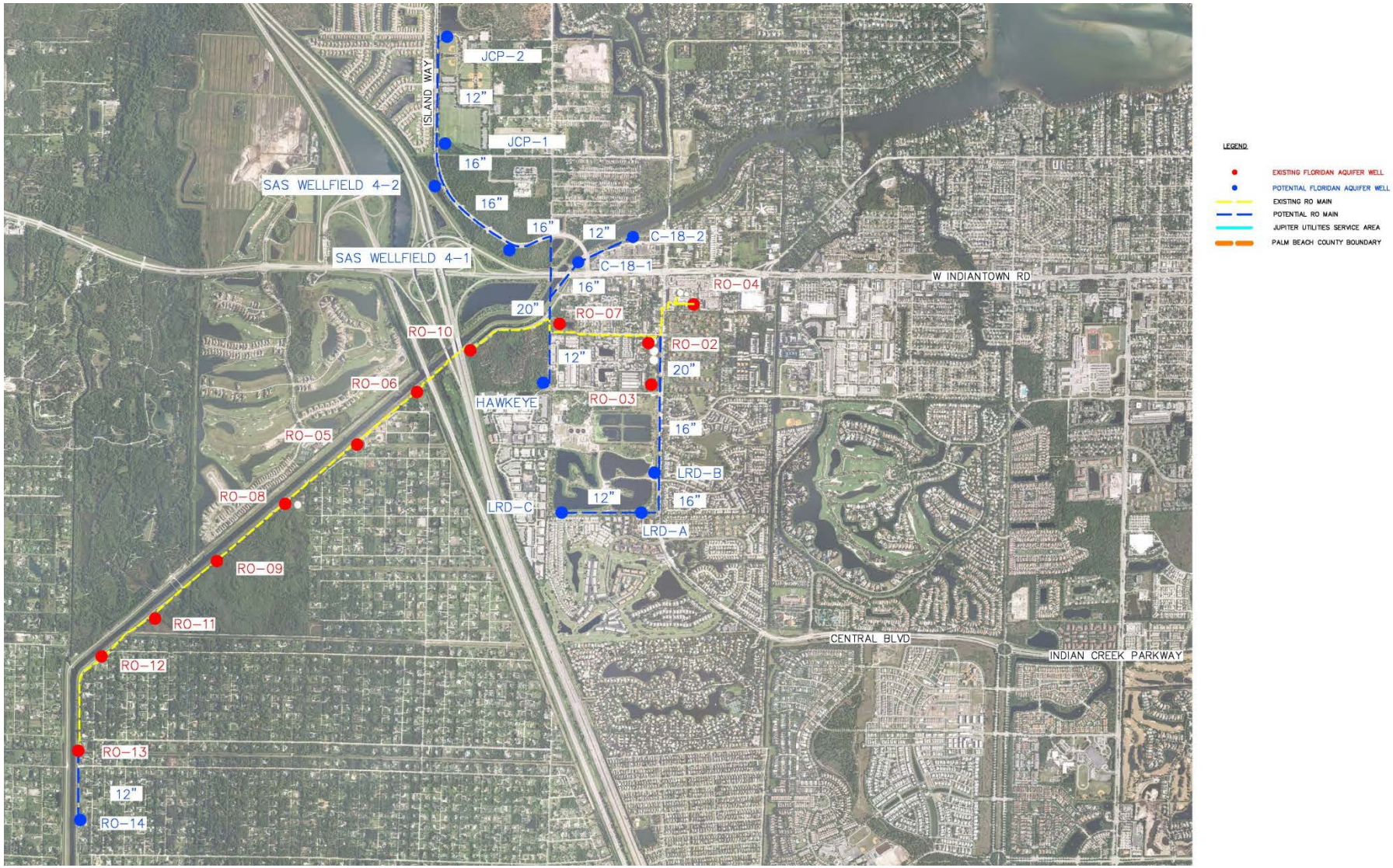


Table 2.5
Potential Future Floridan Aquifer Well Sites

Site Name	Site Location
LRD-A	Southeast corner of LRD plant site on LRD property
LRD-B	Midway on east side of LRD plant site on LRD property
LRD-C	Southwest corner of LRD plant site on LRD property
C-18 Canal-1	North of Jupiter West Plaza in SFWMD property south of C-18 Canal
C-18 Canal-2	Southwest corner of C-18 Canal & Island Way on SFWMD Property
SAS Wellfield 4-1	South side Island Way on previously acquired well sites
SAS Wellfield 4-2	South side Island Way on previously acquired well sites
JCP-1	Southwest portion Jupiter Community Park on Park property
JCP-2	Northwest portion Jupiter Community Park on Park property
RO-14	South of Well RO-13 in C-18 Canal R/W on Town owned easement
Hawkeye	Southeast corner Hawkeye property, northwest of LRD site on privately owned property

Each well site is evaluated for the following relevant features.

Property Ownership: The underlying property owner for each of the potential well sites significantly affects the ability to acquire the right to construct and own a well at that site.

Adjacent Uses: Property use, in particular residential use, adjacent to the well site is an important factor to consider when evaluating a well site. Construction of a well, and future maintenance of a well, involves large and powerful equipment. The well pump is a mechanical device which can generate noise and Town maintenance staff must be at the site for emergency repairs regardless of the time of day.

Vehicular Access: Well construction, operation, maintenance, repair, and well rehabilitation all require vehicular access to the site.

Formation Water Disposal: Construction of a Floridan Aquifer well, and any future rehabilitation of that well, generates a flow of brackish water containing ground-up limestone from the formation and this formation water requires treatment and disposal. The formation

water is brackish and disposal must be to a location that flows into a tidal water body to prevent salt contamination of the fresh surficial groundwater. Accessibility to a tidal water body has a significant effect on the viability of a potential Floridan Aquifer well site.

Raw Watermain Construction: Each Floridan Aquifer well must be connected to the existing raw watermain system. The length of raw watermain required for any particular well site, and any natural features along the pipeline route which will increase the construction cost, affect the viability of a well site.

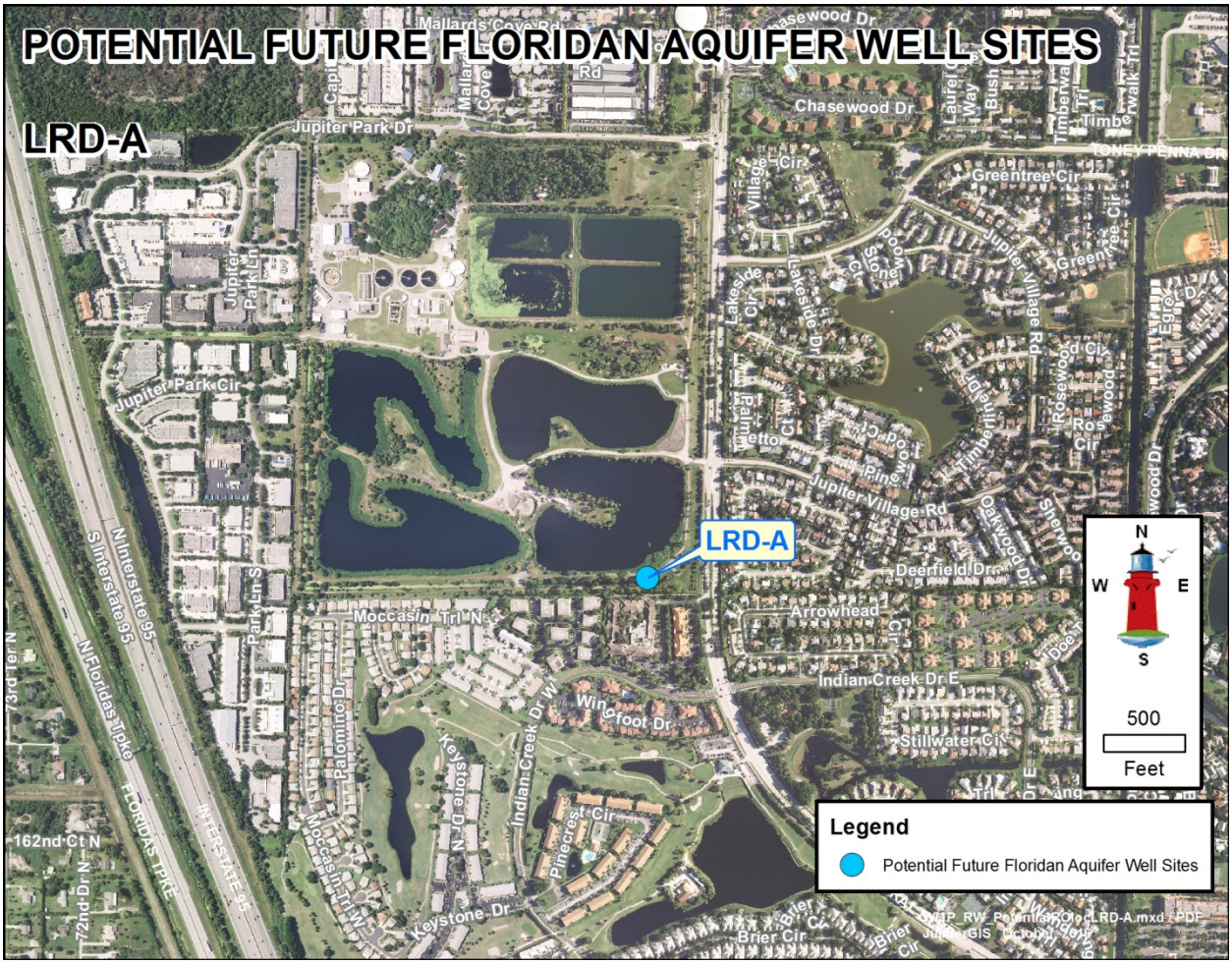
Electrical Power: Each Floridan Aquifer well requires electrical power to operate the well pump and accessibility to electrical power affects the viability of the well site. Additionally, Floridan Aquifer wells should have available emergency electrical power which requires construction of a generator housed in a building as well as fuel storage. The ability of a site to support an emergency generator and its accessibility by Florida Power & Light affects the viability of that site.

Conflicts with Existing Utilities: Conflicts with existing utilities, at the well site or along the raw watermain route, will affect the viability of a potential Floridan aquifer well site.

Site Name: LRD-A

Site Location: This well site is located on the southeast corner of the Loxahatchee River District Wastewater Treatment Plant site. See **Figure 2.6**.

Figure 2.6



Property Ownership: The LRD site is under public ownership by LRD.

Adjacent Uses: Property use adjacent to this well site is single family residential to the south, thoroughfare roadway to the east, wastewater treatment to the north.

Vehicular Access: Vehicular access is provided through the LRD site access roads or directly from Central Boulevard.

Formation Water Disposal: Formation water disposal during drilling/redevelopment is not considered possible into the LRD storage ponds due to high salt content of formation water. Disposal into the LRD injection well is technically possible; however, may not be viable due to regulatory issues relative to the Town not being the permitted owner of the disposal well. A possible discharge location would be to the west by a temporary pipe into an outfall crossing I-95 and into the SIRWCD canal system. The most viable location for disposal of formation water would be to the east by a temporary pipe into Central Boulevard roadway drainage which discharges into the Heights Canal.

Raw Watermain Construction: Raw watermain construction is largely through undeveloped land on the LRD site. The raw watermain would extend north along the west side of Central Boulevard and on the LRD site to Jupiter Park of Commerce Drive, then continue north along the west side of Central Boulevard on the Town owned Central Blvd. Water Storage Facility.
The section of existing FRP raw watermain along the west side of Central Boulevard, from Jupiter Park of Commerce Drive to Jupiter Gardens Boulevard, is to be replaced with HDPE material. The approach to replace this pipe is to use the existing 24” FRP as a casing and pull a 20” HDPE through the FRP pipe which is in use as the suction pipe for RO-3. This approach calls for a pump to be installed at RO-3 with electrical and controls from the South Central Blvd. High Service Pump Station. RO-3 will discharge into the proposed 20” HDPE.

Electrical Power: Electrical power is not available at the site but would appear to be close by with the amount of power on the LRD site. Since Jupiter is a separate entity than LRD, electrical power will need to come from a Florida Power & Light source on a separate meter.

Conflicts with Existing Utilities: There are no expected conflicts with existing utilities at the site and along the raw water route.

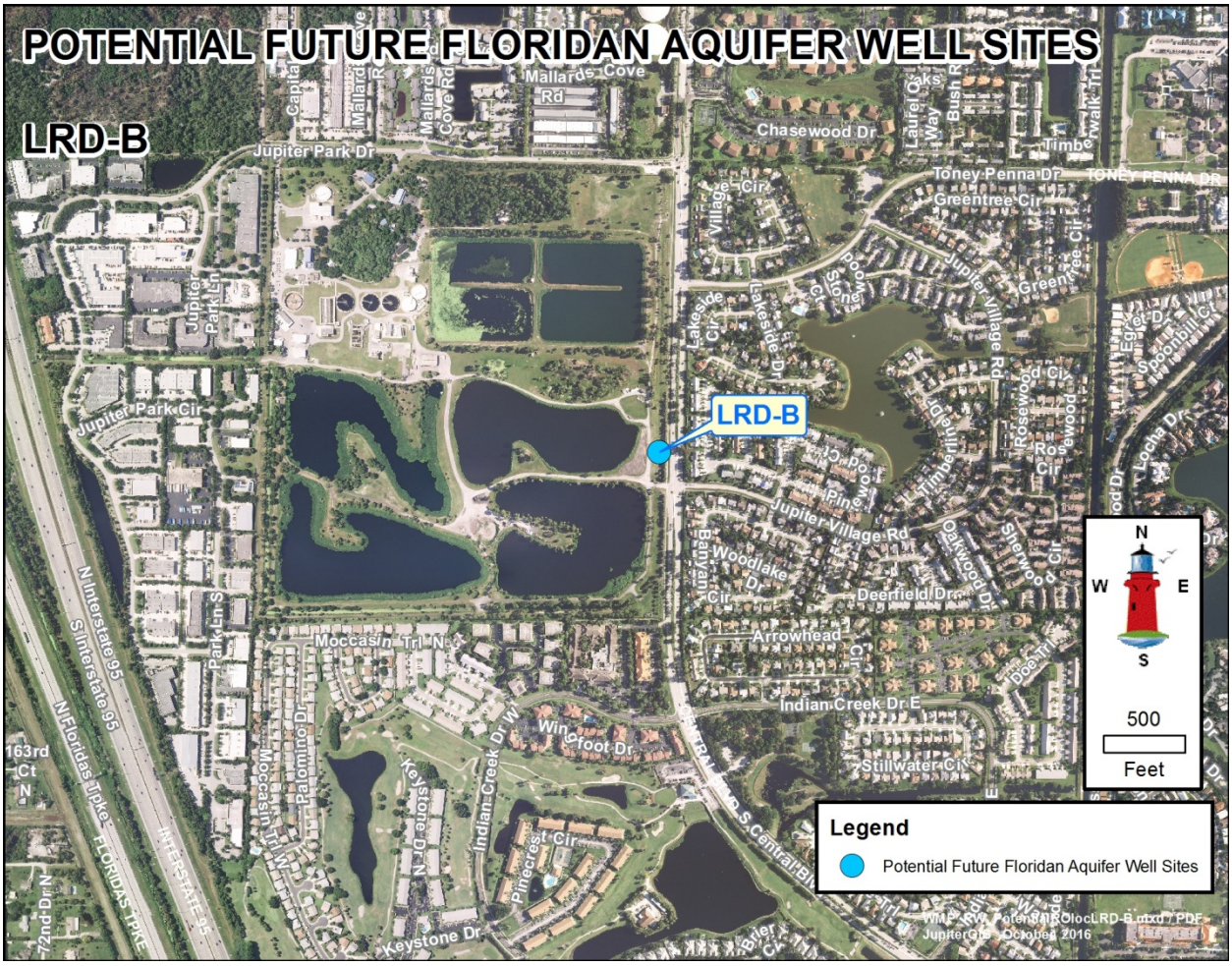
Comments: The well site should be moved north of the south line and as close to Central Blvd. as possible in order be set back as far as possible from the residential area to the south.

The existing raw water main at Central Blvd. and Jupiter Gardens Blvd. is 30” and has available capacity for additional flow from any future wells south of Jupiter Gardens Blvd.

Site Name: LRD-B

Site Location: This well site is located on the east side of the Loxahatchee River District Wastewater Treatment Plant Site, approximately midway between the north and south limits of the LRD site. See **Figure 2.7**.

Figure 2.7



Property Ownership: The LRD site is under public ownership by LRD.

Adjacent Uses: Property use adjacent to the well site is thoroughfare roadway to the east and wastewater treatment to the west.

Vehicular Access: Vehicular access is provided through the LRD site access roads or directly from Central Boulevard.

Formation Water Disposal: Formation water disposal during drilling/redevelopment is not considered possible into the LRD storage ponds due to high salt content of formation water.
Disposal into the LRD injection well is technically possible; however, may not be viable due to regulatory issues relative to the Town not being the permitted owner of the disposal well. The most viable location for disposal of formation water would be to the east by a temporary pipe into Central Boulevard roadway drainage which discharges into the Heights Canal.

Raw Watermain Construction: Raw watermain construction is largely through undeveloped land. The raw watermain would extend north along the west side of Central Boulevard and on the LRD site to Jupiter Park of Commerce Drive, then continue north along the west side of Central Boulevard on the Town owned Central Blvd. Water Storage Facility.

The section of existing FRP raw watermain along the west side of Central Boulevard, from Jupiter Park of Commerce Drive to Jupiter Gardens Boulevard, is to be replaced with HDPE material. The approach to replace this pipe is to use the existing 24” FRP as a casing and pull a 20” HDPE through the FRP pipe which is in use as the suction pipe for RO-3. This approach calls for a pump to be installed at RO-3 with electrical and controls from the South Central Blvd. High Service Pump Station. RO-3 will discharge into the proposed 20” HDPE.

Electrical Power: Electrical power is not available at the site but would appear to be close by based on the amount of electrical power on the LRD site. Since Jupiter is a separate entity than LRD, electrical power to a well must be provided from a FPL source on a separate meter.
Of the three possible well sites located on LRD property, this site is best suited to house an emergency generator. This generator can supply other Floridan wells constructed on the LRD site.

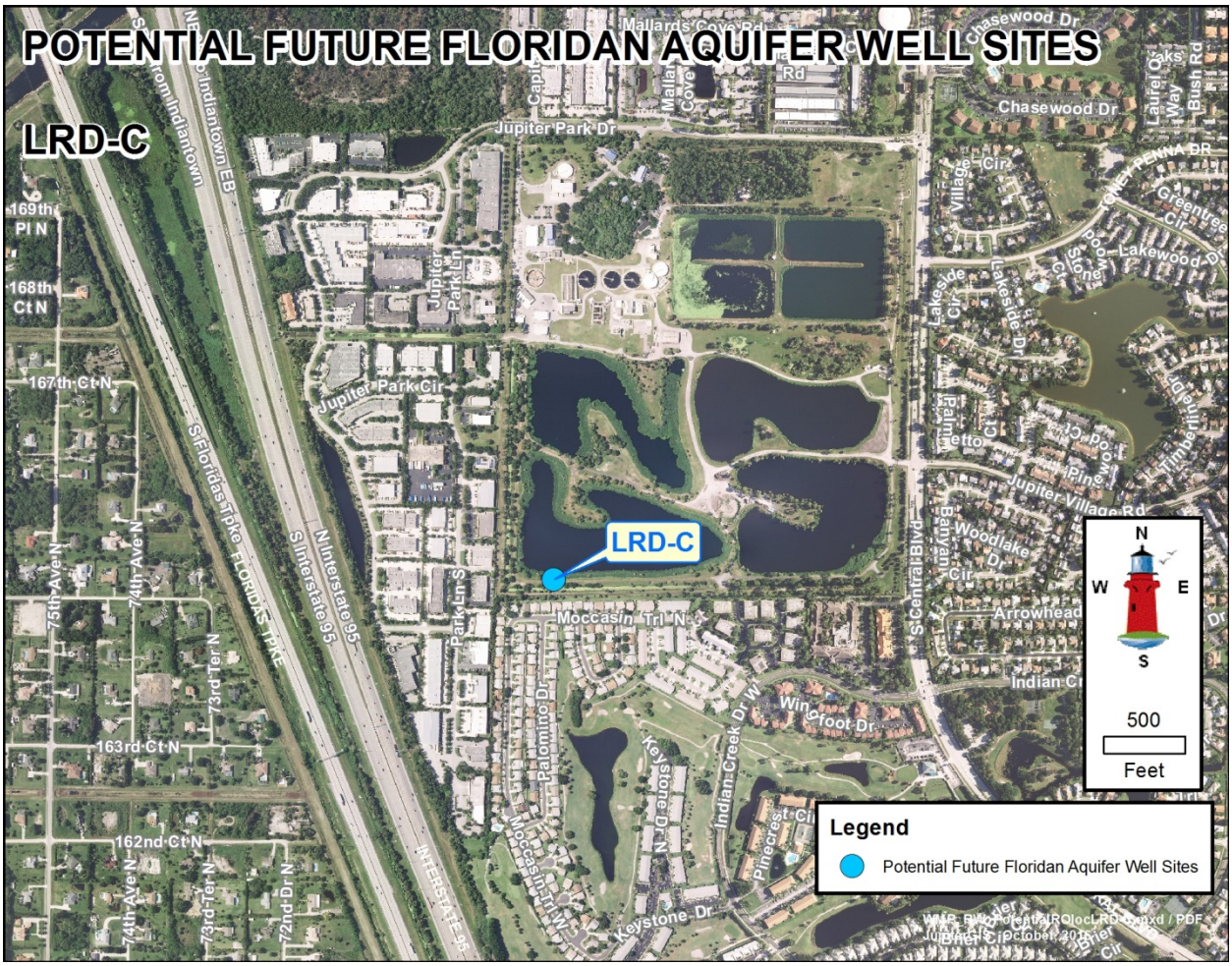
Conflicts with Existing Utilities: There are no expected conflicts with existing utilities at the site and along the raw water pipe route.

Comments: The existing raw water main at Central Blvd. and Jupiter Gardens Blvd. is 30” and has available capacity for additional flow from any future wells south of Jupiter Gardens Blvd.

Site Name: LRD-C

Site Location: This well site is located on the southwest corner of the Loxahatchee River District Wastewater Treatment Plant site. See **Figure 2.8**.

Figure 2.8



Property Ownership: The LRD site is under public ownership by LRD.

Adjacent Uses: Property use adjacent to the well site is single family residential to the south, light industrial to the west, and wastewater treatment to the north.

Vehicular Access: Vehicular access is provided through the LRD site access roads.

Formation Water Disposal: Formation water disposal during drilling/redevelopment is not considered possible into the LRD storage ponds due to the high salt content of formation water. Disposal into the LRD injection well is technically possible; however, may not be viable due to regulatory issues relative to the Town not being the permitted owner of the disposal well. A possible discharge location would be to the west by a temporary pipe into an outfall crossing I-95 and into the SIRWCD canal system.

The most viable location for disposal of formation water would be to the east by a temporary pipe into the Central Boulevard roadway drainage which discharges into the Heights Canal.

Raw Watermain Construction: Raw watermain installation would be largely through undeveloped land on the LRD site. The raw watermain would extend east along the LRD south line, then north along the west side of Central Boulevard and on the LRD site to Jupiter Park of Commerce Drive, then continue north along the west side of Central Boulevard on the Town owned Central Blvd. Water Storage Facility.

The section of existing FRP raw watermain along the west side of Central Boulevard, from Jupiter Park of Commerce Drive to Jupiter Gardens Boulevard, is to be replaced with HDPE material. The approach to replace this pipe is to use the existing 24" FRP as a casing and pull a 20" HDPE through the FRP pipe which is in use as the suction pipe for RO-3. This approach calls for a pump to be installed at RO-3 with electrical and controls from the South Central Blvd. High Service Pump Station. RO-3 will discharge into the proposed 20" HDPE.

Electrical Power: Electrical power is not currently available at the site but would appear to be nearby considering the amount of power currently in use and in place on the LRD site. Since Jupiter is a separate entity from LRD, electrical power will need to come from a Florida Power & Light source on a separate meter.

Conflicts with Existing Utilities: There are no expected conflicts with existing utilities at the site and along the raw water pipe route.

Comments: The well should be placed north and east as far as allowed to be set back as far as possible from the residential and industrial uses.

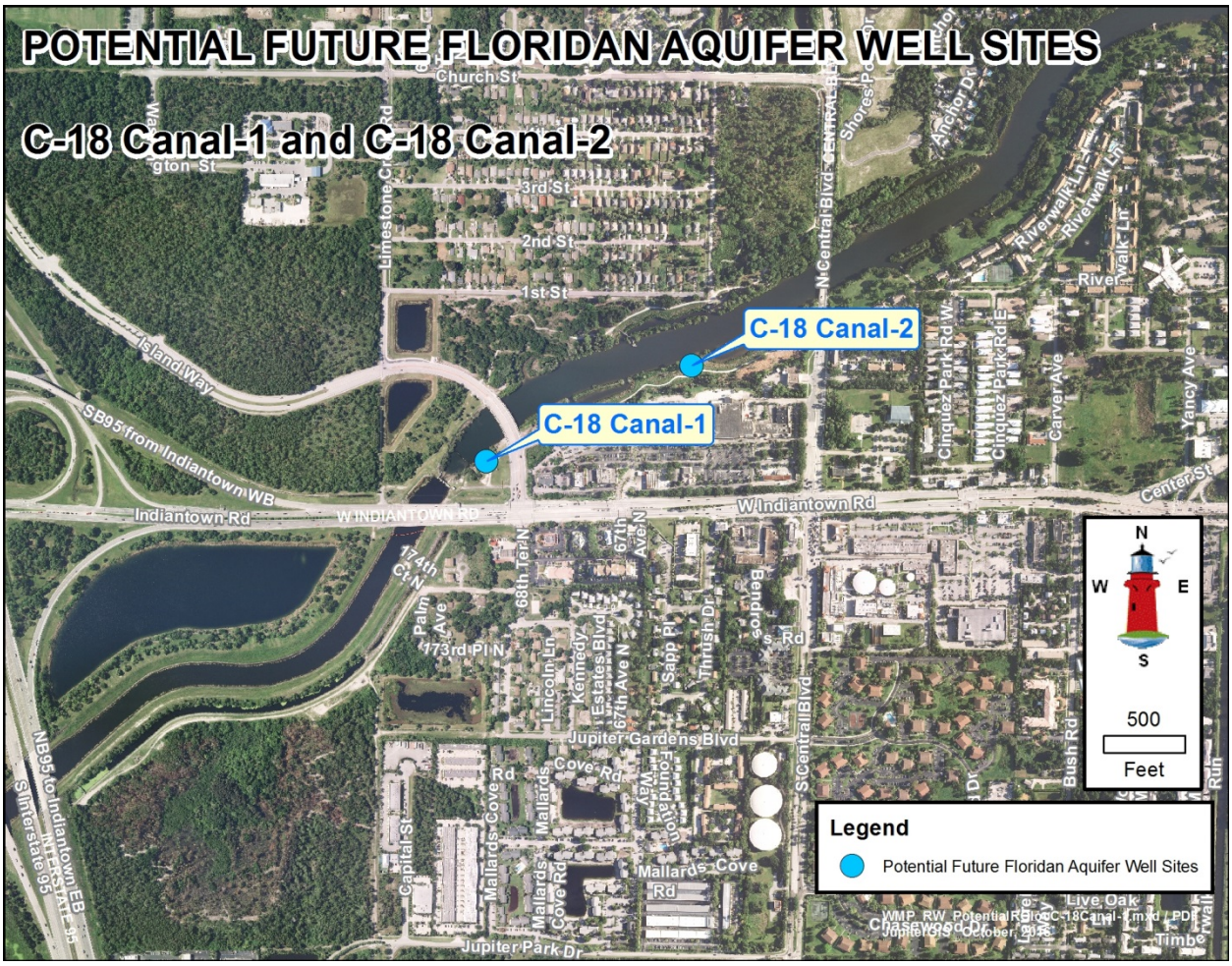
The ditches in the site corner area must be replaced with culverts.

The existing raw water main at Central Blvd. and Jupiter Gardens Blvd. is 30" and has available capacity for additional flow from any future wells south of Jupiter Gardens Blvd.

Site Name: C-18 Canal -1, -2

Site Location: Well Site 1 is adjacent to the SFWMD S-46 structure, south of the C-18 Canal, and west of Island Way. Well Site 2 is within the C-18 Canal right of way east of Island Way and north of Jupiter West Plaza. See **Figure 2.9**.

Figure 2.9



Property Ownership: All of this property is under public ownership by SFWMD as canal right-of-way.

Adjacent Uses: There are no residential areas adjacent to Well Site 1. There is commercial use located south of Well Site 2.

Vehicular Access: Vehicular access would be along the C-18 Canal right-of-way from Island Way.

Formation Water Disposal: Formation water disposal during drilling/redevelopment would be into the adjacent C-18 Canal.

Raw Watermain Construction: Raw watermain installation for Site 2 will be along the south side of the C-18 Canal, cross under Island Way to Site 1, run south along the west side of Island Way, cross under Indiantown Road using horizontal directional drilling (HDD) construction, continue south along the future southern extension of Island Way or within the road rights of ways in the Kennedy Estates neighborhood and connect to the existing 24" Floridan raw water main on Jupiter Gardens Blvd.

Electrical Power: Electrical power to wells along this alignment would be from available FPL service, likely along Island Way. There is not likely space on these sites for an emergency generator.

Conflicts with Existing Utilities: Design of the proposed raw watermain route will take into account there are existing utilities along the raw water pipe route. Piping that will cross Indiantown Road will be deep enough to avoid conflicts with existing utilities in Indiantown Road.

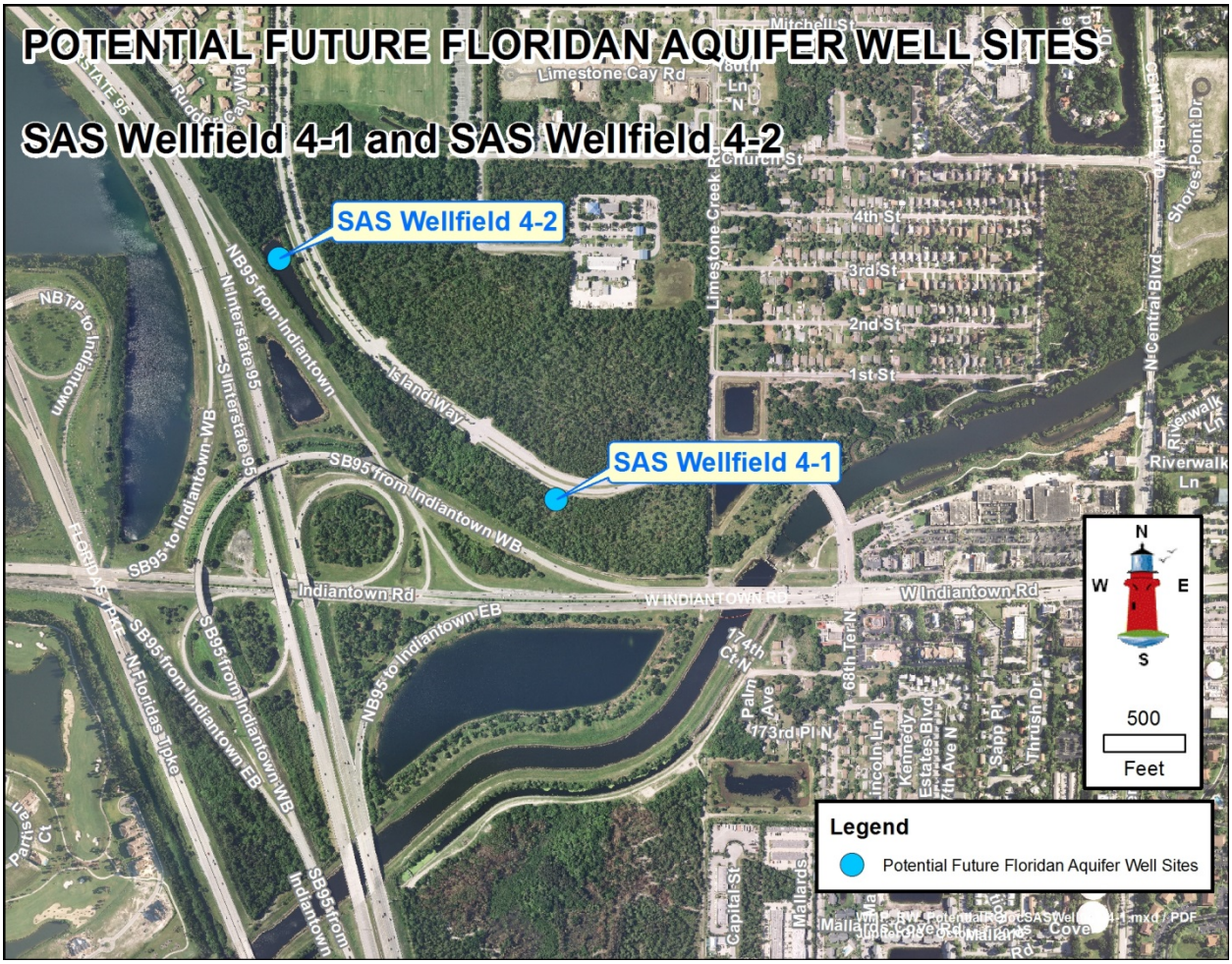
Comments: When considering a new well adjacent to the S-46 Water Control Structure, it is important to note that there is an out of service USGS Floridan well on this site.

The existing raw watermain on Jupiter Gardens Drive has hydraulic capacity to accept flow from wells north of Indiantown Road since the existing wells along the C-18 Canal are to be reduced in production capacity.

Site Name: SAS Wellfield 4-1,-2

Site Location: These sites are located along the west side of Island Way, between Limestone Creek Road and Church St. extension. See **Figure 2.10**.

Figure 2.10



Property Ownership: The underlying property is in private ownership; however, the right to develop surficial aquifer wells was previously obtained by the Town from the private property owner.

Adjacent Uses: Adjacent property uses is unknown to the west and single-family residential to the east.

Vehicular Access: Vehicular access to these sites would be along Island Way.

Formation Water Disposal: Disposal of formation water during drilling/redevelopment will require construction of a pipeline to the C-18 Canal. This pipeline would be adjacent to the raw watermain serving this site. The formation water disposal pipe would be situated to serve any other wells constructed north of the C-18 Canal.

Raw Watermain Construction: Raw watermain installation will be south along Island Way, cross under Indiantown Road using HDD construction, continue south along the future southern extension of Island Way or within the road rights of ways in the Kennedy Estates neighborhood, and connect to the existing 24" Floridan raw watermain on Jupiter Gardens Blvd.

Electrical Power: Electrical power to these sites would be from the available FPL grid, likely along Island Way. Emergency power can be provided from the generator facility planned as a part of proposed SAS Wellfield 4.

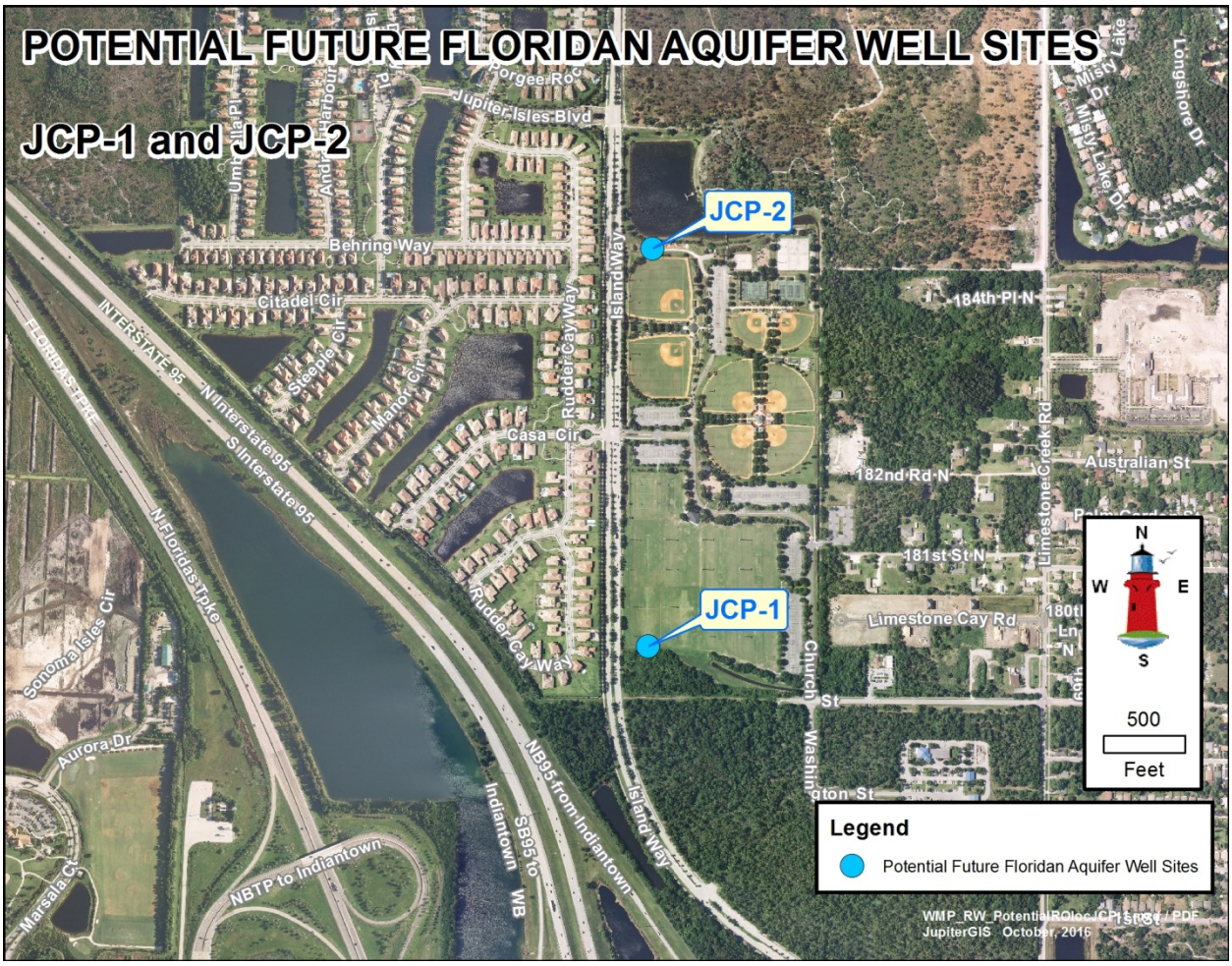
Conflicts with Existing Utilities: Design of the raw watermain route will take into account existing utilities along the raw water pipe route. Piping that will cross Indiantown Road will be deep enough to avoid conflicts with existing utilities in Indiantown Road.

Comments:
These sites would be located along Island Way or along I-95 in the same locations or vicinity as the SAS Wellfield 4 sites that have been previously acquired. Well sites used for Floridan Aquifer wells need to be significantly larger than a surficial aquifer well site to allow for the larger equipment during construction and future maintenance of a Floridan well. A maximum of two well sites would be appropriate to allow for proper spacing between Floridan Aquifer wells.

Site Name: Jupiter Community Park (JCP-1, -2)

Site Location: Well Site 1 is located on the southwest portion of Jupiter Community Park adjacent to Island Way. Well Site 2 is located on the northwest portion of the park adjacent to Island Way. See **Figure 2.11**.

Figure 2.11



Property Ownership: These sites are under public ownership by the Town of Jupiter as a park site.

Adjacent Uses: Adjacent use to these well sites is public sports park and nature preserve to the north, east, and south; single-family residential to the west across Island Way.

Vehicular Access: Access to the site can be through the park or directly from Island Way.

Formation Water Disposal: Disposal of formation water during drilling/redevelopment will require construction of a pipeline to the C-18 Canal. This pipeline would be adjacent to the raw watermain serving these sites. The formation water disposal pipe would be situated to serve any other wells constructed north of the C-18 Canal.

Raw Watermain Construction: Raw watermain installation will be south along Island Way, cross under Indiantown Road using HDD construction, continue south along the future southern extension of Island Way or within the road rights of ways in the Kennedy Estates neighborhood, and connect to the existing 24" Floridan raw watermain on Jupiter Gardens Blvd.

Electrical Power: Electrical power to these sites would be from the available FPL grid, likely along Island Way. Emergency power will be provided from the generating facility planned as a part of the proposed SAS Wellfield 4.

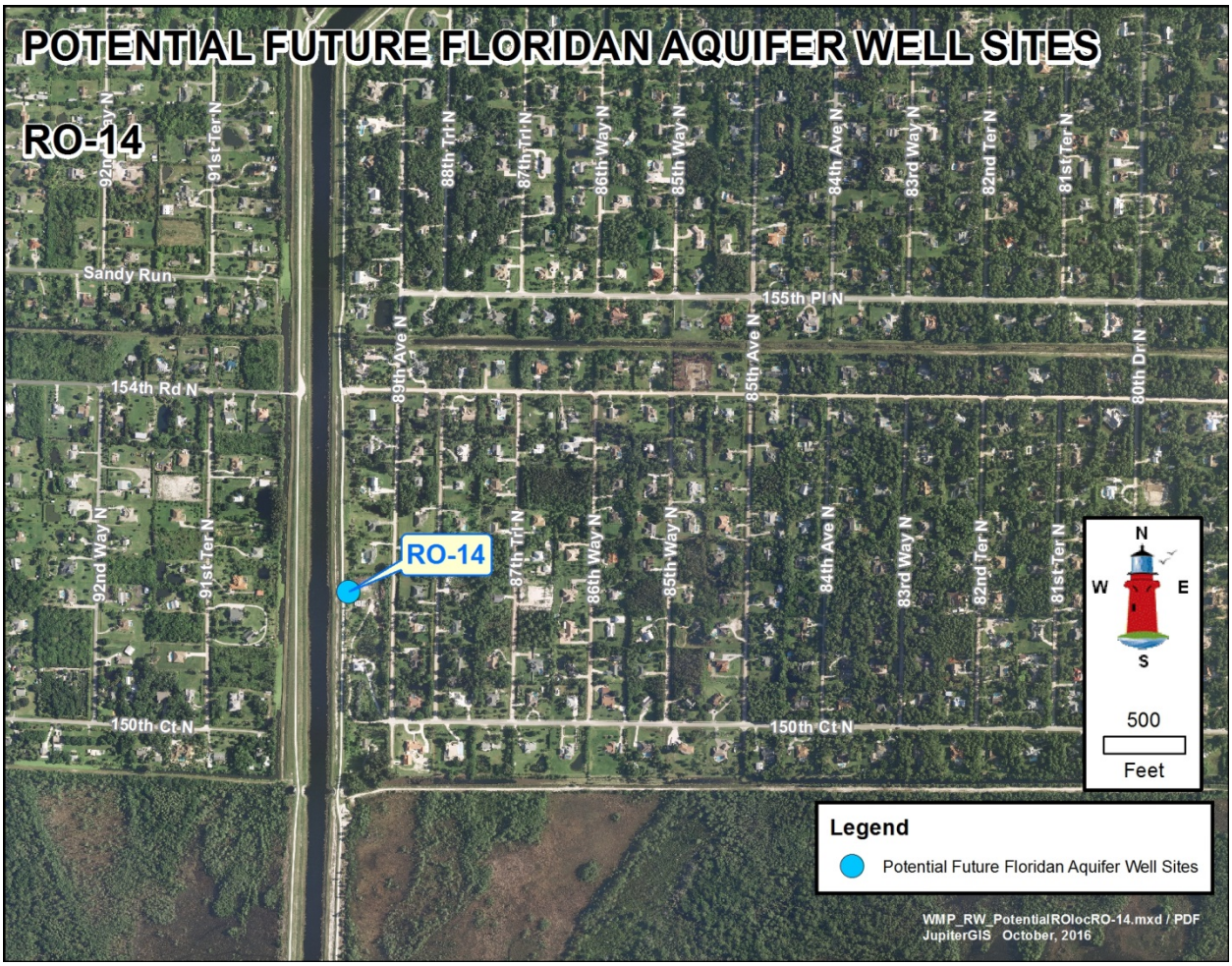
Conflicts with Existing Utilities: Design of the raw watermain route will take into account existing utilities along the raw water pipe route. Piping that will cross Indiantown Road will be deep enough to avoid conflicts with existing utilities in Indiantown Road.

Comments:
The existing raw watermain on Jupiter Gardens Drive has hydraulic capacity to accept the wells north of Indiantown Road since the existing wells along the C-18 Canal are to be reduced in production.

Site Name: RO-14

Site Location: This well site is located on the east side of the C-18 Canal, west of Palm Beach Country Estates, and approximately 1,200' south of the existing well RO-13. See **Figure 2.12**.

Figure 2.12



Property Ownership: The C-18 Canal right-of-way is publicly owned by SFWMD. The Town has a previously acquired easement right to this site via Interlocal Agreement with SFWMD.

Adjacent Uses: Property use adjacent to the well site is single-family residential located immediately adjacent to the east and single-family residential to the west beyond the 300' wide C-18 Canal right-of-way.

Vehicular Access: Vehicular access to the site is along the C-18 Canal right-of-way with access to the Canal right-of-way at the Town owned Riverbend Pump Station.

Formation Water Disposal: Formation water disposal during drilling/re-development is available into the adjacent C-18 Canal.

Raw Watermain Construction: Raw watermain installation would be along the undeveloped C-18 Canal right-of-way to the existing 24" raw watermain at Well RO-13.

Electrical Power: Provisions for electrical power are included at the Riverbend Pump Station. Cable installation is required from RO-14 to the existing power cable at Well RO-13.

Conflicts with Existing Utilities: There are no expected conflicts with existing utilities at the RO-14 site and along the raw water pipe/electrical supply cable route.

Comments: Overall Development cost for this well is expected to be low compared to other sites since provisions were previously made for electrical power, control communication, connection to the raw watermain system, previously acquired easement rights, and convenient formation water disposal.

Use of RO-14 will require that a restriction be placed on the pumping capacities of all wells west of the Central Blvd. Water Storage Facility. This restriction will require that eight wells (RO-7 through RO-14) be limited to a pumping capacity of 1,060 GPM each and two wells, RO-5 and RO-6 be limited to 530 GPM each. Individual wells would be allowed to pump at a rate greater than 1,060 GPM, however the aggregate total coming from these wells should not exceed 8,900 GPM.

Site Name: Hawkeye

Site Location: This well site is located on the southeast corner of the Hawkeye property and the site would be located immediately north west of the Northwest corner of the LRD site. See **Figure 2.13**.

Figure 2.13

Property Ownership: This site is under private ownership and property rights must be obtained to construct, operate, and maintain a well at this site.

Adjacent Uses: Property use adjacent to the well site is office/commercial to the east and wastewater treatment to the south.

Vehicular Access: Vehicular access to the site is along Park of Commerce Drive.

Formation Water Disposal: Formation water disposal is to be provided using the well's raw watermain with valves and diversion piping at well RO–7 that will discharge into SIRWCD Outfall Canal.

Raw Watermain Construction: Raw watermain installation would be along the undeveloped eastern line of the Hawkeye property and tie to the existing 24" raw watermain located ast the westend of Jupiter Gardens Blvd.

Electrical Power: Electrical power would be provided for this site from the FPL grid and emergency power by a generator located on the site.

Conflicts with Existing Utilities: Design of the raw watermain would account for existing utilities at the site and along the proposed raw water main route.

Comments: Development of a well at the Hawkeye site will require that a restriction be placed on the pumping capacities of all wells west of the Central Blvd. Water Storage Facility. This restriction will require that eight wells (RO-7 through RO-14) be limited to a pumping capacity of 1,060 GPM each and two wells, RO-5 and RO-6 be limited to 530 GPM each. Individual wells would be allowed to pump at a rate greater than 1,060 GPM, however the aggregate total coming from these wells should not exceed 8,900 GPM.

Conclusions

It is recommended that additional Floridan Aquifer wells be constructed to allow the production capacity of all the Floridan Aquifer wells to be reduced to approximately 1,060 GPM except when the Reverse Osmosis Water Treatment Plant (ROWTP) is operating all nine Trains. This will reduce stress on the individual well boreholes and expand the aquifer drawdown area of the Floridan Aquifer wellfield preserving water quality, well production capacities, and general wellfield health.

It is recommended that three (3) new wells be constructed which will bring the total number of wells to 15. Adding three new wells with a production capacity of approximately 1,060 GPM will provide two (2) Floridan Aquifer wells in standby when the ROWTP is operating nine Trains at full production capacity of 13.7 MGD.

It is recommended that three (3) new well sites be acquired. The RO-14 site was previously acquired and should be kept in reserve for future use. This well site can be developed whenever necessary since the site and supporting utilities have already been provided.

The proposed future individual well production rates will require modifications to many of the well pumps, piping, and instrumentation. In general, smaller pumps will be required in order to produce the lower flow rates. It is recommended that an improvement project within this element include wellhead and pumping modifications.

Table 2.6 below presents a summary of the potential well site development factors. These development factors include monetary values were appropriate and priority values in those development factors that have no monetary value. The data in **Table 2.6** indicates that the LRD wells carry the lowest potential capital cost while the C-18 Canal and SAS Wellfield 4 sites carry a higher capital cost but offer the highest benefit to increasing the area for aquifer drawdown.

Recommended Budget

Table 2.6 identifies a budget cost for construction of each well and the site improvements necessary for an operational Floridan Aquifer well at that site.

The budget value for Well Construction includes a complete well without any wellhead improvements. It includes well drilling operations, casings and grouting, mud handling, reverse air solids handling, treatment and pumping of formation water, production zone development including acidizing, and logging.

The budget value for Wellhead Construction includes the features currently in place and in use at the existing most recent Floridan well sites.

The budget value for Formation Water Disposal includes pipelines, both temporary and permanent, and discharge provisions at the point of disposal.

A budget for the raw watermain needed to serve an individual well site is not practical since a pipe must be extended from each well to the existing raw watermain system even if this pipe passes a well site which was not acquired. The potential future well sites have been placed into four groups for the purposes of estimating the raw watermain component of the budget value for construction of these future wells. These groups are shown on **Table 2.6**. Raw water main construction for each group is as follows.

- Group 1 – Assumes construction of a raw watermain beginning at Jupiter Gardens Drive and proceeding South to LRD A site and then west to LRD C site
- Group 2 - Assumes construction of a raw watermain beginning at Jupiter Gardens Drive and proceeding north across Indiantown Road and the C-18 Canal to the SAS Wellfield 4-1 site
- Group 3 – Assumes construction of raw watermain beginning at Jupiter Gardens Drive proceeding north across Indiantown Road/C-18 Canal and north on Island Way to JCP – 2 site
- Group 4 - Assumes construction of raw watermain beginning at RO-13 and proceeding south to the RO-14 site
- Group 5 - Assumes construction of raw watermain beginning at the Hawkeye site and proceeding north to Jupiter Gardens Drive

The raw watermain budget value in **Table 2.6** represents the total cost for raw water mains to serve that entire group, includes all wells in that group, and the total budget value for all raw water mains in that group is evenly divided among the wells. If construction of future wells does not follow the groups shown in **Table 2.6**, the budget values must be adjusted based on the wells that will be constructed. Since the recommendation is to only construct three additional wells, the raw watermain sizes may change based on the wells that are constructed.

The budget value for Emergency Electrical Supply represents a value based on assumptions specific to each group since providing emergency power to each site varies. The assumptions for each group are as follows.

- Group 1 – Assumes that a single source of electrical power will be developed for all wells in Group 1. This will include normal and emergency electrical power

- Group 2 – Assumes that the two C-18 wells will not have emergency power and that SAS WF 4-1 will be provided both normal and emergency power from the proposed electrical power facility planned as a part of SAS Wellfield 4
- Group 3 – Assumes that all three sites in Group 3 will be provided with both normal and emergency power from the proposed electrical power facility planned as a part of SAS Wellfield 4
- Group 4 – Assumes that both normal and emergency power will be provided from the existing Riverbend Storage and Repump facility
- Group 5 – Assumes that both normal and emergency power will be provided by a distribution panel and emergency generator located on the Hawkeye site

Table 2.6 includes a relative comparison of three non-monetary factors for each well site. These factors are considered an important component of the suitability of each potential site. Each factor is assigned a value between 1 and 10 with 1 being the least desirable and 10 being the most desirable.

Property use, in particular residential use, adjacent to the well site is an important factor to consider when evaluating a well site. Construction of a well, and future maintenance of a well, involves large and powerful equipment.

Each well site presents a different set of issues and attributes relative to activities during construction. Significant interaction with the public during construction is not favorable.

The Hydrogeological Rating of each potential well site assesses the potential benefit of the well site to spread out withdrawal from the Floridan Aquifer wellfield and promote sustainability of the wellfield.

Based on the matrix evaluation, the most appropriate location to construct the additional three (3) wells would be the Loxahatchee River District (LRD) site. Previously, the Town's CIP called for the construction of RO-14 at the southwest corner of Palm Beach County Estates in 2020. The estimated cost of this well is $2,935,745. Given the potential cost savings, it is further recommended that the construction of RO-14 be delayed and construction of the wells on the LRD site be immediately persued, if obtainable.

Table 2.6
Floridan Well Development Matrix
Town of Jupiter

	Group 1			Group 2			Group 3			Group 4	Group 5
	LRD-A	LRD-B	LRD-C	C-18-1	C-18-2	SAS WF 4-1	SAS WF 4-2	JCP-1	JCP-2	RO-14	Hawkeye
Well Construction Cost	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000	$1,500,000
Wellhead Construction Cost	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000	$650,000
Formation Water Disposal	$30,000	$15,000	$100,000	$0	$0	$268,000	$550,000	$172,000	$318,000	$0	$15,000
Raw Water Main	$202,000	$651,000	$231,000	$385,000	$182,000	$540,000	$1,025,000	$175,000	$318,000	$200,000	$250,000
Normal & Emergency Electrical	$250,000	$250,000	$250,000	$0	$0	$900,000	$400,000	$400,000	$400,000	$100,000	$250,000
Well Site Total	**$2,632,000**	**$3,066,000**	**$2,731,000**	**$2,535,000**	**$2,332,000**	**$3,858,000**	**$4,125,000**	**$2,897,000**	**$3,186,000**	**$2,450,000**	**$2,665,000**
Well Group Total	**$8,429,000**			**$8,725,000**			**$10,208,000**			**$2,450,000**	**$2,665,000**
Adjacent Property Uses	6	8	6	10	10	3	3	7	7	5	9
Constructability Rating	9	9	9	7	7	7	7	6	6	9	9
Hydrogeological Rating	7	7	7	6	6	7	7	8	8	7	5
Average Non-Monetary Rating	**7.3**	**8.0**	**7.3**	**7.7**	**7.7**	**5.7**	**5.7**	**7.0**	**7.0**	**7.0**	**7.7**

Group 1 - Assumes construction of raw watermain beginning at Jupiter Gardens Drive and proceeding South to LRD A site and then west to LRD C site.

Group 2 - Assumes construction of raw watermain beginning at Jupiter Gardens Drive and proceeding north across Indiantown Road and the C-18 Canal to SAS Wellfield 4-1 site.

Group 3 - Assumes construction of raw watermain beginning at Jupiter Gardens Drive proceeding North across Indiantown Road/C-18 Canal and north on Island Way to JCP-2 site.

c. Reverse Osmosis Concentrate Treatment Facility Improvements

The Concentrate Treatment Facility (CTF) treats concentrate produced at the Reverse Osmosis Water Treatment Plant (RO WTP) and includes two induced draft degasifiers. This element will focus on the two degasifiers and recommended improvements that will allow the degasifiers, and therefore the CTF, to operate more efficiently and with greater flexibility in automatic operation.

Degasifier 1301 was constructed with the original RO WTP in 1989 and Degasifier 1302 was added in 1996.

Reverse Osmosis Concentrate Treatment Facility

Description of Facility and Deficiency

The Facility includes the following major components and their function.

1. Two induced draft degasifier towers with each tower having two separate vertical cells. Upward air flow through the individual cells removes hydrogen sulfide from the downward flowing concentrate and increases dissolved oxygen content in the concentrate.
2. Three chemical metering pumps that inject acid into the concentrate to reduce its pH which improves hydrogen sulfide removal within the degasifier.
3. A single air blower that draws air through the two degasifiers and pushes the hydrogen sulfide laden air into the scrubber.
4. A 2-stage forced draft caustic/chlorine scrubber to reduce hydrogen sulfide in the air from the degasifiers prior to it being released into the atmosphere.
5. A panel that controls the degasifier components.

There is ducting and manually operated dampers in place that allow the air from the CTF degasifiers to be pulled by the RO permeate degasifier odor control system (MBA) blowers and treated at the MBA units for reduction of hydrogen sulfide. This method of operation is an emergency backup to the caustic/chlorine scrubber.

The degasifiers are designed to each treat 3.3 MGD of concentrate and are not redundant. The design air flow in each degasifier is 11,000 CFM or a total of 22,000 CFM.

The scrubber is designed for a maximum air flow rate of 22,000 CFM.

These degasifiers, blower, and chemical metering pumps have an excellent performance record treating concentrate that meets the standards required for discharge into the C-18 Canal.

Operating efficiency is generally at its highest when the treatment units are operating at or near their peak capacity. At lower system operating rates it would be best to operate the CTF degasifier one cell at a time. This is not possible for these units without significant modifications to the air outlet connections at the top of the degasifier. This analysis will focus on improvements needed to allow either degasifier to operate independently of the other degasifier and will not consider the modifications needed to operate individual degasifier cells.

The current operation of the degasifiers and the CTF is inefficient for several reasons as described below.

1. There is a significant difference in concentrate flow through each of the two degasifiers when both are online. This leads to varying levels of treatment in each degasifier.

2. The control system is not able to operate each degasifier independently. This eliminates the ability to reduce operating cost by operating only one degasifier when RO WTP production allows.
3. The air blower operation is currently single speed which means that it cannot produce the reduced air flow required for one degasifier. This does not allow the energy savings of reduced air flow and requires the scrubber to consume additional chemicals when a lower air flow would require less chemicals.
4. Logic in the existing control panel cannot be modified due its proprietary origins and therefore the addition of chemical to the degasifiers will waste chemicals.

Recommended Improvements

The improvement needed to allow each degasifier to operate independently is installation of actuators operated by the control system on each of the existing four degasifier feed pipe valves. The existing valves should be replaced and fitted with air-powered actuators to be compatible with the rest of the plant equipment. Each degasifier air outlet duct is equipped with an actuated damper and therefore no modifications are needed to the air side of each degasifier.

The improvement needed to create equal flow in the two degasifiers when both are online is replacement of the nozzles in both degasifiers. This will require replacement of the distribution piping in Degasifier 1301. The degasifier distribution piping, which supports the nozzles and distributes concentrate to the nozzles, in Degasifier 1301 uses a style of pipe joint for nozzle connection that is no longer available. These nozzles and their connection to the distribution header are shown below.

Reverse Osmosis Concentrate Treatment Facility Degasifier 1301 Nozzles

Accordingly, these nozzles cannot be replaced with nozzles hydraulically identical to the nozzles in Degasifier 1302. Degasifier 1302 nozzle connections are standard pipe thread and are shown below. Replacing the distribution piping in Degasifier 1301 with nozzle connections that are standard pipe thread will allow selection of replacement nozzles that will be identical in both degasifiers.

Reverse Osmosis Concentrate Treatment Facility Degasifier 1302 Nozzles

The improvement needed to allow the CTF to operate at two different air flow rates is control of the existing VFD unit on the air blower. The control system will then be able to operate the blower at speeds that are appropriate for efficient operation of one or two degasifiers.

The improvement needed to correct logic and performance of the control panel is to replace the control panel with one having components compatible with the existing plant control/SCADA system.

A recommended budget to construct the CTF improvements described herein is $300,000.

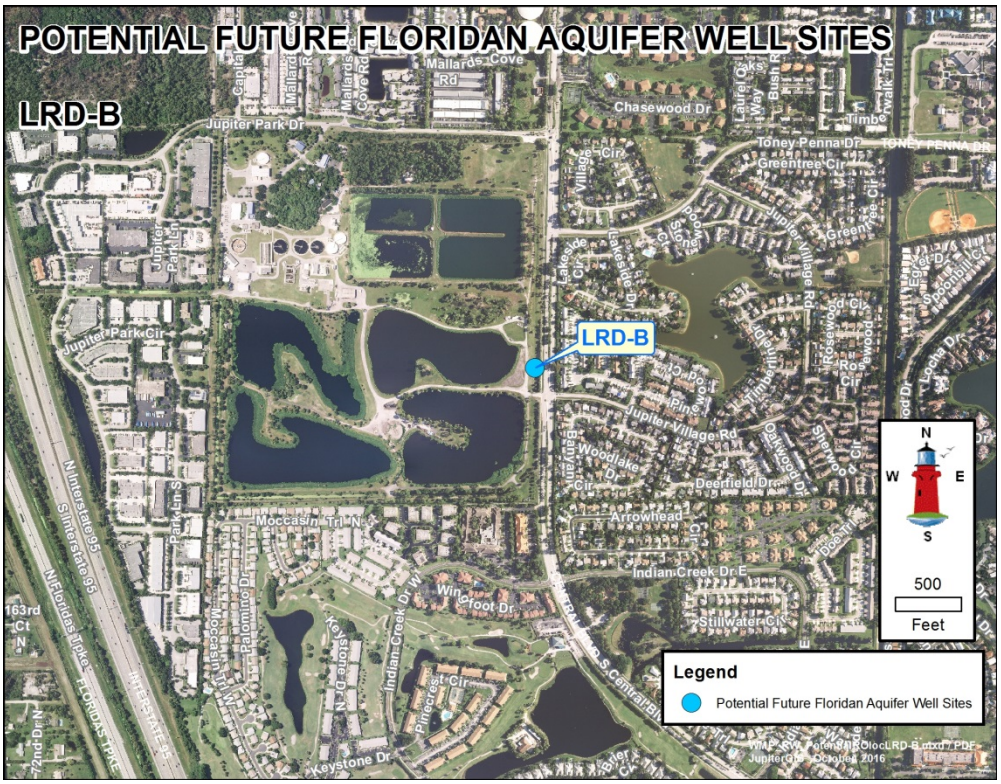
d. Future Reverse Osmosis Treatment Modifications to Address Raw Water Degradation

The Reverse Osmosis Water Treatment Plant (ROWTP), which is responsible for approximately 45% of the drinking water produced for customers of the Jupiter Water System, is facing the challenge of increasing salinity in its raw water supply. As salt content in the raw water increases a higher pressure is required to be applied to the reverse osmosis membranes to make the same amount of drinking water.

As discussed in previous sections of this Update, additional Flordan Aquifer (FA) wells are needed to reduce the rate of decline of water quality in the Town's FA wellfield and to protect individual FA wells from over pumping which leads to stress on the wells and the wellfield and contributes to water quality degredation. The Town's FA wells are relatively young, ranging in age from 12-28 years old. Therefore, it has only been until recently, that historical trending of FA water quality data has been a useful tool for predicting future water quality targets to indentify limitations of existing equipment and processes. Furthermore, FA water quality data collected from this Update forth will continue to be trended against the future water quality projections included herein so that adjustments to future equipment and processes improvements can be made as needed. It is expected that salinity of the FA raw water will continue to increase with use over time however; it is believed that the rate of increase can be slowed down or controlled by managing use of the wells including pumping rates and rotation of wells in service. Nevertheless, the Jupiter Water System must plan ahead and be prepared for increasing salt content in the FA raw water and its effect on ROWTP equipment and processes.

Figure 2.7 provides a projection of ongoing degradation of the Floridan Aquifer raw water quality over time in terms of Total Dissolved Solids (TDS). The figure illustrates the expected future range of TDS concentrations projecting out to the year 2035. It provides the estimated upper and lower TDS concentrations (levels) of water produced from the Floridan Aquifer wells based on known water quality data from the Town's individual wells to date. The combined raw water TDS from the entire wellfield currently falls at the approximate midpoint of the current range (5,200 mg/L TDS). As such, the average water quality produced from the wellfield is expected to be near the midpoint of the range (7,500 mg/L TDS) in 2035.

Figure 2.7



The rate of TDS increase in produced water from the wells is dependent on factors including natural aquifer conditions, pumping rate and well spacing. All Upder Floridan Aquifer wells that are pumped undergo increases in TDS over time. The rate of the TDS increase varies from well to well. Because TDS increases in water produced from individual wells over time, the combined wellfield raw water TDS also increases.

The historical TDS increases shown in **Figure 2.14** include the addition of new wells approximately every ten years. Wells RO-5, RO-6, RO-7, RO-8, RO-9 and RO-10 were added in 1996-1998; Wells RO-11, RO-12 and RO-13 were added in 2006. Because new wells initially provide lower TDS water than well that have been existing in service for many years, the addition of wells reduces the average TDS of the combined raw water. It is expected that an additional 4 wells will be added in the future. Without the addition of new wells, the slope TDS projection will likely be steeper than shown in **Figure 2.14** and the Floridan Aquifer raw water TDS in 2.35 will likely be greater than 7,500 TDS.

Based on projections for future FA water quality provided in **Figure 2.7**, two significant limitations in the ROWTP have been indentified and will need to be addressed in order to

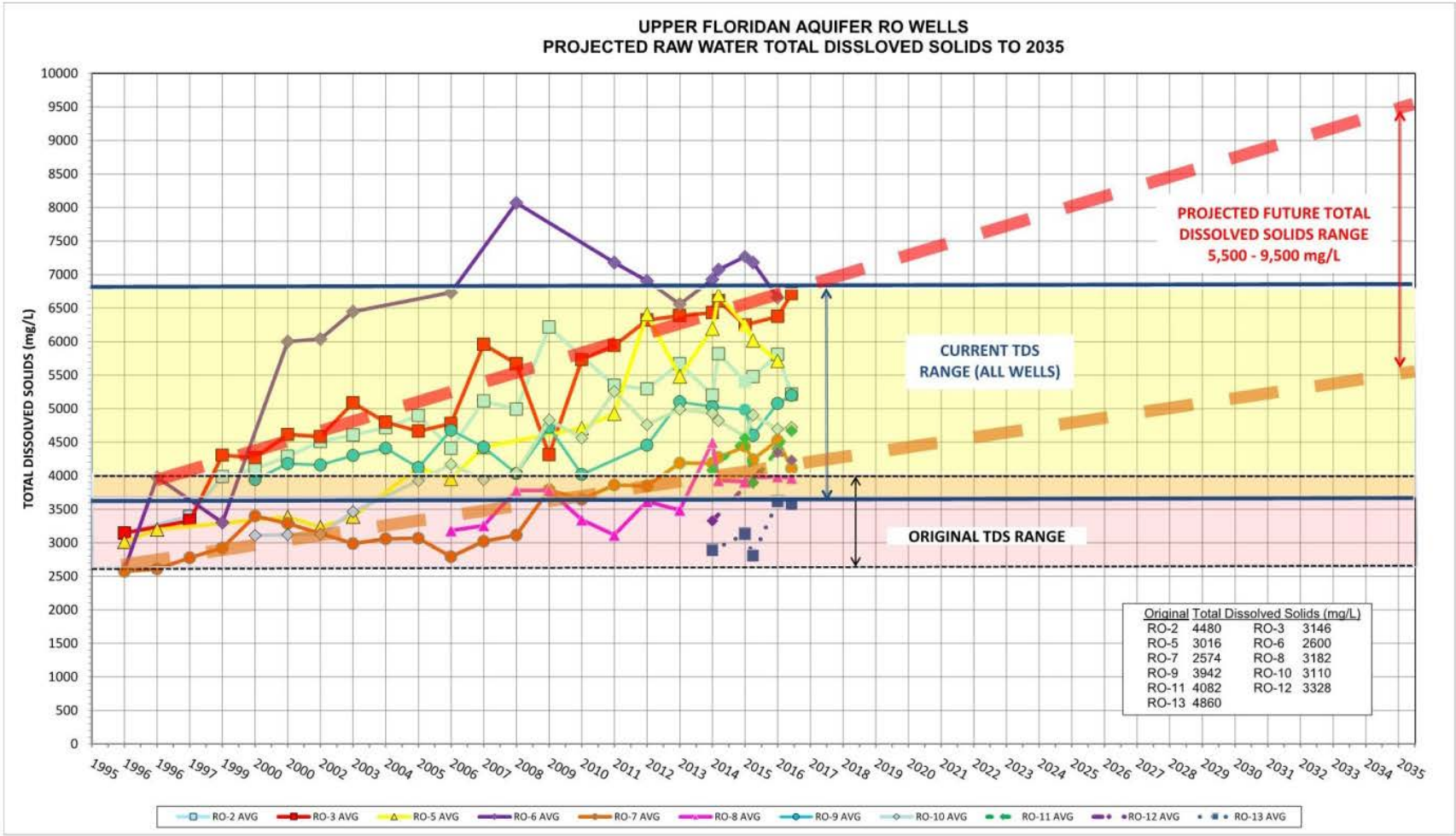
continue drinking water production at the quantity and quality that the Plant was designed and that currently exists.

The first limitation is feed pressure, or pressure applied to the reverse osmosis membranes. The current system of well pumps and feedwater pumps can produce approximately 294 PSI. The recommended improvement to overcome this limitation is installation of a five unit pumping station to boost raw water pressure by approximately 95 PSI and therefby boost pressure on the membranes by a similar amount. This recommendation avoids modifying nine (9) existing feed water pumps and fourteen (14) existing Floridan Aquifer well pumps.

The second limitation is salt content in the drinking water, expressed as salt rejection by the membranes. Modern membranes can reject 99.8% of the salt in the feedwater, or allow 0.2% of the salt to pass the membrane into the drinking water. As the raw water salt content increases, the salt content of the drinking water increases until it is higher than the 125 ppm limit established by the Water Department. The recommended remedy is to treat a small portion of the product water produced by the membranes with a second pass through additional reverse osmosis membranes to remove additional salt. Water produced by this second pass would be blended with the RO plant product water to produce drinking water with a salt content of approximately 125 ppm.

The following presents an approach for making incremental modifications to the Jupiter Reverse Osmosis Water Treatment Plant equipment and processes to allow the facility to continue producing drinking water that meets design criteria as salt content, or TDS increase in the raw water supply serving the plant. The approach contains three phases based on projected future TDS increases which allows the modifications and capital expenditures to be distributed over a longer period of time and potentially avoid implementing those improvements having the higher capital casts in the event the future increase in raw water TDS is less than projected.

Figure 2.14



JLA Geosciences, Inc.

*Projection of future raw water TDS assumes RO-4 in service in 2016; and three additional wells in 2020.

There follows a description of the recommended three phase improvement program to incrementally modify the ROWTP, and its support systems, to allow the ROWTP to operate with higher salinity raw water. A number of assumptions must be established to guide this improvement program.

- For a conservative approach, train performance projections will use a membrane equal to the DOW BW30HR when raw water TDS exceeds 7,300 PPM. This is considered conservative as there are at this time membranes with rejection equal to the BW30HR and requiring less feed pressure. It is likely that a somewhat lower pressure membrane will be available in the future when raw water TDS exceeds 7,300 PPM.
- Assume a maximum Stage 1 feed pressure of 390 PSI. This is not considered conservative as the Stage 1 membrane vessels on trains E, F, G, H, and I all have a pressure limitation of 400 PSI. Stage 1 membrane vessels on trains A, B, C, and D have a 600 PSI pressure limitation.
- Assume the maximum Stage 2 boost will be 175 PSI. This is considered conservative as a higher interstage boost is available and could be implemented.
- Assume a maximum total permeate TDS of 125 ppm. This is considered conservative as a higher permeate TDS could be acceptable based on other finished water characteristics and the use of corrosion inhibitors.
- The existing feed pumps limit Stage 1 feed pressure to each train. The maximum discharge pressure from each existing feed pump, assuming there is 10 PSI pressure at the inlet to each pump, is as follows.
    - Bank I (Trains A-D) = 354 PSI
    - Bank II (Trains E-H) = 294 PSI
    - Train I = 325 PSI.
- This limitation in available feed pressure is significant as raw water TDS increases. In order to increase Stage 1 feed pressure, a raw water booster station is required which represents a significant improvement project and a significant capital expenditure.

Phase 1

Phase 1 is intended to accommodate raw water TDS concentrations from less than 4,700 PPM to 7,300 PPM. Phase 1 involves continuation of the current membrane replacement program to place high rejection, low-energy membranes in all nine (9) trains. Bank II, consisting of Trains E, F, G, H, membranes have been replaced. Replacement of Bank I membranes, Trains A, B, C, D, along with Train I should be completed in fiscal year (FY) 2020. During replacement of membranes in Bank I trains, the train array is to be changed from its current 28:14 to 31:13 to make them identical to the trains in Bank II. Train I will remain in the same 35:14 array and also

continue to produce 1.7 MGD permeate while all other trains produce 1.5 MGD permeate or product water.

An improvement required during Phase 1 is installation of Stage 2 feed pressure booster pumps or replacing the existing interstage energy recovery devices (ERDs) so as to provide 175 PSI boost from Stage 1 concentrate to Stage 2 feedwater. The existing turbine driven boost pumps can achieve a total boost of approximately 80 PSI. The future requirement for 175 PSI boost is not possible using only a turbine driven ERD. The Stage 2 pressure boost needed as the raw water TDS concentration increases requires more energy than is available from the Stage 1 concentrate. Accordingly, there are two approaches available for increasing the available interstage boost.

The first is to add a pump to the existing interstage ERD discharge to further boost feed water pressure to Stage 2 so that it is higher than is possible to achieve by a turbine driven pump. This pump would be capable of approximately 500 GPM with a pressure boost of approximately 100 PSI and require approximately 40 hp. This approach allows the ERD unit to always operate at maximum recovery, which means maximum recovery of energy, and then have a variable speed pump incrementally increasing the Stage 2 feed pressure. This approach preserves the investment made in the existing ERD units while still providing finite control of the membrane train operation.

The second alternative is to install new ERD units that are composed of a turbine, a pump, and an electric motor, all on a common shaft. Currently there is one supplier of units configured in this fashion. This approach provides the same control of train operation as in the first approach and requires a similar installation of electrical supply and pump control wiring. The benefit is the unit is new and the turbines are likely to operate at a higher energy recovery efficiency than the existing units.

Installation of new devices to increase boost capability above the current capability of 80 PSI is required when raw water TDS reaches approximately 5,800 PPM. In order to accommodate raw water TDS concentrations up to 7,300 PPM, the required Stage 2 boost is 125 PSI. It is recommended that installation of added booster pumps, or new ERD units, be implemented in FY 2018 and that any new ERD units, or added booster pumps, that are installed during Phase 1 will be equipment that will be adequate through Phase 3 of this improvement program.

An interim measure to delay installation of new ERD units, or added booster pumps, that will allow the new membranes to function without an increase in interstage boost is to install valves that create a back pressure on Stage 1 permeate. This arrangement will increase Stage 1 feed pressure but allow proper balance of production between the train's two stages. With raw water TDS at approximately 7,300 PPM, and Stage 2 boost limited to the currently available 80

PSI, Stage 1 permeate backpressure must be 60 PSI and that creates a feed pressure of 280 PSI. This is within the capability of the existing feed pumps. It is not common practice to impose permeate back pressure on membranes and if this interim measure is considered it should be agreed to and with approval from the membrane manufacturer so as to maintain membrane warranties.

With raw water TDS at approximately 7,300 PPM, and interstage boost able to achieve 125 PSI, total permeate TDS is projected to be approximately 150 PPM, which is slightly higher than desired but still acceptable.

Phase 2

Phase 2 is intended to accommodate raw water TDS values from 7,300 PPM to 8,500 PPM. Based on the TDS growth projection, these improvements would be needed in 2028 or soon thereafter. During this phase, individual train recovery will be reduced from the current 75% to 70% while maintaining raw water supply to each train of 2.0 MGD, with the exception of Train I which receives 2.3 MGD. This will reduce the production capacity of each RO train and consequently the ROWTP from its current 13.7 MGD to 12.7 MGD.

To maintain a conservative approach, it is assumed that membranes in all nine (9) trains will be replaced at the onset of Phase 2 improvements. All of the ECO PRO 440 membranes are assumed to be replaced with membranes equivalent to the DOW BW30HR. No other improvements are required during this phase.

With raw water TDS at approximately 8,500 PPM, using BW30HR membranes at 70% recovery, interstage boost at 125 PSI, feed pressure would be 262 PSI which is below the existing feed pump limitation of 294 PSI and permeate TDS would be 135 PPM.

Phase 2 is considered an interim phase which does not require capital expenditures other than replacement of membranes. Reducing the reverse osmosis treatment production capacity could become permanent in the event the ultimate requirement of the Jupiter Water System allows a decrease of 1 MGD in total production capacity. Reducing the recovery to 70% as recommended would effectively decrease production capacity of the entire treatment plant from 30.0 MGD to 29.0 MGD.

Phase 3

Phase 3 is intended to accommodate raw water TDS concentrations from 8,500 ppm to 11,500 PPM. It is expected that this phase would not need to be implemented during the next 20 years. Significant capital improvements are required during Phase 3 in order for the reverse osmosis treatment to operate at 75% recovery restoring plant operating capacity to 30.0 MGD,

produce permeate with a TDS concentration of approximately 125 PPM, retain the existing raw water transmission system piping and individual Floridan Aquifer well pumps, and retain the existing feed water pumps.

Train operating projections conducted for preliminary design of Phase 3 improvements use a membrane equal to the DOW BW30HR which requires a slightly elevated feed pressure over other currently available membranes.

Feed pressure required for the individual trains rises above the 294 PSI limitation of the existing feed pumps when raw water TDS values exceed 9,500 TDS with an interstage boost of 175 PSI. In order to accommodate this design condition, several design concepts were investigated that would provide a raw water pressure of 95 PSI delivered to the suction side of the feed pumps, therby increasing the maximum available train feed pressure to 390 PSI.

There follows a description of those concepts.

- All of the Floridan Aquifer well pumps, projected to be 15 when Phase 3 improvements are required, could be replaced with new pumps, motors, and electrical components able to deliver an additional 100 PSI into the raw water collection system. This concept requires a significant number of improvements in the wellfield and may result in the need to replace sections of the raw water piping due to the projected increase in pressure.
- All of the nine train feed pumps can be rebuilt or replaced to produce 395 PSI discharge pressure. This requires modifying nine pumps and likely the electrical components and electrical supply for each pump.
- A booster pump station could be constructed on the ROWTP site which would boost raw water pressure to the existing feedwater pumps. This concept eliminates modifications to the well pumps and the feed pumps. The recommended boost of 95 PSI allows all existing raw water and treated raw water piping, fittings, and cartridge fillers to remain in service. The recommended configuration for the raw water booster station would include five 250 hp pumps with one pump as a redundant backup. The pump station would use vertical turbine pumps similar to those in use at the NF WTP. It is anticipated that the raw water booster pump station would be installed in the vicinity of the current sludge handling facility. Installation of a booster pumping station at that location allows all of the existing Floridan Aquifer well pumps to remain unchanged and to avoid possible need to replace portions of the raw water transmission system piping due to an increase in its operating pressure.

The train feed water piping and components on all nine Trains, including the Stage 1 feed manifolds and Stage 1 concentrate manifolds, may need to be replaced with piping having a 450 PSI pressure rating.

Stage 2 feed water and Stage 2 concentrate piping and components may need to be replaced with piping and components having a pressure rating of 650 PSI.

Bank II and Train I Stage 2 pressure vessels will need be replaced with units having a pressure rating greater than 650 PSI.

In order to meet the design criteria of permeate TDS having a value of approximately 125 PPM, a component of Phase 3 is installation of a second pass on all nine (9) membrane trains. Two alternatives were considered in configuration and placement of the second pass membrane treatment facilities.

- Two or three treatment units could be constructed, likely in the area of the sludge handling facilities, that would further treat a common supply of Stage 2 permeate. This concept requires construction of a new building and piping from the existing process building to the new second pass building. A significant concern with this concept of larger capacity second pass treatment units is the inability to operate any desired number of RO trains. It may become necessary to operate a specific number of RO trains if there are a limited number of larger capacity second pass trains.

- The second alternative is installation of second pass components on each of the existing RO trains. This alternative allows each of the existing nine RO trains to produce drinking water quality permeate, regardless of the number of RO trains online. The second pass vessels will be housed in the unused Stage 1 locations. The second pass will use a new feed pump that discharges a metered flow of Stage 2 permeate through the second pass vessels. The expected flow rate of permeate through the second pass is approximately 150 GPM which requires approximately 4 membrane vessels. The second pass is intended to be single stage and operate at at least 65% recovery. Concentrate from the second pass, approximately 55 GPM, will be placed into the Stage 1 raw water pipe. This will reduce TDS of the feedwater coming into each train and reduce Stage 1 and Stage 2 feedwater pressures. Permeate production in Stage 1 and Stage 2 of each train will be increased to accommodate the concentrate flow from the second pass.

There follows a recommended budget for implementing the new and modified facilities listed and recommended above for Phase 1 and Phase 2 of this improvement program.

Phase 1 includes new membranes in 5 trains (A-D and I) which carries a recommended budget amount of $750,000. Also included in Phase 1 are added pumps for increasing interstage boost

in all nine trains or new energy recovery devices that would include a motor assisted unit on each of the nine trains. Installation of either of these recommended devices will require modifying piping on each train. The recommended budget for this work is $1,500,000. Implementation of this phase should occur in 2020 based on current TDS projections, with replacement of the ERDs occurring in 2018 if raw water salinity increase warrants it.

Phase 2 includes replacement of membranes in all nine RO trains and reducing individual train recovery from 75% to 70%. The recommended budget for membrane replacements in Phase 2 is $1,993,000.

Phase 3 includes construction of a raw water booster pump station on the WTP site. A recommended budget for this facility is $4,200,000. Phase 3 also includes adding a second pass reverse osmosis treatment system for portions of the Stage 2 permeate on each of the nine trains. A recommended budget for these improvements is $1,600,000. Implementation of this phase should occur in 2028 based on projected raw water TDS levels for the Town's FA wells.

e. Reverse Osmosis Permeate Degasifier Improvements

The Reverse Osmosis Water Treatment Plant (ROWTP) includes 3 degasifiers which remove hydrogen sulfide from the RO permeate. The 1989 ROWTP initial construction phase included the first two degasifiers, D-401 and D-402, and the third degasifier, D-403, was added during the Phase 2 expansion in 1996.

The issue examined by this Master Plan Element is the adequacy of existing post treatment equipment for degasification of RO permeate to determine if the three existing degasifiers impose a hydraulic limitation which prevents the ROWTP from producing water at its rated capacity of 13.7 MGD and if the degasifiers are performing their treatment function of removing hydrogen sulfide from water produced by the reverse osmosis treatment process.

Description of Facility and Deficiency

The ROWTP produces drinking quality water by treating brackish Floridan Aquifer raw water using reverse osmosis membranes to remove salt and other mineral contaminants. The Floridan Aquifer raw water contains elevated levels of hydrogen sulfide gas which if left in the drinking water will produce an objectionable odor and taste. The ROWTP post treatment facilities which includes three degasifiers remove hydrogen sulfide gas from permeate produced by the reverse osmosis process.

Reverse Osmosis Permeate Degasifiers

The ROWTP, including the three permeate degasifiers, was originally designed for a treatment capacity of 12.0 MGD requiring a maximum hydraulic capacity of 4.0 MGD through each degasifier. In 2005, the ROWTP capacity was subsequently increased to 13.7 MGD with the addition of Train I. AS a result, the maximum hydraulic requirement on each of the three degasifiers increased from 4.0 MGD to 4.6 MGD.

The RO permeate degasifiers remove hydrogen sulfide from the permeate by passing air at a high flow rate upward through the degasifier while permeate is flowing downward through the degasifier. Air passing through the degasifier becomes laden with hydrogen sulfide removed from the permeate and if this air is released to the atmosphere untreated it will create a significant odor coming from the water plant. To prevent creating an odor to areas around the water plant, hydrogen sulfide is removed from the degasifier air discharge in a subsequent treatment process using two Mobile Bed Absorber (MBA) treatment units.

Operation of the RO permeate degasifiers is directly linked to operation of the MBA units since they operate in tandem with the dedicated blower for each MBA unit pushing air through the MBA unit and pulling air through all three degasifiers. The air flow rate through each MBA must be operated within a relatively narrow range of flow to keep the units packing mobile, or suspended in the flow of air. Any increase in airflow causes the packing to lose mobility and be

pressed upward and any decrease in airflow causes the packing to lose mobility and drop to the bottom of the unit. Therefore the ability to adjust airflow through the degasifiers is not possible.

There was previous concern that each RO degasifier might not able to pass 4.6 MGD to treat the full 13.7 MGD capacity of the ROWTP. During previous hydraulic testing, all three RO permeate degasifiers were online, D-401 and D-402 overflowed when the ROWTP was operating 8 RO trains at a flow rate of 12.0 MGD.

Subsequent hydraulic testing conducted as a part of this Master Plan Update included operating the ROWTP at a permeate production flow rate of 4.7 MGD and directing that flow separately into each of the three degasifiers. Since the required flow rate for the 13.7 MGD ROWTP is 4.6 MGD through each RO Degasifier this procedure tested each degasifier at a flow rate slightly higher than its required flow rate. None of the degasifiers overflowed during this test and water level in all three degasifiers was approximately 2” below the overflow level. This testing concluded that there is not a hydraulic limitation in the three RO permeate degasifiers at current plant rated capacity of 13.7 MGD.

Based on the ROWTP capacity of 13.7 MGD, each RO degasifier operates at a maximum liquid flow of 4.6 MGD which is equivalent to a liquid loading rate of 31 gallons per minute per square foot (GPM/SF), which is somewhat higher than the maximum standard design criteria of 24 GPM/SF for degasifiers in this type of service removing hydrogen sulfide from RO permeate.

Based on the maximum allowable MBA airflow rate of 30,000 cubic feet per minute (CFM), each RO permeate degasifier currently operates at an air flow rate of 10,000 CFM. This produces a ratio of 24 CFM Air to 1 CFM Water, which is lower than the standard design criteria of 30 CFM Air to 1 CFM Water for degasifiers in this type of service. Accordingly, the RO Permeate Degasifiers are operating with a higher liquid flow and a lower air flow than called for by standard degasifier design criteria.

Adding a fourth degasifier would reduce the maximum liquid flow in each degasifier to 3.42 MGD or a liquid loading rate of 24 GPM/SF which then places it at the maximum standard design criteria. This can be considered an improvement to the degasifiers and could improve their overall hydrogen sulfide removal efficiency. Furthermore, adding a fourth degasifier would reduce the air flow in each degasifier to 7,500 CFM. This will creating an air to water ratio of 18 to 1 which places air flow in each degasifier well below the standard design criteria ratio of 30 to 1 for degasifiers in this type of service.

In general, when the degasifier operating conditions create an air to water ratio below the standard criteria of 30 to 1, hydrogen sulfide removal through the degasifier may not be as

effective. However, specific testing of these degasifiers prior to construction of the Phase 2 expansion in 2005 found that the degasifiers do have adequate hydrogen sulfide removal when operating at lower air to water ratios provided the permeate pH is close to 5.2.

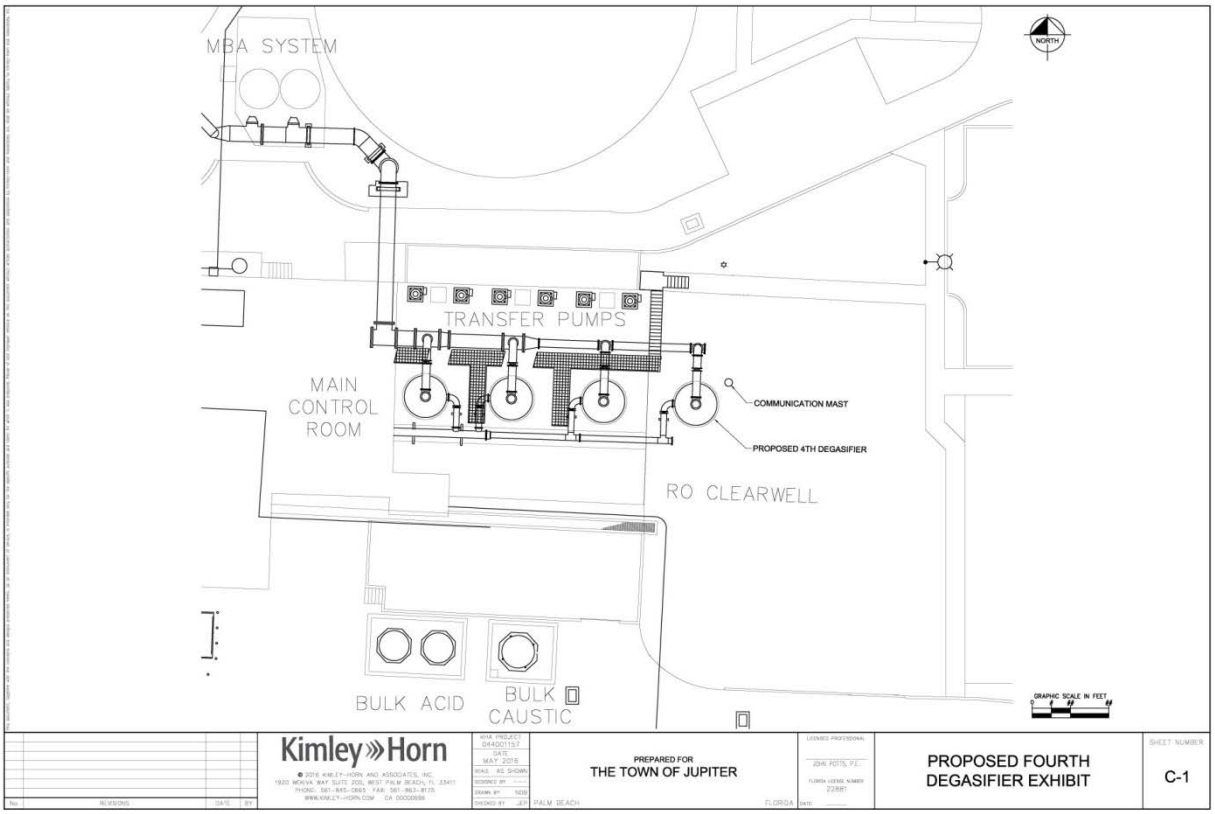
In order to raise the air to water ratio, additional airflow is needed through each of the permeate degasifiers. The relatively strict airflow requirements through the two existing MBA units does not allow increasing airflow through the MBA units which would in turn increase airflow through the degasifiers. The only alternative is to add a third MBA unit or other method of removing hydrogen sulfide from the RO permeate degasifier air discharge. This could not be accomplished adjacent to the existing MBA units due to lack of available space and is not considered a viable option.

Decreasing water and air flows through the existing degasifiers by adding a fourth degasifier could improve hydrogen sulfide removal efficiency. However, there is not a reliable method of predicting degasifier performance when the water and air flow rates are outside of the standard design criteria. Accordingly, there is not a method of conclusively determining that degasifier efficiency would be improved without actual testing of a degasifier at the projected future water and air flow rates. This testing is possible and would allow determination of the amount of improvement in degasifier efficiency or if there is no improvement in degasifier efficiency. A significant improvement in the degasifier efficiency could justify construction of a fourth degasifier.

Degasifiers have no moving parts and therefore redundancy is not a regulatory requirement; however, a redundant degasifier would allow unit cleaning, packing replacement, and other maintenance or repair functions to occur without losing ROWTP capacity. This ability to continue operations without reduction in production capacity has a benefit to the water system; however, placing a value on that benefit is not possible.

Installation of a fourth degasifier could improve performance of the existing three degasifiers relative to their primary water treatment function to reduce hydrogen sulfide concentration below 0.3 Parts Per Million (PPM) which is a State of Florida drinking water regulation. A second benefit would be availability of a redundant RO permeate degasifier to allow any degasifier to be taken off-line for maintenance or repairs without interrupting ROWTP production capacity. There is space available to install a fourth degasifier and this is shown in **Figure 2.15**.

Figure 2.15



Adding a fourth degasifier will require increasing the size of the air duct and permeate supply header between D-402 and D-403. The air duct between D-402 and D-403 is currently 24” and must be increased to 42” while the air duct from D-403 to the new degasifier would be 24”. The permeate supply pipe between D-402 and D-403 must be increased to 24” while the permeate supply pipe from D-403 to the new degasifier would be 18”.

In order to maintain identical operating characteristics with the existing three degasifiers, the fourth degasifier should be identical and be 11’ in diameter, 17’-8” high, and have an 8’ packing depth.

Recommended Improvements

There is not sufficient justification at this time to recommend adding a fourth degasifier. However, it is recommended that testing be performed on the existing degasifiers as discussed in this section to measure hydrogen sulfide removal efficiency at lowered air and water flow rates.

A recommended budget to add a fourth degasifier, in general as oriented and shown in **Figure 2.15**, is $500,000. A recommended budget to conduct the recommended degasifier testing is $7,000.

f. Nanofiltration Concentrate Main Hydraulic Investigation & Repairs

The Town transfers byproduct water flows from the nanofiltration (NF) water treatment process to the Loxahatchee River District (LRD) for use in its reuse or irrigation-quality (IQ) water distribution system. Hydraulic testing and analysis to determine practical flow limits of the concentrate discharge piping system between the Town's NF plant and LRD was conducted.

Currently the practical limit of concentrate pressure available at the Nanofiltration Water Treatment Plant (NFWTP) is 38 PSI, measured by the pressure transmitter located on the Concentrate Treatment Panel. Concentrate pressures greater than 38 PSI frequently lead to fluctuations in operating conditions of the NF Trains, interfering with plant operations and are not easily tolerated.

Waters that currently discharge into the concentrate discharge piping system include NF concentrate, NF Pilot Unit concentrate and permeate, and Backwash Recovery Pump Station (BWRPS) discharge. Each NF Train produces approximately 350 GPM of concentrate flow; therefore, the existing five NF Trains generate 1,750 GPM of combined concentrate flow. The BWRPS receives flow from the pretreatment filter backwashing operation, NFWTP floor/instrument drains, RO WTP floor/instrument drains, IX regeneration operations, and ROWTP mezzanine cooling. The BWRPS system includes approximately 350,000 gallons of storage capacity which allows the BWRPS pumping rate to vary throughout the day using storage as a buffer.

For the purposes of analysis, the order of priority for flow into the concentrate discharge system is NF concentrate, NF Pilot Unit, and BWRPS. This is based on the assumption that the primary obligation at the water plant is to produce drinking water.

An objective of this analysis is to determine a maximum rate of flow for waters other than NF concentrate into the NF concentrate discharge system with the intent that these waters will be beneficial in reducing, on a weekly basis, the total dissolved solids (TDS) content of the NF concentrate conveyed to LRD. Reducing TDS in the water delivered to LRD is referred to as "blending" and the blend water is considered all water sent to LRD except NF Concentrate. In order to place the maximum amount of blend water into the concentrate discharge system, flow from the NF Pilot and BWRPS must be in service and there must be a source of water having a lower TDS than NF Concentrate available to the BWRPS.

Onsite testing was conducted on February 26, 2016 and May 11, 2016 which included operating the concentrate discharge system at different overall flow rates using varying flow rates of NF concentrate and BWRPS discharges. Flow measurements were available from the BWRPS alone, concentrate flow as a sum of the individual NF train concentrate flow meters, and the single flow meter that measures all flow leaving the WTP site through the NF Concentrate Main to LRD. The source of flow into the NF Concentrate Main is a factor when analyzing system head losses since discharge from the BWRPS has a shorter route (than the on-site NF Concentrate piping) to reach the NF Concentrate Main where it leaves the WTP site. In addition, pressure readings on the SCADA screen include head losses through the NF Concentrate on-site/in-utilidor piping.

During the February 26, 2016 testing event, pressure readings were recorded from the SCADA screen and at the LRD site immediately upstream of the check valve that is a part of the LRD metering station. The pressure reading on the SCADA control screen is sensed at the south end of the 6” concentrate pipe in the utilidor but the pressure measuring device is located in the NF Process Room above the utilidor and approximately 6’ above the floor level. This makes the pressure reading approximately 10 psi less than the actual pressure in the 6” pipe. This pressure is also not the pressure at the beginning of the NF Concentrate Main since it includes head losses in the concentrate piping within the utilidor and outside the NF building up to the Pig Launch.

There is no pressure reading on the SCADA screen unless there is concentrate flow through the utilidor since the check valve in the concentrate discharge pipe prevents pressure generated by the BWRPS from reaching the sensor.

The pressure measurement taken at the LRD site is immediately upstream of the LRD flow meter and check valve. It is assumed that this pressure gauge is at elevation 14.0’.

The data collected relative to pressure was all related to a reference elevation of 14.0’ which is the approximate elevation of the pressure gauge at LRD.

Data was collected for 12 scenarios, two of which did not include pressure measurements at the LRD site and one of which included pressure measurements at the LRD site, pig launch on the NF WTP site, and concentrate panel at the NFWTP.

A second round of hydraulic testing was conducted on May 11, 2016. This round of testing was intended to confirm the findings developed during testing in February, 2016. Several pressure monitoring locations were also added along the NF Concentrate Main route. Data was collected for 5 scenarios, Scenarios 12-16.

An additional pressure monitoring station was palced at an existing pipe wye located at the LRD metering station upstream of the air release valve location and also upstream of two plug valves. This additional pressure monitoring location was intended to determine if there was any additional head loss through the two plug valves.

In addition, another pressure monitoring station was added to the May 2016 testing located on the west side of Central Boulevard where the NF Concentrate Main crosses Central Boulevard. This additional pressure monitoring station was intended to confirm that there are no significant pressure losses in the section of NF Concentrate Main under Central Boulevard.

A third additional pressure monitoring station was also located on the top of the pig launch located on the NF Concentrate piping on the WTP site upstream of the transition to the NF Concentrate Main. This additional pressure monitoring station was intended to determine if there is any significant head loss through the buried in-line check valve located upstream of the pig launch.

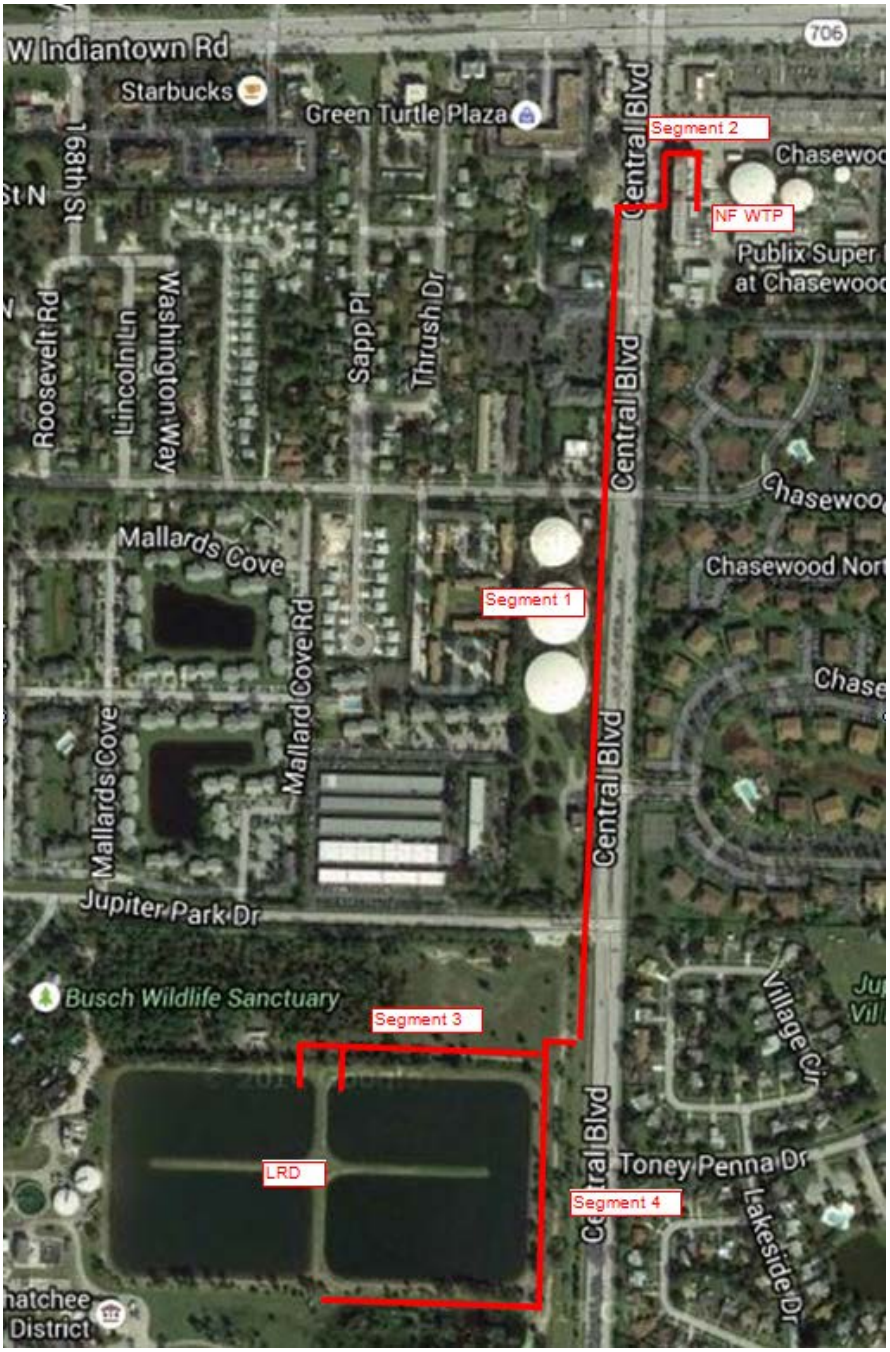
For the purposes of this analysis the concentrate piping system was divided into four Segments which are shown on **Figure 2.16**. Of interest are Segments 1, 2, and 3 which include the following:

Segment 1 – Approximately 2,550’ of 14” DR 11 high density polyethylene (HDPE) pipe, beginning at the pig launch and extending to the LRD onsite metering station. Segment 1 is also referred to as the NF Concentrate Main.

Segment 2 – An equivalent length of approximately 525’ of 12” cast iron (CI) pipe located in the NFWTP Utilidor and extending outside of the building to the pig launch. Segment 2 is also referred to as the NF Concentrate Onsite/Utilidor piping.

Segment 3 – Approximately 630’ equivalent length of 14” CI pipe from the LRD onsite metering station to the LRD IQ storage ponds.

Figure 2.16



Data collected during hydraulic testing allowed calculation of the head loss in each of the three segments.

In order to calculate the head loss in Segment 1, the pressure at the Pig Launch is needed. This pressure measurement was not obtained during the February 2016 testing, Scenarios 1-11, and therefore it must be calculated. The head loss through Segment 2 was calculated and

subtracted from the pressure at the Concentrate Panel. A C Factor of 110 was used in these calculations and for the purposes of simplifying the calculations a single point of entry for the concentrate at the south end of the 12" concentrate pipe in the utilidor was assumed. The calculated head loss in Segment 2 is approximately 1 PSI at 1,050 GPM concentrate flow and approximately 2.5 PSI at 1,750 GPM concentrate flow.

Scenarios 12-16 include pressure readings at the Pig Launch and therefore calculation of the head loss through those segments is straightforward.

Table 2.7 presents the data recorded during this hydraulic testing event and includes the later scenarios, Scenarios 12-16. **Table 2.8** presents this data arranged in groups of approximately equal total flow through the NF Concentrate Main. Each of the scenarios conducted on May 11 shows approximately the same hydraulic performance compared to the performance noted in scenarios conducted on February 26. There is no indication that conditions have changed or that conclusions reached based on the data accumulated in February are not accurate.

Table 2.7

Town of Jupiter
Concentrate Main to LRD
Hydraulic Testing
5/11/2016

Date	Time & Notes	Trains On-Line	Conc. Flow (GPM)	BWRP Flow (GPM)	Sum Flow (GPM)	Fit Flow (GPM)	SCADA Screen Pressure @ Elev 22' (psi)	LRD Pressure Wye @ Elev 12' (psi)	Pressure @ Pig @El 18' (psi)	SCADA Press. @ Elev. 14' (psi)	Pressure @ Pig @El 14' (psi)	Pressure ARV Central @ Elev 14' (psi)	LRD Pressure Wye @ Elev 14' (psi)	LRD Pressure ARV @ Elev 14" (psi)	Head Loss LRD Main SCADA-LRD ARV (psi)	Head Loss LRD Main Pig-LRD ARV (psi)	Scenario
2/26/2016	2:03	2	818	0	818	818	5.4			8.9				3.0	5.9		1
2/26/2016	2:06	2	688	438	1126	1113	10.2			13.7				5.5	8.2		2
2/26/2016	2:10	2	654	785	1439	1427	17.6			21.1				9.0	12.1		3
2/26/2016	2:15	3	1092	0	1092	1106	10.4			13.9				5.5	8.4		4
2/26/2016	2:20	3	1009	378	1387	1413	17.1			20.6				8.0	12.6		5
2/26/2016	2:27	3	995	739	1734	1747	26.6			30.1				12.0	18.1		6
2/26/2016	2:32	4	1454	0	1454	1464	19.6			23.1				9.0	14.1		7
2/26/2016	2:38	4	1227	770	1997	2021	36.5			40.0				16.0	24.0		8
2/22/2016	10:39	5	1836	0	1836	1864	33.7			37.2				NA	NA		9
2/22/2016	10:40	5	1416	697	2113	2146	43.2			46.7				NA	NA		10
3/22/2016	9:00	0	0	1398	1398	1388	0.0		20.3	23.1	22.0			10.0	13.1	12.0	11
5/11/2016	1:58	3	1050	100	1450	1485	17.3	4.5	17.0	19.8	18.7	19.0	3.6	6.5	13.3	12.2	12
5/11/2016	2:02	3	1150	0	1150	1150	10.7	0.5	10.5	14.2	12.2	13.5	0.0	3.5	10.7	8.7	13
5/11/2016	2:09	4	1420	0	1420	1420		4.0	16.0		17.7	18.5	3.1	6.0	NA	11.7	14
5/11/2016	2:28	4	1180	560	1740	1920	32.0	10.5	30.0	35.5	31.7	30.0	9.6	12.5	23.0	19.2	15
5/11/2016	2:34	4	1540	0	1540	1540	20.6	5.0	17.5	24.1	19.2	20.0	4.1	7.0	17.1	12.2	16

1. SCADA screen pressure transducer on NF Concentrate panel at elevation 22'
2. Concentrate flow is discharging into storage ponds at LRD 5/11/16
3. Concentrate flow is discharging into LRD DIW pond 2/26/16
4. LRD to storage pond, pressure gauge on top of pig launch
5. Pressure gauge on top of pig launch @ elevation 18'

Table 2.8

Town of Jupiter
Concentrate Main to LRD
Hydraulic Testing
5/11/2016

Date	Time & Notes	Trains On-Line	Conc. Flow (GPM)	BWRP Flow (GPM)	Sum Flow (GPM)	Fit Flow (GPM)	SCADA Screen Pressure @ Elev 22' (psi)	LRD Pressure Wye @ Elev 12' (psi)	Pressure @ Pig @El 18' (psi)	SCADA Press. @ Elev. 14' (psi)	Pressure @ Pig @El 14' (psi)	Pressure ARV Central @ Elev 14' (psi)	LRD Pressure Wye @ Elev 14' (psi)	LRD Pressure ARV @ Elev 14" (psi)	Head Loss LRD Main SCADA-LRD ARV (psi)	Head Loss LRD Main Pig-LRD ARV (psi)	Scenario
2/26/2016	2:03	2	818	0	818	818	5.4			8.9				3.0	5.9		1
2/26/2016	2:15	3	1092	0	1092	1106	10.4			13.9				5.5	8.4		4
2/26/2016	2:06	2	688	438	1126	1113	10.2			13.7				5.5	8.2		2
5/11/2016	2:02	3	1150	0	1150	1150	10.7	0.5	10.5	14.2	12.2	13.5	0.0	3.5	10.7	8.7	13
3/22/2016	9:00	0	0	1398	1398	1388	0.0		20.3	23.1	22.0			10.0	13.1	12.0	11
2/26/2016	2:20	3	1009	378	1387	1413	17.1			20.6				8.0	12.6		5
5/11/2016	2:09	4	1420	0	1420	1420		4.0	16.0		17.7	18.5	3.1	6.0	NA	11.7	14
2/26/2016	2:10	2	654	785	1439	1427	17.6			21.1				9.0	12.1		3
2/26/2016	2:32	4	1454	0	1454	1464	19.6			23.1				9.0	14.1		7
5/11/2016	1:58	3	1050	100	1450	1485	17.3	4.5	17.0	19.8	18.7	19.0	3.6	6.5	13.3	12.2	12
5/11/2016	2:34	4	1540	0	1540	1540	20.6	5.0	17.5	24.1	19.2	20.0	4.1	7.0	17.1	12.2	16
2/26/2016	2:27	3	995	739	1734	1747	26.6			30.1				12.0	18.1		6
2/22/2016	10:39	5	1836	0	1836	1864	33.7			37.2				NA	NA		9
5/11/2016	2:28	4	1180	560	1740	1920	32.0	10.5	30.0	35.5	31.7	30.0	9.6	12.5	23.0	19.2	15
2/26/2016	2:38	4	1227	770	1997	2021	36.5			40.0				16.0	24.0		8
2/22/2016	10:40	5	1416	697	2113	2146	43.2			46.7				NA	NA		10

1. SCADA screen pressure transducer on NF Concentrate panel at elevation 22'
2. Concentrate flow is discharging into storage ponds at LRD 5/11/16
3. Concentrate flow is discharging into LRD DIW pond 2/26/16
4. LRD to storage pond, pressure gauge on top of pig launch
5. Pressure gauge on top of pig launch @ elevation 18

The similar pressures between the Pig Launch and the air release valve on the west side of Central Boulevard demonstrate that the NF Concentrate Main crossing Central Boulevard has no significant head loss.

The similar readings between the Pig Launch and SCADA screen indicate that at lower flow rates there is no significant head loss through the buried check valve on the WTP site upstream of the Pig Launch. Piping that is a part of this segment includes the onsite concentrate piping located in the utilidor. The May 11 data indicates that at the flow rate of approximately 1,750 GPM, head loss between the Pig Launch and the SCADA screen increases from 2.5 to 4.9 psi. This represents a higher head loss than is expected. Accordingly, it is recommended that the in-line check valve be removed from the piping or the internal components removed from the check valve. This is likely only precautionary since the head loss is not significantly higher; however, the presence of that check valve would always remain of concern.

Comparison of the two pressure readings at the LRD metering station indicate strongly that the pressure gauge installed on the wye is not accurate. When corrected for elevation difference, the difference in these two gauges is 3.5 psi throughout all readings which implies that there is not a hydraulic restriction between the two gauges. If there was a restriction in the plug valves, the difference between these two readings would increase as flow increased.

Pressures observed during the May 11 testing were overall approximately 2 psi less than the pressure readings in April/February. This is attributable to LRD directing concentrate into the storage ponds after the February testing was conducted. The IQ storage ponds are at a lower water surface elevation than the deep injection well (DIW) pond and the pipe length to reach the DIW pond is longer than the pipe length to reach the IQ storage ponds.

In order to determine if there are unforeseen or unpredicted head losses in the LRD piping on site which carries the NF concentrate to the LRD storage ponds, a head loss was calculated using a C factor of 110 and that calculated head loss compared to the measured head loss in 8 scenarios. The variation between calculated head loss and observed head loss consistently varied by approximately 6%. This gives credibility to the data collected and the analysis technique. This is also a routinely acceptable value for C Factor in ductile pipe of this age. This indicates that there is no unforeseen obstruction in that piping segment.

A calculated C Factor should remain the same regardless of flow and is a method of determining if there are unforeseen or unexplained head loses in a piping segment.

Using the data collected during February 2016 and May 2016 testing, a C Factor in Segment 1 was calculated under 13 different scenarios and varied between 46 and 57. This is considered consistent and gives credibility to the data collected and the analysis technique. Hydraulic testing conducted in November 2009 resulted in a calculated C factor in Segment 1 of

approximately 110. Hydraulic testing conducted in February 2011 reulted in a calculated C factor of 85 calculated for Segment 1.

Based on the pipe material and age, the NF Concentrate Main (Segment 1) should have a C Factor of approximately 130. The calculated C factors obtained from the testing data indicate a significant obstruction to flow within this pipe segment. Additionally, and of significant concern, is the fact that the C factor is decreasing with time implying that the cause of the restriction in the NF Concentrate Main is getting worse.

A reduction in pipe C Factor can be the result of the following:

1. A piece of foreign material in the pipe creating a physical obstruction to flow within the pipe
2. An air pocket at a high point in the pipe creating an obstruction to flow
3. An accumulation of sand/debris at a low point in the pipe creating an obstruction to flow
4. Collapse of the pipe reducing its cross-sectional area
5. Scouring of the pipe internal wall creating a rough pipe wall surface

Any of these causes are possible in the case of the NF Concentrate Main although 2 and 5 are not considered likely in this situation.

If Segment 1 was operating with the appropriate C Factor of 130 and assuming the same 38 PSI maximum concentrate pressure at the NF Plant, the maximum capacity of Segment 1 would be approximately 2,400 GPM, which is also the design capacity of the pipe. Recall Segment 1's current capacity has been reduced to 1,850 GPM.

As a result, operation of the BWRPS must be controlled in order to prevent its flow from overloading the concentrate discharge pipe and creating operating pressures in the concentrate discharge system that interfere with proper operation of the NF WTP. The backwash recovery system receives approximately 3,500,000 gallons of water per week. The pump station must remove at least that amount of water in order to prevent accumulation of water in the BWR system. This requires the BWRPS to operate at a constant, or average, flow rate of 350 GPM.

Because the NF Concentrate Main is limited in capacity, the maximum amount of blending will occur by operating the BWRPS at a flow rate equal to 1,850 GPM less combined NF Concentrate flow from the NF Trains less NF Pilot flow. For the purposes of discussing blend water, NF Pilot discharge is the same TDS as raw water since it is a combination of Pilot concentrate and Pilot permeate. TDS of raw water is lower than TDS of concentrate.

The amount of blend water that can be added to the concentrate on a weekly basis will be dependent on the amount of drinking water produced at the NF WTP. If the NF WTP operates 3 NF Trains, concentrate flow is 1,050 GPM. This will allow a blend water flow rate of 800 GPM. With 4 NF Trains in operation concentrate flow increases to 1,400 GPM and blend water reduces to 450 GPM. Clearly a wide variety of blend ratios could be assumed; however, the most direct approach for operation of the system is to maintain concentrate system flow at 1,850 GPM and allow the blend ratio to be what it is.

In the future there may be the desire to blend additional waters, the recommended source for additional blend water is the raw water pressure relief valve and piping which discharge into the Backwash Recovery Basin. When levels in the Backwash Recovery Basin decline to a predetermined elevation, the pressure relief valve can be opened by the Control System to allow water from the raw water system into the basin. To accomplish this the flow rate of raw water to the NFWTP must be increased in order to have water available to feed the NF trains and to serve as blend water to the Backwash Recovery Basin. This would be accomplished by activating a Well Group, likely composed of a single well, and modulating the pressure relief valve to operate as a flow control valve to achieve a flow rate in the Raw Water Pressure Relief pipe equal to the flow rate from the well, or wells, activated to supply this water. This would keep the NF raw water supply pressure at a constant value.

Recommendations

There follows recommendations based on the findings of this investigation.

1. The current effective capacity of the concentrate discharge piping system is 1,850 GPM. This capacity limitation will remain in place until the source of head loss in Segment 1 can be located and corrected or other measures taken to allow the NF WTP to operate without interference from elevated back pressures in the concentrate discharge system.
2. The priority for streams entering the NF Concentrae Main system are NF concentrate, followed by NF Pilot Unit discharge, followed by BWR discharge.
3. Investigations should be under taken to determine the cause of the low C Factor evident in Segment 1 and restore the design capacity of the NF Concentrate Main to 2,400 GPM.
4. The current recommended operating protocol for the BWRPS is that it operate at a flow rate equal to 1,850 GPM less the flow of NF concentrate and less the flow of NF Pilot Unit.
5. The buried to check valve in the onsite concentrate main upstream of the pig launch should be removed or the internal components of the check valve removed.

To complete these efforts a preliminary project budget in the amount of $115,000 is recommended for the FY17 budget.

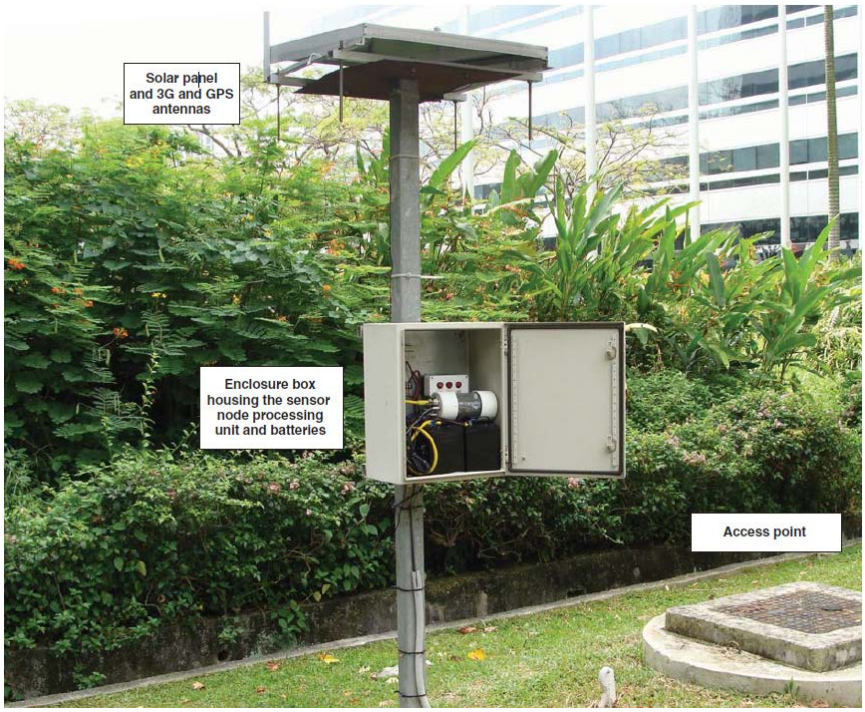
g. Transmission/Distribution System Remote Sensing

The Town is presently only able to monitor flows and pressures at the water treatment plant and at high service pumping facilities. It is recommended that the Town add remote flow monitoring stations at major aerial and subaqueous crossings as shown in **Table 2.9** in order to more closely monitor the distribution system.

Table 2.9
Remote Sensing Requirements by Location

Location	Size	Pipe Modification	Power Drop	Permitting
North Island Way (West Side @ JCC)	16” DIP	Yes	Yes	PBC
Egrets Landing (East Side)	16” DIP	Yes	No, use wellsite 31 or 33	
Alt A1A Bridge (East side)	12” DIP to 20” STL	No	Yes	PBC DOT
Alt A1A Bridge (West side)	12” DIP to 20” STL	No		
Indiantown Rd Bridge (North side)	10” HDPE	No	Yes	PBC DOT
Indiantown Rd Bridge (South side)	16” HDPE	No		
Marcinski Rd	16” DIP	Yes	Yes	PBC incl ROW req
Marcinski Rd	18” DIP	Yes		
Island Way North of Indiantown Rd	16” DIP	Yes	Yes	PBC
Central Blvd North of Indiantown Rd	16” DIP	Yes	Yes	
Loxahatchee River Rd	12” DIP	Yes	Yes	PBC

Each location will include a flowmeter, communication equipment, Remote Telemetry tower (RTU), RTU enclosure, and cabling. Most of the locations will require a new power feed from Florida Power & Light (FPL).



Typical Remote Sensing Station

In addition to the flow monitoring stations, it is also recommended to add pressure sensing stations. The regions conceptually proposed presently for these stations are:

- Juno Beach
- The Bluffs of Jupiter
- North Coastal
- South Coastal
- North Jupiter
- Center Street
- Military Trail near Town Hall
- Pennock Point
- Loxahatchee River Rd
- Little Club
- Jupiter Village
- The Heights of Jupiter
- Northwest Abacoa
- Southeast Abacoa
- Palm Beach Country Estates (PBCE)

For the pressure monitoring stations, each location will include a pressure sensor, communication equipment, antenna, solar power, and RTU enclosure.

The estimated cost for this project is $763,624 and is currently programmed within the Water Utility's CIP for FY2021.

IV. 25 Year Capital Plan

Table 2.10 summarizes the 25 year capital plan for the water utility incorporating the operating and capital needs as generated by this 2017 Master Plan Update. It should be noted that all future capital costs have been adjusted to account for inflation utilizing the current Engineering News Record Construction Cost Index (3%).

Table 2.10

Capital Improvement Projects	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total 2017 to 2041
Professional Services	$ 52,931	$ 53,732	$ 55,344	$ 57,005	$ 58,715	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 277,727
Large Meter Replacement Program	265,000	90,640	93,359	96,160	99,045	102,016	105,077	108,229	111,476	114,820	118,265	121,813	125,467	129,231	133,108	137,101	141,214	145,451	149,814	154,309	158,938	163,706	168,617	173,676	178,886	3,385,418
Meters New	130,000	96,875	77,500	77,500	67,813	58,125	58,125	58,125	58,125	58,125	38,750	38,750	38,750	38,750	29,063	29,063	14,725	12,013	-	-	-	-	-	-	-	980,175
Meter Replacement Program	911,255	477,920	492,258	507,025	522,236	537,903	554,040	570,661	587,781	605,415	623,577	642,285	661,553	681,400	701,842	722,897	744,584	766,921	789,929	813,627	838,036	863,177	889,072	915,744	943,216	17,364,354
Juno Beach Distribution System Improvements	1,623,186	-	-	-	-	-	-	-	-	-	-	-	-	-	946,893	-	-	-	-	-	-	-	-	-	-	2,570,079
Utility Billing Services & Enterprise Asset Management System	-	-	-	-	-	-	-	-	696,724	-	-	-	-	-	-	-	-	-	936,338	-	-	-	-	-	-	1,633,062
Asset Maintenance Program - Capitalize	538,394	590,975	663,037	837,844	778,662	615,246	876,012	887,167	672,298	846,517	721,503	619,324	585,300	611,890	855,341	639,574	994,270	983,442	698,878	937,661	741,440	832,321	798,375	810,192	1,149,507	19,285,170
Ion Exchange Resin Replacement	-	-	-	-	-	-	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	300,010	510,431
Pump Replacement Program	-	-	-	-	-	564,445	-	962,301	108,367	1,082,878	-	673,977	2,631,190	4,351,655	216,733	81,275	-	81,275	1,671,518	449,543	871,990	-	-	-	-	13,747,147
MBA Rehab for RO Permeate Odor Contl	-	-	2,369,060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,369,060
Nano Pretreatment Sand Filter Media Replacement	-	-	-	316,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	316,693
WTP Replacement Program	-	-	-	-	-	-	-	4,642,464	11,606,161	6,963,697	-	-	-	425,608	6,106,872	12,213,744	6,106,872	-	703,466	-	-	-	17,379,900	25,279,569	-	91,428,352
RO & Nano Membrane Replace Prgm (2019-Nano 1-5 & 2020-RO A-D & I)	-	-	1,857,090	874,890	-	-	-	2,352,505	-	-	872,704	-	2,727,199	-	-	1,247,383	-	3,161,571	-	-	-	-	4,909,393	-	-	18,002,735
Piping Upgrade-Central Blvd Pump Station	-	-	-	-	-	-	-	-	3,597,908	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,597,908
Penn Park Distribution System Improvements	-	420,101	2,142,589	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,562,690
Generator Replacement Program (No. 3)	-	-	-	97,517	-	-	-	-	-	199,216	-	106,291	-	635,159	-	-	-	-	-	151,597	-	764,718	850,721	963,840	859,162	4,628,221
Central Blvd HSP North Electrical Improvements	453,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	453,480
Loxahatchee River Road Area Distribution System Impr	-	675,834	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	675,834
Elsa and Paulina Roads Infrastr Improve (to coincide w/drainage)	270,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270,000
(PBC) Center St - Thelma Ave to Woodland Estates WM Relocation	272,903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	272,903
Nano Concentrate Main to LRD Hydraulic Investigation & Corr	115,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115,000
Indiantown Rd Bridge Transmission Main Valve Replacement	-	265,225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	265,225
Bluffs Service Valve Replacement Program	-	410,804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410,804
RO Concentrate Treatment Facility Improvements	-	309,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	309,000
RO Mods to Addr RW Degradation - Incr Interstage Boost	-	1,545,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,545,000
Floridan Aquifer Wellfield Impr RO-15, RO-16, RO-17	-	-	-	9,210,596	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,210,596
RO Degasifier Impr - Add 4th Degasifier (if needed)	-	-	-	-	-	579,637	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	579,637
RO Mods to Addr RW Degradation - RW Boost PS - RO 2nd Pass	-	-	-	-	-	-	-	-	-	-	-	8,028,556	-	-	-	-	-	-	-	-	-	-	-	-	-	8,028,556
Pine Gardens North Drainage & Distribution Improvements	-	-	-	1,081,751	200,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,281,751
Perigon Way Distribution System Improvements	-	-	104,470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104,470
Construction of Floridan Aquifer Well RO-14	-	-	-	-	-	-	-	-	-	-	-	3,654,585	-	-	-	-	-	-	-	-	-	-	-	-	-	3,654,585
Nano Acid Bulk Tank Replacements	-	-	-	-	-	-	696,724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	696,724
IT Continuity of Operations	314,139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314,139
Complete Final Connection to SFWMD Regional System	-	-	1,721,822	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,721,822
Brentwood North Distribution Improvements	-	-	-	-	65,049	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65,049
Distribution System Flow and Pressure Monitoring	-	-	-	-	752,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	752,600
Demo Lime Sludge Drying Equipment	-	-	380,315	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	380,315
Old Dixie Highway Water Main Replacement	-	-	-	-	-	-	-	-	-	-	1,490,383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,490,383
Toney Penna at JRE Transmission Main Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	962,675	-	-	-	-	-	-	-	-	-	-	962,675
Storage Reservoir Replacement Program	-	-	-	-	-	-	-	-	-	-	-	742,207	-	1,270,537	-	-	-	-	-	-	-	-	2,460,370	-	-	4,473,114
Production Well Replacement Program (2019-Wells 6-11)	-	-	2,090,786	-	554,529	1,142,329	3,306,113	2,423,794	-	-	-	4,092,001	7,517,840	-	5,633,915	4,446,168	-	1,628,688	-	3,559,573	-	-	5,633,915	-	-	42,029,651
Recharge System Replacement Program	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,016,249	-	-	-	5,016,249
Yacht Club Dr Area Distribution Improvements (incl Clark Ln)	-	-	-	-	-	-	373,745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,002,934	-	-	-	1,376,679
Fisherman's Landing Water Main Replacement	-	-	-	-	839,482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	839,482
Bella Vista Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	631,548	-	-	-	-	-	-	631,548
Jupiter Dunes Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	631,548	-	-	-	-	-	-	631,548
Hampton Pl & Hampton Cir Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	335,004	-	-	-	-	335,004
Jupiter Plantation Distribution Improvements	-	-	-	-	-	-	-	-	-	-	311,593	-	-	-	-	-	-	-	-	-	-	-	-	-	-	311,593
Ocean Parks Condos Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	415,608	-	-	-	-	-	-	-	-	415,608
Villas on the Green Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	745,434	-	-	-	-	-	-	-	-	-	-	-	-	745,434
Total Projects	$ 4,946,288	$ 4,936,106	$ 12,047,630	$ 13,156,981	$ 3,938,131	$ 3,599,701	$ 5,969,836	$ 12,005,246	$ 17,438,840	$ 9,870,668	$ 4,176,775	$ 18,719,789	$ 15,243,154	$ 8,144,230	$ 15,586,441	$ 19,517,204	$ 8,417,273	$ 6,779,361	$ 6,213,039	$ 6,066,310	$ 2,945,408	$ 8,643,105	$ 33,090,363	$ 28,143,021	$ 3,430,781	273,025,680

Chapter 3: Financial Forecast and Recommendations

I. Financial Forecasts and Recommendations

This section of the Water Master Plan provides a discussion of the financial forecast to: i) present the basis for the funding of the capital program as identified in the plan, including the adequacy of the connection fees; ii) evaluate trends in the expenditure requirements to be funded from rates (rate sufficiency and potential changes in rates to fund such expenditures); and iii) estimate the projected financial position of the Water System based on the forecast of assumptions regarding customer growth, inflation, funding of capital re-investment, and other factors and other observations for consideration by the Town. The overall purpose of this analysis is to provide the Town additional information for strategic and business planning purposes as it evaluates the capital funding and water service delivery plans as well as certain risks to the utility which may affect the projections and which need to be continuously monitored by the Town. This forecast is intended to be dynamic and will be adjusted yearly by the Town as part of the annual budget and capital planning process. Undefined terms reflected in this section will have the same meaning as prescribed in Resolution No. 38-88, as amended and supplemented from time to time, which authorized the issuance of the utility revenue bonds for the System (which have been refunded by the outstanding bank loans but which is still being relied upon relative to rate covenant and financial policies delineated in the resolution and referred to as the "Bond Resolution").

a. Capital Expenditure Overview

The capital plan as identified in the Water Master Plan, which also includes projects that have previously been approved by the Town, is shown on **Table 3.2** on the following page and as summarized on **Table 3.1** below. The capital plan includes the following expenditures by functional type:

Table 3.1
Summary of Water Capital Projects – Fiscal Years 2017 to 2041 ($000s) [1]

	2017 to 2021	2022 to 2026	2027 to 2031	2032 to 2036	2037 to 2041	Totals
Summary of Capital Expenditures:						
Expansion-related Projects	$3,202	$290	$3,839	$56	$---	$7,387
Renewals, Replacements, and Rehabilitation Projects	35,509	48,594	58,032	46,937	75,918	264,990
General Operating (budgetary) Projects	314	---	---	---	335	649
Contributions and Grant Projects	---	---	---	---	---	---
Total Capital Expenditures	$39,025	$48,884	$61,871	$49,993	$76,253	$273,026

[1] Amounts derived from Table 3.2 on following page.

As can be seen above, the majority of the identified capital expenditures identified in the Water Master Plan are for renewals, replacements, rehabilitation, improvements, and upgrades (the "renewals and replacements") of the Water System (approximately 97% of the identified capital costs). This would be expected since the majority of the Water System service area is approaching a built-out condition from both an installed asset / utility service availability standpoint and a capacity need standpoint. This is further amplified by the fact that during the next 25 years, the majority of the existing installed assets is expected to have reached their average service lives and will need replacement or upgrades in order to continue to provide high quality water service. It should be noted that the capital costs shown on **Table 3.2** include an allowance for inflation at 3.0% annually beginning in Fiscal Year 2018 to account for the then future cost of the capital needs anticipated to be placed upon the Water System.

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Table 3.2
Summary of Capital Improvement Plant – Fiscal Years 2017 to 2041

Capital Project Description	Project Type	Fiscal Year Planning Period 2017 to 2021	2022 to 2026	2027 to 2031	2032 to 2036	2037 to 2041	Total Planning Period
Professional Services	Expansion	$277,727	$-	$-	$-	$-	$277,727
Large Meter Replacement Program	Renewal / Upgrade	644,204	541,618	627,884	727,889	843,823	3,385,418
Meters New	Expansion	449,688	290,625	184,063	55,800	-	980,175
Meter Replacement Program	Renewal / Upgrade	2,910,694	2,855,800	3,310,657	3,837,958	4,449,245	17,364,354
Juno Beach Distribution System Improvements	Renewal / Upgrade	1,623,186	-	946,893	-	-	2,570,079
Utility Billing Services & Enterprise Asset Management System	Renewal / Upgrade	-	696,724	-	936,338	-	1,633,062
Asset Maintenance Program	Renewal / Upgrade	3,408,912	3,897,240	3,393,358	4,253,825	4,331,835	19,285,170
Ion Exchange Resin Replacement	Renewal / Upgrade	-	-	210,421	-	300,010	510,431
Pump Replacement Program	Renewal / Upgrade	-	2,717,991	7,873,555	2,283,611	871,990	13,747,147
MBA Rehab for RO Permeate Odor Control	Renewal / Upgrade	2,369,060	-	-	-	-	2,369,060
Nano Pretreatment Sand Filter Media Replacement	Renewal / Upgrade	316,693	-	-	-	-	316,693
WTP Replacement Program	Renewal / Upgrade	-	23,212,322	6,532,480	19,024,081	42,659,469	91,428,352
RO & Nano Membrane Replace Program (2019-Nano 1-5 & 2020-RO A-D & I)	Renewal / Upgrade	2,731,980	2,352,505	3,599,903	4,408,954	4,909,393	18,002,735
Piping Upgrade-Central Blvd Pump Station	Renewal / Upgrade	-	3,597,908	-	-	-	3,597,908
Penn Park Distribution System Improvements	Renewal / Upgrade	2,562,690	-	-	-	-	2,562,690
Generator Replacement Program (No. 3)	Renewal / Upgrade	97,517	199,216	741,450	151,597	3,438,441	4,628,221
Central Blvd HSP North Electrical Improvements	Renewal / Upgrade	453,480	-	-	-	-	453,480
Loxahatchee River Road Area Distribution System Impr	Renewal / Upgrade	675,834	-	-	-	-	675,834
Elsa and Paulina Roads Infrastr Improve (to coincide w/drainage)	Renewal / Upgrade	270,000	-	-	-	-	270,000
(PBC) Center St – Thelma Ave to Woodland Estates WM Relocate	Renewal / Upgrade	272,903	-	-	-	-	272,903
Nano Concentrate Main to LRD Hydraulic Investigation & Corr	Renewal / Upgrade	115,000	-	-	-	-	115,000
Indiantown Rd Bridge Transmission Main Valve Replacement	Renewal / Upgrade	265,225	-	-	-	-	265,225
Bluffs Service Valve Replacement Program	Renewal / Upgrade	410,804	-	-	-	-	410,804
RO Concentrate Treatment Facility Improvements	Renewal / Upgrade	309,000	-	-	-	-	309,000
RO Mods to Addr RW Degradation – Incr Interstage Boost	Renewal / Upgrade	1,545,000	-	-	-	-	1,545,000

Table continued on following page.

Table 3.2 (continued)

Capital Project Description	Project Type	Fiscal Year Planning Period 2017 to 2021	2022 to 2026	2027 to 2031	2032 to 2036	2037 to 2041	Total Planning Period
Floridan Aquifer Wellfield Impr RO-15, RO-16, RO-17	Renewal / Upgrade	9,210,596	-	-	-	-	9,210,596
RO Degasifier Impr – Add 4th Degasifier (if needed)	Renewal / Upgrade	-	579,637	-	-	-	579,637
RO Mods to Addr RW Degradation – RW Boost PS – RO 2nd Pass	Renewal / Upgrade	-	-	8,028,556	-	-	8,028,556
Pine Gardens North Drainage & Distribution Improvements	Renewal / Upgrade	881,751	-	-	-	-	881,751
Pine Gardens North Drainage & Distribution Improvements	Renewal / Upgrade	400,000	-	-	-	-	400,000
Perigon Way Distribution System Improvements	Renewal / Upgrade	104,470	-	-	-	-	104,470
Construction of Floridan Aquifer Well RO-14	Expansion	-	-	3,654,585	-	-	3,654,585
Nano Acid Bulk Tank Replacements	Renewal / Upgrade	-	696,724	-	-	-	696,724
IT Continuity of Operations	Operating	314,139	-	-	-	-	314,139
Complete Final Connection to SFWMD Regional System	Expansion	1,721,822	-	-	-	-	1,721,822
Brentwood North Distribution Improvements	Renewal / Upgrade	65,049	-	-	-	-	65,049
Distribution System Flow and Pressure Monitoring	Expansion	752,600	-	-	-	-	752,600
Demo Lime Sludge Drying Equipment	Renewal / Upgrade	380,315	-	-	-	-	380,315
Old Dixie Highway Water Main Replacement	Renewal / Upgrade	-	-	1,490,383	-	-	1,490,383
Toney Penna at JRE Transmission Main Improvements	Renewal / Upgrade	-	-	962,675	-	-	962,675
Storage Reservoir Replacement Program	Renewal / Upgrade	-	-	2,012,744	-	2,460,370	4,473,114
Production Well Replacement Program (2019-Wells 6-11)	Renewal / Upgrade	2,645,315	6,872,236	17,243,756	9,634,429	5,633,915	42,029,651
Recharge System Replacement Program	Renewal / Upgrade	-	-	-	-	5,016,249	5,016,249
Yacht Club Dr. Area Distribution Improvements (incl. Clark Lane)	Renewal / Upgrade	-	373,745	-	-	1,002,934	1,376,679
Fisherman's Landing Water Main Replacement	Renewal / Upgrade	839,482	-	-	-	-	839,482
Bella Vista Distribution Improvements	Renewal / Upgrade	-	-	-	631,548	-	631,548
Jupiter Dunes Distribution Improvements	Renewal / Upgrade	-	-	-	631,548	-	631,548
Hampton Pl & Hampton Cir Distribution Improvements	Operating	-	-	-	-	335,004	335,004
Jupiter Plantation Distribution Improvements	Renewal / Upgrade	-	-	311,593	-	-	311,593
Ocean Parks Condos Distribution Improvements	Renewal / Upgrade	-	-	-	415,608	-	415,608
Villas on the Green Distribution Improvements	Renewal / Upgrade	-	-	745,434	-	-	745,434
Total Projects		$39,025,136	$48,884,291	$61,870,389	$46,993,186	$76,252,678	$273,025,680
Percent of Total		14.3%	17.9%	22.7%	17.2%	27.9%	100.00%

The 3.0% factor is representative of the average annual increase in construction costs as reported by the *Engineering News Record*, which tracks such changes in constructions costs, over the past twenty years. The increased capital needs are allocable to the existing customers and will need to be funded i) primarily from Water System operations (rates) since the majority of the capital costs are classified as renewals and replacements as well as ii) additional debt being incurred by the System as a result of the timing / need of the capital expenditures. This will result in the need for the recognition of annual transfers to the Renewal and Replacement Fund from operations and the use of other capital reserves, which will be critical to the ability to fund the improvements while limiting the need to issue additional bonds above amounts considered fiscally prudent for the Water System.

It should be noted that in the development of the capital improvement plan, no capital costs associated with the extension of service to the Jupiter Farms service area or development has been assumed. Although planned to be served on a water production and treatment (capacity) basis in prior years, the majority of residents of this community have indicated that they do not desire to receive potable water service from the Water System on a regional water basis at this time. To the extent this service assumption would change, it is anticipated that the capital program costs would increase above what is presented on **Table 3.2** but also the amount of accounts served and the corresponding connections fees received and recurring rate revenues that would be earned would increase above what is presented in this section of the report which should provide benefit and financial resources towards the additional capital needs.

The capital improvement program forecast recognizes that the level of the expenditure needs will generally exhibit an increasing trend over time as assets reach their useful service life (many of the primary Water System assets are relatively new, being in service less than twenty-five (25) years). **Table 3.3** provides a summary of the primary projects recognized during the financial forecast for the Water System:

Table 3.3

Summary of Primary Water System Capital Projects (000s) [1]

Project Description	Amount (Rounded)	Fiscal Years of Expenditure
Raw Water Pumping Station – RO Plant	$8,029	2028
Production Well Replacement Program	42,030	Recurring – per Well 2019 – 2039
Recharge System Replacement Program	5,016	2038
Floridan Aquifer Wellfield Improvements RO Wells 15 through 17	9,211	2020
Water Treatment Plant Major Facility Replacement	23,212	2024 – 2026
Water Treatment Plant Major Facility Replacement	24,853	2030 – 2033
Water Treatment Plant Major Facility Replacement	42,659	2039 – 2040
Meter Replacement Program	17,364	Recurring – Annually
Asset Management Program	19,285	Recurring – Annually
Pump Replacement Program	13,747	Recurring – Annually
RO and Nanofiltration Water Plant Membrane Replacement	18,003	Recurring – 5 Years

[1] Amounts derived from Table 3.2.

b. Long –Term Cash Flow Projections and Financial Position

In order to evaluate the funding of the capital program and the financial position of the Water System, a detailed financial forecast was prepared. Included in Appendix C at the end of this section are financial projections for the Water System. The analysis was for the current budget year 2017 and an additional twenty-four (24) year period ending 2041 (the "Forecast Period") and includes annual projections of gross revenues, operating expenses, payment of the debt service requirement, and other required deposits to the various funds and accounts established by the Bond Resolution, including the Renewal and Replacement Fund, and balances available for capital outlay and other System purposes. Projected revenue includes those from sales (rate revenue), other operating revenues of the System, interest income on the available unrestricted funds as defined in the Bond Resolution, and other miscellaneous revenues derived from System operations. Additionally, projections of Connection Fees were also recognized since this represents a financial resource to the Water System and are used generally to fund expansion-related debt service payments.

The development of the financial forecast required certain assumptions with respect to conditions, which may occur in the future. While we believe the assumptions are reasonable for the preparation of the financial forecast, they are dependent upon future events and actual conditions may differ from those assumed. The following is a summary of the primary assumptions recognized in the development of the financial forecast.

1. Projected sales revenue for the Water System were based on growth projections in customers and corresponding water sales (usage) which recognizes the estimated remaining equivalent residential connections that are considered available for connection as identified in the Master Plan. The customer and sales forecasts were based on historical growth and usage trends and recognize that, over time, average water use per customer will marginally decline (0.15% per year) due to continued increased conservation awareness (both indoor and discretionary use) and other factors.

   Additionally, the financial forecast includes the following rate adjustments:

   i. A customer (ERC) growth rate of approximately 0.3% compounded annually during the Forecast Period with a higher growth rate occurring during the first ten years of the Forecast Period (increasing at 0.75% annually or approximately 370 units per year) and a lower growth at the end of the period as the service area approaches a built-out condition which was assumed to be in 2034.

   ii. For Fiscal Year 2017, an assumed average index based on the application of the Water and Sewage Maintenance Index of 3.83% (consistent with budget projections) and subsequently for the remainder of the Forecast Period a minimum annual rate index of 2.1% applied each October 1st with such index being generally consistent with Town Council action over the past several years and is slightly lower than the ten year forecast of the consumer price index as prepared and published by the Congressional Budget Office as of August 2016 (approximately 2.3%).

2. Interest income has been estimated on balances in certain funds created by the Town, including balances in the Revenue Fund (operating reserves) and the Renewal and Replacement Fund. An assumed average interest earnings rate of approximately 0.29% was recognized in Fiscal Year 2017; such earnings rate was assumed to subsequently increase to 2.25% by Fiscal Year 2027. The interest earnings rates were applied to the average account balances projected during the Forecast Period to determine the income earnings estimates.

   In addition to the earnings on fund balances that provide a financial benefit or resource to the Water System, the forecast of interest income also recognizes earnings on an internal or inter-fund loan made to the Stormwater Utility to finance stormwater capital projects and major rehabilitation expenditures. The

inter-fund loan provides benefits to both enterprise funds in that: i) it allows the Stormwater Utility to secure funds at lower interest rates and with very limited issuance costs which results in reduced loan payments and a corresponding reduction in rates when compared to the use of traditional financing programs; and ii) allows the Water System to earn a higher rate of return on available reserves which is being accrued for future expenditure needs which increases the overall revenues for the benefit of such system. It has been assumed that the Stormwater Utility will borrow $5.730 million from available unencumbered funds in the Water System during Fiscal Year 2020 (resulting in an estimated capital project fund deposit to the Stormwater Utility of $5.7 million). In order to maintain an arms-length transaction, it was assumed that the loan would have a fifteen (15) year term at an annual average interest rate of 2.75%, which would result in an annual inter-fund loan repayment (principal and interest) of $471,345. Based on these assumptions, the average annual interest earned during the 15-year term of the inter-fund loan was approximately $89,000 annually (higher in the beginning of the loan repayment period and reducing over time as increasing principal deposits occur).

3. Guaranteed Revenue and Accrued Guaranteed Revenues were based on: i) the current rates in effect for such fees which were subsequently indexed annually by 2.1%, which is consistent with the assumed indexing of the monthly water rates for service, during the Forecast Period; ii) projections of the remaining ERCs available to connect predicated on projected Water System capacity needs and current levels of service based on existing customer use relationships for the water service area; iii) the current amount of ERCs that have reserved capacity; and iv) the projected growth in accounts during the Forecast Period that would be subject to the payment of such fees. The amount of revenue from these fees continues to provide economic benefit to the Water System and averages $327,000 annually during the Forecast Period with the higher level of fees being collected early in the Forecast Period (averaging $640,000 through Fiscal Year 2026 – the first ten years of the Forecast Period) with essentially no fees being collected by the Fiscal Year 2034; the elimination of this fee would result in an immediate 2.4% increase in water rates to maintain revenue neutrality (based on Fiscal Year 2017 to 2026 revenue projections for the fees relative to the retail water sales projected).

4. Connection Fees (which include off-site transmission fees and meter installation charges) were based on the projected growth in accounts and the current rates

for service; such fees were not annually indexed during the Forecast Period since the primary infrastructure is currently in service. It should be noted that during the Forecast Period the capital plan does currently recognize approximately $7.4 Million in expansion-related expenditures during the Forecast Period and the total estimated Connection Fees contributions are approximately $11.6 million which indicates that the remaining growth is anticipated to finance the expenditure needs and possibly provide a financial reimbursement to the system (although timing differences may exist relative to capital needs and Connection Fee resource availability). The amount of capital contributions from the application of these fees is material to the cash flow projections and averages $462,000 annually during the Forecast Period with the higher level of fees being collected early in the Forecast Period (averaging $853,000 through Fiscal Year 2026 – the first ten years of the Forecast Period) with no fees being collected after Fiscal Year 2034. Funds received from the application of Connection Fees from the System have been assumed not to be a revenue of the Water System for debt coverage purposes but a financial resource which was applied based on the following priority of use: i) meter installation charges from new connections (not meter replacements to existing customers) funding the cost of the extension; ii) funding of expansion-related debt service payments; and iii) if remaining funds were available, payment of expansion-related capital expenditures.

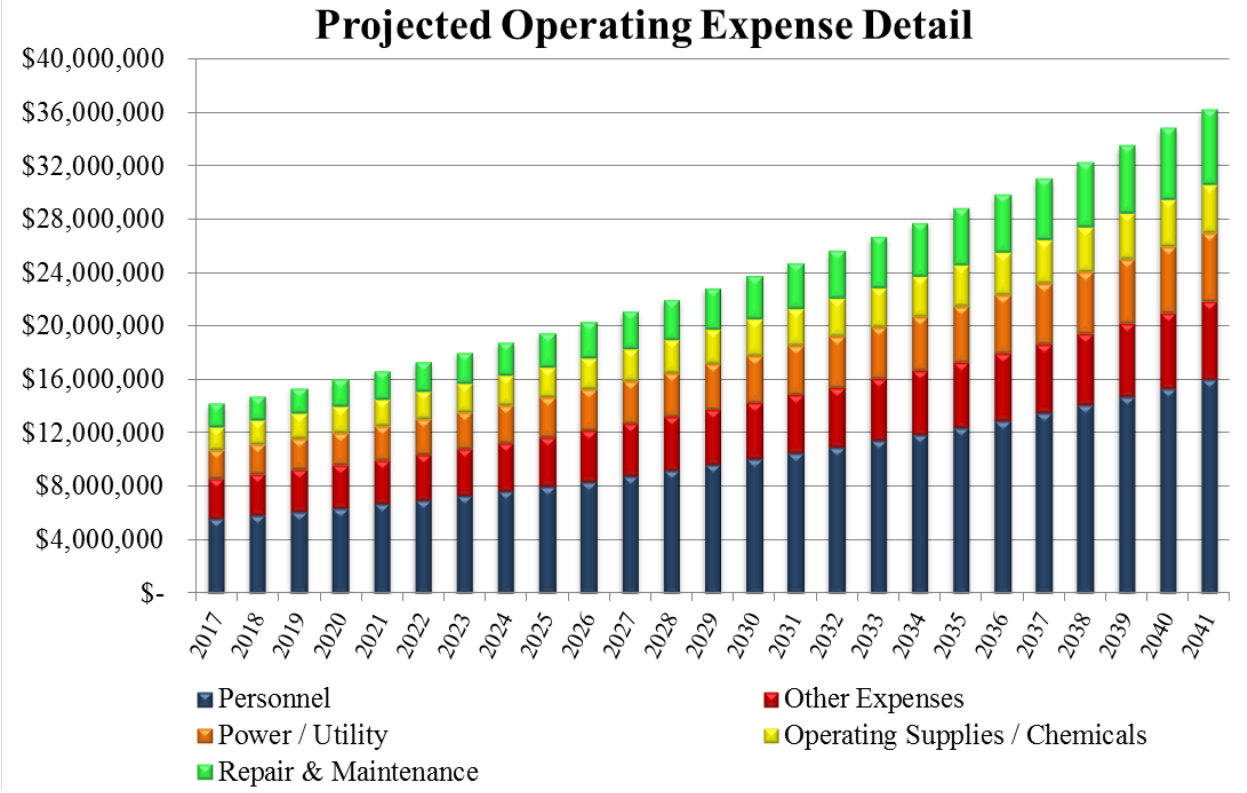
5. It must be emphasized that the forecast of customer growth recognizes providing water service to all of the identified development within the service area (approximately 4,938 ERCs based on the projected finished water demand and average level of service projections) which reflects a build-out estimate of 52,402 ERCs. As with any estimate, this service level may materially change based on the development characteristics of the remaining property in the service area, timing to such assumed additions, and other factors; the estimate is considered reasonable for the purposes of the financial plan presented herein. Additionally, this growth assumption does not include providing any water service to the Jupiter Farms area west of I-95, which is estimated to represent approximately 5,200 ERCs of potential growth to the Water System. This places an element of risk on the financial forecast since: i) it is not known if and when the request for service will occur for this area; ii) the extensions of service may not necessarily lead to connections without heightened marketing and financial incentive offerings consistent with previous policies in Palm Beach Country Estates; and iii) that until some experience in the area is achieved, water sales

per connected ERC may be less than the current system average since it is expected that irrigation needs will be met by on-site wells.

6. Based on the financial forecast, the financial resources from growth-related fees provide a benefit to the financial forecast and the need to bring the utility to a "revenue from existing customer" basis will become more important as the Water System service area matures to maintain operating efficiencies and to keep the unit cost of providing service at reasonable levels. The need to maintain adequate net revenue margins and capital funding deposits will become critical over time since additional margins / funds produced by growth, through the utilization of constructed capacity, will begin to slow and diminish.

7. Projected operating expenses are based on various factors such as projected expense increases due to inflation and projected changes in expenses associated with anticipated changes in operations. The escalation was based on historical trends, projections of inflation prepared by the Congressional Budget Office, and other factors. The escalation rates ranged from 2.5% (general inflation) to 7.5% for health care expenses. Salaries and Benefits were increased by approximately 4.0% through 2026 and then reflected a declining trend in adjustment due to employees capping out in terms of salary adjustments, changes resulting from changes in the work force, and other factors.

   During the Forecast Period, the change in operating expenses is projected to average approximately 4.0% annually. It should be noted that the cost of labor, utilities and chemicals / operating supplies accounts for approximately 68% percent of the total operating expenses and these costs are required (e.g., set by regulation, generally uncontrollable as to cost, etc.) for ongoing utility operations and service. This can be seen below for the Forecast Period:



8. The forecast of operating expenses includes the payment to the General Fund to account for expenses accounted for in such fund that are allocable to the Water System. The budgeted payment for the Fiscal Year 2017 is $796,350; this payment was assumed to remain constant during the Forecast Period. Any increase in the payment without a corresponding revenue increase would serve to reduce operating margins and the ability to annually make transfers for renewal and replacement-related capital expenditures.

9. Although considered a System operating expense for financial reporting purposes, depreciation and amortization expenses have not been recognized as an operating expense pursuant to the Bond Resolution since such amounts represent non-cash expenses. In lieu of depreciation and amortization expenses, the financial forecast recognizes the annual funding of the Renewal and Replacement Fund and the payment of principal on bonds / debt issued to fund capital expenditures of the Water System.

10. The Town originally issued utility system revenue bonds pursuant to the provisions of the Bond Resolution (the "Outstanding Bonds") to finance capital

improvements for the Water System. As of October 1, 2016, a total principal amount of $26,400,000 of utility revenue bonds is estimated to be outstanding (the "Outstanding Bonds" and assumes that the October 1st payment is made since funds were deposited in twelve equal installments during the Fiscal Year 2016 to fund such principal payment). The debt service requirements included in this Report for the Outstanding Bonds were based on the actual debt service schedules for each issue and are presented on a "gross" basis (i.e., not net of interest earnings on any debt service related funds or accounts). Furthermore, the amounts shown are based on the monthly funding requirements of the various sinking funds as required by the Bond Resolution that authorized the bonds (essentially an accrual basis) as opposed to when the debt service requirements are actually paid. The following is a summary of the Outstanding Bonds:

Table 3.4
Summary of Existing Principal Amount of Bonds Outstanding

Issue	Year of Debt Maturity	Principal Outstanding [*]
TD Bank Bonds, Series 2010 (the "Series 2010 Bonds")	2023	$4,915,000
SunTrust Bank Bonds, Series 2013 (the "Series 2013 Bonds")	2029	21,485,000
Total Principal Outstanding		$26,400,000

[*] Estimated amount outstanding as of October 1, 2016 after the payment of the principal payment due on October 1st of such Fiscal Year.

The capital program as identified on **Table 3.2** was funded based on i) the nature of the project (e.g., expansion-related); ii) the availability of funds to the Town for project funding; iii) the use of additional bonds to the extent that funds were not readily available; and iv) the policy to maintain an adequate cash balance in the operating reserves and the Renewal and Replacement Fund accounts. With respect to the operating reserves (working capital) and in order to maintain an "AAA" credit rating, a minimum liquidity equal to 180 days of operating expenses was recognized. This target level is suggested: i) to limit the operating risk to the utility as the system continues to approach a mature (built-out) condition; ii) to maintain a "AAA" credit rating; and iii) to provide an emergency hedge for major storm events that may strike the service area that could result in an immediate a) reduction in revenues and cash flow and b) increase in operating and maintenance expenditures. For the Renewal and Replacement Fund, the ending balance in the fund at the end of the Forecast Period is approximately

$6,745,000, which is significantly less than the target balance of $12,254,000 recognized in the financial forecast (amount calculated based on the Fiscal Year 2012 initial $5,200,000 annual deposit to the fund, adjusted annually thereafter for inflation based on the historical change in the Construction Cost Index as published in the *Engineering News Record* or approximately 3%). Although the ending balance in the Renewal and Replacement Fund is considered as being low, such balance is at the end of the Forecast Period; the Water System has additional leveraging capability to issue future debt for capital project financing which would provide an infusion of cash to the fund with a corresponding result being an improvement in the capital liquidity position for the fund. The availability of capital funds for future capital expenditures will need to be closely monitored by the Town as facilities age and utility plant renewals and replacements continue.

The following table summarizes the capital improvement program (CIP) funding plan recognized in the financial forecast by five-year forecast period increments:

Table 3.5
Capital Improvement Program Funding Plan ($000s)

		Recognized Funding Plan			
Forecast Period – Capital Expenditures	Total Capital Projects [1]	R&R Fund	Connection Fee Fund [2]	Operating Fund and Contributions	Additional Parity Bonds
FY 2017 – FY 2021	$39,025	$35,109	$3,202	$714	$---
FY 2022– FY 2026	48,884	45,594	290	---	---
FY 2027 – FY 2031	61,871	58,032	3,839	---	---
FY 2031 – FY 2036	46,993	46,937	56	---	---
FY 2037 – FY 2041	76,253	50,918	---	335	25,000
Total Forecast Period	$273,026	$239,590	$7,387	$1,049	$25,000
Percent of Total CIP	100.0%	87.7%	2.7%	0.4%	9.2%

CIP = Capital Improvement Program

[1] Amounts shown based on information presented on Table 3.2.
[2] Amounts shown do not include payment of expansion-related debt service expenditures or the repayment of funds to operating reserves (repayment of expansion-related capital financing) of $1.438 Million during latter portion of Forecast Period.

As can be seen above, approximately $240 Million or 88% of the assumed capital expenditure program will be funded from the Renewal and Replacement Fund (derived from deposits from annual operations during the Forecast Period). Although there is identified over $32 Million of expansion-related expenditures

(debt-repayment and capital expenditures), the estimated balance in the Connection Fee Fund coupled with the future collection of Connection Fees from System growth are projected to not be sufficient to fund all of the identified expenditures (the first priority assumed for fund drawdown is to fund the expansion-related debt service for the benefit of the existing customer). This will result in the need to use operating reserves as a "bridge" in the financing of the expansion-projects in the near term portion of the Forecast Period. However, as the expansion-related bonds mature, the Connection Fees can then be used to reimburse the operating reserves such that a prudent liquidity position is maintained over the long-term. Based on the projection of expansion-related debt service and capital projects, the existing Connection Fees will not be sufficient to directly fund all the expenditures over time. Specifically, it is projected that this shortfall will approach $26.4 million, which may be due in part to the removal of the Jupiter Farms service area (customer growth) from the financial forecast. However, as new customers are added to the System, the debt contribution that is embedded in the rates for monthly water service does provide a benefit to the existing rate payer (i.e., per increased contributions) and serves to provide additional resources to fund the operating fund contributions to the Connection Fee Fund (for example, if the average debt service component in the monthly bill per ERC is $10 in Fiscal Year 2017 and based on the growth assumed for the Forecast Period, this would result in approximately $15 million in debt service contributions above what the existing customers are contributing). Should the Town lower the Connection Fees, this may cause an immediate strain on the rates of the Water System and the need to issue additional debt or increase water rates above what is assumed in the financial forecast.

11. A significant component associated with the funding of the capital program is the continued deposits to the Renewal and Replacement Fund ("R&R Fund"), the annual funding from operations is critical to the long-term financial health of the System. The initial year of the forecast recognizes the fund deposits at $6.03 Million (based on the initial deposit of $5.2 Million established in Fiscal Year 2012 as adjusted for inflation predicated on the average historical Construction Cost Index as published in the *Engineering News Record* to the current year deposit level) and then increased thereafter for construction cost increase allowances. It is appropriate to fund the R&R Fund annually from operations since this matches the use of the system by the existing customer base and the

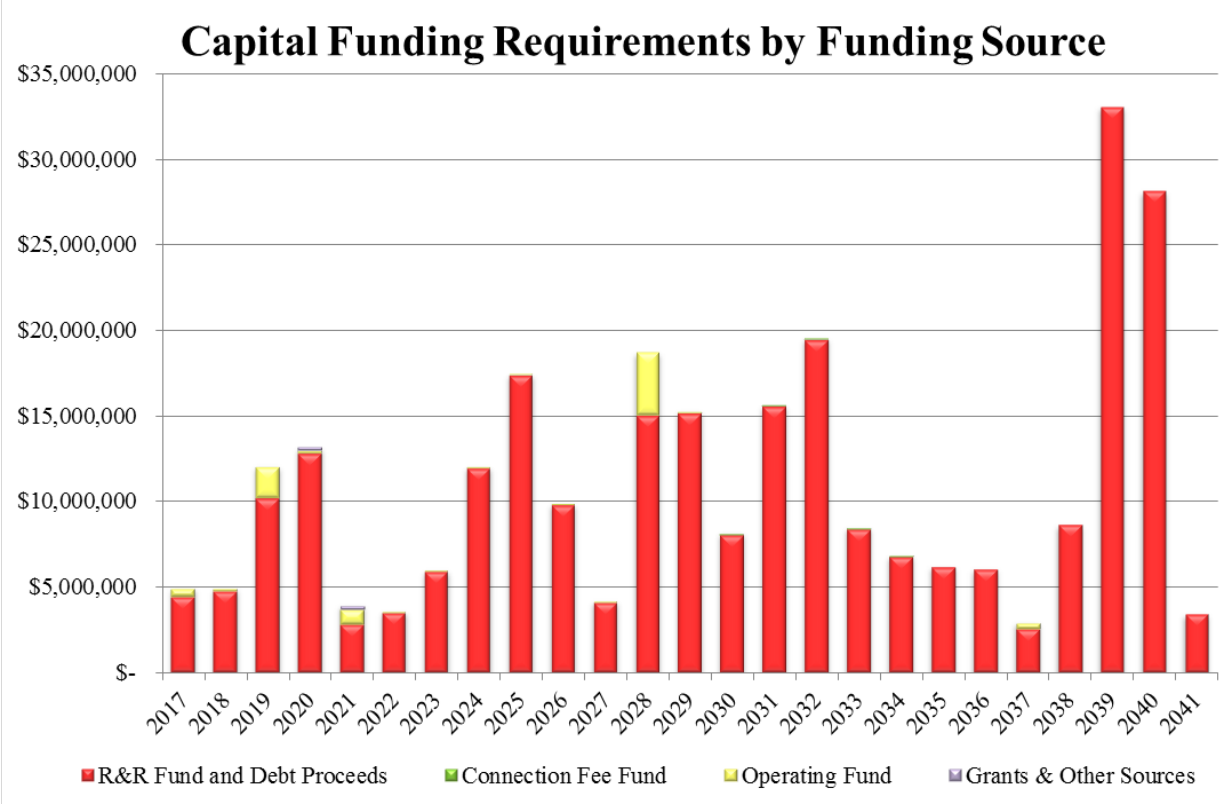
need to replace the assets at the end of the useful service life of such assets (a depreciation expense equivalent).

It should be noted that the annual funding of the R&R Fund in relationship to annual depreciation expense has become a key indicator with the credit rating agencies since the more "equity-based" capital funding a utility has, the less risk on the utility in terms of funding capital improvements coupled with the need to issue additional bonds (the Water System depreciation expense as reported in the 2015 Comprehensive Annual Financial Report was $5.76 million). It is recommended that this level of R&R Funding be recognized in the future, which is prudent and promotes the long-term stability of rates to the Town's customers. It should also be noted that the deposit to the R&R Fund should at a minimum be equal to the annual depreciation expense of system assets, which matches asset use to cost recovery in rates. This funding policy will ensure adequate debt service coverage and provide for a recurring and efficient method for funding the renewal of Water System assets; this funding objective was identified by Fitch Ratings as being prudent and assisted in the affirmation of the AAA rating by Fitch in February 2013. This capital funding level is further discussed below regarding the review of certain key financial ratios associated with the evaluation of the projected financial position of the Water System.

It should be noted that the capital funding plan does rely on the need to issue additional bonds to finance a portion of the CIP. Based on the schedule of the CIP projects (expenditures) as shown on **Table 3.2**, the forecast assumes the issuance of tax-exempt bonds in Fiscal Year 2039 (the "Series 2039 Bonds"). At the time of the assumed issuance of the additional debt, all of the Outstanding Bonds will have matured and it is estimated that there will be no additional debt payable from System gross revenues when the Series 2039 Bonds are issued which provides for low debt leveraging ratio (as discussed later in this section) and will maintain rate sustainability. The assumptions recognized in the development of the additional debt service assumptions with respect to the issuance of the Series 2039 Bonds include: i) total principal amount of the Series 2039 Bonds estimated at approximately $26,045,000 issued at par (no premium or discount); ii) an assumed average coupon rate of 5.50%; iii) a term of twenty-five years with no interest expense being funded from bond proceeds; iv) no requirement to fund the debt service Reserve Fund (the deposit is often referred to as the reserve fund requirement and generally equates to the maximum annual debt service payment of the bonds) from the proceeds of the

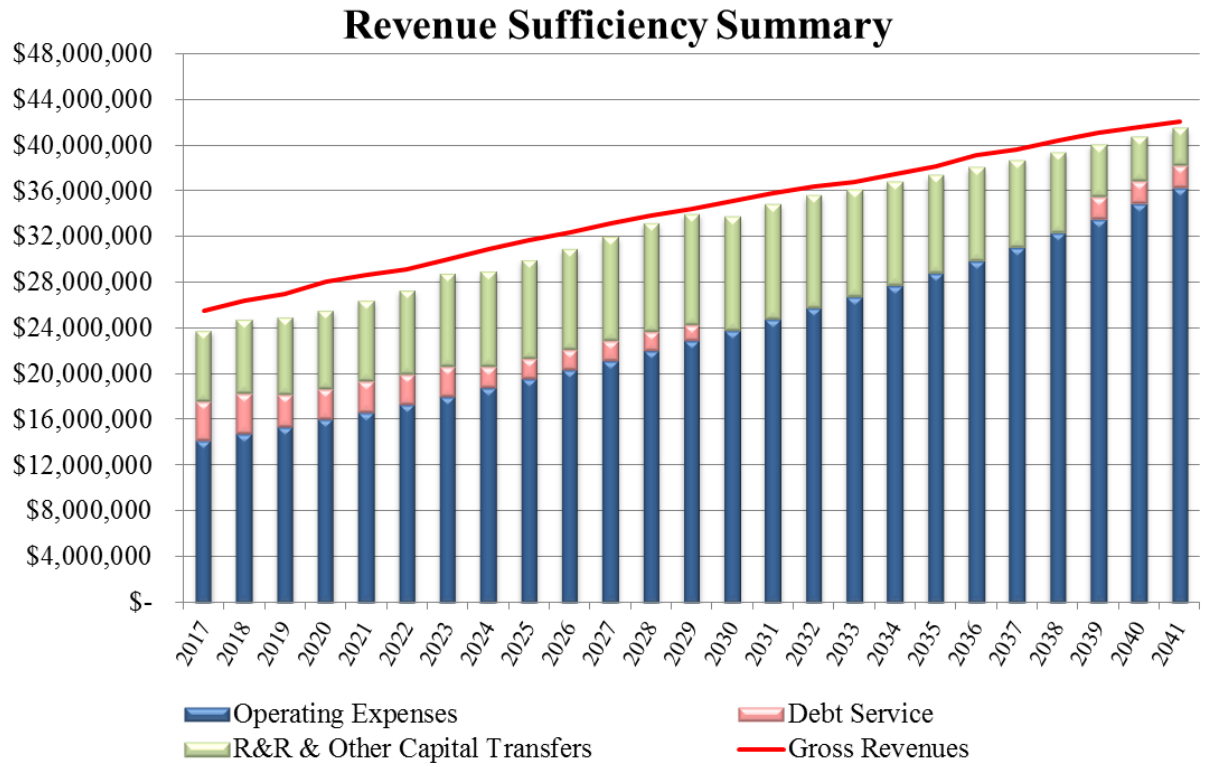
Series 2039 Bonds due to the AAA-credit rating of the system; v) a debt repayment schedule which assumes annual level debt service payments; and vi) the payment of issuance expenses associated with the Series 2039 Bonds assumed to be equal to approximately 4% of the principal amount of the bonds issued. It is assumed that the Series 2039 Bonds would be issued on or about October 1, 2038 (first day of the Fiscal Year 2039). Based on these financing assumptions, it was assumed that the annual debt service requirement would be $1.947 Million and the Series 2039 Bonds would mature on October 1, 2063. The need to issue bonds to finance the capital needs of the System are at the end of the Forecast Period and should be monitored closely by the Town since the increased debt service will affect the level of the ongoing R&R Fund deposits in such Fiscal Years (without any additional rate relief).

Based on the primary assumptions discussed above, the following figure illustrates the capital appropriation forecast and corresponding funding sources for the Water System for the Forecast Period:



As can be seen above, the capital program varies from year to year primarily due to when assets reach their useful service life and must be replaced. It must be realized that until Fiscal Year 2029, operating reserves are used to bridge the expansion-related capital projects and debt service payments on Outstanding Bonds but are partially reimbursed during the latter part of the Forecast Period.

Based on the assumptions discussed above regarding the funding requirements of the Water System and as previously mentioned, the forecast assumes the need for continued annual application of the price index rate adjustments; the discontinuance or deferral of the annual rate index could materially affect the amount of rate revenue realized and the Water System's respective ability to fund the ongoing capital re-investment needs as well as maintain a strong financial credit rating. A major driver for the continuance of the indexing application in the first half of the Forecast Period is due to the need to fund the identified capital needs of the utility as shown in the previous figure. Additionally, the continued inflationary impacts on the cost of operations and maintenance affect the financial picture over time and also contribute to the need to annually index the rates for service. The following is a summary of the projected revenue compared to the total estimated revenue requirements / expenditure funding needs for the Forecast Period as reflected in the financial forecast (with emphasis being placed on the near-term needs of the utility).



In the development of the financial forecast, a projection of certain other financial ratios was developed to evaluate the projected financial position of the Water System. The analysis includes a series of charts and figures prepared to provide the Town with a visual representation of the financial and statistical trends in the selected financial ratios or benchmarks anticipated for the Water System over the Forecast Period. The performance ratios discussed below considered the credit rating rationale or findings identified by both Fitch Ratings (February 2013) and Standard and Poor's (November 2012) with respect to the financial review of the utility credit for the Town, which recognized the following:

- Strong financial margins with a strong debt service coverage;
- Management has maintained a high Liquidity Position;
- Declining debt burden with no near-term borrowing plans with rapid existing debt amortization;
- Manageable capital plan that excludes (limits) the need for additional debt issuance;
- Strong customer base with rates being very competitive relative to regional utilities; and
- Strong Financial management policies and stewardship.

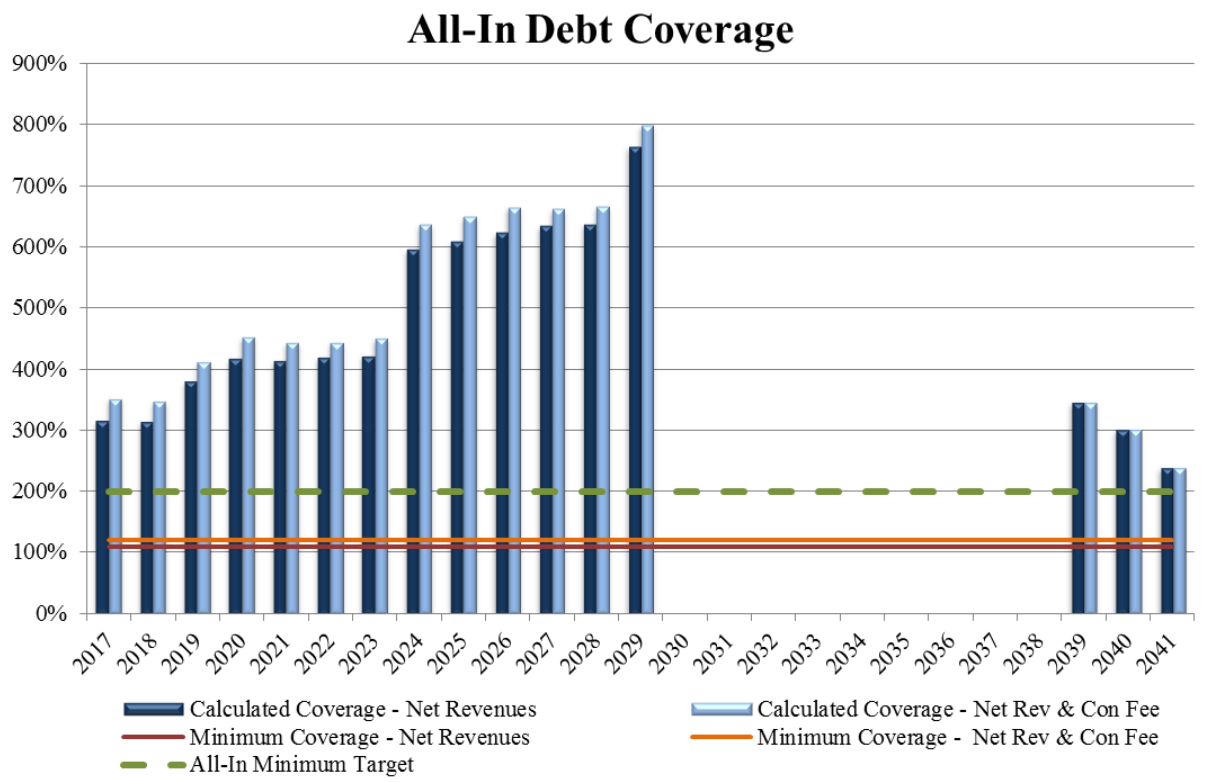
The key rating driver identified by Fitch Ratings in their report on the Town's Water System was "sustained financial performance at current high levels" and is the key business principal relative to the financial evaluation included herein. The following is a brief description of other financial ratios and financial results evaluated for the Town's consideration based on the primary assumptions mentioned above.

Debt Service Coverage Ratio

An important component in the development of the financial forecast is the determination of whether the rate covenants as outlined in the Bond Resolution authorizing the issuance of Water System Outstanding Bonds will be met. Generally, these covenants are in the form of certain debt service coverage ratios, which are applicable to the level of rates both currently and projected to be in place as well as meeting the fund deposit requirements (generally referred to as the "flow of funds" and primarily links to the payment of expenses, senior and subordinate lien debt, and

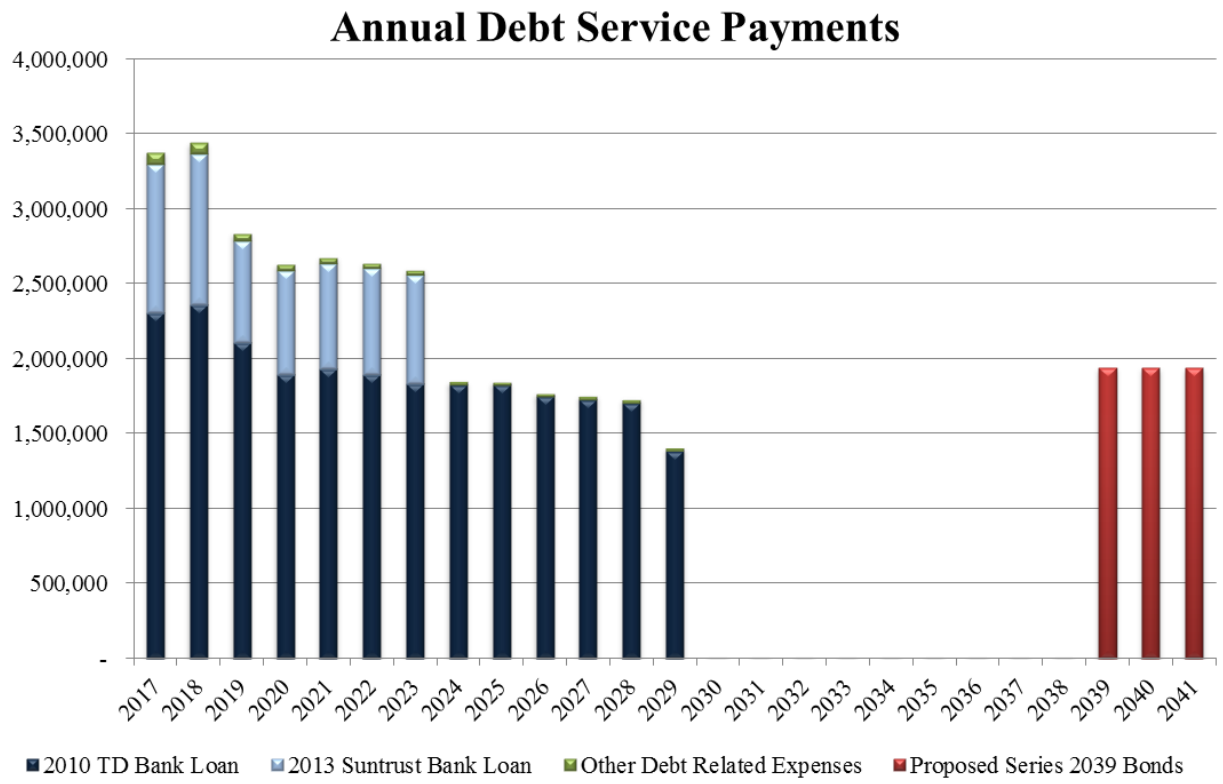
the funding of the R&R Fund). The Town's Bond Resolution contains a rate covenant which provides that the Town will at all times fix, charge and collect reasonable rates and charges so that net revenues (defined as the total or gross revenue less operating expenses as generally defined in an authorizing bond resolution) are adequate at all times to pay at least one hundred and ten percent (110%) and with the inclusion of Connection Fees one hundred and twenty percent (120%) of the annual debt service payment. This is viewed as a minimum requirement in order to not be in default of the covenants of the Bond Resolution; an AAA-rated utility generally would see a debt service coverage ratio in the 175% to 250% range (assumed a target of 200% to recognize this credit rating) which would also be an indication of a positive capital re-investment rate.

As shown below and summarized, the Town's anticipated net revenue, assuming that the Town continues to index the water rates annually to produce an increase in rate revenues assumed at 2.1% per year beginning in Fiscal Year 2018 and for every year thereafter, should be adequate for the Forecast Period to meet the rate covenant requirements defined in the Bond Resolution and continue to promote a AAA-credit rating. The debt coverage ratio is calculated by dividing the annual net revenue with / without Connection Fees by the annual debt service payment each year and illustrates the financial margin (ability) of Water System revenues to meet current total debt service payments (the higher the percent, the stronger the ratio) and is considered as a key ratio by the credit rating agencies:



As can be seen on the figure above, the debt service coverage ratio (for outstanding and anticipated bonds) is very strong and increases significantly during the Forecast Period. This is due to the outstanding bonds maturing during the Forecast Period with no increase in the issuance of additional bonds during the period that the debt service on the Outstanding Bonds are still being paid by Water System revenues. Specifically, the Series 2010 Bonds mature in Fiscal Year 2023 and the Series 2013 Bonds mature in Fiscal Year 2029; there is no debt service payments (as shown in the following figure below) funded from net revenues after Fiscal Year 2029 until the proposed additional bonds are issued in Fiscal Year 2039. The figure below provides a presentation of the annual debt service requirement that must be funded from the net revenues of the Water System, which illustrates the decline in the Outstanding Bonds debt payments as the bond maturities occur as well as the assumed issuance of the Series 2039 Bonds. It should be noted that the debt service payments assumed for the Series 2039 Bonds are less than the current debt service payments of the System associated with the Outstanding Bonds. This should provide a financial benefit for the potential of increased revenue leveraging in support of an increase in the amount of bonds required to be issued if CIP expenditure requirements,

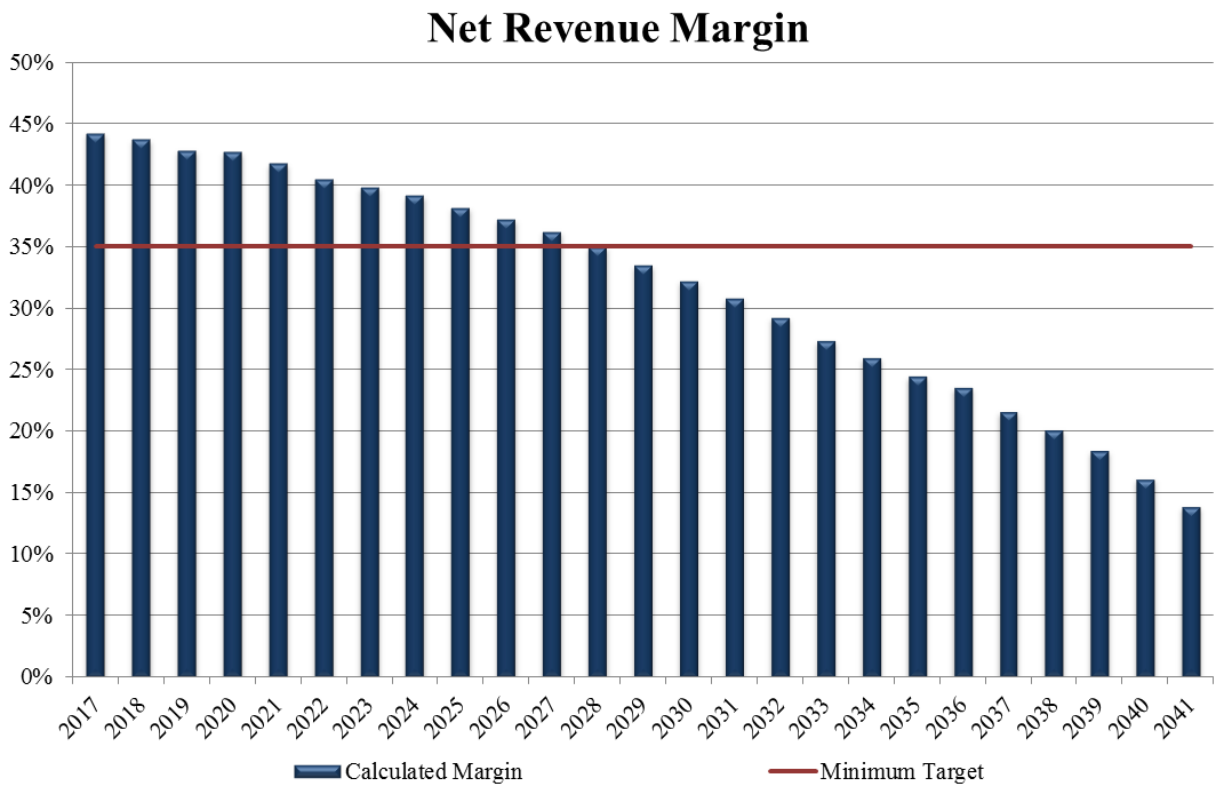
regulations, or extraordinary events require the need to issue additional bonds above what is assumed for the financial forecast.



Projected Net Revenue Margin

The net revenue margin ratio is a measure of a utility system's ability to meet its operating expenses and indicates the net contribution margin estimated to be earned by the Water System. The contribution margin represents the amount of net revenues from operations that are available to meet the other System expenditure requirements after the payment of the operating expenses (e.g., debt service, deposits to the Renewal and Replacement Fund, etc.) and primarily relate to the ability to fund capital re-investment. Since Connection Fees are restricted as to use for expansion-related capital expenditures and are a one-time revenue (not recurring like water sales revenue), Connection Fees are not included in the evaluation of the net revenue margin. A relatively low net revenue margin ratio (for example, 25 percent) indicates that a large portion of operating revenue is used to pay operating expenses with limited capital re-investment opportunity. A high net revenue margin ratio (for example, 45 percent) indicates a significant portion of operating revenues is available for Water System expenditures other than the payment of operating

expenses. A minimum target of 35 percent was assumed since relates to the Moody's Investor Service median for water utilities for this ratio. However, understanding the importance of the need to fund renewals and replacements over time and to minimize the need to rely too heavily on debt for ongoing asset replacement capital funding, a higher target should be considered. As can be seen below and assuming the implementation of the annual price index rate revenue adjustments, the net revenue margin ratio is projected to decrease during the Forecast Period.



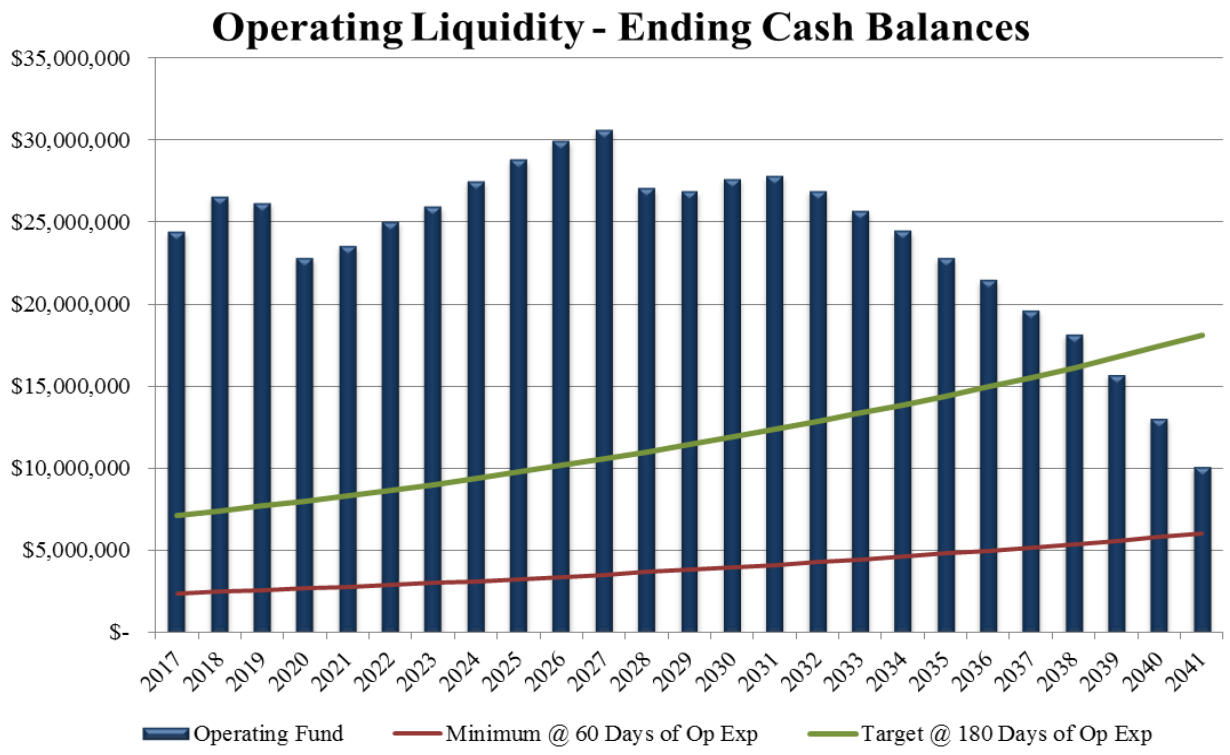
The reason for the decrease is due to the price index factor assumed for financial forecast presented in the report which is used to increase water service rates (primary source of System revenue) coupled with a decline in Guaranteed Revenues due to the build-out of the service area (overall percentage change in revenues) is less than the average increase in the cost of operations and maintenance assumed during the Forecast Period. Although a higher net revenue margin ratio is recommended for the latter part of the Forecast Period, one must recognize that the amount of debt service payments (a driver for a higher net revenue margin ratio) is projected to significantly decline in the later part of the Forecast Period and therefore there is less pressure to have a higher ratio; this will change once the Series 2039 Bonds are issued. This trend needs to be monitored closely and it must be

recognized that future rate increases may be required above the price index in the future as the net revenue margins continue to decline and the need to continue to fund ongoing capital from Water System operations continues. It should be noted that the price index assumption reflected in the financial forecast is less than the water and sewage maintenance index recently incurred which is used by the Town in the index of rates in order to be conservative (e.g., the adopted 2017 index was 3.83% and the forecast assumes a conservative 2.1% annual rate index adjustment). If the actual index recognized in the development of the System revenues was 3% for the Forecast Period (instead of the assumed 2.1%), the net revenue margin estimated for the last year of the financial forecast would approximate the minimum target ratio in Fiscal Year 2041.

As previously mentioned, the ratio does not include Connection Fees since they represent non-recurring contributions or financial inflows (not a recurring revenue). If the Connection Fees were recognized, the ratio would be more favorable in the near term but would not affect the latter part of the Forecast Period due to declining growth in new customers served and the corresponding receipt of such fees.

Liquidity (Cash) Position

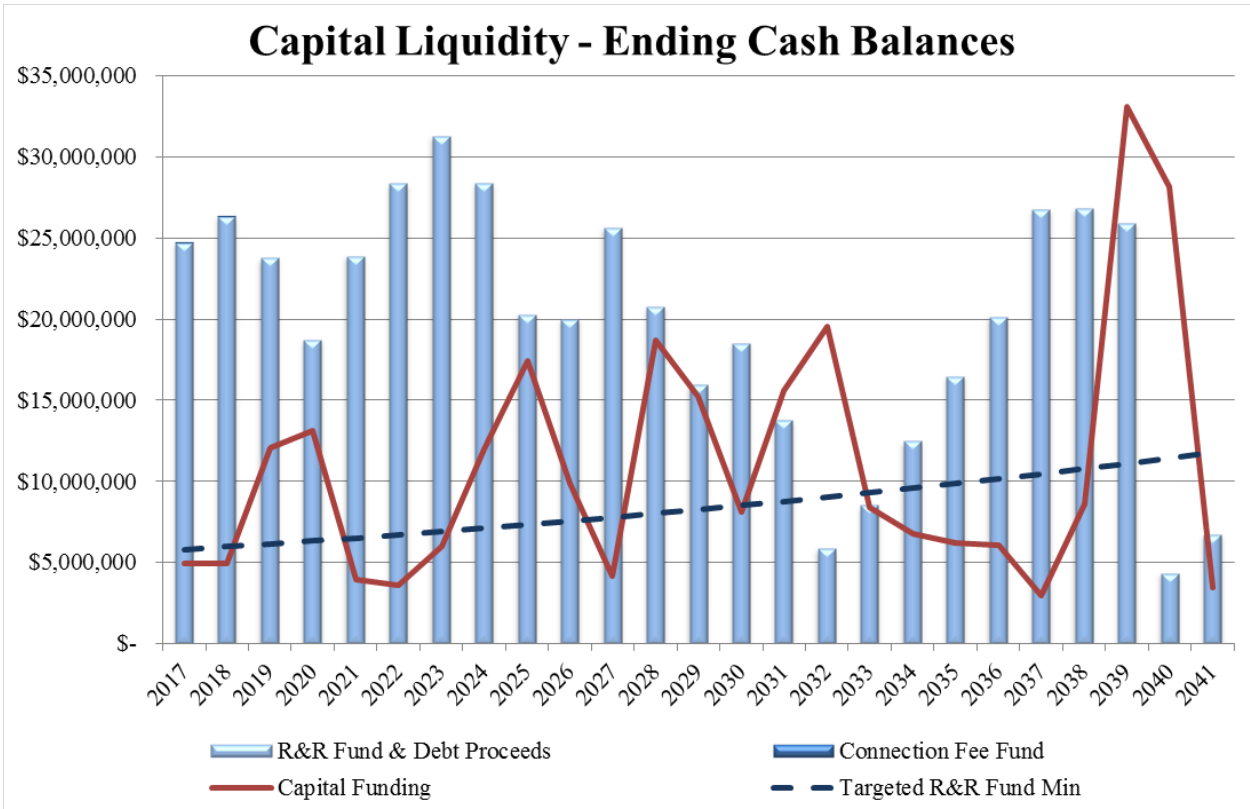
A major credit component deals with the amount of liquidity a utility maintains relative to working capital (operating) and capital reserves. With respect to working capital reserves, a minimum target of 180 days of operating expenses was recognized which was considered appropriate for a mature water system (limited customer growth). The maintenance of a strong liquidity position has been a key indicator in the Fitch Ratings credit report for the Town's Water System. Further, it would be considered prudent for the working capital reserves to be higher if a low net revenue margin is being experienced in order to provide a rate stabilization / financial hedge (risk reduction) on operations. The following figure summarizes the projected working capital reserves for the Forecast Period, based on the assumptions delineated earlier in this section of the Water Master Plan:



As can be seen above, in the early portion of the Forecast Period, the available working capital reserves are greater than the target working capital reserve. However, over time, as the net revenue margin declines and the need to fund capital re-investment continues (which would include transfers from operating reserves to the R&R Fund or to the Connection Fee Fund to finance expansion-related capital / debt service payments), the projected reserves decline. Overall, for the majority of the Forecast Period, the projected operating reserves are projected to be strong (although not increasing above current Fiscal Year 2017 levels) and is consistent with the Fitch Ratings observations of the System which resulted in the assignment of the AAA-credit rating to the system.

In addition to working capital or operating reserves, which are for ongoing operations and the payment of debt financing, the Water System should also maintain a capital reserve to accrue funds for ongoing renewals and replacements but to also have funds for extraordinary or unplanned capital expenditures that occur from time to time. Further, the capital reserve would allow for the continuity of funding the capital program since funds would be available in advance of appropriation such that the Utility Department can more effectively plan for capital expenditures (e.g., bundling of projects to achieve a better price bid). The following figure summarizes the

projected capital reserves for the Forecast Period based on the assumptions delineated earlier in this section of the Water Master Plan:



As can be seen on the figure above, the capital reserves fluctuate based on the annual renewal and replacement expenditures as the Water System assets begin to reach their useful service lives and require replacement. In most years, the capital balance is above the target level (initially set at $5.00 Million and escalated annually for inflation on the cost of construction – 3.0% and which is also consistent with the annual depreciation expense on the depreciable assets in service for the Water System). The funding of the R&R Fund and maintenance of a capital reserve equal at least to the annual depreciation expense was considered as a prudent financial objective of the Town by Fitch Ratings. Additionally, this reserve allows for the continuation of capital projects for the subsequent year since the funds are considered available which promotes the continuity of the program.

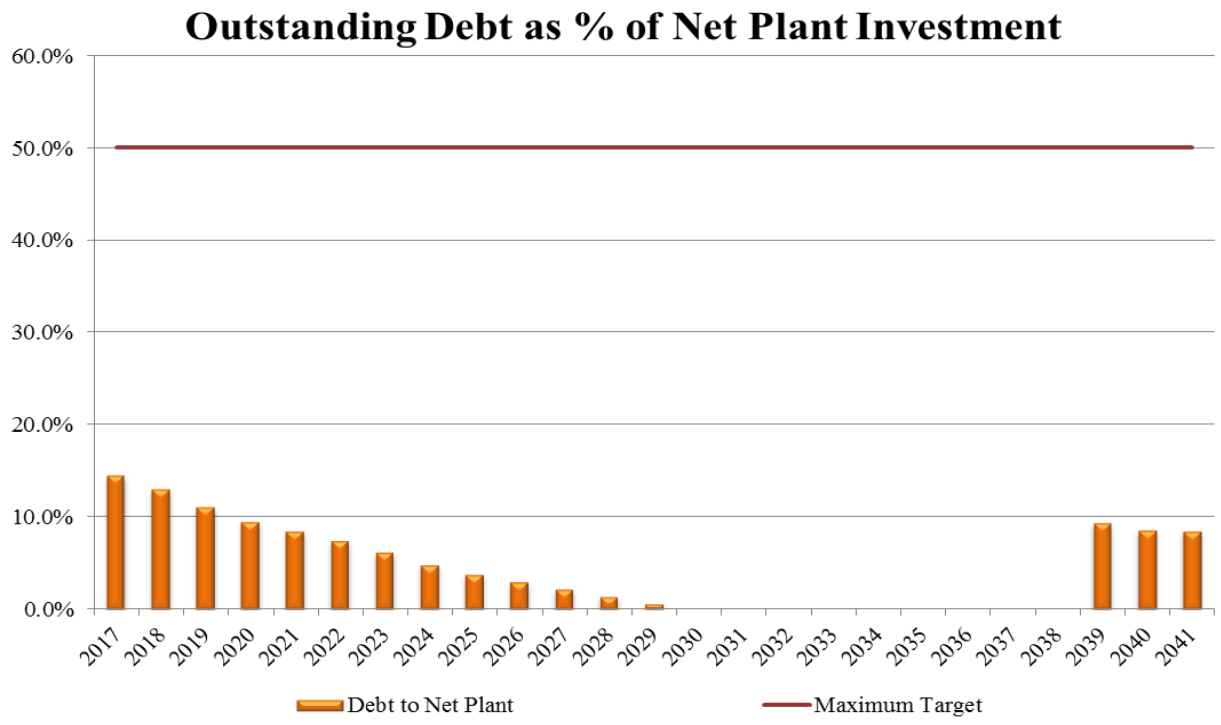
Free Cash as a Percent of Depreciation

A key ratio recently identified by the credit rating agencies is the "free cash as a percent of depreciation" which measures the amount of net revenues available after the payment of debt service and other required transfers (absent the R&R Fund) which

would be available for other System requirements (i.e., essentially capital re-investment). The ratio indicates the annual financial capacity to maintain facilities at current levels of service from existing cash flows. The issue being addressed by the rating agencies is whether there are the proper resources generated annually to maintain capital such that there is less risk in the need to issue additional bonds or due to increased expenditures funded from net revenues due to the need for emergency capital / repairs and maintenance expenditures. As can be seen below, the ratio through Fiscal Year 2038 is projected to be favorable and indicates that a strong annual capital re-investment rate in the System is adequately being accomplished. It should be noted that the reason for the decline in the ratio beginning in Fiscal Year 2031 is due to the continued decline in the net revenue margin after the benefits of the Outstanding Bonds maturities are recognized; in Fiscal Year 2039, the significant reduction is due to the assumed issuance of the additional revenue bonds in such year to fund capital needs. Overall, the re-investment rate is favorable but is due (through Fiscal Year 2029) to the benefits of the reduction in the debt service payments for the Outstanding Bonds as the debt matures which masks the effects of the decline in the net revenue margin. Knowing that the Town is aware of this issue and assuming that a lower than average price index rate adjustment is maintained during the Forecast Period as assumed in this conservative financial plan, the Town will need to closely monitor these financial relationships.

Debt to Net Plant Investment

As mentioned above, the forecast assumes the issuance of bonds in Fiscal Year 2039 to fund $25 Million of renewal and replacement projects, which we consider as being extremely manageable from a rate perspective. As can be seen below, even with the issuance of additional bonds, it is projected that the Water System will be well below the maximum debt to net plant ratio identified for the financial forecast as shown below and that future leveraging of the net revenues (e.g., for increased regulatory issues) will not adversely affect the amount of debt allocable to the System from a credit perspective.



c. Rate Comparison

A primary indicator used by credit rating agencies, neighboring utilities, and the Towns peers is the comparability of the rates for monthly service. Generally, a utility that has a strong financial and strategic rate implementation policy maintains a competitive rate position with its neighboring and similar utilities. **Table 3.6**, on the following page, provides a comparison of the monthly cost of providing water service for a 3/4-inch water meter at various usage levels calculated under the existing rates of the Town. Also included on the comparison are bills calculated under the rates of other neighboring Florida utilities as of the billing month of September 2016. The 3/4-inch (or smallest meter for the neighboring utilities) meter comparison was prepared since this represents the majority of the System's water residential customers and the majority of the customers for the other utilities reflected in the comparison. As can be seen in the comparison, the Water System rates produce bills for the Town that are competitive when compared to the other neighboring utilities. It should be noted that the Town's rates do reflect the high degree of treatment being used by the Water System to provide service (e.g., reverse osmosis water treatment) and the status of the Town's capital program and corresponding asset age (new facilities being built to meet needs with no grant funds received to assist in construction, which many utilities historically received).

Table 3.6
Comparison of Typical Monthly Residential Bills for Water Service [1]

	Residential Service for a 5/8" or 3/4" Meter							
	0 Gallons	2,000 Gallons	5,000 Gallons [2]	8,000 Gallons	10,000 Gallons	15,000 Gallons	20,000 Gallons	30,000 Gallons
Town of Jupiter								
Existing Rates	20.91	23.37	27.06	31.63	34.97	44.60	59.35	88.85
Other Surveyed Florida Utilities:								
City of Boynton Beach	12.35	15.65	20.60	25.55	30.16	44.96	59.76	89.36
City of Deerfield Beach	15.00	20.30	28.25	38.24	45.58	65.01	85.16	125.46
City of Delray Beach	15.72	15.72	18.22	21.97	24.47	32.97	42.97	70.47
City of Fort Lauderdale [2]	6.53	10.53	21.39	34.68	45.74	79.21	116.56	224.86
Fort Pierce Utilities Authority	13.88	24.53	31.63	42.28	49.38	71.58	98.23	151.53
Indian River County	9.05	13.45	20.49	29.18	36.88	63.83	102.33	179.33
City of Lake Worth [2]	18.75	24.79	35.48	49.43	62.03	107.72	162.87	301.27
Martin County [2]	16.83	21.15	27.63	34.11	38.43	53.68	73.23	116.63
City of Melbourne [2]	8.00	17.14	30.85	44.56	53.70	76.55	99.40	145.10
Okeechobee Utility Authority	19.44	27.64	44.06	62.54	74.86	105.66	136.46	198.06
Palm Beach County [2]	13.28	15.96	21.60	30.48	36.40	73.70	111.00	194.70
City of Port St. Lucie [2]	9.75	17.53	29.20	44.44	54.60	83.51	114.76	177.26
Riviera Beach Utility District [2]	15.79	20.61	27.84	37.71	44.29	66.04	87.79	142.29
St. Lucie County [2]	22.25	29.35	40.00	58.78	71.30	112.80	161.20	258.00
St. Lucie West Services District [2]	15.42	22.36	32.77	43.18	50.12	67.47	84.82	119.52
Seacoast Utility Authority	19.70	21.70	24.70	33.56	41.42	61.07	80.72	120.02
South Martin Regional Utility [2]	19.82	21.60	26.65	32.89	37.05	52.65	68.25	109.95
City of Stuart [2]	13.49	18.67	26.56	34.69	44.03	69.72	96.97	155.32
City of Sunrise [2]	18.62	25.92	36.87	47.82	55.12	73.37	91.62	128.12
Village of Tequesta [2]	15.75	20.73	28.20	35.67	40.65	58.23	79.23	128.73
City of Vero Beach [2]	13.60	15.26	17.75	26.09	31.65	45.55	73.35	128.95
Village of Wellington [2]	18.22	22.34	28.52	36.72	42.86	58.21	78.81	133.21
City of West Palm Beach [2]	20.91	27.38	37.09	48.44	56.54	78.98	102.84	153.08
Other Surveyed Florida Utilities' Average	$15.31	$20.45	$28.54	$38.83	$46.40	$69.67	$96.01	$154.40

[1] Unless otherwise noted, amounts shown reflect residential rates in effect September 2016 and are exclusive of taxes, franchise fees, or water restriction surcharges, if any, and reflect rates charged for inside the city service. All rates are as reported by the respective utility. This comparison is intended to show comparable charges for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utility.

[2] Utility is currently involved in a rate study, is planning to conduct a rate study, or is expected to implement a rate revision or price index / pass-through adjustment within the next twelve months following the comparison preparation date.

☐ Denotes Average Monthly Residential Use per Account

Rates for water and wastewater utility service greater than 2% of median household income may present an affordability concern based on industry standards and may be considered a financial burden to certain utility customers (assumed at 0.8% for a water-only utility). Based on the medium household income expressed in 2014 dollars of $70,240 as reported by the U.S. Census for the County and the average utility use of 10,000 gallons per month (which is a high water use – the industry generally uses 7,000 gallons), the County's average water bill (based on October 1,

2016 rates) currently approximates 0.6% of the median income and is considered to be within the affordability levels generally recognized by the industry.

In the development of the financial forecast, a primary rate assumption included the annual implementation of the price index rate adjustment corresponding in annual rate revenue increases. The application of the rate index i) allows the utility a vehicle to maintain utility revenue margins and promote overall financial performance; ii) is considered as a prudent financial and management policy by the rating agencies; iii) limits the need for large rate adjustments in the future since rates are marginally increased annually for the customer's benefit; iv) allows the utility to achieve the highest credit rating which reduces the overall cost of borrowing for the long-term benefit of the customers and the Town; v) is acceptable to the customers since there is no significant change in rates and no material impact on the affordability of water service to such customers; and vi) generally results in the lowest rates over the long-term. The Town implemented the price index for these reasons and such application has assisted the Town in securing the highest financial credit rating. By not implementing the price index, the utility loses the "time value of money" relative to the financial impact to the System and places the utility in a fiscally greater financial risk position (e.g., results in the inability to fund capital or need to issue more debt beyond what is prudent for the system). The application of the annual rate index promotes the sustainability of the system for the long-term in terms of revenue generation and funds availability and use.

d. Observations and Recommendations

Based on the financial evaluation as presented herein in support of the funding of the anticipated capital needs of the Water System, we offer the observations and recommendations:

1. The Water System should continue to set policy, which will promote the maintenance of the "AAA" rating with the credit agencies. This should i) promote stability in long-term rate competitiveness; ii) limit the risk to the utility due to market changes such as increased regulations; iii) allow for future debt borrowing at lowest interest costs; and iv) provide benefit to the overall credit rating of the Town.

2. The Water Master Plan identifies the need to fund approximately $273.0 Million in capital expenditures for the Fiscal Year 2017 to 2041 time frame. The majority of the capital expenditures is considered as being renewals to and replacements of the existing installed utility plant (approximately 97% of the total identified

needs) and is attributable to the utility plant facilities reaching their useful service lives during the Forecast Period. This is typical for a mature system which the Water System is now transitioning in (from a growth-related system) and for the water utilities in the South Florida area.

3. Renewal and replacement-related capital expenditures generally benefit existing customers since the assets are in service to serve such customers. Prudent utility business practices suggest that the funding of such expenditures should be from an annual deposit to a capital fund (i.e., Renewal and Replacement Fund) in order to match asset use to asset replacement. This is generally considered as a "depreciation equivalent." It is recommended that the Town continue to annually fund a deposit to the R&R Fund at the amounts identified in the financial forecast as follows:
    i. Recognize an annual $6.0 Million deposit for Fiscal Year 2017, which is essentially equivalent to the depreciation expense on depreciable assets; and

    ii. Increase the deposit by the construction cost index as published annually in the Engineering News Record to account for changes in construction costs (the financial forecast assumes 3.0% annually).

4. The Town should continue to annually index the monthly water service rates to promote the maintenance of the net revenue margins and provide funds for ongoing renewals and replacement capital projects. The indexing of water rate revenues is critical to the financial forecast and strong financial position of the Water System. The financial forecast assumes an annual 2.1% rate revenue index adjustment effective each October 1st beginning in Fiscal Year 2018; it is recommended that the Town continue to apply an index to the monthly rates for water service to maintain utility revenue margins and allow for the continued funding of ongoing capital renewals and replacements (critical as utility plant ages and begins to approach its effective service life). The 2.1% rate revenue index is considered as a minimum index that should be applied annually. A deferral or discontinuance in increasing revenues by annually adjusting rates for the price index allowance will cause greater rate increases in the future, absent any significant change in the financial forecast objectives and assumptions, and will place the utility in a financially negative position with a higher degree of financial risk. By way of example, if the Fiscal Year 2018 price index was not implemented and recognizing that the annual reduction in rate revenue affects

cash flow for the remainder of the Forecast Period (due to the time value of money), the ending working capital reserves assuming no other changes would reduce by approximately $6 Million by Fiscal Year 2027 and by $16 Million by 2038.

5. The Connection Fees were based primarily on the cost of the Nanofiltration Plant as the last increment of capacity and are considered as being reasonable. Furthermore, the Connection Fees are necessary to recover the cost of capacity from new users to the Water System. Any reduction in the Connection Fees charged to new development within the Town's service area will put additional rate pressure on the monthly rates for service since the Connection Fees are a financial resource to the System. Although provided in the Connection Fee ordinances, the assumed fees for the financial presentation did not assume any indexing in the fees since the majority of the capital costs to provide service have been constructed.

6. The Town's raw water supply is the Surficial Aquifer System ("SAS"), which is susceptible to salt water intrusion that can be caused by drought, the severity of which may be amplified due to the effects of climate change as estimated by the South Florida Climate Change Compact. In addition to the Town, other entities in the Town's water utility service area have also been granted SAS withdrawal permits from the SFWMD. In order to limit the risk of jeopardizing the Town's raw water supply, a recommendation to address the migration of salt water into the Town's wellfields is to eliminate major withdrawals from the SAS by targeting non-Town owned SAS withdrawal facilities with large permitted withdrawal rates located in the SAS Adaptation Action Zone (previously discussed in the Master Plan), which pose the greatest risk to salt water intrusion and connect them to the Town's regional water system. Since this action i) serves as a regional benefit (including the Town) by limiting salt water intrusion and potential avoidance of future CIP expenditures; and ii) may be recognized as an extraordinary property loss by the other entities (taking facilities off-line that have a remaining useful service life), the water production and treatment capacity allocated to these regionalization efforts should recognize a potential waiver of the Connection Fee (in whole or in part based on the additional assets to be constructed). Additionally, a supplemental water rate for ongoing water supply should also be considered that would: i) recover all of the variable costs to withdrawal, treat, and deliver the water supply to the other entities; and ii) recover an allowance for certain fixed costs (e.g., renewals and replacements on System assets needed

to provide the service). Since this allocation of capacity to these other entities for regional benefits would reflect unreserved and available capacity or may include new capacity that should be recovered by the region (not only the Town), these rate recommendations should not negatively impact the System retail customers.

7. The Town should update the financial forecast every 1 to 3 years to monitor trends and changes in Water System operations and capital needs to evaluate business and rate strategies in order to maintain the financial position of the Water System and the overall sufficiency of rates to meet the financial commitments of the utility.

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Table 3.7
Cash Flow Analysis

Line No.	Description	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
1	**Growth % of Retail Water Sales Over Prior Year**	104.8%	103.0%	102.8%	102.8%	102.7%	102.6%	102.6%	102.5%	102.5%	102.5%	102.3%	102.3%	102.3%	102.3%	102.2%	102.2%	102.1%	102.1%	102.0%	102.0%	102.0%	102.0%	102.0%	102.0%	102.0%
2	**Growth % of Oper. Income & Full Cost Alloc. Over Prior Year**	99.2%	101.0%	100.8%	100.7%	100.4%	100.1%	100.0%	99.8%	99.7%	99.5%	98.9%	98.8%	98.6%	98.4%	97.9%	97.7%	97.0%	96.6%	95.8%	95.4%	94.7%	93.9%	92.9%	91.7%	90.1%
3	**Adjusted Operating Fund Balance**	$ 22,142,261	$ 24,408,445	$ 26,551,426	$ 26,177,067	$ 22,316,845	$ 23,073,234	$ 24,600,095	$ 25,568,290	$ 27,162,338	$ 28,528,394	$ 29,687,889	$ 30,379,016	$ 26,860,180	$ 26,739,508	$ 27,536,513	$ 27,772,509	$ 26,882,708	$ 25,686,954	$ 24,537,624	$ 22,878,521	$ 21,534,784	$ 19,674,503	$ 18,230,185	$ 15,788,801	$ 13,096,250
4	Add: Operating Income Excluding GF Xfers & FCA	10,853,553	10,951,254	11,033,145	11,109,629	11,152,648	11,161,691	11,159,999	11,143,199	11,108,269	11,055,025	10,938,105	10,813,379	10,673,667	10,515,857	10,314,723	10,098,441	9,818,448	9,513,966	9,148,238	8,760,719	8,336,808	7,874,071	7,369,923	6,821,717	6,226,437
5	Less: General Fund Full Cost Allocation	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)	(796,350)
6	Add: Guaranteed Revenues & AGRF	913,098	845,184	735,186	703,053	632,435	564,707	538,523	521,685	491,454	459,723	343,044	320,919	297,713	273,391	202,603	182,868	92,234	70,950	-	-	-	-	-	-	-
7	Add: Interest Earned Prior Periods	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Add: Capital Surcharge/Loan Program Principal Pymt	89,972	106,439	116,421	126,846	137,126	147,255	157,840	168,903	180,464	192,547	203,915	215,802	228,234	241,236	254,186	267,735	156,369	135,504	121,093	345,232	42,155	37,579	32,815	27,857	22,697
9	Add: GF Loans Principal Repayment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Add: Other Non-Operating Income (Grants, etc.)	-	-	-	200,000	200,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	Add: Transfer from Stormwater & Other Funds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Add: Transfers from R&R Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	Add: Transfers from Connection Fee Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	451,128	337,979	337,979	168,989	142,098	-	-	-	-	-	-	-
14	Add: Stormwater Fund Loan Principal Pymt	-	-	-	313,770	322,399	331,265	340,374	349,735	359,352	369,235	379,389	389,822	400,542	411,557	422,875	434,504	446,453	458,730	-	-	-	-	-	-	-
15	Less: Loan to Stormwater Fund	-	-	-	(5,730,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	Less: Transfers to R&R Fund	(6,028,225)	(6,209,072)	(6,395,344)	(6,587,204)	(6,784,821)	(6,988,365)	(7,198,016)	(7,413,957)	(7,636,375)	(7,865,467)	(8,101,431)	(8,344,473)	(8,594,808)	(8,852,652)	(9,010,256)	(8,733,616)	(8,455,391)	(8,058,191)	(7,548,789)	(7,094,778)	(6,603,952)	(5,705,802)	(3,171,627)	(2,537,583)	(1,849,597)
17	Less: Additional Transfer to R&R Fund	-	-	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(1,000,000)	(2,000,000)	(2,000,000)	(2,000,000)	(2,000,000)	(2,000,000)	(2,000,000)	(2,000,000)	(3,000,000)	(3,000,000)	(3,000,000)
18	Less: Capital Surcharge Program Loans	-	(112,699)	(90,927)	(91,452)	(80,437)	(69,295)	(69,714)	(70,141)	(70,578)	(71,024)	(47,505)	(47,814)	(48,129)	(48,451)	(36,471)	(36,722)	(18,489)	(15,827)	-	-	-	-	-	-	-
19	Less: Deposit to Membrane & Ion Reserves	-	(42,246)	(42,246)	(42,246)	(35,658)	(35,658)	(638,454)	(638,454)	(638,454)	(662,577)	(661,116)	(810,990)	(810,990)	(810,990)	(810,990)	(810,990)	(648,388)	(648,388)	(648,388)	(648,388)	(648,388)	(1,006,879)	(1,006,136)	(1,006,136)	(1,006,136)
20	Less: Annual Debt Service Payments	(1,028,964)	(987,777)	(536,945)	(485,357)	(436,074)	(384,555)	(332,706)	(206,252)	(171,912)	(136,938)	(102,820)	(68,353)	(78,654)	-	-	-	-	-	-	-	-	-	(1,946,638)	(1,946,638)	(1,946,638)
21	Less: Transfers to Gen Fund/Other CIP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Less: Capital Project Expenditures	(314,139)	-	-	(200,000)	(200,000)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(335,004)	-	-	-	-
23	Less: Capital Equipment Expenditures	(174,022)	(258,339)	(264,797)	(271,417)	(278,203)	(285,158)	(292,287)	(299,594)	(307,084)	(314,761)	(322,630)	(330,696)	(338,963)	(347,437)	(356,123)	(365,026)	(374,152)	(383,506)	(393,093)	(402,921)	(412,994)	(423,318)	(433,901)	(444,749)	(455,868)
24	Less: Capitalized Salaries	(208,300)	(216,632)	(225,297)	(234,309)	(243,682)	(253,429)	(263,566)	(274,109)	(285,073)	(296,476)	(308,038)	(319,744)	(331,574)	(343,511)	(355,534)	(367,622)	(379,754)	(391,906)	(404,055)	(416,176)	(428,662)	(441,522)	(454,767)	(468,410)	(482,463)
25	Less: Working Capital @ 16.67% of Expenses (2mos)	(3,405,128)	(3,502,089)	(3,596,744)	(3,714,779)	(3,823,536)	(3,920,310)	(4,025,288)	(4,148,157)	(4,299,789)	(4,452,957)	(4,587,818)	(4,741,376)	(4,916,996)	(5,079,745)	(5,254,310)	(5,452,432)	(5,642,993)	(5,818,528)	(5,995,318)	(6,177,379)	(6,362,494)	(6,560,362)	(6,815,241)	(7,110,494)	(7,367,645)
26	Less: Transfers to R&R Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	Less: Transfers to Connection Fee Fund	(1,218,944)	(1,415,164)	(3,214,600)	(1,345,949)	(2,301,574)	(1,614,075)	(1,557,073)	(950,073)	(980,073)	(939,573)	(1,182,372)	(4,847,957)	(861,872)	-	-	-	-	-	-	-	-	-	-	-	-
28	Adj.: Adjustment to Tie To Financial Statements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Oper. Funds Avail. for Future CIP before Int. Income	20,824,812	22,770,955	22,272,928	18,131,302	18,781,119	19,930,957	20,623,377	21,954,724	23,116,189	24,068,801	24,442,263	20,811,186	20,682,001	21,353,541	21,448,845	20,531,276	19,249,685	17,895,505	16,020,961	14,448,480	12,325,903	10,651,920	8,008,263	5,328,015	2,440,689
31	Add: Interest Income	178,505	278,382	307,395	470,765	468,579	748,828	919,624	1,059,457	1,112,415	1,166,131	1,348,936	1,307,619	1,140,511	1,103,227	1,069,355	898,999	794,275	823,591	862,242	908,925	986,106	1,017,903	965,297	657,741	382,149
32	Total Operating Fund Balance with Working Capital	24,408,445	26,551,426	26,177,067	22,316,845	23,073,234	24,600,095	25,568,290	27,162,338	28,528,394	29,687,889	30,379,016	26,860,180	26,739,508	27,536,513	27,772,509	26,882,708	25,686,954	24,537,624	22,878,521	21,534,784	19,674,503	18,230,185	15,788,801	13,096,250	10,190,483
33	**Renewal & Replacement Fund Balance**	23,053,839	24,697,166	26,315,565	23,734,756	18,710,836	23,863,035	28,345,482	31,270,241	28,375,531	20,269,645	19,985,146	25,609,667	20,738,677	15,940,071	18,498,233	13,762,100	5,818,565	8,519,796	12,459,027	16,443,166	20,120,021	26,761,957	26,831,534	25,918,933	4,319,631
34	Add: Annual Contributions to R&R Fund	6,028,225	6,209,072	6,395,344	6,587,204	6,784,821	6,988,365	7,198,016	7,413,957	7,636,375	7,865,467	8,101,431	8,344,473	8,594,808	8,852,652	9,010,256	8,733,616	8,455,391	8,058,191	7,548,789	7,094,778	6,603,952	5,705,802	3,171,627	2,537,583	1,849,597
35	Add: Additional Transfer from Operating Fund	-	-	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	3,000,000	3,000,000	3,000,000
36	Add: Annual Deposit to Membrane, Ion Resin Reserve	-	42,246	42,246	42,246	35,658	35,658	638,454	638,454	638,454	662,577	661,116	810,990	810,990	810,990	810,990	810,990	648,388	648,388	648,388	648,388	648,388	1,006,879	1,006,136	1,006,136	1,006,136
37	Add: Debt/Bond Proceeds for R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25,000,000	-	-
38	Add: Transfers In Operating Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	Add: Transfers In	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	Less: Capital Project Expenditures	(4,449,218)	(4,785,499)	(8,335,874)	(11,947,586)	(2,859,003)	(3,541,576)	(5,911,711)	(9,594,616)	(17,380,715)	(9,812,543)	(3,265,321)	(15,026,454)	(12,266,784)	(8,105,480)	(15,557,379)	(18,240,759)	(8,402,548)	(3,605,777)	(6,213,039)	(6,066,310)	(2,610,404)	(8,643,105)	(28,180,970)	(28,143,021)	(3,130,771)
41	Less: Capital Proj. Exp. - Membrane, Ion Resin, Storm	-	-	(1,857,090)	(874,890)	-	-	-	(2,352,505)	-	-	(872,704)	-	(2,937,620)	-	-	(1,247,383)	-	(3,161,571)	-	-	-	-	(4,909,393)	-	(300,010)
42	Less: Annual Debt Service Payments	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	Less: Transfers To Operating Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	Less: Membrane, Ion Resin, & Storm Fund Reserve	(4,252,127)	(4,294,372)	(2,479,528)	(1,646,884)	(1,682,542)	(1,718,200)	(2,356,654)	(642,603)	(1,281,057)	(1,943,634)	(1,732,045)	(2,543,035)	(416,406)	(1,227,396)	(2,038,386)	(1,601,993)	(2,250,381)	262,802	(385,586)	(1,033,974)	(1,682,362)	(2,689,242)	1,214,016	207,880	(498,245)
45	Less: Minimum Deposit per Bond Resolution	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)	(500,000)
46	Adj: Adj BS Items - AP/Retainage/US1 FDOT Deposit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	R&R Funds Avail. for Future CIP before Int. Income	19,880,719	21,368,612	20,580,662	16,394,846	21,489,769	26,127,283	28,413,588	27,232,928	18,488,588	17,541,512	23,377,622	17,695,641	15,023,665	16,770,837	11,223,714	3,716,571	5,769,415	12,221,829	15,557,579	18,586,047	24,579,595	23,642,292	26,632,949	4,027,511	5,746,338
49	Add: Interest Income	64,320	152,580	174,565	169,106	190,724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	Total R&R Fund Bal. with Minimum Deposit Req & Rsrv	24,697,166	26,315,565	23,734,756	18,710,836	23,863,035	28,345,482	31,270,241	28,375,531	20,269,645	19,985,146	25,609,667	20,738,677	15,940,071	18,498,233	13,762,100	5,818,565	8,519,796	12,459,027	16,443,166	20,120,021	26,761,957	26,831,534	25,918,933	4,319,631	6,744,583
52	**Connection Fees Fund Balance**	6,990	3,210	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53	Add: Annual Contributions to Connect Fee Fund	1,229,097	1,117,093	894,556	894,556	782,553	670,550	735,552	735,552	735,552	735,552	489,878	489,878	489,878	489,878	367,041	367,041	183,714	154,110	-	-	-	-	-	-	-
54	Add: Debt/Bond Proceeds for Connection Fees	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	Add: Transfers from Operating Fund	1,218,944	1,415,164	3,214,600	1,345,949	2,301,574	1,614,075	1,557,073	950,073	980,073	939,573	1,182,372	4,847,957	861,872	-	-	-	-	-	-	-	-	-	-	-	-
56	Less: Annual Debt Service Payments	(2,272,100)	(2,384,860)	(2,254,500)	(2,106,000)	(2,205,000)	(2,226,500)	(2,234,500)	(1,627,500)	(1,657,500)	(1,617,000)	(1,633,500)	(1,644,500)	(1,313,000)	-	-	-	-	-	-	-	-	-	-	-	-
57	Less: Capital Project Expenditures	(182,931)	(150,607)	(1,854,666)	(134,505)	(879,128)	(58,125)	(58,125)	(58,125)	(58,125)	(58,125)	(38,750)	(3,693,335)	(38,750)	(38,750)	(29,063)	(29,063)	(14,725)	(12,013)	-	-	-	-	-	-	-
58	Less: Transfers to Operating Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	(451,128)	(337,979)	(337,979)	(168,989)	(142,098)	-	-	-	-	-	-	-
	Adj: Adj BS & Other Items - AP/Retainage/PY Fee Refund																									
60	Conn. Fees Avail. for Future CIP before Int. Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	Add: Interest Income	3,210	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
62	Connection Fee Fund Balance	3,210	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	Total Funds Available At Year End	$ 49,108,820	$ 52,867,001	$ 49,911,823	$ 41,027,681	$ 46,936,269	$ 52,945,578	$ 56,838,531	$ 55,537,869	$ 48,798,039	$ 49,673,035	$ 55,988,683	$ 47,598,857	$ 42,679,579	$ 46,034,746	$ 41,534,609	$ 32,701,273	$ 34,206,750	$ 36,996,651	$ 39,321,687	$ 41,654,805	$ 46,436,461	$ 45,061,719	$ 41,707,734	$ 17,415,881	$ 16,935,066

Table 3.8
Capital Improvement Plan

Line No.	Capital Improvement Projects	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total CIP 2017 - 2041
1	Professional Services	$ 52,931	$ 53,732	$ 55,344	$ 57,005	$ 58,715	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 277,727
2	Large Meter Replacement Program	265,000	90,640	93,359	96,160	99,045	102,016	105,077	108,229	111,476	114,820	118,265	121,813	125,467	129,231	133,108	137,101	141,214	145,451	149,814	154,309	158,938	163,706	168,617	173,676	178,886	3,385,418
3	Meters New	130,000	96,875	77,500	77,500	67,813	58,125	58,125	58,125	58,125	58,125	38,750	38,750	38,750	38,750	29,063	29,063	14,725	12,013	-	-	-	-	-	-	-	980,175
4	Meter Replacement Program	911,255	477,920	492,258	507,025	522,236	537,903	554,040	570,661	587,781	605,415	623,577	642,285	661,553	681,400	701,842	722,897	744,584	766,921	789,929	813,627	838,036	863,177	889,072	915,744	943,216	17,364,354
5	Juno Beach Distribution System Improvements	1,623,186	-	-	-	-	-	-	-	-	-	-	-	-	-	946,893	-	-	-	-	-	-	-	-	-	-	2,570,079
6	Utility Billing Services & Enterprise Asset Management System	-	-	-	-	-	-	-	-	696,724	-	-	-	-	-	-	-	-	-	936,338	-	-	-	-	-	-	1,633,062
7	Asset Maintenance Program	538,394	590,975	663,037	837,844	778,662	615,246	876,012	887,167	672,298	846,517	721,503	619,324	585,300	611,890	855,341	639,574	994,270	983,442	698,878	937,661	741,440	832,321	798,375	810,192	1,149,507	19,285,170
8	Ion Exchange Resin Replacement	-	-	-	-	-	-	-	-	-	-	-	-	210,421	-	-	-	-	-	-	-	-	-	-	-	300,010	510,431
9	Pump Replacement Program	-	-	-	-	-	564,445	-	962,301	108,367	1,082,878	-	673,977	2,631,190	4,351,655	216,733	81,275	-	81,275	1,671,518	449,543	871,990	-	-	-	-	13,747,147
10	MBA Rehab for RO Permeate Odor Contl	-	-	2,369,060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,369,060
11	Nano Pretreatment Sand Filter Media Replacement	-	-	-	316,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	316,693
12	WTP Replacement Program	-	-	-	-	-	-	-	4,642,464	11,606,161	6,963,697	-	-	-	425,608	6,106,872	12,213,744	6,106,872	-	703,466	-	-	-	17,379,900	25,279,569	-	91,428,352
13	RO & Nano Membrane Replace Prgm (2019-Nano 1-5 & 2020-RO A-D & I)	-	-	1,857,090	874,890	-	-	-	2,352,505	-	-	872,704	-	2,727,199	-	-	1,247,383	-	3,161,571	-	-	-	-	4,909,393	-	-	18,002,735
14	Piping Upgrade-Central Blvd Pump Station	-	-	-	-	-	-	-	-	3,597,908	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3,597,908
15	Penn Park Distribution System Improvements	-	420,101	2,142,589	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,562,690
16	Generator Replacement Program (No. 3)	-	-	-	97,517	-	-	-	-	-	199,216	-	106,291	-	635,159	-	-	-	-	-	151,597	-	764,718	850,721	963,840	859,162	4,628,221
17	Central Blvd HSP North Electrical Improvements	453,480	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	453,480
18	Loxahatchee River Road Area Distribution System Impr	-	675,834	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	675,834
19	Elsa and Paulina Roads Infrastr Improve (to coincide w/drainage)	270,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	270,000
20	(PBC) Center St - Thelma Ave to Woodland Estates WM Relocation	272,903	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	272,903
21	Nano Concentrate Main to LRD Hydraulic Investigation & Corr	115,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115,000
22	Indiantown Rd Bridge Transmission Main Valve Replacement	-	265,225	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	265,225
23	Bluffs Service Valve Replacement Program	-	410,804	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	410,804
24	RO Concentrate Treatment Facility Improvements	-	309,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	309,000
25	RO Mods to Addr RW Degradation - Incr Interstage Boost	-	1,545,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,545,000
26	Floridan Aquifer Wellfield Impr RO-15, RO-16, RO-17	-	-	-	9,210,596	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9,210,596
27	RO Degasifier Impr - Add 4th Degasifier (if needed)	-	-	-	-	-	579,637	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	579,637
28	RO Mods to Addr RW Degradation - RW Boost PS - RO 2nd Pass	-	-	-	-	-	-	-	-	-	-	-	8,028,556	-	-	-	-	-	-	-	-	-	-	-	-	-	8,028,556
29	Pine Gardens North Drainage & Distribution Improvements	-	-	-	881,751	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	881,751
30	Pine Gardens North Drainage & Distribution Improvements	-	-	-	200,000	200,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400,000
31	Perigon Way Distribution System Improvements	-	-	104,470	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104,470
32	Construction of Floridan Aquifer Well RO-14	-	-	-	-	-	-	-	-	-	-	-	3,654,585	-	-	-	-	-	-	-	-	-	-	-	-	-	3,654,585
33	Nano Acid Bulk Tank Replacements	-	-	-	-	-	-	696,724	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	696,724
34	IT Continuity of Operations	314,139	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	314,139
35	Complete Final Connection to SFWMD Regional System	-	-	1,721,822	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,721,822
36	Brentwood North Distribution Improvements	-	-	-	-	65,049	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65,049
37	Distribution System Flow and Pressure Monitoring	-	-	-	-	752,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	752,600
38	Demo Lime Sludge Drying Equipment	-	-	380,315	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	380,315
39	Old Dixie Highway Water Main Replacement	-	-	-	-	-	-	-	-	-	-	1,490,383	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,490,383
40	Toney Penna at JRE Transmission Main Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	962,675	-	-	-	-	-	-	-	-	-	-	962,675
41	Storage Reservoir Replacement Program	-	-	-	-	-	-	-	-	-	-	-	742,207	-	1,270,537	-	-	-	-	-	-	-	-	2,460,370	-	-	4,473,114
42	Production Well Replacement Program (2019-Wells 6-11)	-	-	2,090,786	-	554,529	1,142,329	3,306,113	2,423,794	-	-	-	4,092,001	7,517,840	-	5,633,915	4,446,168	-	1,628,688	-	3,559,573	-	-	5,633,915	-	-	42,029,651
43	Recharge System Replacement Program	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,016,249	-	-	-	5,016,249
44	Yacht Club Dr Area Distribution Improvements (incl Clark Ln)	-	-	-	-	-	-	373,745	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,002,934	-	-	-	1,376,679
45	Fisherman's Landing Water Main Replacement	-	-	-	-	839,482	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	839,482
46	Bella Vista Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	631,548	-	-	-	-	-	-	631,548
47	Jupiter Dunes Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	631,548	-	-	-	-	-	-	631,548
48	Hampton Pl & Hampton Cir Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	335,004	-	-	-	-	335,004
49	Jupiter Plantation Distribution Improvements	-	-	-	-	-	-	-	-	-	-	311,593	-	-	-	-	-	-	-	-	-	-	-	-	-	-	311,593
50	Ocean Parks Condos Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	415,608	-	-	-	-	-	-	-	-	415,608
51	Villas on the Green Distribution Improvements	-	-	-	-	-	-	-	-	-	-	-	-	745,434	-	-	-	-	-	-	-	-	-	-	-	-	745,434
53	Total Projects	$ 4,946,288	$ 4,936,106	$ 12,047,630	$ 13,156,981	$ 3,938,131	$ 3,599,701	$ 5,969,836	$ 12,005,246	$ 17,438,840	$ 9,870,668	$ 4,176,775	$ 18,719,789	$ 15,243,154	$ 8,144,230	$ 15,586,441	$ 19,517,204	$ 8,417,273	$ 6,779,361	$ 6,213,039	$ 6,066,310	$ 2,945,408	$ 8,643,105	$ 33,090,363	$ 28,143,021	$ 3,430,781	$ 273,025,680
	Funding by Source of Funds																										
54	Water Operating Funds	$ 314,139	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 335,004	$ -	$ -	$ -	$ -	$ 649,143
55	Water O&M Reserve Funds - Loans	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	Water Off-site Transmission Fees	130,000	96,875	77,500	77,500	820,413	58,125	58,125	58,125	58,125	58,125	38,750	38,750	38,750	38,750	29,063	29,063	14,725	12,013	-	-	-	-	-	-	-	1,732,775
57	Water Plant Capacity Charges	52,931	53,732	1,777,166	57,005	58,715	-	-	-	-	-	-	3,654,585	-	-	-	-	-	-	-	-	-	-	-	-	-	5,654,134
58	Water Renewal & Replacement Funds	4,449,218	4,785,499	8,335,874	11,947,586	2,859,003	3,541,576	5,911,711	9,594,616	17,380,715	9,812,543	3,265,321	15,026,454	12,266,784	8,105,480	15,557,379	18,240,759	8,402,548	3,605,777	6,213,039	6,066,310	2,610,404	8,643,105	28,180,970	28,143,021	3,130,771	246,076,462
59	Water R&R Subfund - Membrane, Ion, Storm	-	-	1,857,090	874,890	-	-	-	2,352,505	-	-	872,704	-	2,937,620	-	-	1,247,383	-	3,161,571	-	-	-	-	4,909,393	-	300,010	18,513,166
60	Water Revenue Bonds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
61	Intergov - Grant Funds - CDBG - PBC	-	-	-	200,000	200,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400,000
62	Intergov - Grant Funds - SWFWMD - WTR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
63	Intergov - Grant Funds - Lox River Pres Init - WTR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	Intergov - Grant Funds - FEMA - WTR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
65	Shared Costs With Others	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
66	Private Developer Funded - WTR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
68	Total Funding Sources	$ 4,946,288	$ 4,936,106	$ 12,047,630	$ 13,156,981	$ 3,938,131	$ 3,599,701	$ 5,969,836	$ 12,005,246	$ 17,438,840	$ 9,870,668	$ 4,176,775	$ 18,719,789	$ 15,243,154	$ 8,144,230	$ 15,586,441	$ 19,517,204	$ 8,417,273	$ 6,779,361	$ 6,213,039	$ 6,066,310	$ 2,945,408	$ 8,643,105	$ 33,090,363	$ 28,143,021	$ 3,430,781	$ 273,025,680

Table 3.9

Summary of Asset Maintenance Programs

Line No.	Description	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total 2017 to 2041
	Asset Maintenance R&R Program																										
	Recharge System																										
1	Maintenance Dredging of Canals (every 5 yrs)	$ -	$ -	$ -	$ -	$ 69,212	$ -	$ -	$ -	$ -	$ 80,235	$ -	$ -	$ -	$ -	$ 93,015	$ -	$ -	$ -	$ -	$ 107,830	$ -	$ -	$ -	$ -	$ 125,004	$ 475,296
2	Total Recharge System	-	-	-	-	69,212	-	-	-	-	80,235	-	-	-	-	93,015	-	-	-	-	107,830	-	-	-	-	125,004	475,296
	Wells																										
3	Continual Well R&R	235,251	238,810	245,975	253,354	260,955	268,783	276,847	285,152	293,707	302,518	311,593	320,941	330,570	340,487	350,701	361,222	372,059	383,221	394,717	406,559	418,756	431,318	444,258	457,586	471,313	8,456,653
4	Clean and Paint Wellhead piping	-	6,334	-	-	6,921	-	-	7,563	-	-	8,264	-	-	9,031	-	-	9,868	-	-	10,783	-	-	11,783	-	-	70,547
5	Total Wells	235,251	245,144	245,975	253,354	267,876	268,783	276,847	292,715	293,707	302,518	319,857	320,941	330,570	349,518	350,701	361,222	381,927	383,221	394,717	417,342	418,756	431,318	456,041	457,586	471,313	8,527,200
	Ground Storage Tanks																										
	On-Site clean/paint every 5 yrs due to MBAs																										
6	Two Tanks On-Site (3 MG, 1.5 MG)	-	-	-	-	63,675	-	-	-	-	73,816	-	-	-	-	85,574	-	-	-	-	99,203	-	-	-	-	115,004	437,272
	Off-Site clean/paint every 10 years																										-
7	Central Blvd Tanks (2-5MG, 1-8MG)	-	-	-	-	-	-	-	226,888	-	-	-	-	-	-	-	-	-	304,919	-	-	-	-	-	-	-	531,807
8	Juno Tank (3 MG)	-	-	-	-	41,527	-	-	-	-	-	-	-	-	-	55,809	-	-	-	-	-	-	-	-	-	75,002	172,338
9	Riverbend Tank (3 MG) last painted in 2008	-	38,003	-	-	-	-	-	-	-	-	-	51,073	-	-	-	-	-	-	-	-	-	68,638	-	-	-	157,714
10	Total Ground Storage Tanks	-	38,003	-	-	105,202	-	-	226,888	-	73,816	-	51,073	-	-	141,383	-	-	304,919	-	99,203	-	68,638	-	-	190,006	1,299,131
	Buildings Clean and Paint every 10 years																										
11	On-Site Bldgs (Interior & Exterior)	55,227	55,738	57,410	59,132	60,906	62,733	64,615	66,554	68,551	70,607	72,725	74,907	77,154	79,469	81,853	84,309	86,838	89,443	92,126	94,890	97,737	100,669	103,689	106,800	110,004	1,974,086
	WTP Administration/Lab/Maintenance Bldg																										-
	RO Plant Process/Control Rm/Clearwell/pumps																										-
	RO Chemical Bldg																										-
	Nanofiltration Process Bldg																										-
	Nanofiltration Pretreatment Bldg																										-
	Chlorine Bldg																										-
	Concentrate Treatment Facility																										-
	MBA Chemical Bldg																										-
	On-Site Generator Bldg																										-
	On-Site High Service Pump Bldg (& pumps)																										-
	WTP Warehouse Bldg (Future)																										-
	Sludge Vacuum Bldg																										-
	WTP Pole Barn																										-
12	Off-Site Bldgs (Interior & Exterior)	25,103	25,335	26,095	26,878	27,685	28,515	29,371	30,252	31,159	32,094	33,057	34,049	35,070	36,122	37,206	38,322	39,472	40,656	41,876	43,132	44,426	45,759	47,131	48,545	50,002	897,312
	Central Blvd HSP Bldgs & Pumps (2)																										-
	Indian Creek Generator Bldg																										-
	Toney Pena Well House																										-
	Abacoa Generator Bldg																										-
	Riverbend Repump Generator/Electrical Bldg																										-
	Juno Tank Site Electrical Bldg																										-
	Emergency Operations Center (EOC)																										-
	EOC Pole Barn																										-
13	RO Process Room Rehab Work & Crane Rehab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Server Room Relocation, Equipment & Programming	-	-	-	257,915	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	257,915
15	Nano Bldg Architectural Foam Issue	-	-	100,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100,000
16	Total Buildings	80,330	81,073	183,505	343,925	88,591	91,248	93,986	96,806	99,710	102,701	105,782	108,956	112,224	115,591	119,059	122,631	126,310	130,099	134,002	138,022	142,163	146,428	150,820	155,345	160,006	3,229,313
	Other Plant Facilities Clean & Paint																										
17	IX Facility (incld. Brine tank, salt contain & piping)	18,828	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536	26,303	27,092	27,904	28,742	29,604	30,492	31,407	32,349	33,319	34,319	35,348	36,409	37,501	672,987
	Hydropneumatic Tank																										-
	MBA Scrubbers & Duct Work																										-
	CTF Scrubbers & Duct Work																										-
	Nano Degas/Scrubbers/Ductwork																										-
	RO Generator Muffler (high temp coating)																										-
	Above Ground Finished Water Transfer Line																										-
	Bollards on Plant Site																										-
	Backflow Preventors (incld. NF Conc. Piping)																										-
	Bulk Fuel & Chemical Containment Areas																										-
	Nano Bulk Chemical Tanks																										-
	Misc. Exterior PVC																										-
	Plant III Filter																										-
18	Total Other Plant Facilities	18,828	19,002	19,572	20,159	20,764	21,386	22,028	22,689	23,370	24,071	24,793	25,536	26,303	27,092	27,904	28,742	29,604	30,492	31,407	32,349	33,319	34,319	35,348	36,409	37,501	672,987
19	Water Distribution System	6,276	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	224,330
	Bridgegate Drive (Jonathan's Landing-8",130')																										-
	Carlin Park (12", 40')																										-
	Lox. River Road Culvert (12", 40')																										-
	Jupiter Beach Resort (8", 45')																										-
	Toney Penna/Mohican (Jones Creek-Culvert)																										-
	Bluffs Marina																										-
	Indiantown Road (Jones Creek)																										-
	Commodore Dr. (Admirals Cove)																										-
	Island Way (South, East, West)																										-
	Center St. (East, West)																										-
	Reach Island																										-
	Toney Penna (Canal Crossing)																										-
	Loxahatchee River Rd																										-
	Alt A1A (East, West)																										-
	Caseekey Island (Jonathan's Landing)																										-
	Barrow Island (Jonathan's Landing)																										-
20	Total Water Distribution System	6,276	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	12,136	12,500	224,330
	Hydrant Maintenance Painting																										
21	3,300 Hydrants (every 10 yrs)	-	-	-	-	-	-	242,308	-	-	-	-	-	-	-	-	-	325,642	-	-	-	-	-	-	-	-	567,950
22	Total Hydrant Maintenance	-	-	-	-	-	-	242,308	-	-	-	-	-	-	-	-	-	325,642	-	-	-	-	-	-	-	-	567,950
	Information Systems																										
23	GIS Upgrades	5,881	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	211,418
24	SCADA Upgrades	191,828	195,449	201,312	207,352	213,572	219,980	226,579	233,377	240,378	247,589	255,017	96,282	99,171	102,146	105,210	108,367	111,618	114,966	118,415	121,968	125,627	129,395	133,277	137,276	141,394	4,077,545
25	Total Information Systems	197,709	201,419	207,461	213,686	220,096	226,700	233,500	240,506	247,721	255,152	262,807	104,306	107,435	110,658	113,978	117,398	120,919	124,547	128,283	132,132	136,096	140,178	144,383	148,716	153,177	4,288,963
26	Total Asset Maintenance R&R Program	$ 538,394	$ 590,975	$ 663,037	$ 837,844	$ 778,662	$ 615,246	$ 876,012	$ 887,167	$ 672,298	$ 846,517	$ 721,503	$ 619,324	$ 585,300	$ 611,890	$ 855,341	$ 639,574	$ 994,270	$ 983,442	$ 698,878	$ 937,661	$ 741,440	$ 832,321	$ 798,375	$ 810,192	$ 1,149,507	$ 19,285,170
	Membrane Replacements																										
27	RO Bank I (Trains A-D, every 12 yrs)	$ -	$ -	$ -	$ 677,334	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 965,716	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,643,050
28	RO Bank II (Trains E-F, every 12 yrs)	-	-	-	-	-	-	-	-	-	-	436,352	-	-	-	-	-	-	-	-	-	-	-	622,133	-	-	1,058,485
29	RO Bank II (Trains G-H, every 12 yrs)	-	-	-	-	-	-	-	-	-	-	436,352	-	-	-	-	-	-	-	-	-	-	-	622,133	-	-	1,058,485
30	RO Bank II (Train I, every 12 yrs)	-	-	-	197,556	-	-	-	-	-	-	-	-	-	-	-	281,667	-	-	-	-	-	-	-	-	-	479,223
31	Nano (Trains 1-5, every 5 yrs)	-	-	1,857,090	-	-	-	-	2,352,505	-	-	-	-	2,727,199	-	-	-	-	3,161,571	-	-	-	-	3,665,127	-	-	13,763,492
32	Total Membrane Replacements	$ -	$ -	$ 1,857,090	$ 874,890	$ -	$ -	$ -	$ 2,352,505	$ -	$ -	$ 872,704	$ -	$ 2,727,199	$ -	$ -	$ 1,247,383	$ -	$ 3,161,571	$ -	$ -	$ -	$ -	$ 4,909,393	$ -	$ -	$ 18,002,735
	Ion Exchange Resin Replacement																										
33	Ion Exchange Resin Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 210,421	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 300,010	$ 510,431
34	Total Ion Exchange Resin Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 210,421	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 300,010	$ -

Table 3.10

Summary of Asset Maintenance Programs

Line No.	Escal. Ref.		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
	Expenses																										
1	Salaries	Salaries	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
2	OT - Plant	Plt-OT	107.05%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
3	OT - Field	Field-OT	111.77%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
4	FICA	FICA	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
5	FRS	FRS	104.00%	104.00%	104.00%	104.57%	104.00%	104.00%	104.00%	104.00%	104.50%	104.00%	103.90%	103.80%	103.70%	104.00%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
6	Health/Life Insurance	Health	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%
7	Workers Comp	WC	103.50%	119.60%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%
8	OPEB	OPEB	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%
9	Consumer Price Index - Gen Inflation	CPI	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
10	Repairs and Maintenance	R&M	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
11	Utility Costs	Utility	106.01%	104.39%	104.17%	104.17%	104.06%	103.95%	103.95%	103.95%	103.94%	103.94%	103.74%	103.74%	103.74%	103.74%	103.64%	103.64%	103.49%	103.47%	103.35%	103.35%	103.35%	103.35%	103.35%	103.35%	103.35%
12	Gasoline	Gas	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
13	Insurance Costs	Insurance	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
14	Marginal Increase	Marginal	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%
15	Constant	Constant	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
16	Customer Growth Plus Inflation	Customer	103.66%	103.54%	103.32%	103.32%	103.21%	103.10%	103.10%	103.10%	103.09%	103.09%	102.89%	102.89%	102.89%	102.89%	102.79%	102.79%	102.64%	102.62%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
17	Change in Allowance for Doubtful Accounts	Doubtful Accts	100.00%	102.99%	102.77%	102.77%	102.66%	102.55%	102.55%	102.55%	102.54%	102.54%	102.34%	102.34%	102.34%	102.34%	102.24%	102.24%	102.09%	102.07%	101.95%	101.95%	101.95%	101.95%	101.95%	101.95%	101.95%
18	Depreciation as a % of Total Assets		101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%	101.90%
19	Chemical Costs	Chemical	104.01%	103.89%	103.67%	103.67%	103.56%	103.45%	103.45%	103.45%	103.44%	103.44%	103.24%	103.24%	103.24%	103.24%	103.14%	103.14%	102.99%	102.97%	102.85%	102.85%	102.85%	102.85%	102.85%	102.85%	102.85%
20	Other Escalator	Other1	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
21	Working Capital-% of Oper/Non-Oper Expenses		16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%
	Revenues																										
22	Fuel Reimbursement		103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
23	IQ Concentrate		101.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
24	Misc Revenue		100.50%	101.04%	100.82%	100.82%	100.71%	100.60%	100.60%	100.60%	100.59%	100.59%	100.39%	100.39%	100.39%	100.39%	100.29%	100.29%	100.14%	100.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
25	Interest Rate on Investments		0.20%	0.60%	0.70%	0.80%	0.90%	1.00%	1.25%	1.50%	1.75%	2.00%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%	2.25%
26	R&R Contributions		$ 6,028,225	$ 6,209,072	$ 6,395,344	$ 6,587,204	$ 6,784,821	$ 6,988,365	$ 7,198,016	$ 7,413,957	$ 7,636,375	$ 7,865,467	$ 8,101,431	$ 8,344,473	$ 8,594,808	$ 8,852,652	$ 9,010,256	$ 8,733,616	$ 8,455,391	$ 8,058,191	$ 7,548,789	$ 7,094,778	$ 6,603,952	$ 5,705,802	$ 3,171,627	$ 2,537,583	$ 1,849,597
27	Growth in Retail Sales		104.84%	102.99%	102.77%	102.77%	102.66%	102.55%	102.55%	102.55%	102.54%	102.54%	102.34%	102.34%	102.34%	102.34%	102.24%	102.24%	102.09%	102.07%	101.95%	101.95%	101.95%	101.95%	101.95%	101.95%	101.95%
28	Water & Sewer Maintenance Cost Index to		3.83%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%	2.10%
29	Rate Increase		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
30	Water Use Adjustment		-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%	-0.15%
31	Customer Growth		101.16%	101.04%	100.82%	100.82%	100.71%	100.60%	100.60%	100.60%	100.59%	100.59%	100.39%	100.39%	100.39%	100.39%	100.29%	100.29%	100.14%	100.12%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
32	ERCs Connected		48,014	48,514	48,914	49,314	49,664	49,964	50,264	50,564	50,864	51,164	51,364	51,564	51,764	51,964	52,114	52,264	52,339	52,402	52,402	52,402	52,402	52,402	52,402	52,402	52,402
33	Increase in ERCs		550	500	400	400	350	300	300	300	300	300	200	200	200	200	150	150	75	63	-	-	-	-	-	-	-

Table 3.11
Summary of Above-Ground Assets – Original and Replacement Cost [1]

Line No.	Asset Description	Original Cost	Service Life (Years)	Installation Date (Year)	Useful Life Expiration	Useful Life Expiration Replace Cost [2]
	Pump					
1	High Service Pump 11 (Central Blvd North Station)	$ 487,500	20	1995	2035	$ 1,590,243
2	High Service Pump 12 (Central Blvd North Station)	487,500	20	1999	2026	1,082,878
3	High Service Pump 13, 14 (Outside HSP Bldg On-Site)	789,689	20	2002	2029	1,754,127
4	High Service Pump 15 (Central Blvd South Station)	394,844	20	2002	2029	877,063
5	High Service Pump 16 (Central Blvd South Station)	60,000	20	2005	2025	108,367
6	High Service Pump 17, 18	120,000	20	2011	2031	216,733
7	High Service Pump 5 (In HSP Bldg On-Site)	196,400	20	2017	2037	354,720
8	High Service Pump 6 (In HSP Bldg On-Site)	196,400	20	2017	2037	354,720
9	High Service Pump 7 (Outside HSP Bldg On-Site)	295,000	20	1984	2024	962,301
10	High Service Pump 8 (Outside HSP Bldg On-Site)	203,901	20	2016	2036	368,268
11	High Service Pump 9, 10 (Central Blvd North Station)	548,823	20	1990	2030	1,790,281
12	Nano Pretreatment Booster (4) Pump	233,685	20	2010	2030	422,061
13	Nano Transfer (6), Feed (5) Pump	1,184,486	20	2010	2030	2,139,313
14	RO Transfer Pump 8	45,000	20	2017	2037	81,275
15	RO Transfer Pump 9	45,000	20	2015	2035	81,275
16	RO Transfer Pump 10	45,000	20	2014	2034	81,275
17	RO Transfer Pump 11	45,000	20	2017	2037	81,275
18	RO Transfer Pump 12	45,000	20	2016	2036	81,275
19	RO Transfer Pump 13	45,000	20	2012	2032	81,275
20	Juno Repump Station	-	20	1992	2022	564,445
21	Riverbend Pumps P201, P202, P203, P204	240,000	20	2008	2028	673,977
22	Total Pumps	$ 5,708,228				$ 13,747,147
	Storage Reservoirs					
23	Hydropneumatic Tank	$ 250,000	55	1975	2030	$ 1,270,537
24	8 MG Ground Storage Tank ST5	1,277,557	55	1993	2048	6,492,735
25	5 MG Ground Storage Tank ST4	808,326	55	1989	2044	4,108,033
26	3 MG Ground Storage Tank ST3	484,120	55	1984	2039	2,460,370
27	1.5 MG Ground Storage Tank ST2	146,042	55	1973	2028	742,207
28	1 MG Juno Beach Water Storage and Repump Facility	262,001	55	1992	2047	1,331,528
29	3 MG Riverbend Water Storage Repump Facility	1,392,700	55	2008	2063	7,077,908
30	8 MG Ground Storage Tank ST6	3,771,229	55	2002	2057	19,165,946
31	Total Storage Reservoirs	$ 8,391,975				$ 42,649,264
	Wells					
32	Surficial Well 6, 7	$ 370,000	35	1974	2019	$ 2,090,786
33	Surficial Well 8, 9, 10, 11	341,744	35	1977	2019	
34	Surficial Well 12	94,963	35	1978	2021	554,529
35	Surficial Well 13,14	241,855	35	1981	2022	1,142,329
36	Surficial Well 15, 16, 17, 18	491,676	35	1982	2024	2,423,794
37	Surficial Well 23, 24, 25, 26, 27, 28	881,555	35	1986	2028	4,092,001
38	Surficial Well 29, 30	315,745	35	1989	2034	1,628,688
39	Surficial Well 21, 22	315,745	35	1989	2036	1,727,875
40	Surficial Well 31, 32, 33, 34, 35, 36~~, 38~~	1,103,709	35	1994	2029	3,105,684
41	Surficial Well 19 Relocation	300,981	35	2012	2047	846,919
42	Surficial Well 20	185,000	35	1997	2032	520,565
43	Surficial Well 37	180,137	35	2015	2050	506,881
44	Surficial Well 39	482,592	35	2008	2043	1,357,948
45	Surficial Well 40	419,046	35	2011	2046	1,179,138
46	Surficial Well 40 Raw Water Piping	83,996	70	2011	2081	665,065
47	Surficial Well 41	419,046	35	2011	2046	1,179,138
48	Surficial Well 41 Raw Water Piping	83,996	70	2007	2077	665,065
49	Surficial Well 42	484,598	35	2016	2051	1,363,592
50	Surficial Well 43	484,598	35	2016	2051	1,363,592
51	Surficial Well 42, 43 Raw Water Piping	167,993	70	2012	2082	1,330,139
52	Surficial Well 44	482,592	35	2008	2043	1,357,948
53	Surficial Well 45	482,592	35	2008	2043	1,357,948
54	Surficial Well 46	482,592	35	2008	2043	1,357,948
55	Surficial Well 47	482,592	35	2008	2043	1,357,948
56	Surficial Well 39, 44, 45, 46, 47 Raw Water Piping	843,550	70	2000	2070	6,679,079
57	Surficial Well 48, 49, 51, 52, 53, 54, 55	1,395,094	35	1997	2032	3,925,603
58	Surficial Well 50, 67, 68	650,955	35	2001	2036	1,831,698
59	Floridan Well 11, 12, 13	2,002,200	35	2004	2039	5,633,915
60	Floridan Well 11, 12, 13 - RWM Extension To	604,180	70	2004	2074	4,783,790
61	Floridan Well 2, 3	1,174,938	35	1988	2023	3,306,113
62	Floridan Well 4	587,469	35	2021	2056	4,384,459
63	Floridan Well 5, 6, 7	1,568,007	35	1994	2029	4,412,156
64	Floridan Well 5, 6, 7 - Raw Water Collection Piping	733,793	70	1994	2064	5,810,042
65	Floridan Well 8, 9, 10	2,002,200	35	1996	2031	5,633,915
66	Floridan Well 8, 9, 10 - Raw Water Collection Piping	375,000	70	1996	2066	2,969,183
67	Total Wells	$ 21,316,728				$ 82,545,473

Table 3.11 (continued)

	Water Treatment Plant							
68	Chlorine Storage Facility Building		$	766,183	50	2000	2050	$ 3,358,874
69	Chlorine Storage Facility Scrubbers (Single Stage/Single Unit)			250,000	35	2000	2035	703,466
70	Concentrate Treatment			214,243	35	1996	2031	602,850
71	Concentrate Treatement Facility Recirculation Pumps			74,780	35	2015	2050	210,421
72	Dry Sludge Covered Storage			197,013	50	2000	2050	863,686
73	Nanofiltration Treatment Facility			42,531,220	35	2010	2045	119,677,003
74	Nano Sand Filter Media			250,000	10	2010	2020	316,693
75	Nano Sand Filter Media Replacement			-	10	2020	2030	425,608
76	Nano Sand Filter Media Replacement			-	10	2030	2040	571,982
77	Reverse Osmosis Treatment Plant, Trains E, F, G, H, Process Equip			8,779,718	35	1996	2031	23,824,637
78	Reverse Osmosis Treatment Plant, Train I, Process Equip			6,176,528	35	2004	2039	17,379,900
79	Reverse Osmosis Treatment Plant, Trains A, B, C, D, Process Equip			8,706,743	35	1989	2024	23,212,322
80	Reverse Osmosis Treatment Plant, Building			5,471,821	51	1989	2040	24,707,587
81	Reverse Osmosis Permeate Scrubbers (MBAs)			1,112,695	20	1989	2019	2,700,803
82	Total Water Treatment Plant		$	74,530,944				$ 218,555,832
	Buildings							
83	Administration Laboratory Building		$	1,557,475	50	2003	2053	$ 6,827,824
84	EOC Field Maintenance Facility			2,779,041	50	2002	2052	12,183,055
85	Warehouse - Original			295,000	50	2012	2062	1,293,252
86	High Service Pump Building			1,011,232	50	2012	2062	4,433,146
87	High Service Pump Building			1,525,977	50	2008	2058	6,689,740
88	Riverbend Repump Station - 16491 79th Terr N PBG - 2,335 SF			1,557,300	50	2008	2058	6,827,057
89	Total Buildings		$	8,726,025				$ 38,254,074
	Recharge Systems							
90	C-18 Siphon		$	53,888	70	1989	2059	$ 426,676
91	Jupiter Village Outfall Structure To Heights Canal			13,472	70	1989	2059	106,669
92	Indian Creek Outfall Structure To Heights Canal			13,472	70	1989	2059	106,669
93	Indian Creek Surface Weir			5,389	70	1989	2059	42,669
94	Maplewood Outfall Structure To Heights Canal			13,472	70	1989	2059	106,669
95	Salinity Structure			269,442	70	1989	2059	2,133,394
96	Recharge Pump Stations (2)			2,066,628	30	2008	2038	5,016,249
97	Central Blvd Recharge Pipeline			355,000	70	2009	2079	2,810,827
98	Total Recharge Systems		$	2,790,763				$ 10,749,822
	Generators (By Number)							
99	17403 Central Blvd Water Plant	I	$	271,768	35	2003	2038	$ 764,718
100	1451 Tony Penna Well House 12	II		10,741	35	1970	2040	85,045
101	2351 S Central Blvd (CWF #4 WH #15)	III		31,715	38	1982	2020	97,517
102	2534 Jupiter Gardens Blvd H.S.B. North	IV		70,798	35	1991	2026	199,216
103	14255 US Highway 1 Juno Repump	V		37,774	35	1993	2028	106,291
104	17403 Central Blvd R,O.	VI		225,725	35	1995	2030	635,159
105	620 S Central Blvd H.S.B. South	VII		305,332	35	2006	2041	859,162
106	17403 Central Blvd R.O.	VIII		312,309	35	2005	2040	878,795
107	16491 79th Terr N (Western Repump)	IX		302,332	35	2004	2039	850,721
108	3190 Carlstrom Ally - Abacoa Wellfield Gen	X		101,605	35	2008	2043	285,902
109	17403 Central Blvd #Nano 1	XI		341,115	35	2010	2045	959,851
110	17403 Central Blvd #Nano 2	XII		341,115	35	2010	2045	959,851
111	3133 Washington St	EOC		53,875	35	2001	2036	151,597
112	Total Generators		$	2,406,204				$ 6,833,825
113	Totals		$	123,870,867				$ 413,335,437

[1] Amounts shown based on utility plant analysis as prepared by Hazen and Sawyer and Director and Assistant Director, Utilities.
[2] Replacement Cost based on an average construction index of ==========> 3.00%

PART 2

STORMWATER UTILITY

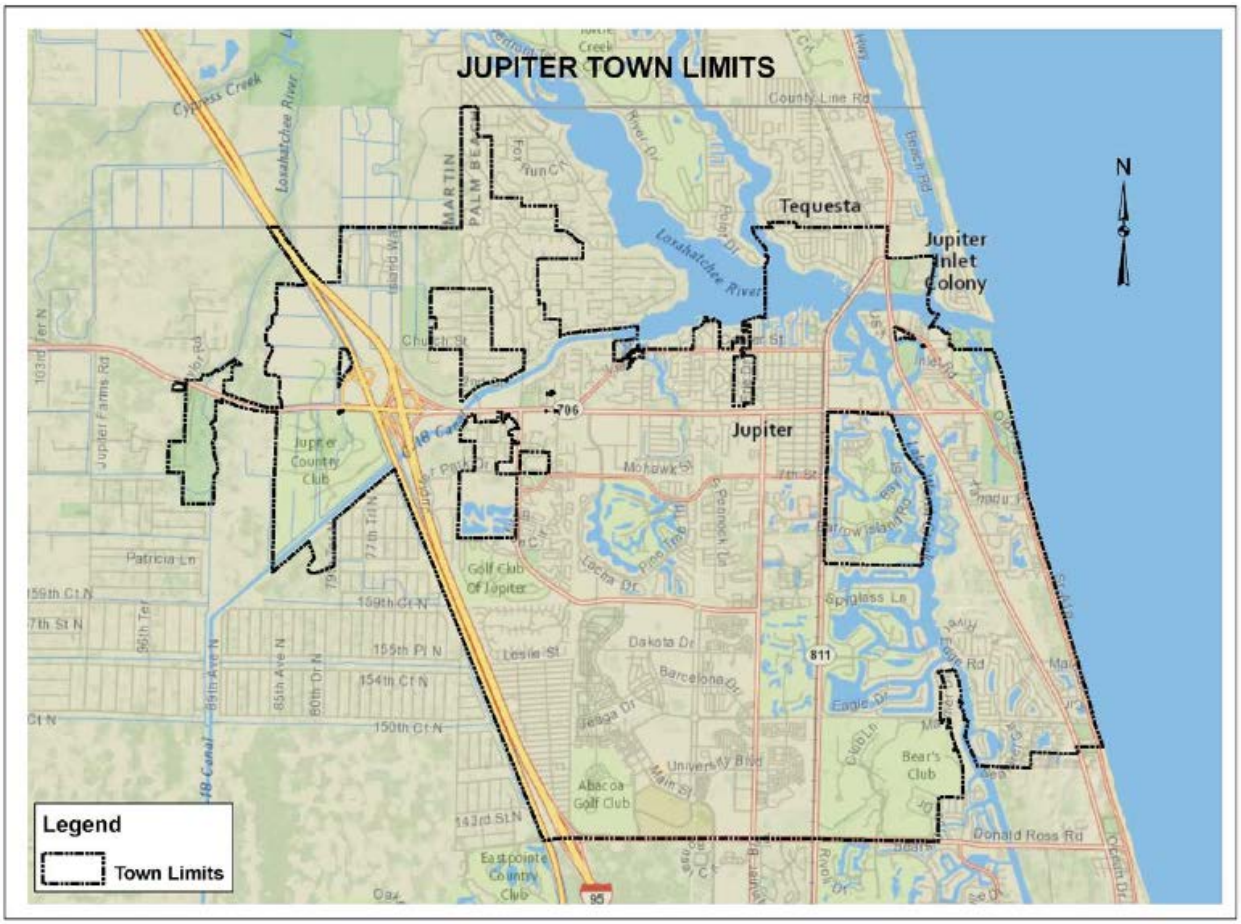
Chapter 4: Existing Condition Assessment

I. Introduction and Town Approach to Stormwater Management

a. Background

The Town of Jupiter (Town) is located in Northeastern Palm Beach County. The municipal boundaries encompass over 22 square miles and the population is now over 60,615 full time residents (**Figure 4.1**). Management of stormwater throughout the Town's limits is achieved through naturally occurring and manmade surface water management features.

Figure 4.1



The primary receiving water bodies within the Town are the Loxahatchee River and the Intracoastal Waterway. Discharge of runoff to the Loxahatchee River from the Town is typically direct but also occurs via the C-18 Canal, Jones Creek, and Sims Creek. Discharge to the Intracoastal Waterway is both direct and via several tributary water management systems including Jonathan's Landing and Admirals Cove. **Figure 4.2** illustrates the various watersheds within the Town's limits. While the Town's Stormwater Utility Service Area includes all properties within the municipal boundaries, portions of the drainage network are shared between private and public entities. **Figure 4.3** illustrates how systems are currently segregated relative to ownership and maintenance responsibilities.

Figure 4.2

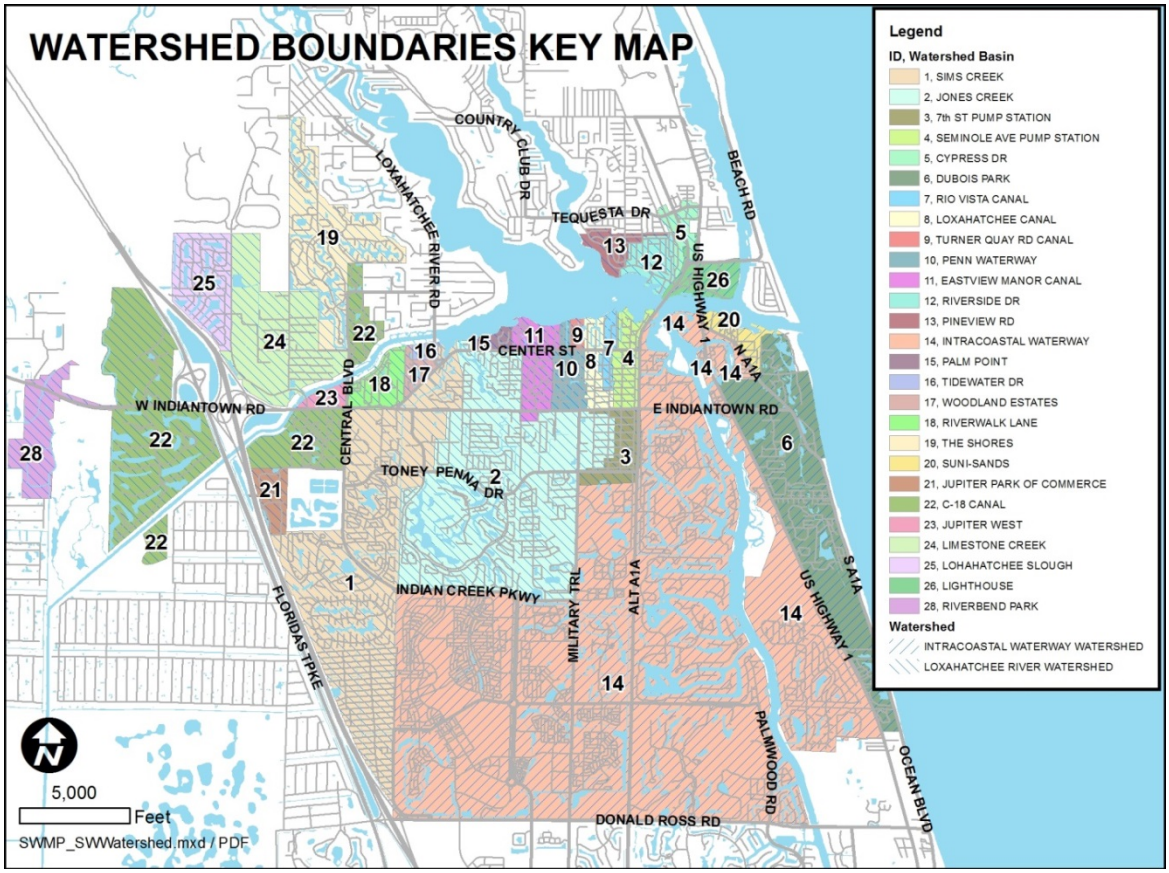
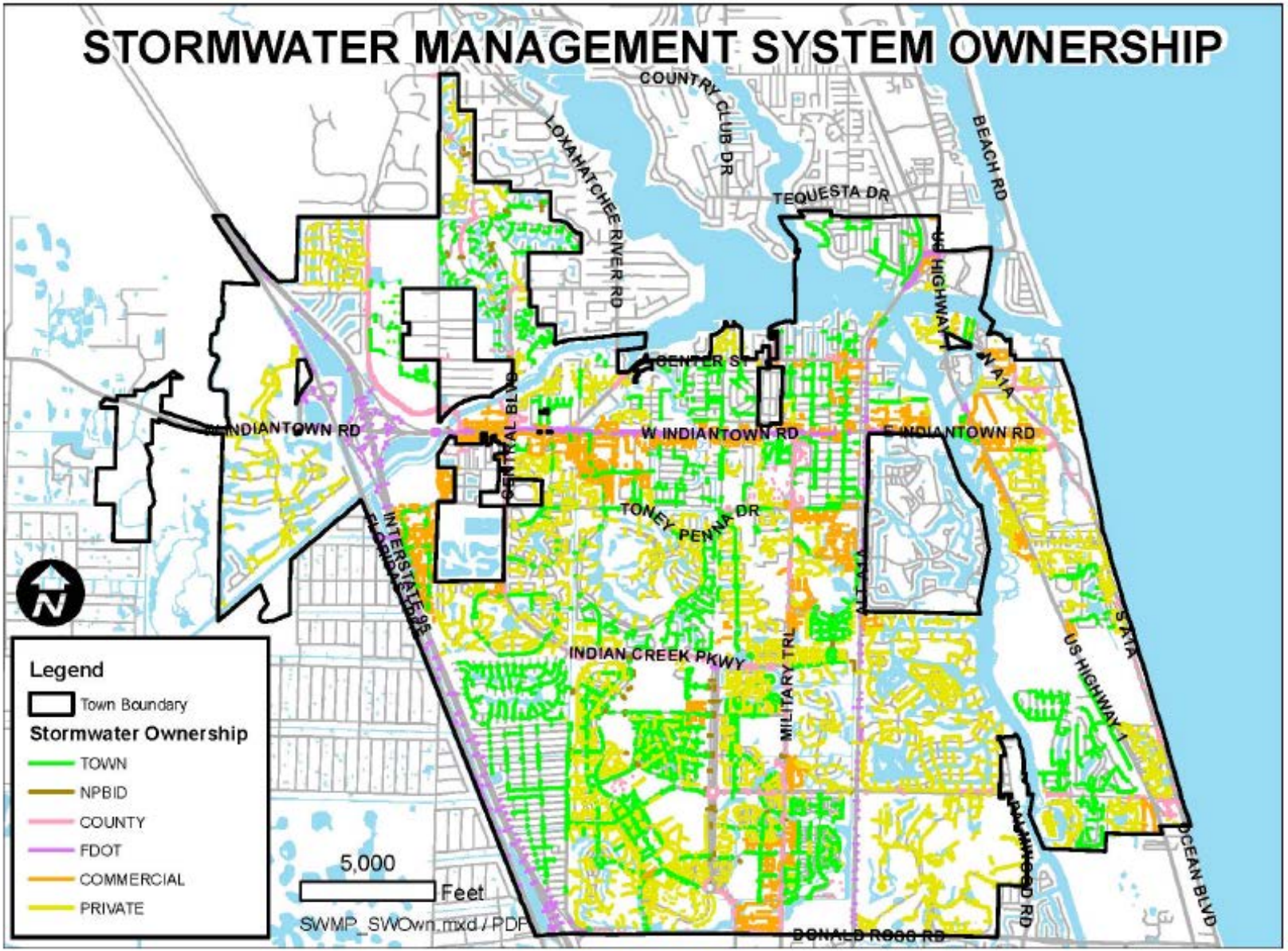


Figure 4.3


STORMWATER MANAGEMENT SYSTEM OWNERSHIP
COUNTRY CLUB DR
LOXAHATCHEE RIVER RD
BEACH RD
TEQUESTA DR
HIGHWAY
N A1A
CENTER ST
CENTRAL BLVD
W INDIANTOWN RD
E INDIANTOWN RD
TONEY PENNA DR
INTERSTATE 95
FLORIDA'S TURNPIKE
INDIAN CREEK PKWY
MILITARY TRL
ALT A1A
US HIGHWAY 1
S A1A
OCEAN BLVD
DONALD ROSS RD
Legend
Town Boundary
Stormwater Ownership
TOWN
NPBID
COUNTY
FDOT
COMMERCIAL
PRIVATE
5,000
Feet
SWMP_SWOwn.mxd / PDF

A review of public entities (other than the Town) involved with stormwater management within the Town's limits follows.

Northern Palm Beach County Improvement District (NPBCID)
Responsible for coordinating the design, construction, and maintenance of "units of development" within the Town. Responsibilities include operation of certain stormwater gates and structures, and maintenance of fixed structures, telemetry, canals, rain gauges, greenway trails, preserves, marshes, lakes, fences, observatory decks, culverts, and selected roadways. NPBCID serves 4,481 acres within the Town.

Florida Department of Transportation (FDOT)
Responsible for the stormwater management systems serving state roads within the Town. FDOT is responsible for systems serving approximately 973 acres within the Town.

North Palm Beach Heights Water Control District (NPBHWCD)
Responsible for the primary surface water management system which serves the North Palm Beach Heights subdivision and numerous other developments within the Sims Creek watershed. Responsibilities include maintenance of canals and canal culverts. NPBHWCD operates a system serving 400 acres within the Town.

Palm Beach County
Responsible for the stormwater management systems serving County roads within the Town limits. Palm Beach County operates a system serving 390 acres within the Town.

South Indian River Water Control District (SIRWCD)
Responsible for the primary stormwater management system which serves the unincorporated portion of Palm Beach County west of Jupiter as well as areas within the Town such as Egrets Landing and Jupiter Park of Commerce. SIRWCD operates a system serving approximately 344 acres within the Town.

Jupiter Inlet District (JID)
Responsible for maintenance of the Jupiter Inlet and the tidal portions of its tributaries.

South Florida Water Management District (SFWMD)
Responsible for water resources management over a 16 county area, including Palm Beach County. The District's responsibilities include planning, construction, regulation, and operation and maintenance.

Loxahatchee River District (LRD)
Involved in preserving and protecting the Loxahatchee River through numerous programs focused on pollution control and public awareness/involvement.

Due to the significant rainfall received in South Florida, stormwater management is particularly important. Two factors typically affect the planning and subsequent actions taken relative to stormwater management:

Jones Creek Preserve

1. Water Quantity – Typically dependent on weather cycles and relatively easy to quantify, although future planning associated with the impacts of climate change is more complex. Water quantity improvements typically require significant capital and time to implement, making sound planning for future improvements more critical. However, since the water quantity improvements often rely on weather patterns, which vary, projects are sometimes difficult to implement and lose momentum/support during the development phases. Again, the spectre of climate change may change this paradigm.

2. Water Quality – While water quantity issues are clearly evident when flooding occurs, water quality issues are less tangible. For this reason, it is often difficult to generate the necessary financial support for water quality improvements.

Since the Town has an understanding of the importance of both water quantity and water quality issues and the corresponding public views on these issues, the Town has taken steps in addressing stormwater management. Some of those steps include:

1. Creation of a Stormwater Utility – The Town created a stormwater utility to provide dedicated and stable funding for operations, maintenance, administration, and capital improvements relative to stormwater management. The Utility's approach helps reduce

fluctuations in financial support of the program that might otherwise occur due to changes in weather cycles and/or frequency of extreme events.

2. Preparation and Updating of a Stormwater Master Plan – This helps set a steady course for addressing water quantity and quality issues, reminding the Town of what is necessary, even when those issues may no longer be at the forefront of immediate municipal concerns.

3. Development of and Participation in the Loxahatchee River Preservation Initiative – Realizing that the general public is typically more focused on flooding issues and funding resolution of those problems, and understanding the crucial nature of protecting the Loxahatchee River, its tributaries, and other water bodies in the region, the Town understood that a creative approach would be necessary to accomplish much needed water quality and environmental improvements in the watershed. To that end, the Town led the way in forming a multi-agency/multi-interest group known as the Loxahatchee River Preservation Initiative (LRPI). The LRPI has partnered with local legislative leaders to complete over $43 million in water quality enhancement projects within the Loxahatchee River Watershed.

LOXAHATCHEE RIVER PRESERVATION INITIATIVE

b. Overview of 1996 Master Plan Update

In 1995, the Town of Jupiter contracted for the development of a Town-wide Stormwater Master Plan. In August 1996, the Town of Jupiter Stormwater Utility Master Plan Final Report was completed. The intent of the 1996 Master Plan was to provide recommended solutions to stormwater related problems deemed to be of a serious nature, and to provide guidance standards for future land development within the Town. For the purposes of that report/study, serious problems were identified as those posing potential “danger to public safety by flooding of homes or blockage of evacuation routes”.

The 1996 Master Plan placed an emphasis on the analysis of the Town’s primary stormwater management systems (PSWMS), of which six distinct systems were identified:

- Sims Creek
- Jones Creek
- Seventh Street Pump Station (Jonathan’s Landing/Area C)
- Seminole Avenue Pump Station
- Riverside Drive
- DuBois Park

The PSWMS are crucial in that they are the backbone of the Town-wide surface water management/drainage network.

The 1996 Master Plan aimed to develop the basis for an integrated stormwater management system with three major objectives.

- Flood Control – proper storage of storm event peak flows and volumes
- Water Quality Control – treatment of the pollutant laden "first flush" of runoff to the maximum extent practicable
- Ecosystem Management – conservation practices to protect natural aquatic habitat

During the development of the Master Plan, an extreme storm even occurred in October 1995 (reportedly 16 inches in 20 hours), allowing an opportunity for field observation. Key items of note were:

- Roadway flooding in the area of Jupiter Medical Center
- Flooding of the Town's Water Treatment Plant
- Home flooding in the Shores subdivision
- Home flooding in the Sims Creek basin (attributed to the North Palm Beach Heights Water Control District primary outfall canal – Heights Canal)
- Home flooding near Radio Road (Jones Creek Basin)
- Business flooding along Cypress Drive

Drainage systems serving these areas were analyzed utilizing hydrologic modeling, and capital improvements were developed and prioritized to solve predicted/observed problems. Thirteen priority projects were identified with a total cost (in 1996 dollars) of $9,254,000 (this excluded three of the projects for which costs were not identified).

High School Ditch Water Quality Structure

c. Overview of 2002 Master Plan Update

The intent of the 2002 document was to update the 1996 Master Plan. As such, only certain areas (where there were concerns or additional investigation was warranted) were evaluated. The 2002 Update included a summary of work completed since the 1996 Master Plan was finished and updates relative to the National Pollutant Discharge Elimination System (NPDES) and Total Maximum Daily Load (TMDL) programs. The update also included a review of structural and non-structural best management practices (BMPs) and grant funding successes and future opportunities.

The 1996 Master Plan recommendations focused largely on projects targeted at flood protection and drainage. By 2002, the majority of these projects were either complete, had been determined to be unnecessary, or were programmed for the future. Thus, in the 2002 Update the Town focused on improving water quality, addressing secondary system drainage issues and retrofitting older systems constructed prior to implementation of water quality criteria.

d. Overview of 2007 Master Plan Update

The 2007 Update summarized the status of completed and planned/ongoing projects and provided an overview of the Seminole Avenue Pump Station and Ocean Dunes basin evaluations.

With primary and secondary stormwater management systems having been largely addressed in the original Master Plan and the 2002 Update, the 2007 Update focused heavily on financial issues related to the Town's stormwater utility. These issues included:

- Comparison of the Town's program with other stormwater utilities,
- A stormwater system asset valuation,
- Equity and accountability relative to stormwater system operations and capital improvements, and
- An evaluation of existing rate sufficiency

The 2007 study found that the Town's stormwater utility rates compared favorably both to statewide and local utility average rates. The rate was also deemed sufficient, based on then current utility operations, to fund planned activities.

e. Overview of 2012 Master Plan Update

The 2012 Update provided descriptions of completed and ongoing stormwater projects. The Update summarized various basin modeling efforts completed by the Town. The results of basin wide models were evaluated in an effort to determine the impact of system modifications within the basin.

Regulatory changes associated with TMDLs and Numeric Nutrient Criteria (NNC) and how those changes would likely impact the various elements of the Stormwater Management System in the Town of Jupiter were outlined in order to better prepare the Utility for future regulatory challenges. For example, changes in the TMDLs and NNC have the potential of requiring the Town to significantly enhance the stormwater system to increase the water quality treatment level of service in order to meet more stringent standards.

An assessment of the future condition of the stormwater system was evaluated through the analysis of the stormwater utility service area demands. The study found that the Town had successfully implemented incentive programs to assist in the improvement of private systems in order to reduce the risk of flooding and increase water quality treatment.

The 2012 study also found that the Town's stormwater utility rates once again compared favorably both to statewide and local utility average rates. Additionally, in-depth financial forecasts were offered which generated specific recommendations intended to maintain the financial stability of the utility given the need for approximately $34 million in capital improvements within the 25 year planning horizon. Continuous and adequate funding of the asset renewal and replacement fund was stressed as well as the continuation of the long-standing practice of annual fee indexing.

f. Stormwater Management Issues

Due to the quantity and distribution of rainfall in Florida, many stormwater management issues exist. These issues are exacerbated by the fact that most stormwater infrastructure has a direct connection with environmentally sensitive coastal ecosystems to which they discharge. When evaluating stormwater management issues, they are typically categorized as being either water quality or water quantity related. A discussion of both is provided below.

Water Quantity

Goals associated with water quantity are typically in the form of meeting "level of service" criteria. These criteria commonly correspond to design storm events and vary depending on the function of the infrastructure being protected. For example, major highways would require a greater level of service (i.e. lower probability of flooding) compared to a smaller local road since it would be more critical for the major road to remain clear of flooding in a large rainfall event.

Establishing these level of service criteria occurs at various levels of government, from federal to local. The primary facilities for which service/protection criteria have been established include:

- Buildings/Structures
- Highways/Roadways

- Parking Lots
- Above Ground Impoundments
- Discharge Structures/Facilities

The level of service criteria typically stipulate that flooding is only permissible for events which exceed the design storm intensity and duration associated with the facility. However, with climate change impacting the relative frequency of extreme events, the design storms which guide the development of the level of service criteria are changing and may result in areas no longer meeting their required level of service.

In addition to specifying level of service criteria, regulations are commonly implemented in order to prevent water quantity issues. In terms of water quantity, regulations limit the offsite discharge during storm events and also specify the required volume of onsite retention/detention which must be provided when developing a site.

The first method for regulating stormwater is through the design and construction of surface storage or retention/detention areas. The requirements for these storage areas differ depending on site characteristics and the potential for impacts to the surrounding area, if applicable. The purpose of these facilities is to provide increased onsite storage which effectively reduces the total offsite discharge during storm events and reduces the potential of downstream flooding.

Regulation of the allowable offsite discharge into a receiving water body is typically managed by the SFWMD, local water control districts (such as the South Indian River Water Control District or North Palm Beach Heights Water Control District), local government, or the Florida Department of Transportation (FDOT). Similar to regulations related to surface storage volumes, discharge regulation is intended to protect downstream facilities from excessive flows which may result in flooding. Regulations commonly stipulate that post-development discharge must be equal to or less than pre-development discharge during a specified storm event. In other cases, discharge may be limited to an allowable rate (based on the size of the drainage area) which is based on the capacity of the primary drainage system.

Water Quality

Essentially all water quality requirements relative to stormwater treatment and/or discharge have their roots in the Clean Water Act passed by Congress in 1972 and amended since. Additionally, the State of Florida created Chapter 373 of the Florida Statutes (the Florida Water Resources Act).

Historical water quality treatment criteria have been based on treating the "first flush" of runoff. This approach is founded on the premise that the initial runoff resulting from a storm event scours accumulated pollutants from ground surface and transfers them to receiving waters. While the basic concept that the first runoff is the most polluted holds true in permitting of stormwater management systems, determination of whether or not water quality criteria are being met is typically achieved through comparing the receiving water body to the surface water quality standards outlined in F.A.C. 62-302. For example, the formation of TMDLs for impaired water bodies and the subsequent creation of a Basin Management Action Plan (BMAP) are aimed at improving water quality on a basin level rather than regulating single point sources.

g. Best Management Practices (BMPs)

BMPs are commonly implemented for preventing adverse impacts associated with stormwater runoff, most commonly reducing the pollutant load discharged to the receiving water body. BMPs may be structural or non-structural and are typically chosen for specific applications based on factors such as the runoff/pollutant characteristics, water quality goals, economics, and physical constraints.

Non-Structural BMPs

BMPs specified as being non-structural typically aim to reduce pollution at the source. These BMPs are typically programmatic in nature and are often more cost effective than structural BMPs. The difficulty with non-structural BMPs is they typically require community involvement to increase their effectiveness, which may be difficult. However, other than public education and outreach, other items which constitute non-structural BMPs include conservation and land management since these actions help minimize anthropogenic sources of pollution.

Structural BMPs

Structural BMPs are typically constructed when pollutants have already entered the waterway and treatment is to be provided in an effort to reduce the load of pollutants discharged. As such, structural BMPs are implemented anywhere between the pollutant source and the point of discharge into the receiving water of concern. Common structural BMPs implemented in South Florida include the following:

- Retention ponds (wet and dry)
- Detention ponds (wet and dry)
- Grassed swales
- Exfiltration trenches
- Pollutant separation devices
- Chemical treatment

Green Infrastructure

Green infrastructure uses natural processes such as infilitration, plant transpiration, and evaporation to manage stormwater near where it falls in urban environments. Examples include rain gardens, constructed wetlands, bioretention areas and swales, and green roofs, all of which can effectively increase water quality treatment and provide additional attenuation of stormwater runoff. Green infrastructure is particularly useful in developed areas where large areas are not readily available for use with classic BMPs such as retention/detention ponds.

h. Water Quality Improvement Projects/Initiatives

Water quality improvement projects and initiatives were a part of the original 1996 Stormwater Master Plan and have been included in each subsequent Master Plan Update.

1. 1996 Master Plan – While the original Master Plan focused largely on flood protection, the Master Plan aimed to develop the basis for an integrated system with three major objectives; flood control, water quality control, and ecosystem management. Some of the capital improvements outlined in that plan included Town-wide rehabilitation of over 110,000 linear feet of swales, installation of erosion protection at 10 locations, and the creation of two large regional attenuation facilities.
2. 2002 Master Plan Update – The 2002 Update further addressed water quality issues as they relate to the Town. It covered regulatory programs such as NPDES and TMDLs, and it outlined various BMPs which could be used for both new development as well as for retrofitting stormwater management systems in older neighborhoods. It advocated continuation of the swale rehabilitation program and proposed the use of BMPs to retrofit certain existing stormwater outfalls.
3. 2007 Master Plan Update – The 2007 Update advocated the continued funding of both specific water quality projects as well as strategic ongoing system retrofits.
4. 2012 Master Plan Update – The 2012 Update further stressed the importance of water quality improvements, such as the continuation of the neighborhood swale rehabilitation program and BMPs implemented with the purpose of removing pollutants and debris prior to discharge to the receiving waters.

i. Cost of Service

As can be seen below in **Table 4.1** the Town's Stormwater Utility Fees are very competitive in comparison to its counterparts. The Town's fees are 29% below the average rate charged by other stormwater utilities in the region and 21% below the average rate charged by all others in the State of Florida. See **Table 4.2**.

Table 4.1

Regional Stormwater Fee Comparison			
Rank	**Stormwater Utility**	**Monthly Cost Per 1,000 Sq. Ft. Impervious Area**	**Monthly Cost Per Typical Single Family Residence**
1	Boca Raton	$1.14	$3.22
2	Stuart	$1.10	$4.07
3	**Jupiter**	**$1.75**	**$4.65**
4	Boynton Beach	$2.58	$5.00
5	Delray Beach	$2.13	$5.33
6	Tequesta	$1.99	$7.13
7	West Palm Beach*	$4.89 $3.33 $1.81	$10.62 $7.22 $3.93
8	Port St. Lucie	$5.59	$12.75
Average Rate of Other Utilities		**$2.73**	**$6.59**
Jupiter Rate vs. Average Rate of Other Utilities		**-36%**	**-29%**

*West Palm Beach rates are as follows: High rate includes street sweeping, stormwater/facility maintenance & use of City canals. Medium rate includes 1 or 2 of the above. Low rate includes none of the above.

**Survey data obtained from utilities in March 2016.

Table 4.2
Statewide Stormwater Utility Fee Comparison Survey

	ERU (sq. ft.)	Single Family Res. = 1 ERU	Per Month	Per 1,000 Sq Ft
Altamonte Springs	2,492	$81.00	$6.75	$2.71
Atlantic Beach	1,790	$100.68	$8.39	$4.69
Aventura	1,548	$30.00	$2.50	$1.61
Bay Harbor Islands	1,548	$60.00	$5.00	$3.23
Belleair	5,459	$143.04	$11.92	$2.18
Belle Island	4,087	$48.00	$4.00	$0.98
Boca Raton	2,837	$38.64	$3.22	$1.14
Boynton Beach	1,937	$60.00	$5.00	$2.58
Bradenton	1,700	$54.00	$4.50	$2.65
Brevard County	2,500	$51.96	$4.33	$1.73
Cape Canaveral	2,074	$60.00	$5.00	$2.41
Cape Coral	3,296	$75.00	$6.25	$1.90
Casselberry	2,304	$84.00	$7.00	$3.04
Charlotte County	43,560	$128.52	$10.71	$0.25
Clearwater	1,830	$171.96	$14.33	$7.83
Clermont	3,154	$36.00	$3.00	$0.95
Cocoa	2,166	$75.00	$6.25	$2.89
Cocoa Beach	2,900	$96.00	$8.00	$2.76
Coconut Creek	2,070	$42.48	$3.54	$1.71
Cooper City	30,000	$249.60	$20.80	$0.69
Coral Gables	2,346	$105.60	$8.80	$3.75
Cutler Bay	1,548	$48.00	$4.00	$2.58
Daytona Beach	1,661	$112.56	$9.38	$5.65
DeBary	2,560	$84.00	$7.00	$2.73
Deland	4,900	$69.72	$5.81	$1.19
Delray Beach	2,502	$63.96	$5.33	$2.13
Deltona	3,484	$75.12	$6.26	$1.80
Doral	1,548	$48.00	$4.00	$2.58
Dunedin	1,708	$121.92	$10.16	$5.95
Eagle Lake	3,347	$48.00	$4.00	$1.20
Edgewater	2,027	$108.00	$9.00	$4.44
El Portal	1,548	$36.00	$3.00	$1.94
Eustis	2,187	$36.00	$3.00	$1.37
Fellsmere	3,250	$48.00	$4.00	$1.23
Flagler Beach	2,049	$60.00	$5.00	$2.44

Table 4.2 (continued)

	ERU (sq. ft.)	Single Family Res. = 1 ERU	Per Month	Per 1,000 Sq Ft
Florida City	1,250	$30.00	$2.50	$2.00
Fort Meade	2,750	$74.28	$6.19	$2.25
Fort Myers	2,500	$57.60	$4.80	$1.92
Fort Pierce	2,186	$54.00	$4.50	$2.06
Fort Walton Beach	3,200	$51.00	$4.25	$1.33
Gainesville	2,300	$108.00	$9.00	$3.91
Golden Beach	8,000	$35.04	$2.92	$0.37
Gulfport	2,300	$43.20	$3.60	$1.57
Haines City	1,935	$54.24	$4.52	$2.34
Hallandale Beach	958	$40.20	$3.35	$3.50
Hialeah	1,664	$30.00	$2.50	$1.50
Hialeah Gardens	1,267	$24.00	$2.00	$1.58
Holly Hill	2,050	$72.00	$6.00	$2.93
Hollywood	2,250	$38.64	$3.22	$1.43
Holmes Beach	2,354	$54.00	$4.50	$1.91
Homestead	2,000	$40.44	$3.37	$1.69
Indian Creek	4,385	$52.56	$4.38	$1.00
Indian Harbour Beach	2,500	$48.00	$4.00	$1.60
Jacksonville	3,100	$60.00	$5.00	$1.61
Jacksonville Beach	1,500	$60.00	$5.00	$3.33
Jupiter	**2,651**	**$55.80**	**$4.65**	**$1.75**
Key Biscayne	1,083	$160.20	$13.35	$12.33
Key West	1,440	$98.64	$8.22	$5.71
Kissimmee	2,404	$96.96	$8.08	$3.36
Lake Mary	4,576	$48.00	$4.00	$0.87
Lake Worth	1,748	$75.60	$6.30	$3.60
Lakeland	5,000	$72.00	$6.00	$1.20
Largo	2,257	$79.80	$6.65	$2.95
Lauderdale Lakes	2,133	$144.00	$12.00	$5.63
Lauderhill	3,800	$146.28	$12.19	$3.21
Leesburg	2,000	$66.00	$5.50	$2.75
Leon County	3,272	$84.96	$7.08	$2.16
Longwood	2,898	$72.00	$6.00	$2.07
Madeira Beach	1,249	$60.00	$5.00	$4.00
Maitland	2,532	$117.60	$9.80	$3.87
Margate	2,328	$61.80	$5.15	$2.21
Marion County	2,275	$15.00	$1.25	$0.55
Medley	1,487	$36.00	$3.00	$2.02

Table 4.2 (continued)

	ERU (sq. ft.)	Single Family Res. = 1 ERU	Per Month	Per 1,000 Sq Ft
Melbourne	2,500	$44.04	$3.67	$1.47
Melbourne Beach	2,500	$36.00	$3.00	$1.20
Miami	1,191	$42.00	$3.50	$2.94
Miami Beach	791	$39.00	$3.25	$4.11
Miami-Dade County	1,548	$48.00	$4.00	$2.58
Miami Gardens	1,548	$48.00	$4.00	$2.58
Miami Shores	1,435	$45.00	$3.75	$2.61
Minneola	1,100	$48.00	$4.00	$3.64
Miramar	3,619	$30.00	$2.50	$0.69
Mount Dora	2,500	$78.00	$6.50	$2.60
Mulberry	3,250	$48.00	$4.00	$1.23
Naples	1,934	$156.60	$13.05	$6.75
Neptune Beach	3,164	$60.00	$5.00	$1.58
New Port Richey	2,629	$40.32	$3.36	$1.28
New Smyrna Beach	1,818	$86.04	$7.17	$3.94
Niceville	7,500	$54.12	$4.51	$0.60
North Bay Village	2,415	$92.64	$7.72	$3.20
North Lauderdale	2,138	$36.00	$3.00	$1.40
North Miami	1,760	$74.28	$6.19	$3.52
North Miami Beach	1,800	$54.00	$4.50	$2.50
Oakland Park	1,507	$84.00	$7.00	$4.64
Ocala	1,948	$48.00	$4.00	$2.05
Ocoee	2,054	$84.00	$7.00	$3.41
Oldsmar	2,550	$60.00	$5.00	$1.96
Opa-Locka	1,548	$22.80	$1.90	$1.23
Orlando	2,000	$119.88	$9.99	$5.00
Ormond Beach	3,000	$96.00	$8.00	$2.67
Oviedo	2,464	$48.00	$4.00	$1.62
Palm Bay	4,602	$53.64	$4.47	$0.97
Palm Coast	3,682	$139.80	$11.65	$3.16
Palmetto	1,999	$44.16	$3.68	$1.84
Pasco County	2,890	$57.00	$4.75	$1.64
Pembroke Park	1,548	$108.00	$9.00	$5.81
Pensacola	2,998	$63.36	$5.28	$1.76
Pinecrest	1,548	$96.00	$8.00	$5.17
Pinellas County	2,339	$117.72	$9.81	$4.19
Plant City	2,280	$66.00	$5.50	$2.41
Polk City	1,000	$18.00	$1.50	$1.50

Table 4.2 (continued)

	ERU (sq. ft.)	Single Family Res. = 1 ERU	Per Month	Per 1,000 Sq Ft
Pompano Beach	2,880	$44.16	$3.68	$1.28
Port Orange	3,050	$99.00	$8.25	$2.70
Port St. Lucie	2,280	$153.00	$12.75	$5.59
Redington Shorts	1,312	$18.00	$1.50	$1.14
Riviera Beach	1,920	$108.00	$9.00	$4.69
Rockledge	2,922	$51.00	$4.25	$1.45
Safety Harbor	1,865	$87.00	$7.25	$3.89
Sanford	2,126	$99.00	$8.25	$3.88
Sarasota County	3,153	$90.60	$7.55	$2.39
Satelite Beach	3,000	$104.04	$8.67	$2.89
Sebastion	3,285	$60.00	$5.00	$1.52
South Miami	1,865	$36.00	$3.00	$1.61
St. Augustine	2,752	$84.00	$7.00	$2.54
St. Cloud	2,664	$76.20	$6.35	$2.38
St. Pete Beach	3,813	$47.09	$3.92	$1.03
St. Petersburg	2,719	$82.08	$6.84	$2.52
Stuart	3,707	$47.40	$3.95	$1.07
Sunny Isles Beach	1,548	$48.00	$4.00	$2.58
Sunrise	1,884	$81.84	$6.82	$3.62
Surfside	1,040	$64.20	$5.35	$5.14
Sweetwater	1,579	$48.00	$4.00	$2.53
Tallahassee	1,990	$95.40	$7.95	$3.99
Tamarac	1,830	$110.28	$9.19	$5.02
Tampa	3,310	$81.96	$6.83	$2.06
Tarpon Springs	1,945	$67.80	$5.65	$2.90
Tavares	3,500	$93.00	$7.75	$2.21
Tequesta	2,506	$85.56	$7.13	$2.85
Titusville	3,300	$83.52	$6.96	$2.11
Umatilla	3,000	$48.00	$4.00	$1.33
Venice	9,489	$60.00	$5.00	$0.53
Volusia County	2,775	$72.00	$6.00	$2.16
West Melbourne	2,500	$36.00	$3.00	$1.20
West Miami	1,400	$30.00	$2.50	$1.79
West Palm Beach	2,171	$127.44	$10.62	$4.89
West Park	1,351	$42.00	$3.50	$2.59
Wilton Manors	3,460	$52.44	$4.37	$1.26
Winter Park	2,324	$138.72	$11.56	$4.97

Table 4.2 (continued)

	ERU (sq. ft.)	Single Family Res. = 1 ERU	Per Month	Per 1,000 Sq Ft
Winter Springs	2,123	$66.00	$5.50	$2.59
		Statewide Average	**$5.88**	**$2.53**
		Jupiter Rate vs. Average Rate	**-21%**	**-31%**

*Rates updated June 2016, Source: Florida Association of Stormwater Utilities

j. Quantification of Water Quality Gains to Date

The Town has been proactive and a leader in the area of implementing water quality based projects in the Loxahatchee River and Intracoastal Waterway watersheds. As early as 1996, well before NPDES or TMDL programs required such initiatives, the Town began progressing toward the necessary improvements. Additionally, the Town has been diligent, through its code and regulatory programs, requiring these improvements of developers. Often times, the Town has had the vision for public / private partnerships in this regard, improving the overall benefits to the watershed.

As part of the 2012 Stormwater Utility Master Plan Update, a GIS based tool was developed to help quantify the improvements in water quality gained through the Town's proactive approach. The program uses a "desk top" level methodology and contains all identifiable permitted stormwater management systems, including the drainage areas served and type of BMP(s) utilized, together with literature values for pollutant reductions based on the BMP used, in order to estimate concentration and/or load reductions for specific parameters and by specific watershed. The results summarized in **Table 4.3** are an update of the results included in the 2012 Stormwater Master Plan Update and account for areas permitted after the 2012 Update was published.

Table 4.3
Estimate of Water Quality Gains to Date

	Loxahatchee River	C-18 Canal	Intracoastal Waterway
Total Contributing Basin Size (Ac)	5,147	2,122	6,015
Acres Served by BMP Type (Ac)			
Dry Detention	323	69	155
Dry Retention	15	4	37
Exfiltration Trench	3	47	72
Wet Detention	1,803	1,706	4,799
Wet Retention	27	0	0
Swale	479	47	151
Pollutant Reduction Percentage			
TSS	33%	61%	60%
TP	28%	59%	58%
TN	28%	59%	58%

For the purpose of approximating the pollutant reductions, the following general methodology was implemented:

1. Data used were provided by SFWMD and the Town of Jupiter.
2. Acreages served and BMP's used were as reported in the databases noted under item (1).
3. Where BMP type was not provided, wet detention was used as the default for projects greater than 10 acres, dry detention for projects 10 acres or less, and swales for roadway projects.
4. Pollutant removal efficiencies were based on typical values, by BMP type as reported in "Best Management Practices for South Florida Urban Stormwater Management Systems, South Florida Water Management District (2002)".

The water quality gains to date for the three primary receiving waters were estimated based on the permitted areas as of May, 2016. The estimates were based on the extent of the permitted areas and literature-based pollutant removal efficiencies of various water quality treatment measures. The water quality gains were estimated for Total Suspended Solids (TSS), Total Phosphorus (TP), and Total Nitrogen (TN) are provided in **Table 4.3**. TP and TN are naturally occurring in the environment due to flora decomposition and animal waste but levels can be increased significantly through the use of fertilizers or improper management of pet waste. Excessive nutrient levels in the waterbody can lead to algal blooms, reductions in dissolved oxygen, and detrimental impacts on aquatic life. Increases in TSS can be attributed to erosion of soils within the basin during runoff events. Water quality treatment measures such as detention and retention ponds allow sediment to be removed prior to being discharged to the receiving waterbody. Elevated TSS levels in the receiving waterbody can result in reduced levels of sunlight reaching submerged aquatic vegetation (limiting growth and photosynthesis) and can also have detrimental impacts on fish and other aquatic life.

Through the continued implementation of water quality improvement measures, the Town is effectively reducing the pollutant loads discharged to the Loxahatchee River and its tributaries. Water quality gains in the Loxahatchee River basin help better position the Town relative to potential regulatory actions associated with current or future impairments of the various receiving waters. In addition to water quality improvements required from a regulatory standpoint, it is recommended that the Town continue implementing actions to improve water quality with other projects where it is cost-effective to do so. The Town has continually considered the benefits of doing this and has effectively incorporated water quality improvements into previous projects despite it not being a requirement from the regulatory agencies.

II. Review of Completed Work

The original Town of Jupiter Stormwater Utility Master Plan (1996) recommended basin by basin structural capital improvements, nonstructural controls, and project prioritization/phasing. Subsequent updates proposed additional projects and programs, as well as updates to some projects.

The Town has made significant accomplishments in the area of stormwater management since completion of the original Master Plan in 1996. These accomplishments generally fall into four categories:

- Capital Improvements (structural controls)
- Operations and Maintenance
- Planning/Regulatory
- Programmatic

Table 4.4 shows major projects completed between 1996 and June, 2016 and includes a brief description, the capital cost, and whether or not the project was from the 1996 Master Plan or 2002, 2007, or 2012 Updates. Capital Improvements which were not identified in the 1996 Master Plan or subsequent updates are also included and labelled accordingly in the table below.

Table 4.4
Summary of Projects Completed Prior to June, 2016

Project Name	Description	Capital Cost	Date Planned/ Completed
Sims Creek Watershed			
Erosion Protection	Installation of erosion protection downstream of salinity barrier	$100,740	1996
NPBH Drainage Improvements	Miscellaneous secondary system drainage improvements	$261,000	2002
NPBH Drainage Improvements	New secondary drainage (Loree, Ferrera, and Dimond St.)	$31,030	2014
WTP Emergency Discharge	Installation of emergency stormwater pumping facility and barrier wall (subsequently a relocated stormwater pump station was constructed onsite as part of the Nanofiltration Water Treatment Plant)	$75,000	1996
Sims Creek Community	Detention area/outfall improvements	$7,710	—
Wellfield #2 Drainage	Dry detention area and pump station to serve new facilities/solve drainage problems	$90,000	2002
NPBH Secondary System Upgrades	Implement additional drainage system improvements	$188,000	2002
Barbara Street Culvert Replacement	Replacement of existing culvert with larger box culvert	$203,467	2002
NPBH Culvert and Headwall Replacements	Replace failing endwalls on specific culvert crossings	$150,000	2012
NPBH Headwall Replacements	Replace five failing endwalls on specific culvert crossings	$501,711	2016
Subtotal		$1,608,658	

Table 4.4 (continued)

Project Name	Description	Capital Cost	Date Planned/ Completed
Jones Creek Watershed			
Jones Creek Restoration	Mangrove trimming, desiltation, and shoreline stabilization	$1,380,000	2002
Pennock Industrial Park	Upgrades to stormwater management system (quality/quantity)	$470,000	2002
Maplecrest Outfall Modifications	Modifications to subdivision outfall structure	$30,000	1996
Greenwood Cove Restoration	Exotic vegetation removal and control structure repair	$50,000	2002
Loxahatchee Club	Modification of outfall control structures	$49,000	1996
Pennock Lane Culvert Repair	Repair to existing culverts at Pennock Lane/Jones Creek	$82,490	1996
Pottawatomie	Installation of neighborhood drainage improvements	$244,200	2002
Jones Creek Hammock Restoration	Hurricane debris cleanup, exotics removal and replanting, and construction of nature trail and boardwalk	$390,000	2006
Pennock Lane Weir Construction	Repair existing culverts, construct weir structure	$138,500	2004
Riverwood Lane	Drainage improvements in Fisherman's Landing subdivision	$185,000	2002
Subtotal		$3,019,190	
Cypress Drive Watershed			
Cypress Drive Drainage Improvements	Installation of comprehensive storm drainage system	$880,000	1996
Subtotal		$880,000	
Riverside Drive Watershed			
Riverside Drive Drainage Improvements	Extension of existing storm drainage system and creation of new outfalls	$521,332	1996
North Jupiter Infrastructure Failure Investigation	Repairs to stormwater system in areas of apparent failure	$355,637	2012
Subtotal		$876,969	

Table 4.4 (continued)

Project Name	Description	Capital Cost	Date Planned/ Completed
Shores, Jupiter Landings, and Limestone Creek Watersheds			
Emergency Outfall	Installation of emergency overflow outfall structure	$300,000	1996
Lake Outfall Repairs	Repair of existing road outfalls to Surface Water Management Lakes	$438,775	2002
Shores Level of Service Upgrades	Construct miscellaneous stormwater management improvements to provide additional flood protection	$150,000	2002
Subtotal		$888,775	
Intracoastal Waterway Watershed			
Jupiter Medical Center	Modifications to outfall control structure at JMS. Primary system improvements (downstream) already completed	$33,000	2012
Jupiter Medical Center	Erosion control and water quality improvements	$16,933	2002
Jonathan's Landing	Improvements to control structures on primary canal	$180,000	1996
Jupiter Ocean Racquet Club/Ocean Walk	Erosion control improvements	$46,648	1996
Subtotal		$276,581	
7th Street Pump Station Watershed			
Pump Station Upgrades and Dry Detention Area	Improvements to existing pump station and construction of new dry detention area	$188,000	1996
Stormwater Pump Station Upgrade	Architectural, electrical and emergency power upgrades to existing station	$797,000	2002
Pine Gardens South	Drainage improvements including exfiltration trenches	$328,552	2016
Subtotal		$1,313,552	

Table 4.4 (continued)

Project Name	Description	Capital Cost	Date Planned/ Completed
Rio Vista Watershed			
Maintenance Dredging	Dredging in Rio Vista Waterway to re-establish canal cross section	$70,500	2012
Drainage Improvements	New drainage infrastructure on Hugh St at intersections of Hepburn Ave and Pinegrove Ave	$24,153	2016
Subtotal		$94,653	
Loxahatchee Canal Watershed			
Loxahatchee Drive Stormwater Facility Rehabilitation	Repair/rehabilitation of existing storm sewer	$250,000	2012
Subtotal		$250,000	
Seminole Avenue Pump Station Watershed			
Jockey Pump	Installation of jockey pump	$48,586	1999
Stormwater Pump Station Upgrade	Architectural, electrical, and emergency power upgrades to existing station	$705,000	2002
Subtotal		$753,586	
Penn Waterway Watershed			
Northview Box Culvert and Hugh Street Outfall	Installation of box culvert (on Penn Ditch) and Construction of new outfall (to Penn Ditch)	$70,000	2002
Subtotal		$70,000	
Tidewater Drive Watershed			
Urban Stormwater Management System Rehabilitation	Outfall retrofits and swale rehabilitation along Tidewater Drive/Tidewater Circle	$67,500	2006
Subtotal		$67,500	

Table 4.4 (continued)

Project Name	Description	Capital Cost	Date Planned/ Completed
Inlet Village Watershed			
A1A Jupiter Beach Road to U.S. Highway 1	Stormwater portion of A1A reconstruction from U.S. 1 to Jupiter Dunes	$725,000	2016
Yarborough Street	Drainage system improvements and exfiltration trenches	$275,997	2013
Parkway Street	Right of Way acquisition, exfiltration trench, and inlet drainage improvements	$228,812	2015
Jupiter Ocean Racquet Club/Ocean Walk	Erosion control improvements	$46,648	1996
Subtotal		$1,276,457	
Island Way Corridor Watershed			
Jupiter Community Park	Permanently upgraded outfall	$320,000	2002
Subtotal		$320,000	
System			
Emergency Operations Center	Construction of a Utility Field Operations and Emergency Operations Center	$2,303,000	—
Stormwater Outfall Retrofit (FY 2005)	Implementation of Water Quality BMP's for Existing Outfalls	$425,000	2002
Urban Stormwater Management System Rehabilitation	Swale rehabilitation and other Best Management Practices (BMPs) to improve water quality treatment and/or stormwater conveyance	$2,747,920 ($1,736,331 in Town Funds)	—
Stormwater Outfall Retrofit (FY 2008)	Implementation of water quality BMPs for existing outfalls	$944,789 ($494,856 in Town Funds)	2002
Improvements Grants	Private Stormwater Improvement Grants	$394,929	—
Redevelopment Grants	Storwmater Management System Redevelopment Grants	$24,409	—
Subtotal		$6,840,047	
Total		$18,535,968	

Table 4.5 shows projects identified in previous Master Plan Updates which are currently ongoing or recommended for implementation. Included are the project name, drainage basin, brief description, anticipated capital cost, and responsible party(ies).

Table 4.5
Summary of Proposed and Ongoing Projects

Project Name	Description	Capital Cost	Responsible Party
Sims Creek Watershed			
Maplewood Drive Stormwater System Repair	Repair existing exfiltration trenches	$75,000	Town
Heights of Jupiter Drainage Improvements, Sliplinng, and Repairs	Construction of headwalls and sliplining existing drainage features	$320,000	Town
Salinity Barrier	Modifications to existing salinity barrier (and permitting for emergency operations)	$48,200	Town
Subtotal		$443,200	
Jones Creek Watershed			
Pennock Industrial Park Drainage Improvements	Replacement of 200 feet of existing 60-inch diameter HDPE pipe/exfiltration trench and drainage improvements on Commerce Way W. and Commerce Lane in Pennock Industrial Park	$470,502	Town
Brentwood South Drainage Improvements, Sliplining, and Repairs	Construction of headwalls and sliplining existing drainage features	$75,000	Town
Subtotal		$545,502	

Table 4.5 (continued)

Project Name	Description	Capital Cost	Responsible Party
Shores, Jupiter Landings, and Limestone Creek Watersheds			
Sliplining Existing Outfalls	Sliplining of eighteen (18) existing outfalls within the basin	$300,000	Town
Jupiter Landings Drainage Improvements	Sliplining and repairs of existing drainage infrastructure	$60,000	Town
Subtotal		$360,000	
Intracoastal Waterway Watershed			
Elsa and Paulina Roads	Infrastructure improvements to reduce flooding and provide water quality treatment prior to discharge	$756,245	Town
Subtotal		$756,245	
Seminole Avenue Pump Station Watershed			
Alma's Place	Removal of exotic vegetation and hydraulic restoration	$185,000	Town
Juno Street	Stormwater pump station and horizontal direction drill new outfall to FEC Canal	$2,553,440	Town
Old Dixie Highway	Drainage system improvements	$100,000	Town
Subtotal		$3,594,685	

Table 4.5 (continued)

Project Name	Description	Capital Cost	Responsible Party
Inlet Village Watershed			
Stormwater Infrastructure Improvements	Infrastructure improvements along Saturn Street, Suni Sands side street, Love Street, Clemons Street, and Inlet Village Promenade	$698,324	Town
Subtotal		$698,324	
System Wide			
Urban Stormwater Management System Rehabilitation	Swale rehabilitation and other Best Management Practices (BMPs) to improve water quality treatment and/or stormwater conveyance	$2,100,000	Town
Stormwater System Rehabilitation	Miscellaneous stormwater system renewal and replacement	$503,300	Town
Private Stormwater Improvements Grants	Matching grant funds for assisting private interests with onsite improvements which further Town's stormwater objectives	$269,300	Town
Stormwater Management System Redevelopment Grants	Matching grant funds to help incentivize stormwater retrofits which further Town's stormwater objectives associated with redevelopment efforts	$275,000	Town
Town Road Outfall R&R	Repair and/or replacement of approximately 95 existing outfalls for which the Town intends to assume ownership and maintenance responsibility	$695,156	—
Subtotal		$3,842,756	
Total		$10,240,712	

Operation and Maintenance

The Town's Stormwater Utility is responsible for day-to-day operation and maintenance of the Town's Stormwater Management System. This requires activities like cleaning and repair of structures, pipes, swales/ditches, etc. It also includes more ambitious undertakings such as neighborhood swale rehabilitation (**Table 4.6** and **Table 4.7**), pump station maintenance, water management facility restoration, and erosion control. Key projects completed subsequent to the 1996 Master Plan include:

- Rebuilding of Love and Clemons Street detention ponds, and cleaning of Seminole Avenue detention pond
- Rebuilding of pumps and operational modifications to both the 7th Street and Seminole Avenue Pump Stations
- Coordinating with FDOT and Palm Beach County regarding drainage problems related to their transportation systems
- Pipe replacements/repairs throughout the stormwater system

Table 4.6
Swale Rehabilitation Program – Completed Work

Streets/Area	Year Completed
Fisherman's Landing	1997
Sims Creek	1997
North Jupiter, Seabrook Area	1997
Whitney Circle	1998
Maplewood (portions)	2000
Todd Street Area (portions)	2000
Oak Terrace	2001
North Jupiter River Estates	2001
Wildwood	2002
Greenwood Cove	2002
Southview Drive	2002
Indian Creek Drive (east and West)	2003

Table 4.6 (continued)

Felter Street	2003
N. Hepburn (portions)	2003
Jupiter Village Road	2004
Holly Cove	2004
Fernwood Creek	2004
North Perry and Douglas Street	2004
Highwood Circle	2005
Elm Circle	2005
Oak Circle	2005
Chevron Circle	2005
Hugh Street	2005
Ungerer Street	2005
Pinetree Trail	2006
Pennock Industrial Park	2006
Brentwood Subdivision	2007
Choctaw and Todd Street (east side)	2007
Maplewood Drive (portions)	2008
Tidewater	2008
Heights Subdivision	2008-2010
Jupiter River Estates	2010
Toney Penna (portions)	2011
Jupiter Lakes Blvd	2013
Maplewood Drive (portions)	2014
Toney Penna (portions)	2014
Old Dixie Highway	2014

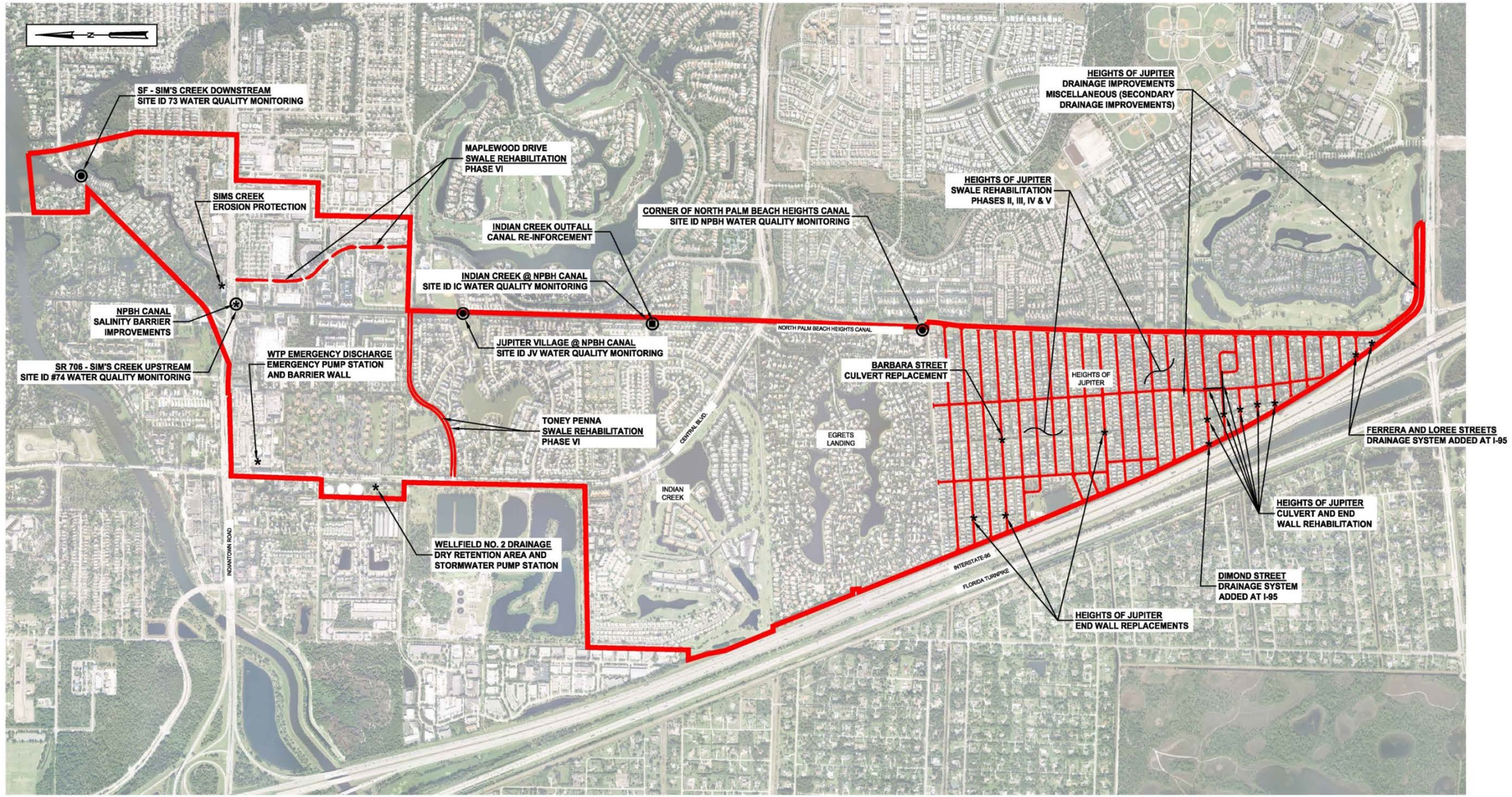
Table 4.7
Streets/Areas Which Need Swale Rehabilitation

Streets/Areas	Priority	Linear Footage of Swale (max)
Yacht Club Drive Area	1	2,480
Jupiter Lakes Blvd.	2	4,360
Pine Gardens South	3	44,640
Pine Gardens North	4	33,000

The Stormwater Utility also provides service as the Town's local coordinator of the Federal Emergency Management Agency (FEMA) Community Rating System. This system provides a systematic means for applying flood insurance discounts to policy holders in participating communities, based on various activities or programs undertaken to reduce the potential for loss due to flood damage. Communities receive a rating from 9 to 1, and receive incremental insurance discounts as they move up the scale (toward a 1). Community-wide, these discounts can represent a significant cumulative savings. Most communities are rated between 7 and 9. The Town is currently rated at 5. The Town's 5 rating allows policy holders with property in a special flood hazard area (SFHA) receive a 25% discount and those not in a SFHA to receive a 10% discount. This equates to a total savings to Town policy holders of $502,948.

The Town participates with Palm Beach County and 36 other municipalities in a multi-jurisdictional strategy known as the Unified Local Mitigation Strategy (LMS). The original LMS was adopted in 1999, and has been subsequently updated in 2004, 2009, and 2014. The 2014 LMS Plan was approved by both the Florida Division of Emergency Management and FEMA. As such, the 2014 plan was formally adopted by both Palm Beach County and the Town.

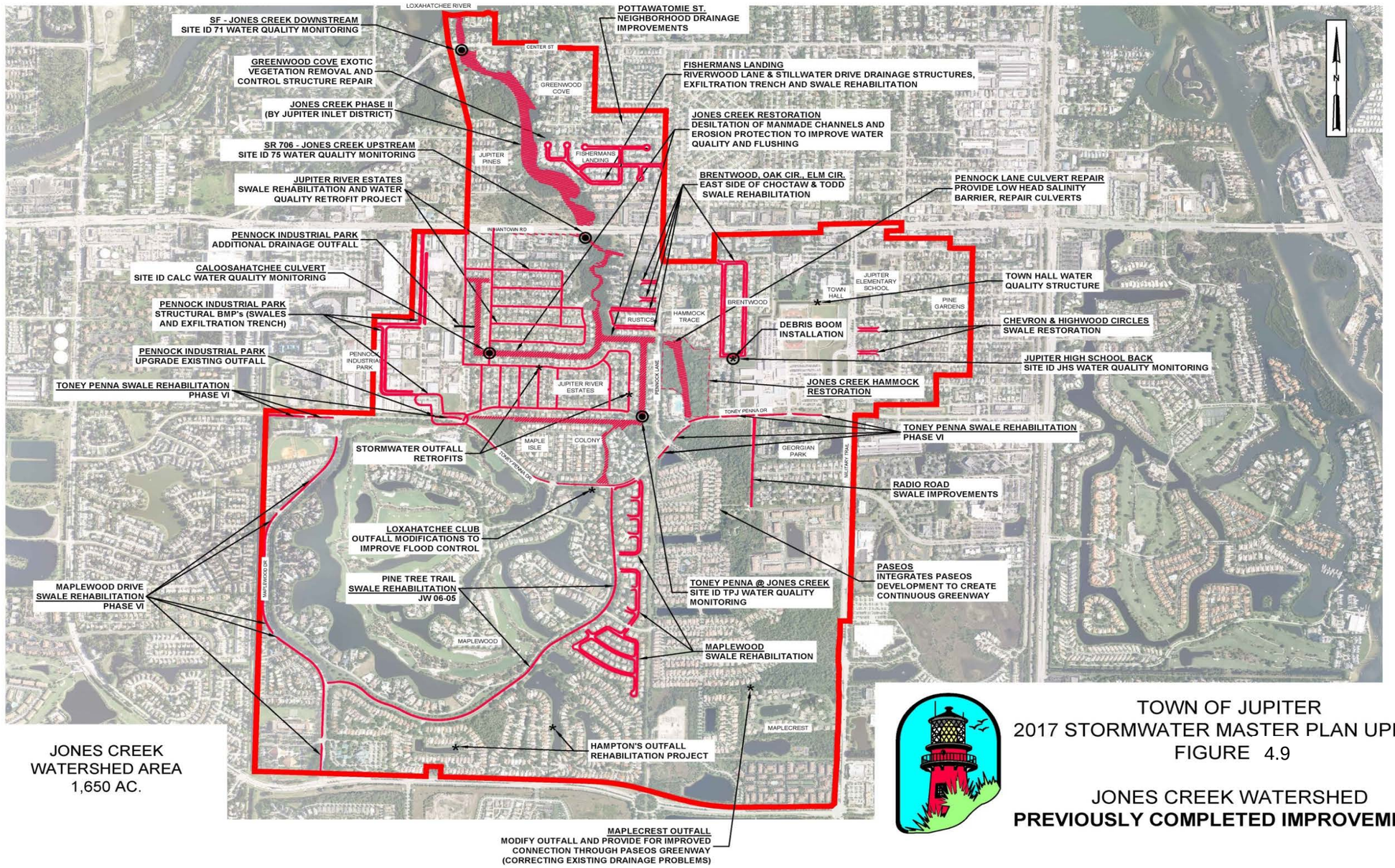
The Town's Stormwater Utility also has a grant program which provides financial assistance to homeowner's associations and other private entities which desire to implement stormwater management improvements consistent with the Town's objectives (the private entity must also put up at least 50% of the required funding). Significant erosion control projects have been completed in Jupiter Ocean Racquet Club, Ocean Walk, and Sims Creek communities using this program. The Town has also been active in assisting other private entities in resolving stormwater management problems (even if they are not involved in the Town's grant program).



SIMS CREEK WATERSHED AREA
1,500 AC.

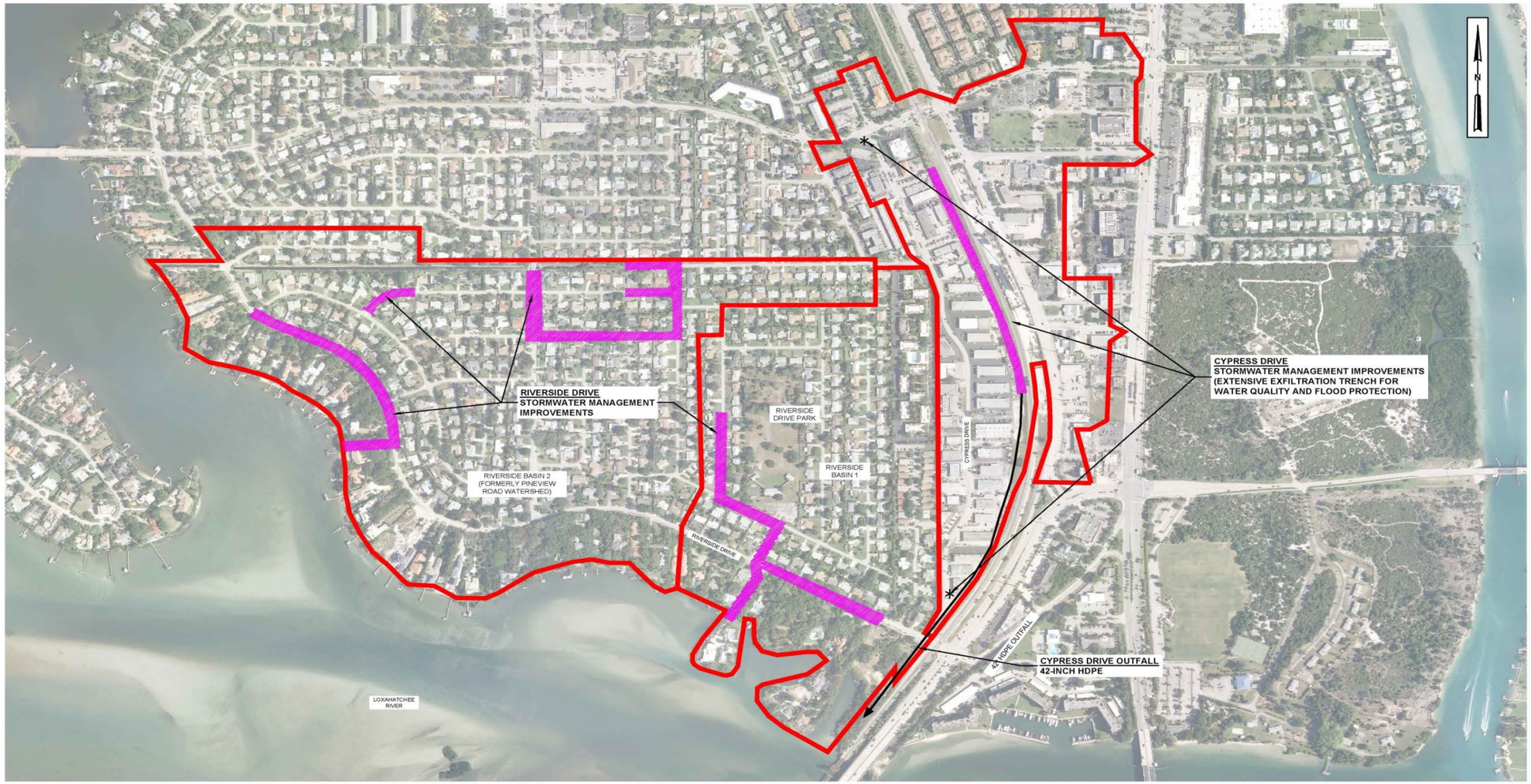
TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.8

SIMS CREEK WATERSHED
PREVIOUSLY COMPLETED IMPROVEMENTS



TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.9

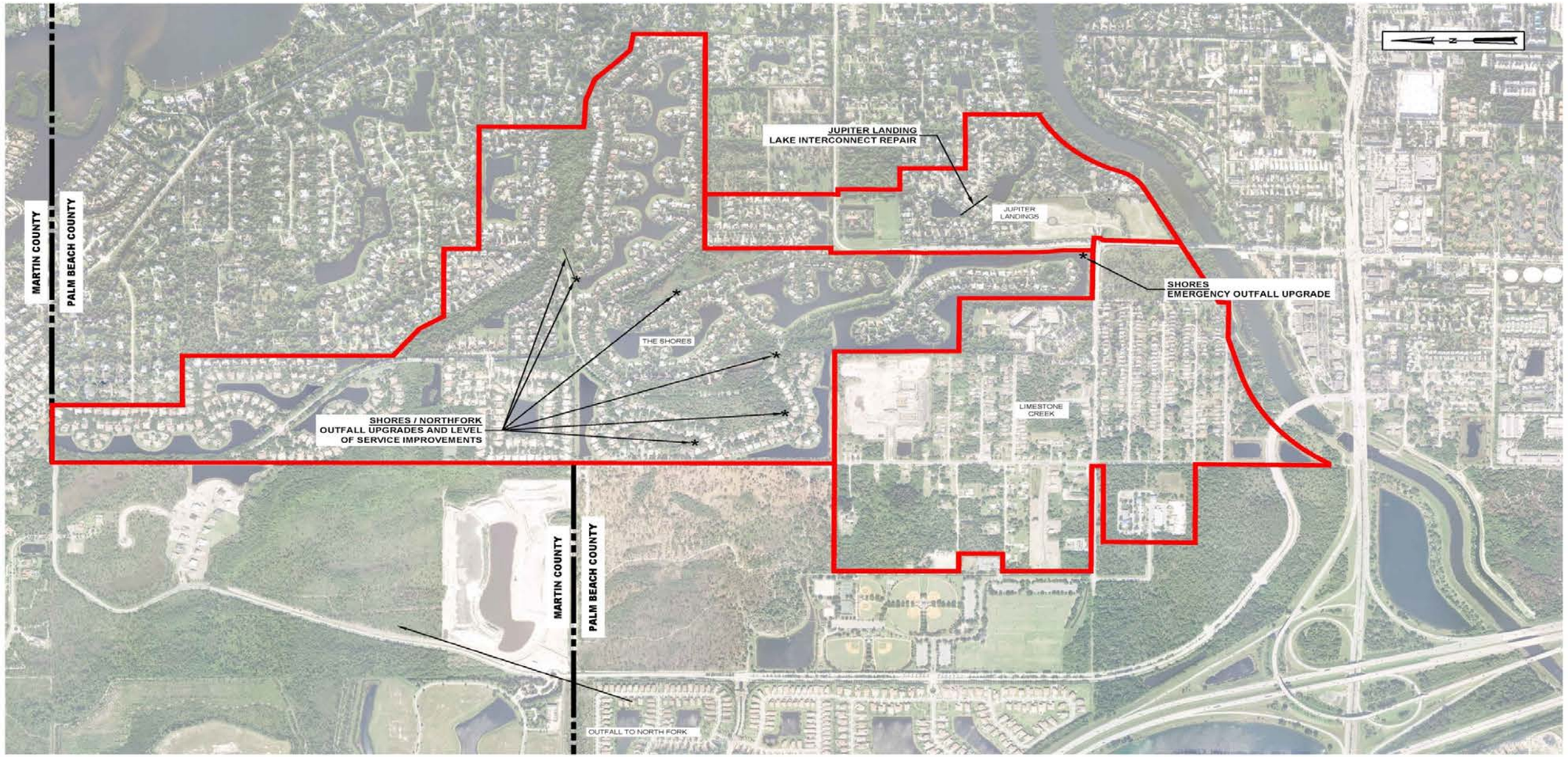
JONES CREEK WATERSHED
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
CYPRESS DRIVE 69.7 AC.
RIVERSIDE DRIVE 183 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.10

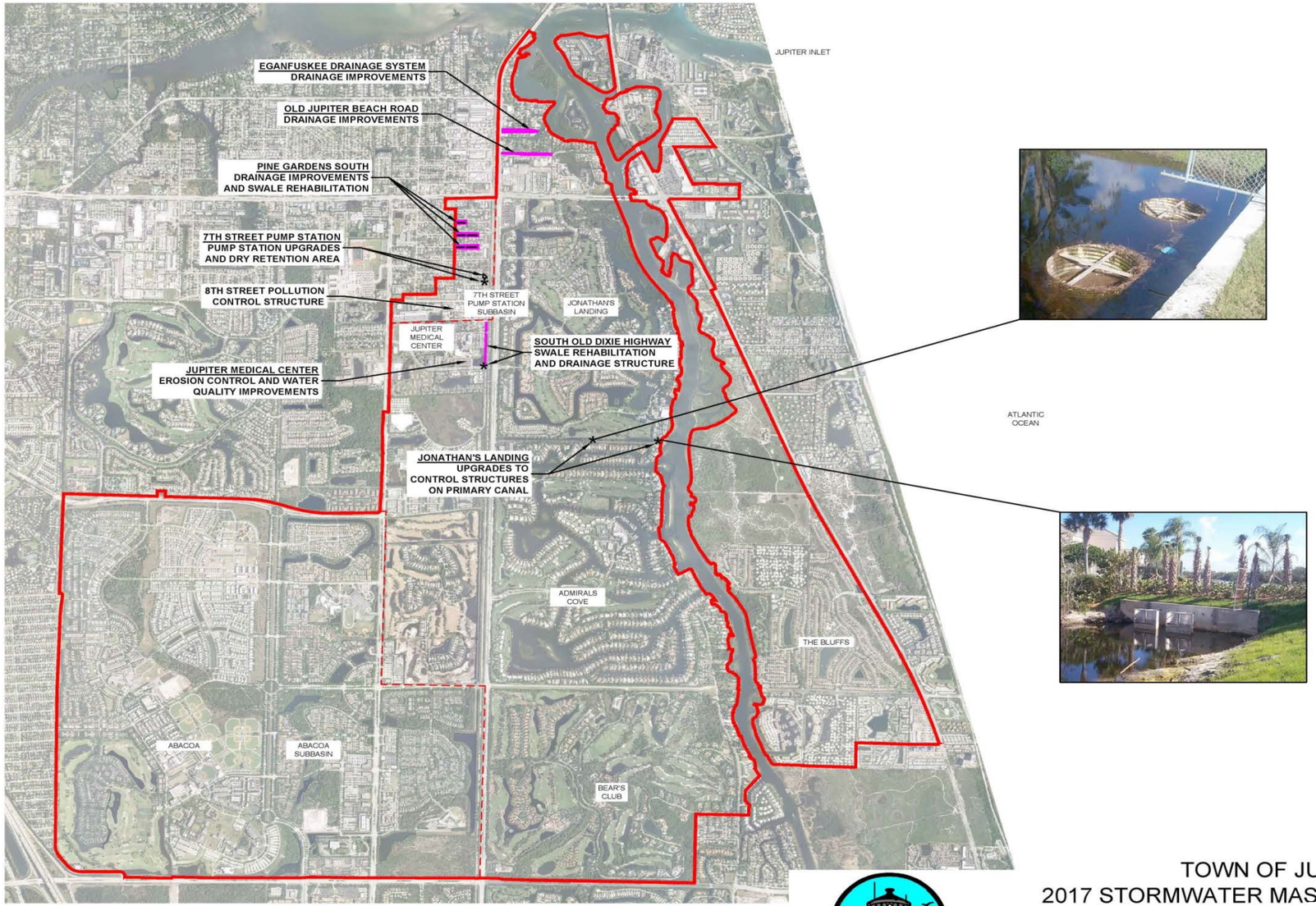
CYPRESS DRIVE AND RIVERSIDE DRIVE
WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
THE SHORES 506 AC.
JUPITER LANDINGS 106 AC.
LIMESTONE CREEK 296 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.11

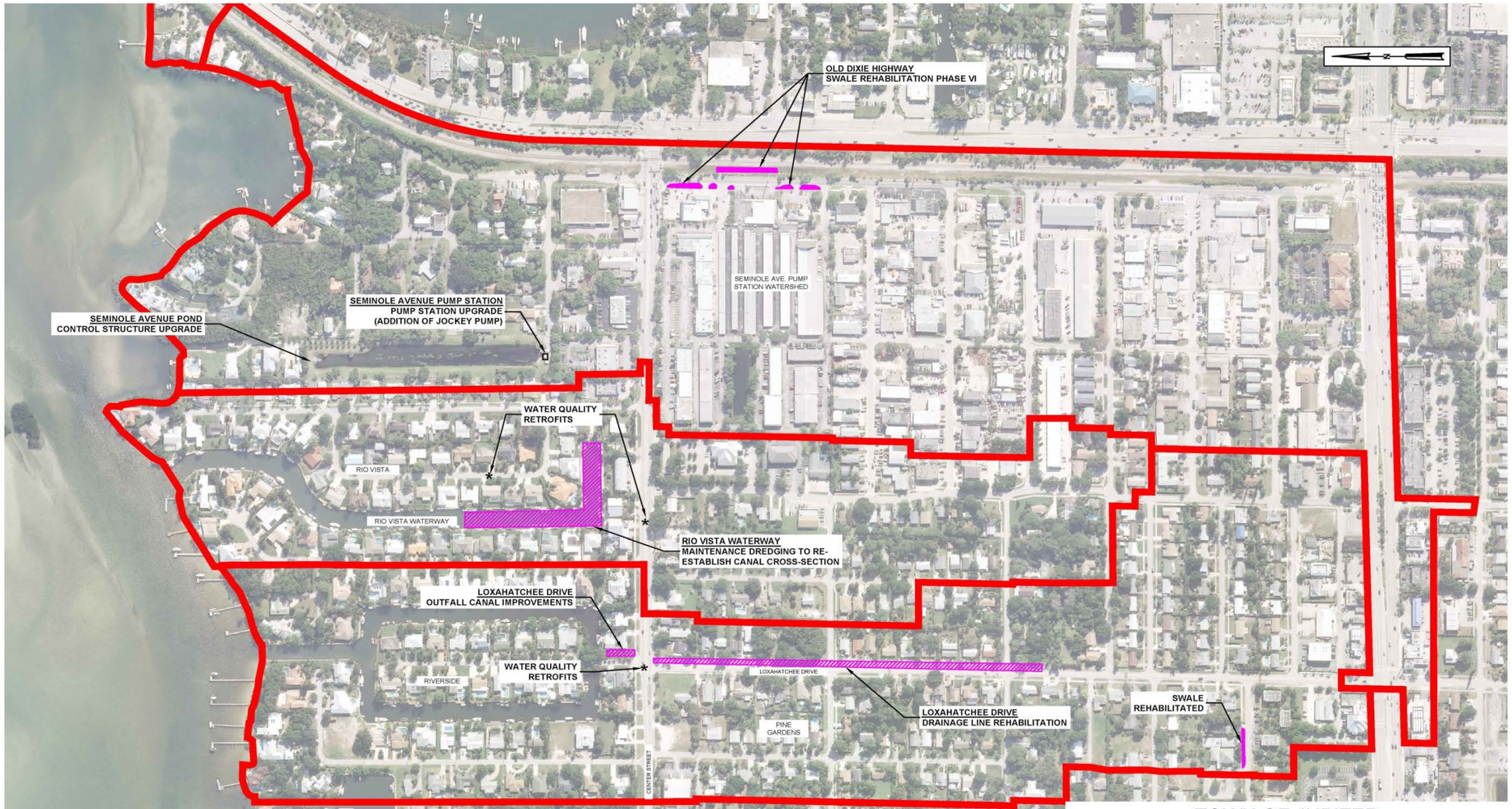
THE SHORES, JUPITER LANDINGS,
& LIMESTONE CREEK WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
EAST OF INTRACOASTAL 944 AC.
WEST OF INTRACOASTAL 5,200 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.12

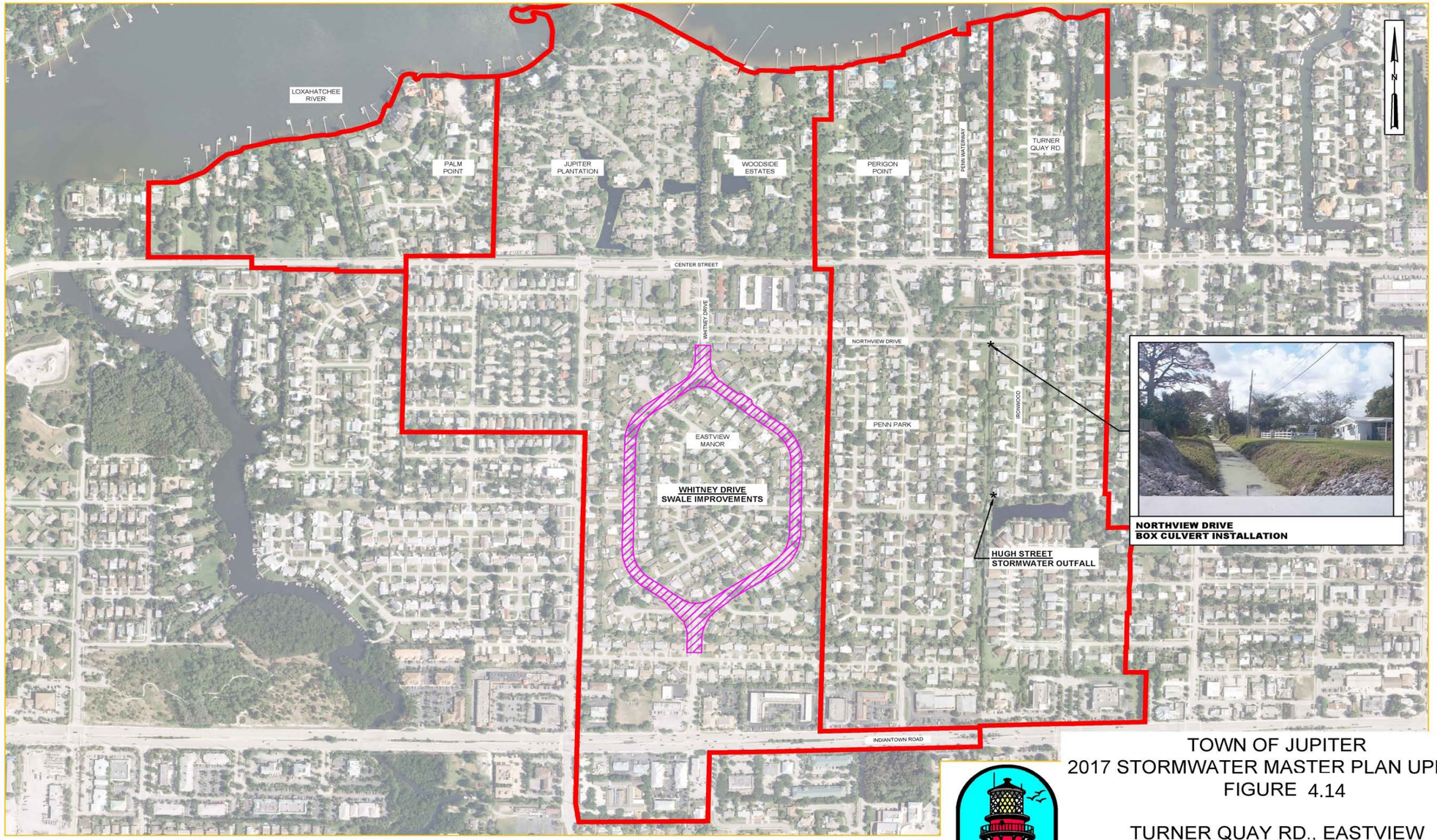
INTERCOASTAL WATERWAY, ADMIRAL'S COVE, ABACOA
AND BEAR'S CLUB WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
RIO VISTA 52.1 AC.
LOXAHATCHEE CANAL 82.4 AC.
SEMINOLE AVE. PUMP STATION 112 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.13

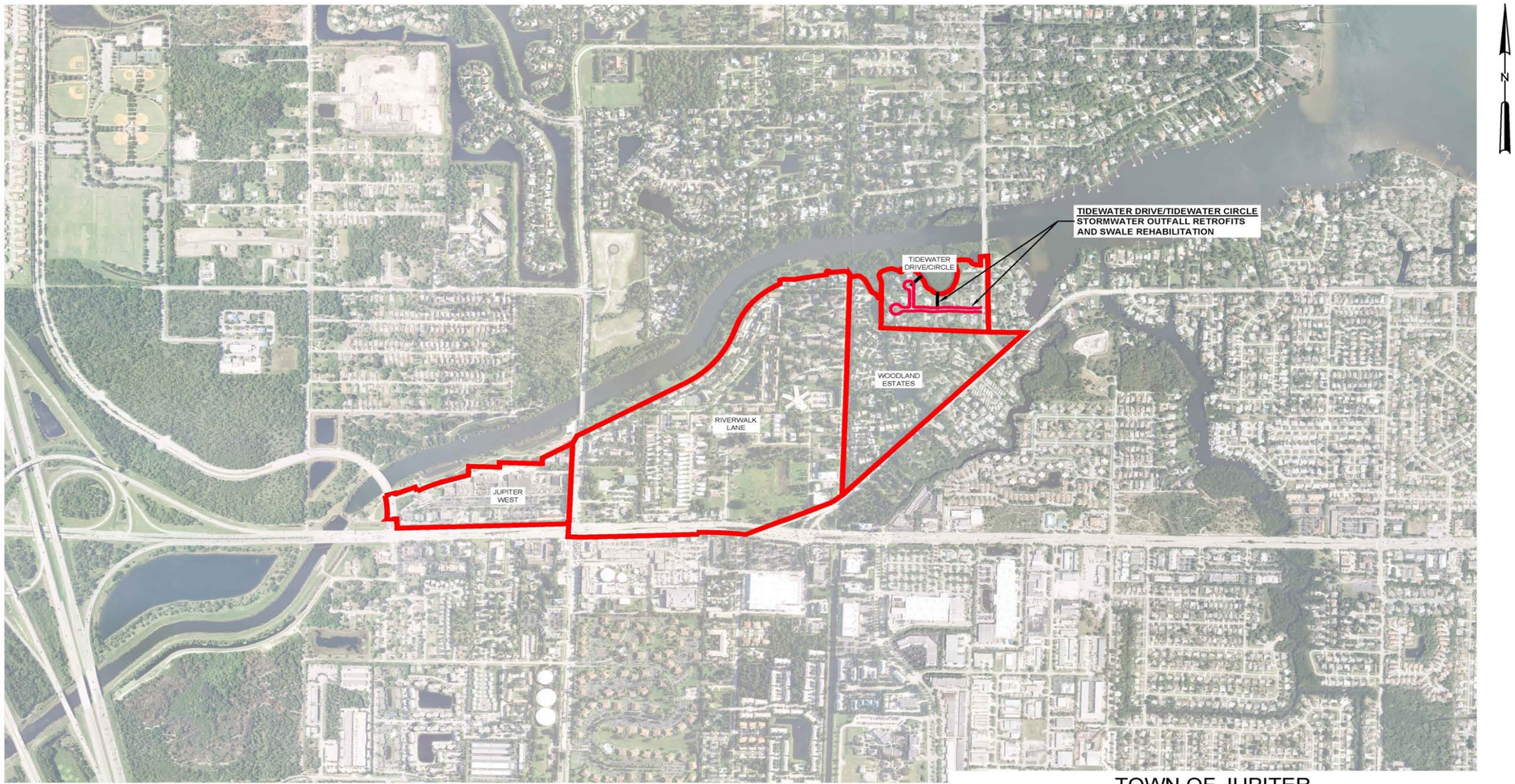
RIO VISTA, LOXAHATCHEE CANAL AND
SEMINOLE AVE. PUMP STATION
PREVIOUSLY COMPLETED IMPROVEMENTS



TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.14

TURNER QUAY RD., EASTVIEW MANOR CANAL, PENN WATERWAY AND PALM POINT WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS

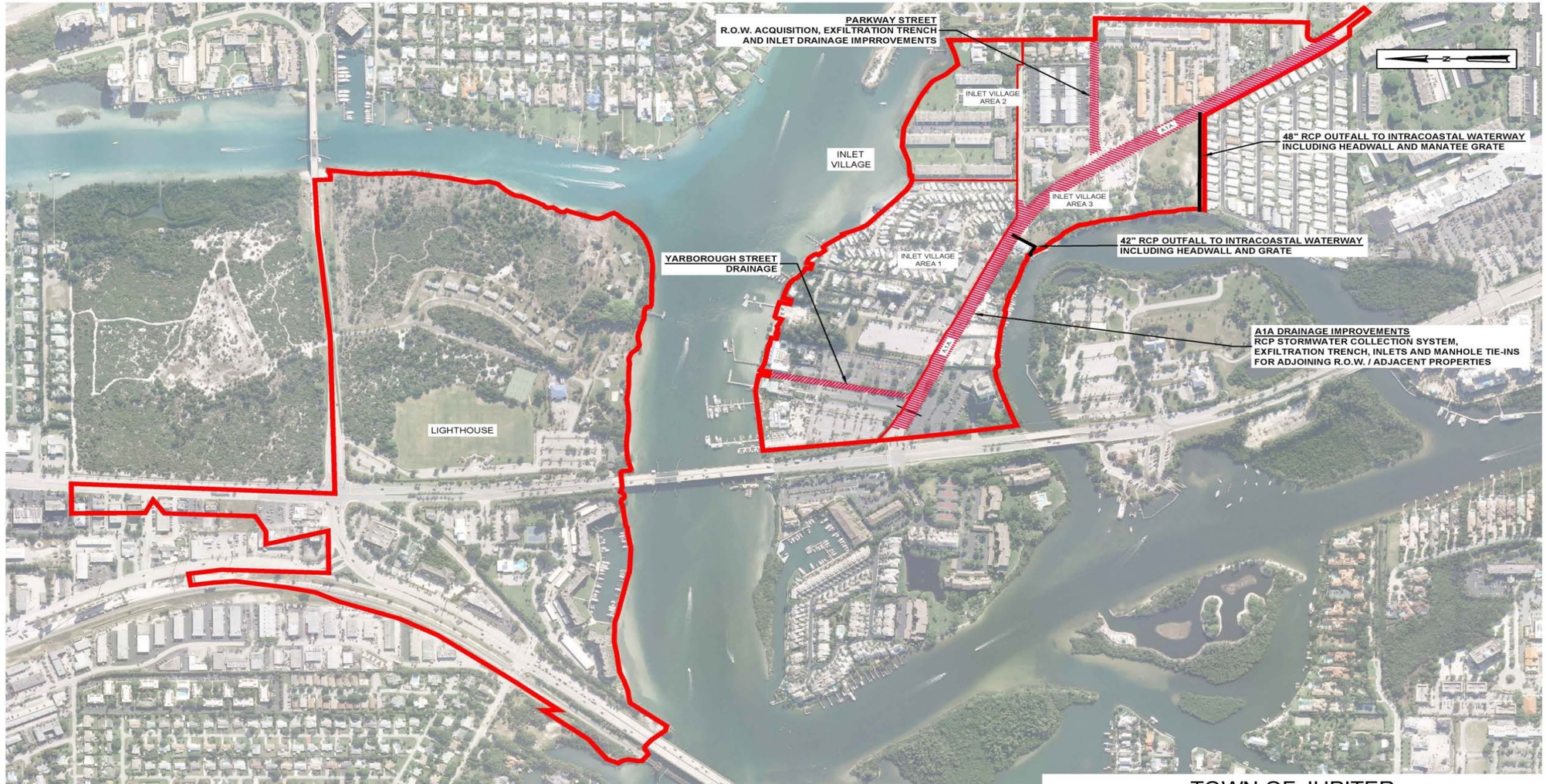
WATERSHED AREAS
TURNER QUAY RD. 19.7 AC.
PENN WATERWAY 122 AC.
EASTVIEW MANOR CANAL 165 AC.
PALM POINT 33.0 AC.



WATERSHED AREAS
TIDEWATER DRIVE 14.8 AC.
WODDLAND ESTATES 39.6 AC.
RIVERWALK LANE 118 AC.
JUPITER WEST 24.1 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.15

TIDEWATER DRIVE, WOODLAND ESTATES
RIVERWALK LANE, JUPITER WEST WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS

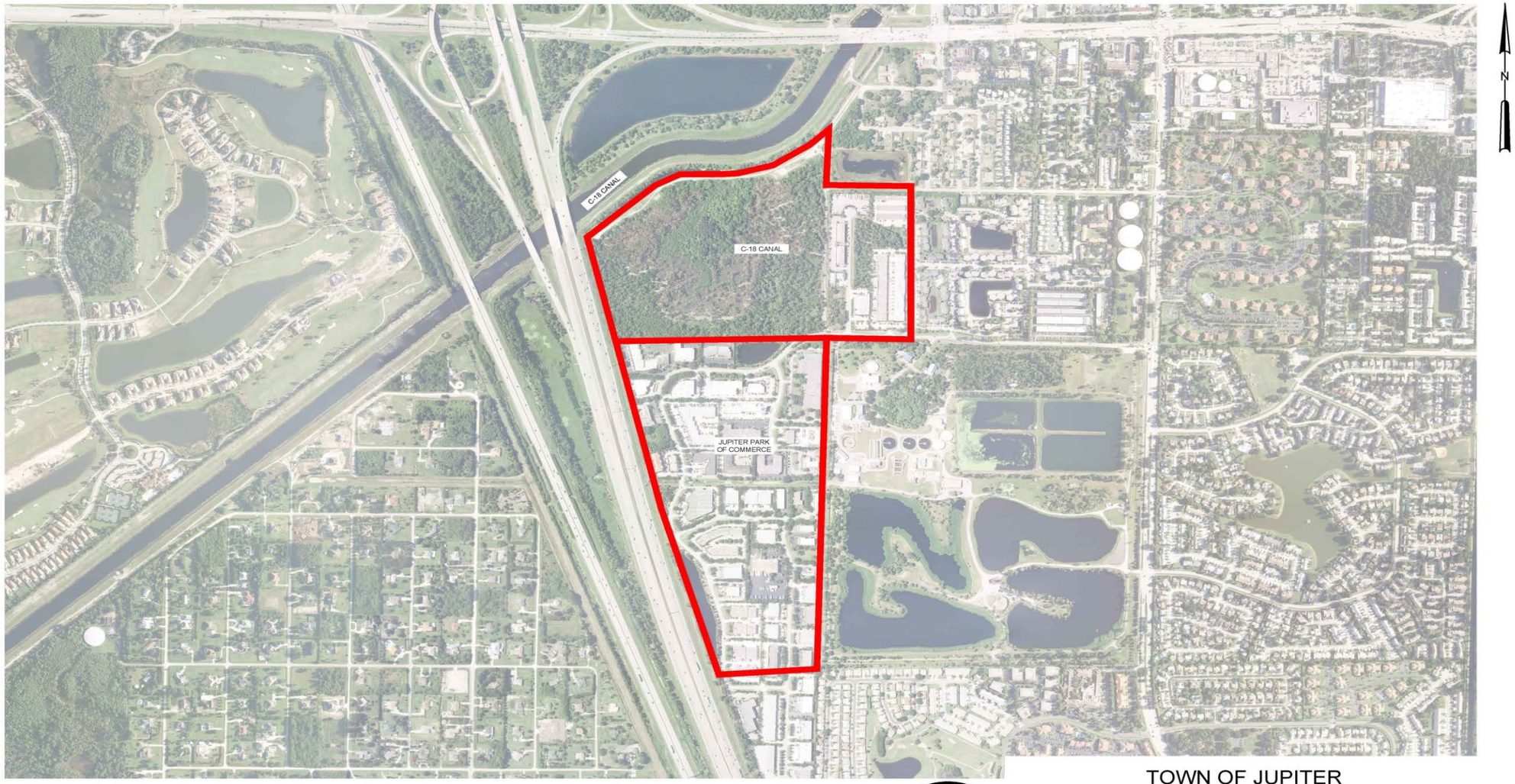


WATERSHED AREAS

LIGHTHOUSE WATERSHED	112 AC.
INLET VILLAGE WATERSHED	80.3 AC.
AREA 1	29.9 AC.
AREA 2	40.8 AC
AREA 3	9.62 AC

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.16

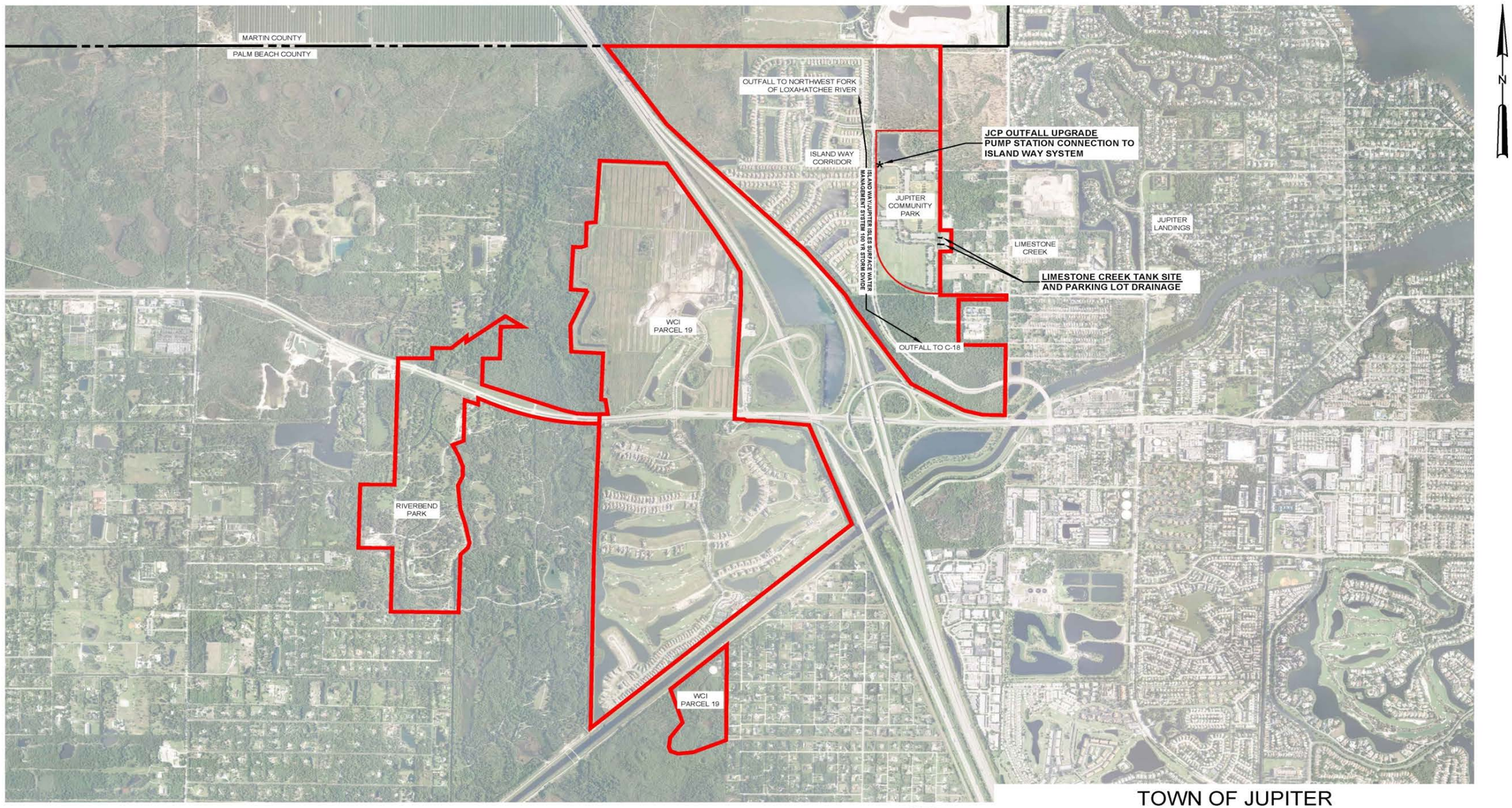
LIGHTHOUSE AND
INLET VILLAGE WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
C-18 CANAL 78.4 AC.
JUPITER PARK OF COMMERCE 82.6 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.17

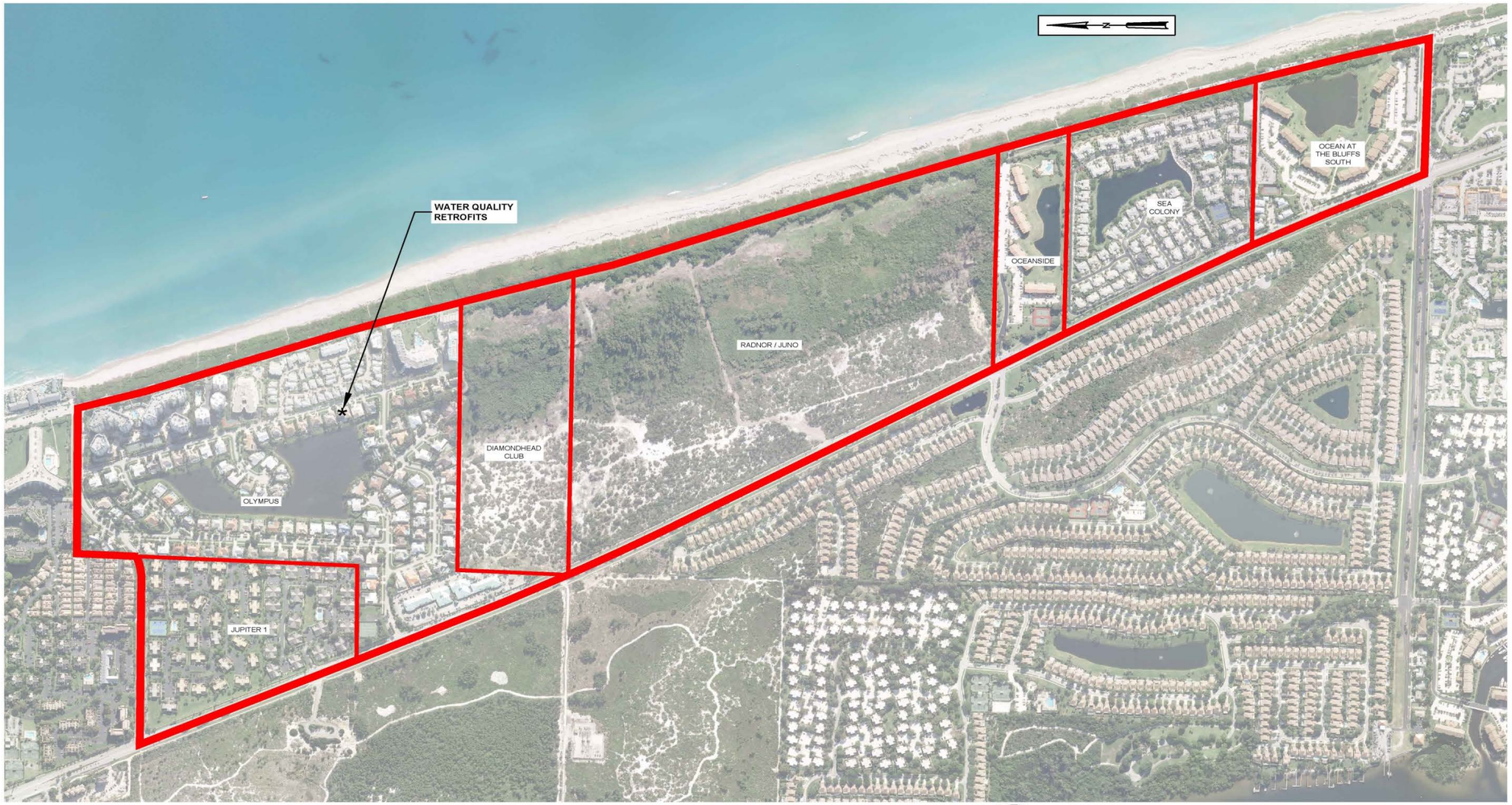
C-18 CANAL AND JUPITER PARK OF COMMERCE WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



WATERSHED AREAS
RIVERBEND PARK 222 AC.
WCI PARCELS 856 AC.
ISLAND WAY CORRIDOR 633 AC.
JUPITER COMMUNITY PARK 95.9 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.18

ISLAND WAY CORRIDOR, WCI PARCEL AND RIVERBEND PARK WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS

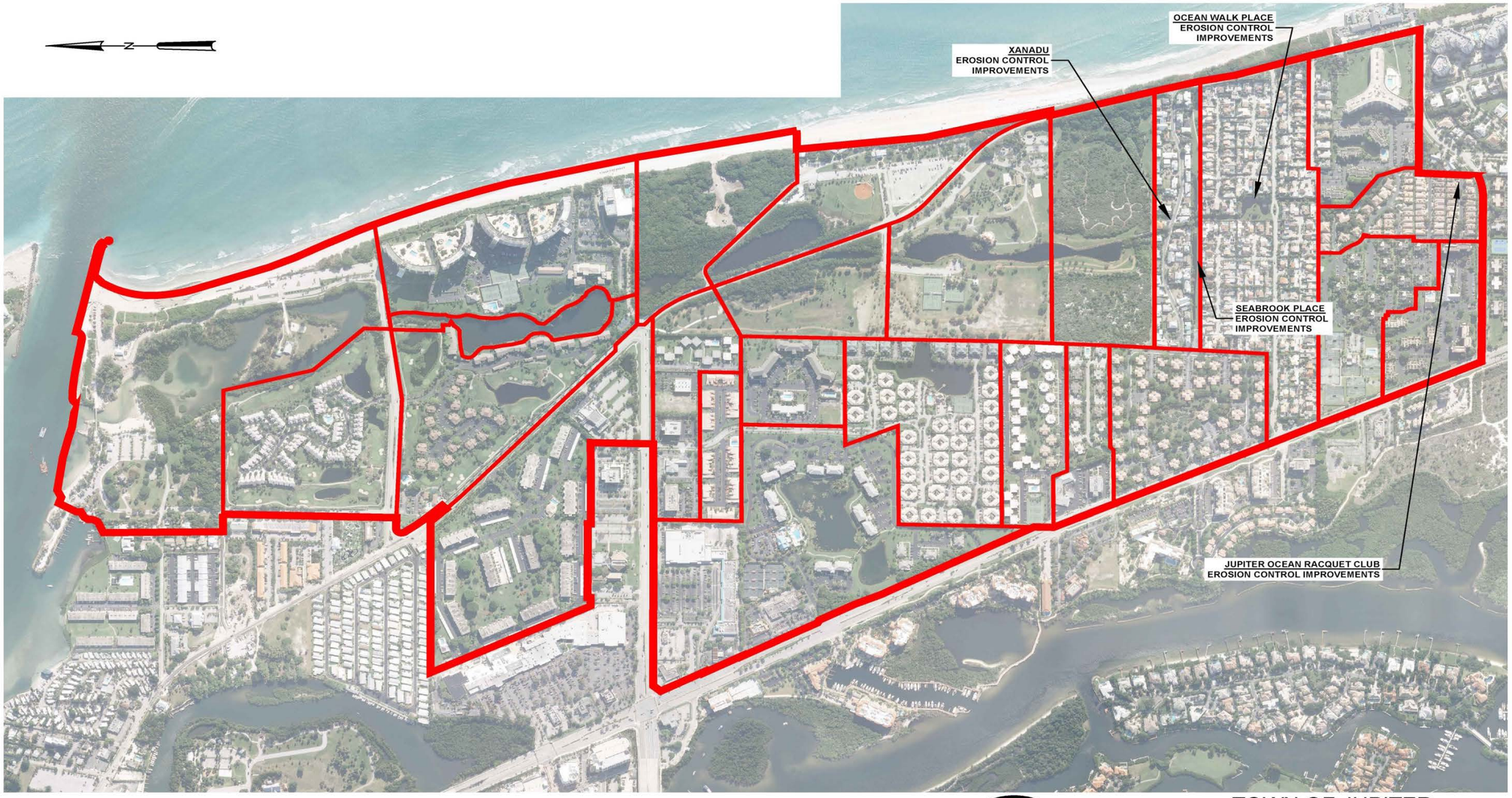


DUBOIS BASIN SOUTH WATERSHED AREAS 347 AC.

JUPITER 1	31.6 AC.	OCEANSIDE	15.4 AC.
OLYMPUS	92.3 AC.	SEA COLONY	33.7 AC.
DIAMONDHEAD	32.8 AC.	OCEAN AT THE	26.8 AC.
RADNOR / JUNO	114 AC.	BLUFFS SOUTH	

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.19

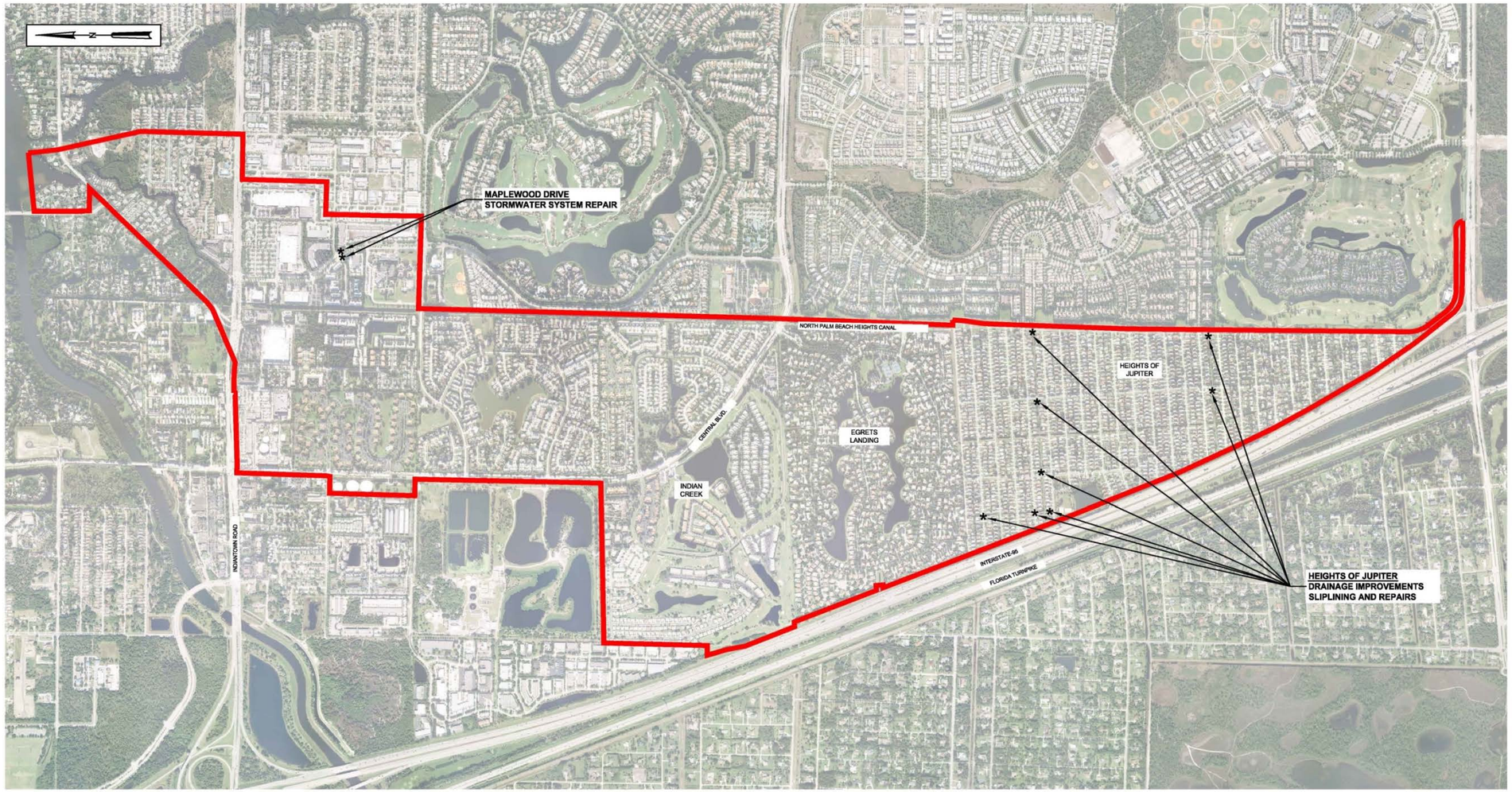
DUBOIS BASIN SOUTH WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



DUBOIS BASIN NORTH
WATERSHED AREA
549 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.20

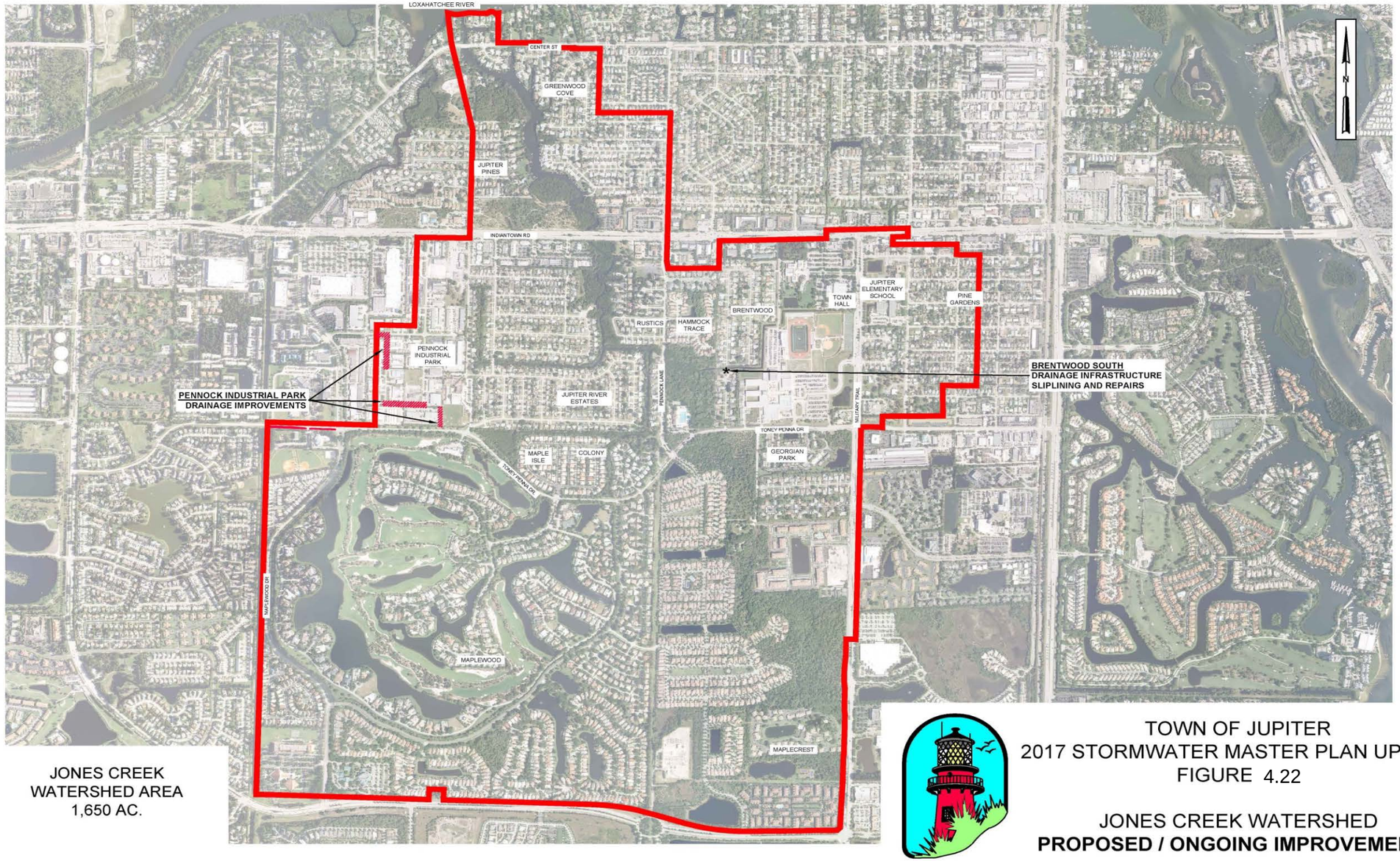
DUBOIS BASIN NORTH WATERSHEDS
PREVIOUSLY COMPLETED IMPROVEMENTS



SIMS CREEK WATERSHED AREA
1,500 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.21

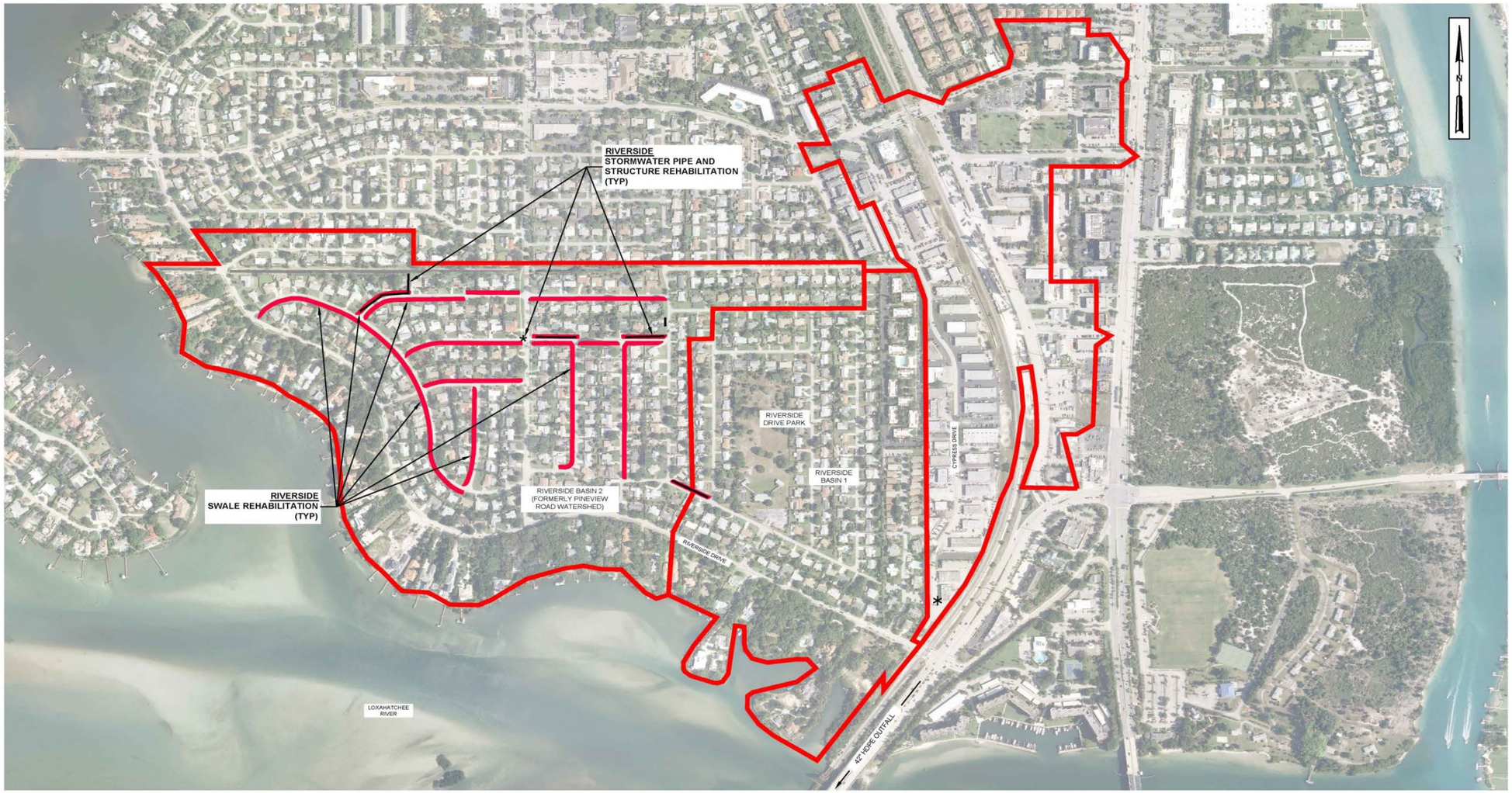
SIMS CREEK WATERSHED
PROPOSED / ONGOING IMPROVEMENTS



JONES CREEK
WATERSHED AREA
1,650 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.22

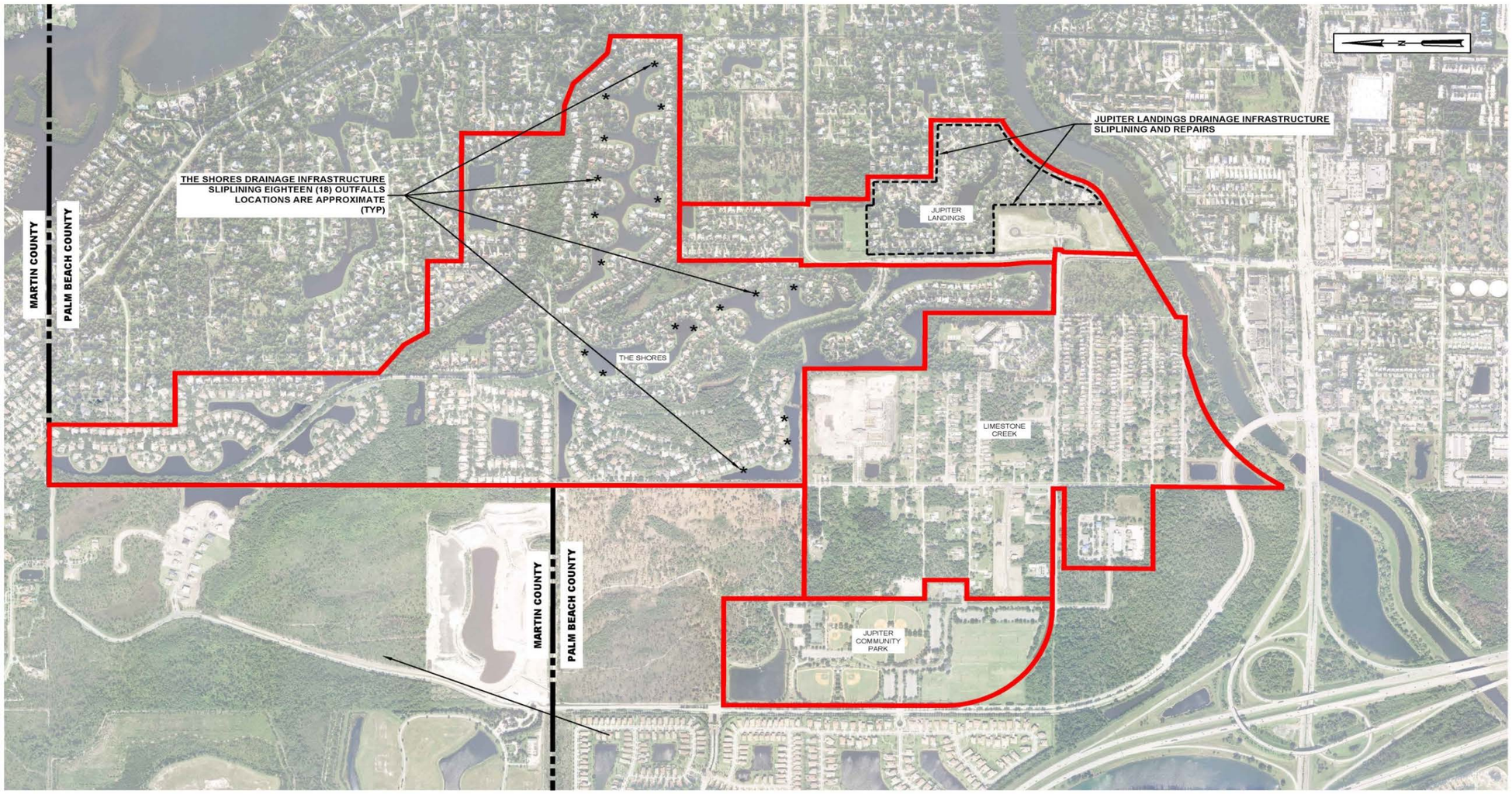
JONES CREEK WATERSHED
PROPOSED / ONGOING IMPROVEMENTS



WATERSHED AREAS
CYPRESS DRIVE 69.7 AC.
RIVERSIDE DRIVE 183 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.23

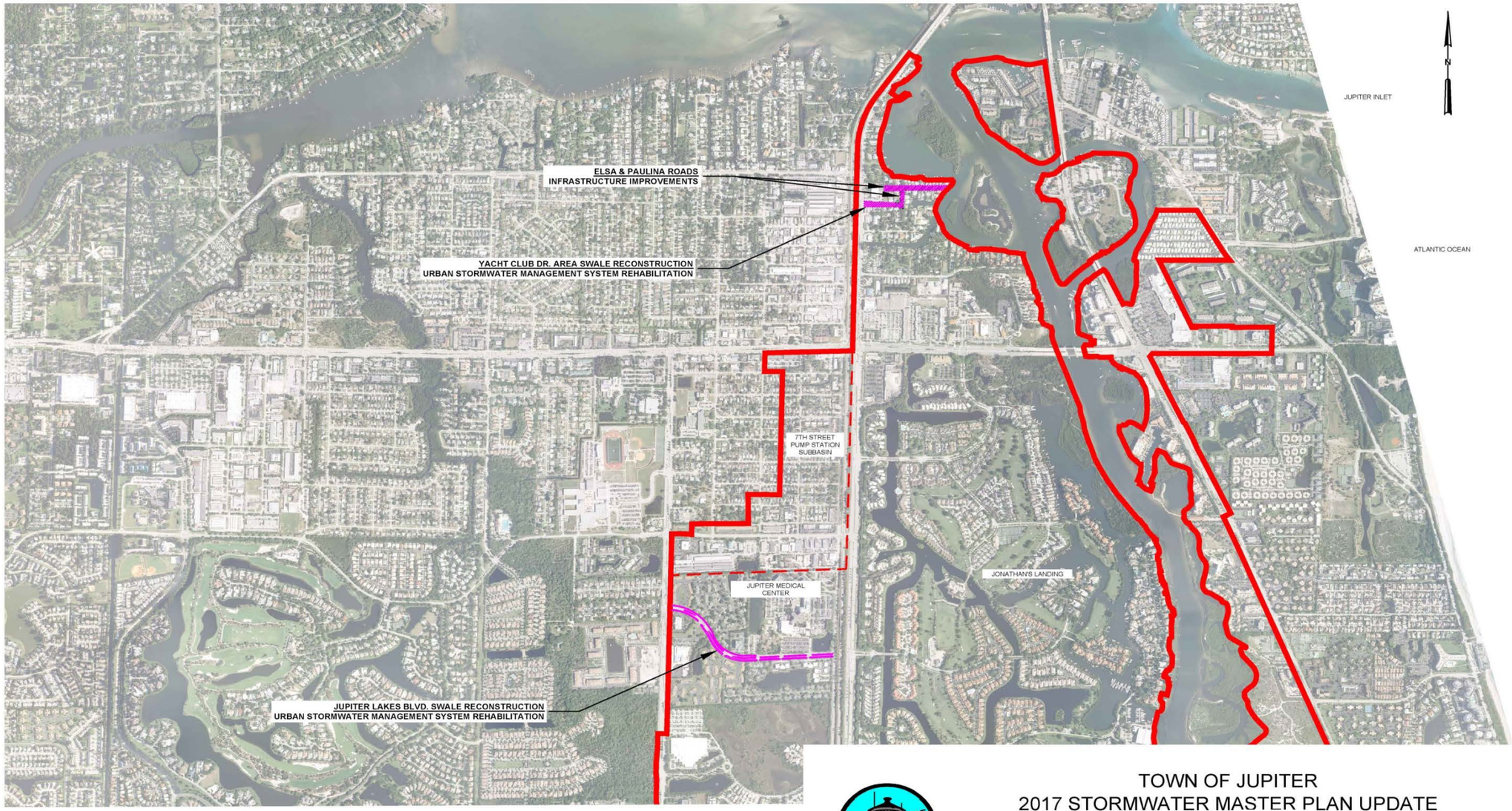
CYPRESS DRIVE AND RIVERSIDE DRIVE
WATERSHEDS
PROPOSED / ONGOING IMPROVEMENTS



WATERSHED AREAS
THE SHORES 506 AC.
JUPITER COMMUNITY PARK 95.9 AC.
JUPITER LANDINGS 106 AC.
LIMESTONE CREEK 296 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.24

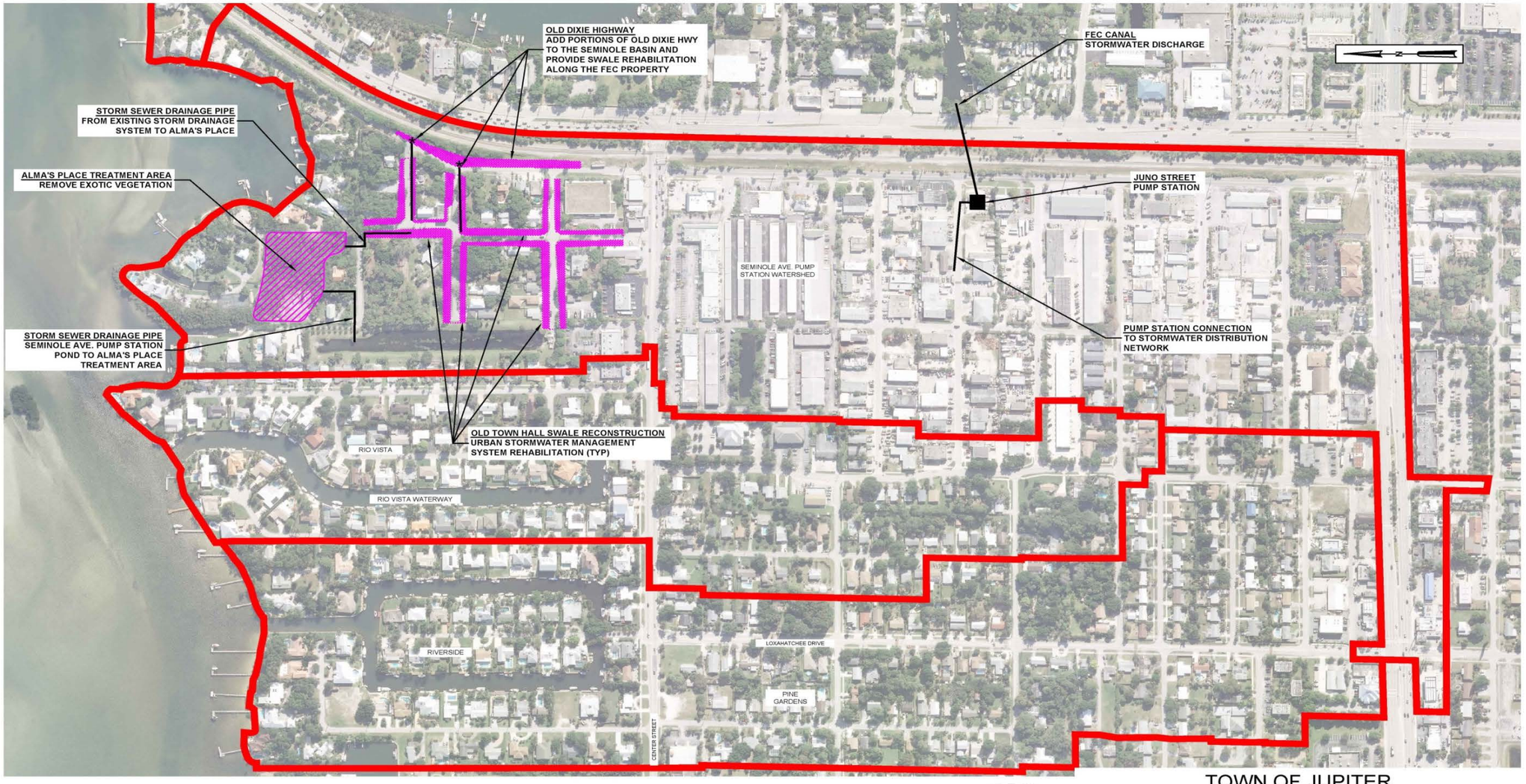
THE SHORES, JUPITER COMMUNITY PARK, JUPITER LANDINGS, & LIMESTONE CREEK WATERSHEDS
PROPOSED / ONGOING IMPROVEMENTS



WATERSHED AREAS
EAST OF INTRACOASTAL 944 AC.(AREA TO THE SOUTH NOT SHOWN)
WEST OF INTRACOASTAL 5,200 AC. (AREA TO THE SOUTH NOT SHOWN)

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.25

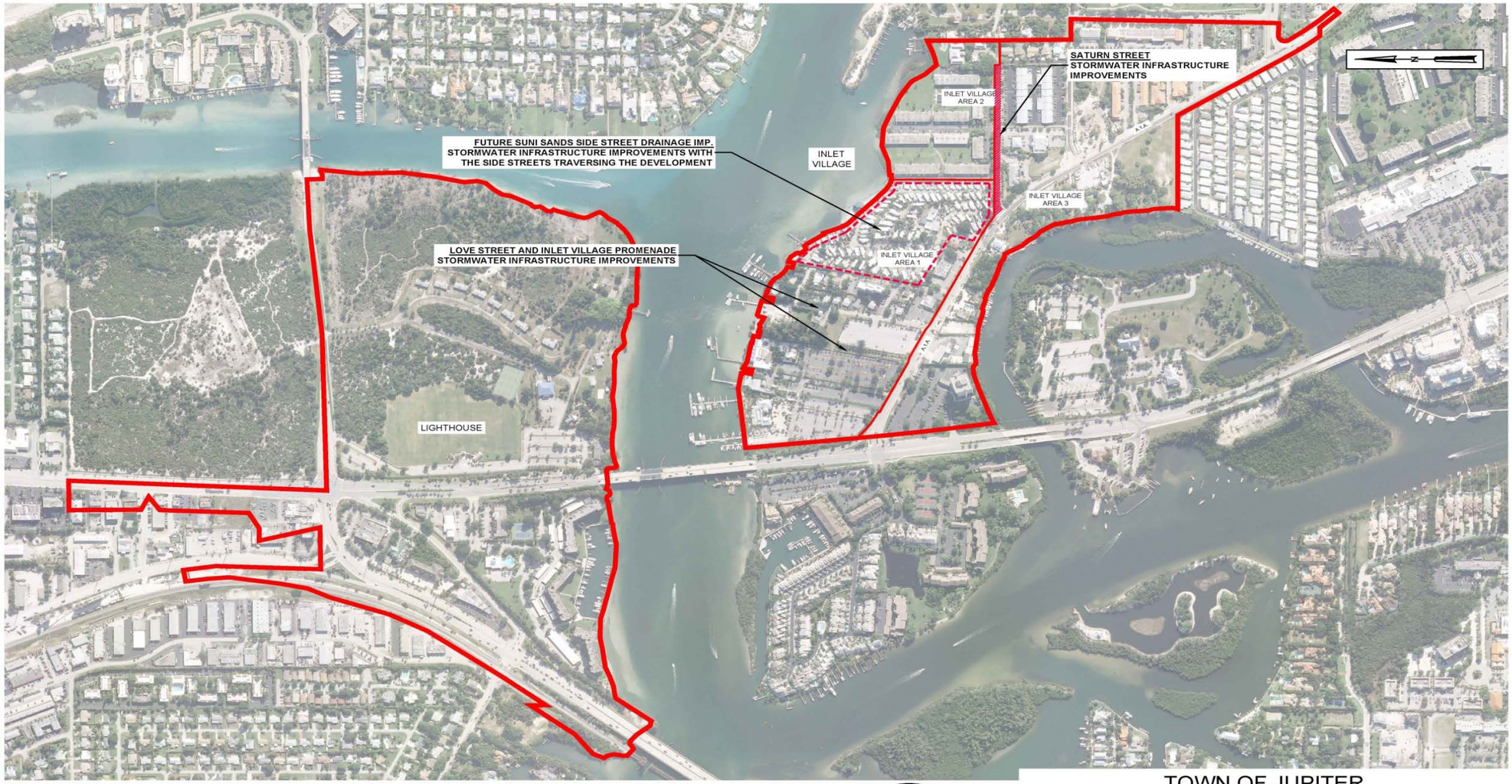
INTERCOASTAL WATERWAY, ADMIRAL'S COVE, ABACOA
AND BEAR'S CLUB WATERSHEDS
PROPOSED / ONGOING IMPROVEMENTS



WATERSHED AREAS
RIO VISTA 52.1 AC.
LOXAHATCHEE CANAL 82.4 AC.
SEMINOLE AVE. PUMP STATION 112 AC.

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.26

RIO VISTA, LOXAHATCHEE CANAL AND SEMINOLE AVE. PUMP STATION
PROPOSED / ONGOING IMPROVEMENTS

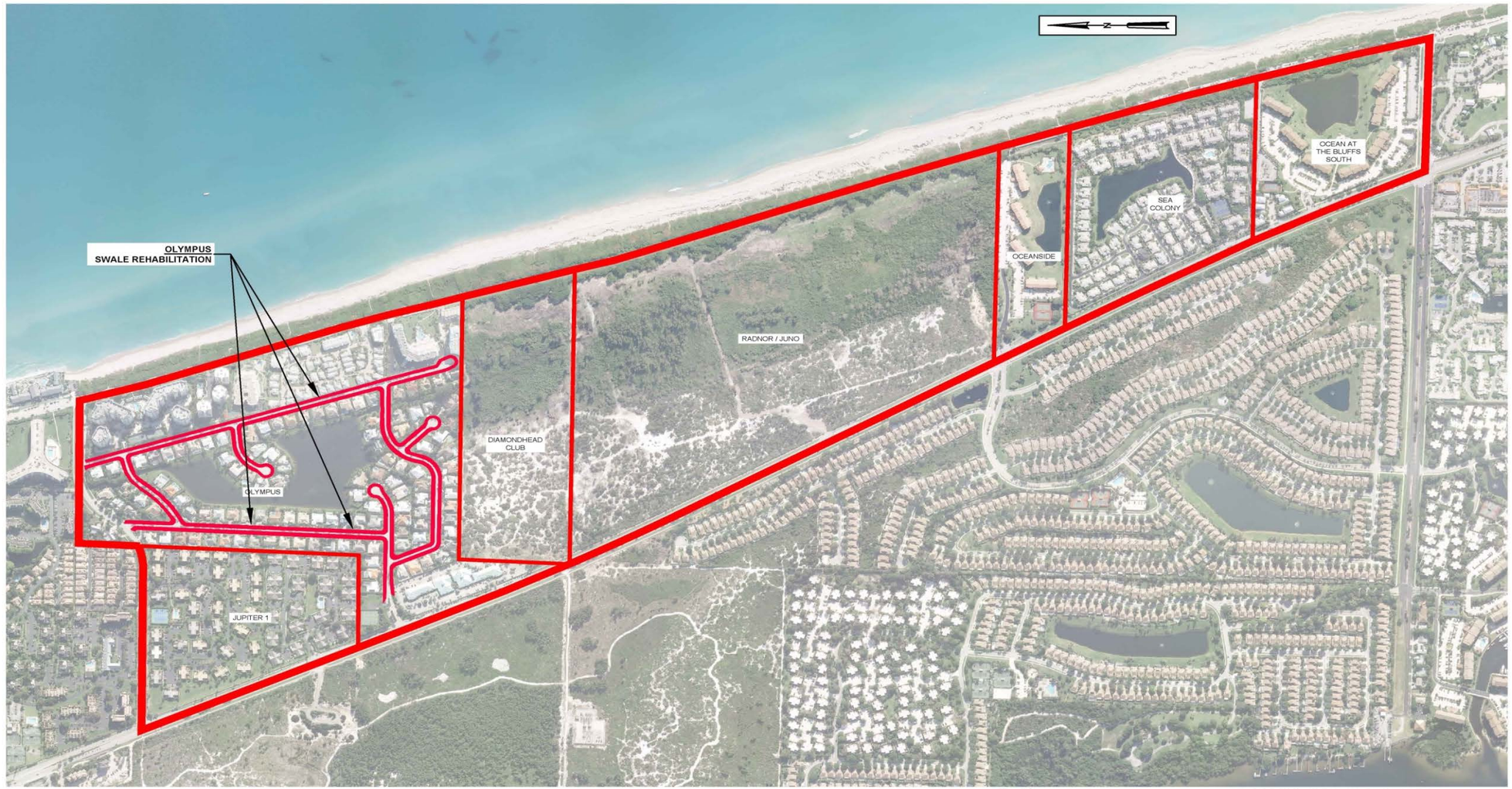


WATERSHED AREAS

LIGHTHOUSE WATERSHED	112 AC.
INLET VILLAGE WATERSHED	80.3 AC.
AREA 1	29.9 AC.
AREA 2	40.8 AC
AREA 3	9.62 AC

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.27

LIGHTHOUSE AND
INLET VILLAGE WATERSHEDS
PROPOSED / ONGOING IMPROVEMENTS



DUBOIS BASIN SOUTH WATERSHED AREAS 347 AC.

JUPITER 1	31.6 AC.	OCEANSIDE	15.4 AC.
OLYMPUS	92.3 AC.	SEA COLONY	33.7 AC.
DIAMONDHEAD	32.8 AC.	OCEAN AT THE	26.8 AC.
RADNOR / JUNO	114 AC.	BLUFFS SOUTH	

TOWN OF JUPITER
2017 STORMWATER MASTER PLAN UPDATE
FIGURE 4.28

DUBOIS BASIN SOUTH WATERSHEDS
PROPOSED / ONGOING IMPROVEMENTS

Chapter 5: Future Condition Assessment

I. Future Growth

As of August 1, 2016, there are 45,750 Equivalent Residential Units (ERU) served by the Town's Stormwater Utility. To determine the Stormwater Utility's ultimate potential for Equivalent Residential Unit (ERU) growth, the Town's Geographic Information System was utilized. The following methodology was employed to project the ultimate number of ERUs that could be served.

The Stormwater Utility's current stormwater accounts were mapped to the Town's existing GIS address points layer (using their location ID). With a 100% match rate, the data source for existing ERUs was determined to be fully mapped and completed.

Next, the remaining GIS address points that were not mapped as current stormwater accounts (and thus identified as possible future ERUs) were selected. These locations were further analyzed, edited, and used to generate a polygon GIS layer for future ERU calculations. The resultant layer of future polygons, includes platted vacant lots, and other vacant tracts of both residential and commercial lands. For example, an existing platted residential lot, such as in Rialto South, Cinquez Park and other areas, an ERU value of 1 is assumed and calculated. For developing residential areas the number of development order approved units is used to calculate ERUs. For other vacant unplatted residential tracts, the Town zoning allowable units was used in conjunction with the acreage, to generate an ERU value. For commercial tracts, their ERU is calculated as follows: trace area (in sq. ft.), multiplied by 70% (the allowable impervious area), divided by 2,651 sq. ft. per ERU (the ERU commercial multiplier). Lastly, given the ongoing redevelopment within Jupiter Inlet Village an assumed additional 200 ERUs were also included within our projections.

The ultimate projection of future equivalent residential units within the current municipal boundaries is estimated to total 49,471.

II. Regulatory Assessment

Introduction

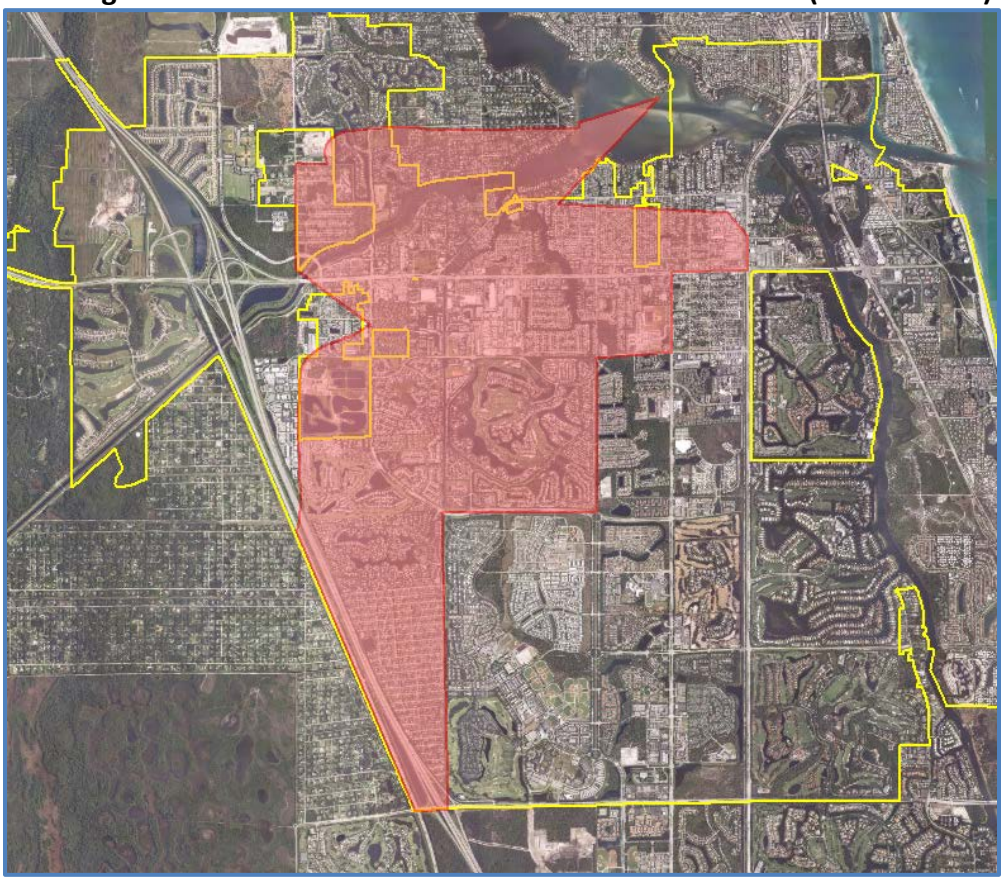
The Southwest Fork of the Loxahatchee River is a primary water body within the Town of Jupiter. Protecting the quality of this water body is not only important from an environmental standpoint, but also from an economic standpoint as the river and its tributaries serve as important ecotourism destinations for South Florida visitors and residents alike. In order to protect water bodies, like the Loxahatchee River, throughout the state, the Florida Department of Environmental Protection established numeric nutrient criteria (NNC). These criteria were implemented as an improvement to the previous narrative nutrient criteria, which specified that an imbalance of flora and fauna indicated impairment. Additional tools such as Total Maximum Daily Loads (TMDL) and Basin Management Action Plans (BMAP) are also used to help improve water quality of surface water bodies throughout the state. The various regulatory components associated with surface water management within the Town are discussed in greater detail below.

Total Maximum Daily Load

The advancement of the Total Maximum Daily Load (TMDL) program may continue to impact the Town's actions relative to stormwater management, drainage area improvements, and implementation of best management practices in the coming years. Following the completion of the 2012 Master Plan Update, the FDEP published the final TMDL for Fecal Coliform bacteria for the Southwest Fork of the Loxahatchee River (WBID 3226C, **Figure 5.1**). Fecal Coliform criteria are measured by quantifying the colony forming units (CFU) in a grab sample collected from the water body being analyzed. The CFU is a unit used for estimating the number of cells which are able to multiply in a sample. Rule 62-302, F.A.C. stipulates that Fecal Coliform levels must not exceed a median value of 14 CFU per 100 mL with more than 10% of the samples not exceeding 43 CFU per 100 mL. The Rule also specifies a maximum one day measurement of 800 CFU/100 mL. Based on the site specific conditions of the Southwest Fork of the Loxahatchee River, the TMDL developed for the Fecal Coliform bacteria for this water body is more stringent than the water quality criteria outlined in Rule 62-302. The TMDL for the Southwest Fork limits the Fecal Coliform levels observed for any sampling event to 43 CFU/100 mL. This limit will require an estimated 91% reduction in current Fecal Coliform levels in the Southwest Fork in

order to be in compliance with the proposed total load. Following the development of a TMDL, a Basin Management Action Plan (BMAP) is created by FDEP. The purpose of a BMAP is to outline the actions needed within the basin to meet the established TMDL. This will be the next step in the regulatory process for reducing Fecal Coliform levels in the Southwest Fork of the Loxahatchee River, though it has not been developed to date. Still, the Town should continue evaluating potential sources of pollutants in order to more effectively prepare for regulatory actions relative to excessive pollutant levels in the future.

Figure 5.1
Drainage Area for Southwest Fork of the Loxahatchee River (WBID 3226C)



In addition to Fecal Coliform bacteria in the Southwest Fork, the FDEP is also evaluating Total Phosphorus, Total Nitrogen, Chlorophyll α, and Dissolved Oxygen throughout the entire Loxahatchee River basin and is beginning modeling efforts. It is expected that modeling of the basin to determine the nutrient TMDL for the waterbody will likely be completed in 2017. While the model results will help the FDEP establish a TMDL for the various segments of the river, another option available to the Town and other stakeholders within the Loxahatchee River Basin is the development of a Reasonable Assurance Plan (RAP), also referred to as a 4b plan. These plans allow the basin stakeholders to implement water quality improvement actions

before a TMDL or subsequent BMAP is developed. The advantage to doing this is the greater flexibility when identifying improvements and establishing time frames for implementation of such improvements compared to the typical TMDL and BMAP process. The greatest difficulty associated with the development of the RAP is the determination of which stakeholders should be held responsible for which projects/improvements. The Town has been an active participant in discussions relative to RAPs, which are being discussed under the banner of the Loxahatchee River Management Coordinating Council (LRMCC).

Numeric Nutrient Criteria

At the time of the 2012 Master Plan Update, narrative nutrient criteria were in the process of being converted to Numeric Nutrient Criteria (NNC). The narrative criteria stipulate that nutrients in discharges to waters of the state should not "cause an imbalance in natural populations of aquatic flora or fauna". The NNC create set concentration limits for Nitrogen, Phosphorus, and Chlorophyll α. On June 7, 2015 the estuary-specific NNC were finalized as Rule 62-302.532 F.A.C. The NNC for the various segments of the Loxahatchee River are summarized in **Table 5.1**. The NNC for the Southwest Fork are most applicable to the Town as it relates to meeting water quality targets since tributaries such as Jones and Sims Creek which are within the Town's limits flow to this segment of the Loxahatchee River. Many sampling points in the Loxahatchee River do not meet the published NNC, especially the Chlorophyll α criteria, which is particularly stringent. In areas which exceed the allowable Chlorophyll α concentrations, the nutrient levels, extent of seagrass, and water clarity indicate good water quality. The stringent criteria may pose challenges to the Town in the future if the requirements are not relaxed following additional modeling and analysis. Chlorophyll α concentrations are dependent on many parameters (e.g. nutrient concentrations and temperature). Due to the dynamic nature of chlorophyll α levels, it is recommended that the Town continue implementing best management practices in order to improve/maintain water quality and continue monitoring trends in Chlorophyll α concentrations.

Table 5.1
Final Numeric Nutrient Criteria for the Loxahatchee River

Estuary	Total Phosphorus	Total Nitrogen	Chlorophyll α
Lower Loxahatchee	0.032 mg/L as AGM	0.63 mg/L as AGM	1.8 µg/L as AGM
Middle Loxahatchee	0.030 mg/L as AGM	0.80 mg/L as AGM	4.0 µg/L as AGM
Upper Loxahatchee	0.075 mg/L as AGM	1.26 mg/L as AGM	5.5 µg/L as AGM
Loxahatchee River Estuary (Southwest Fork)	0.075 mg/L as AGM	1.26 mg/L as AGM	5.5 µg/L as AGM

The Town and the Loxahatchee River District (LRD) collaboratively collect surface water quality data throughout the Loxahatchee River basin and compare the observed pollutant levels to the FDEP water quality criteria. **Figures 5.2**, **5.3**, **5.4**, and **5.5** were provided by the LRD for water quality samples collected in June, 2016 which qualitatively describe the water quality relative to observed bacteria, Total Nitrogen, Total Phosphorus, and Chlorophyl α levels, respectively. Ratings of "good" and "poor", as included in the provided figures, relate to the water quality criteria for each water body the samples were collected from.

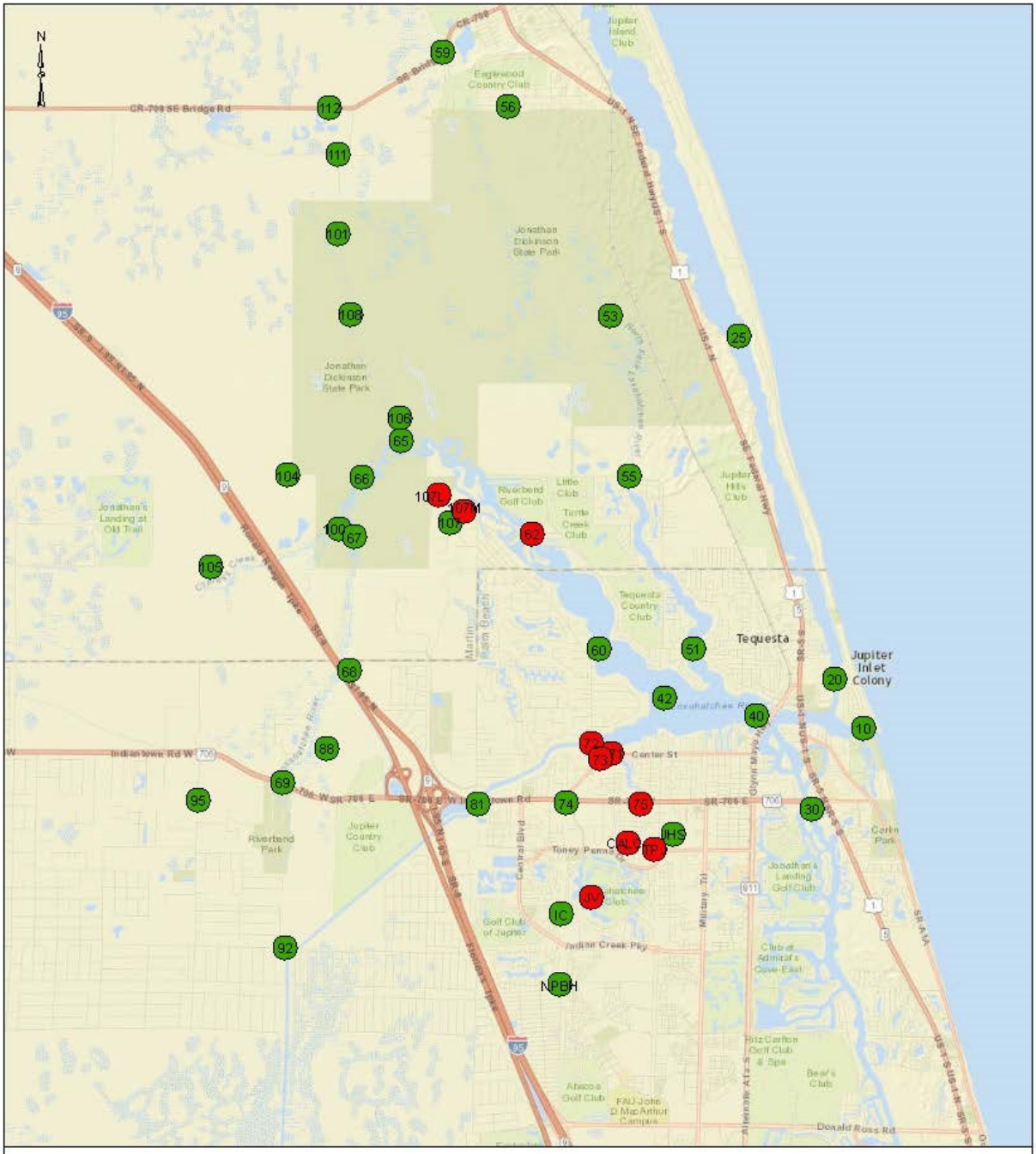
The tributaries of Jones and Sims Creeks have commonly exhibited evidence of impairment based on water quality results collected at various locations within both basins. Of particular concern in these basins is Fecal Coliform bacteria. Bacteria levels in Jones and Sims Creek are typically greater than those measured in the Southwest Fork of the Loxahatchee River, which indicates that impairment of the Southwest Fork may be primarily attributable to pollutants originating from these areas. The Town has been proactive in identifying potential sources of pollutants within the Jones and Sims Creek basins in order to reduce the pollutant loads discharged to the Loxahatchee River.

Clean Water Rule

The Clean Water Rule became effective on August 28, 2015. The new rule revised and expanded the definition of "Waters of the United States" as it is used in the Clean Water Act (CWA). Waters of the United States applies to jurisdictional waterbodies, which includes the Loxahatchee River Basin. These waterbodies are subject to the regulatory requirements described in the CWA such as water quality standards, discharge limitations, permits, and

enforcement. The Clean Water Rule provides better clarity on which waterbodies are covered by the CWA, but does not protect any types of water that were not historically covered by the CWA. It is not expected that the Clean Water Rule will affect the Town since it does not require additional permitting for the Town's surface water management systems. However, it is recommended that the Town continue to monitor the Rule in determining whether it will have future impacts on the Utility.

Figure 5.2



BACTERIA RESULTS

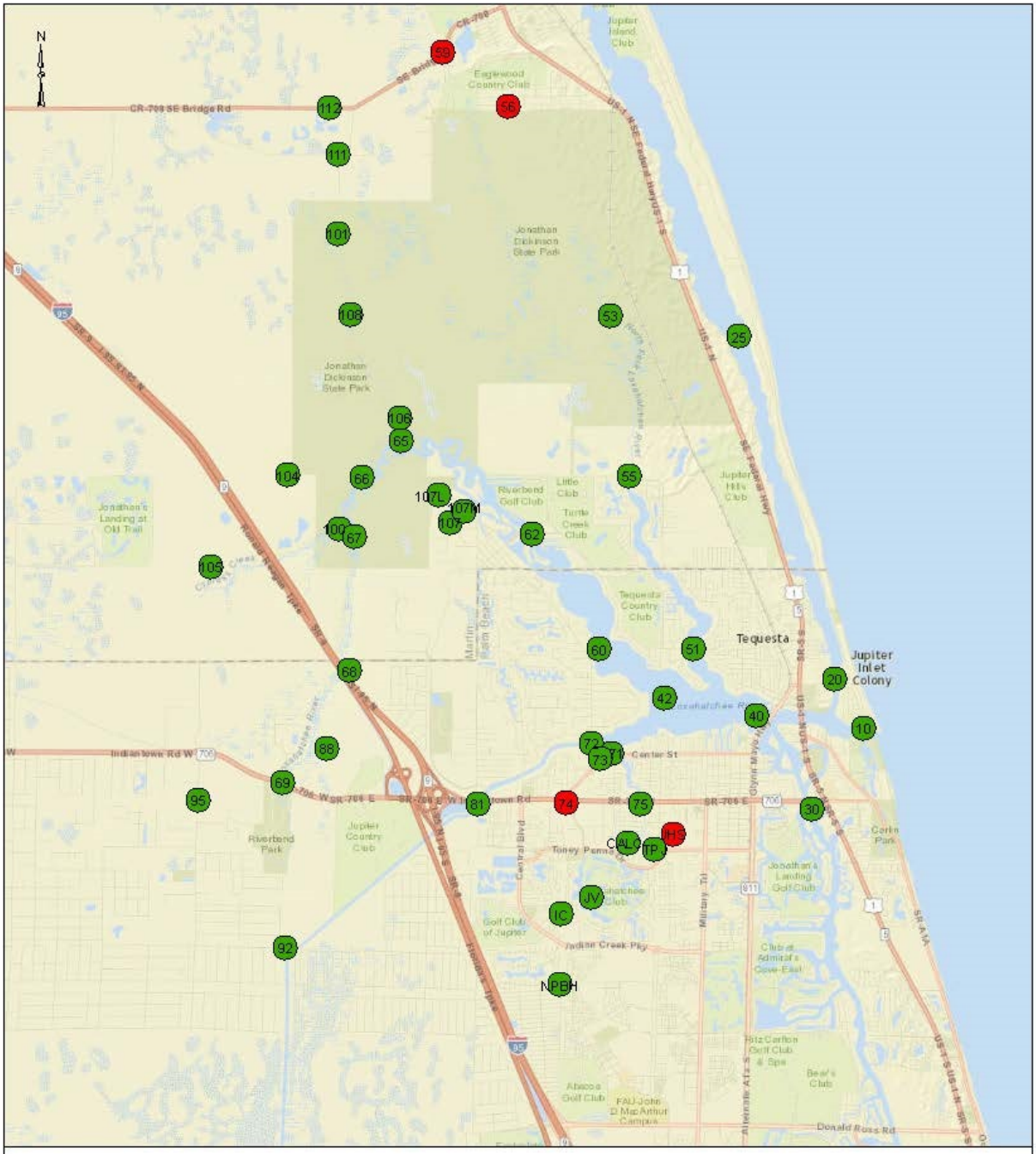
Poor Criteria: Fecal Coliform above 800 or Enterococci above 70 cfu/100ml

Loxahatchee River District
Water Quality Monitoring Program
www.Loxahatcheeriver.org/reports.php
(561) 747-5700

March 2016

GOOD
POOR
Text on each point is Station name/number

Figure 5.3


N
Tequesta
Jupiter Inlet Colony
Jupiter Country Club
Riverbend Park
Jonathan Dickinson State Park
Tequesta Country Club
Eagewood Country Club
Jupiter Island Club
Jupiter Hills Club
Riverbend Golf Club
Little Club
Turtle Creek Club
Jonathan's Landing at Old Trail
Jonathan's Landing Golf Club
Golf Club of Jupiter
Abacoa Golf Club
Ritz Carlton Golf Club & Spa
Bear's Club
Carlin Park
Indiantown Rd W
Center St
Donald Ross Rd
Indian Creek Pky
Military Tri
Central Blvd
Toney Penna
Loxahatchee River
Jupiter Island
Eastern Blvd
Beaver Trail
Dixie Hwy
Federal Hwy
Ocean Blvd
SR-A1A
Riverside Drive
Dyer Mayo Rd
Martin
Palm Beach
Loxahatchee River
Cypress Creek
Cypress Creek Trail
Jupiter Inlet
Jupiter Island Club
Eagewood Country Club
Jonathan Dickinson State Park
Riverbend Golf Club
Little Club
Turtle Creek Club
Jupiter Hills Club
Tequesta Country Club
Jonathan's Landing at Old Trail
Jonathan's Landing Golf Club
Golf Club of Jupiter
Abacoa Golf Club
Ritz Carlton Golf Club & Spa
Bear's Club
Carlin Park
Riverbend Park
Jupiter Country Club
Toney Penna
Loxahatchee River
Jupiter Island
Eastern Blvd
Beaver Trail
Dixie Hwy
Federal Hwy
Ocean Blvd
SR-A1A
Riverside Drive
Dyer Mayo Rd
Martin
Palm Beach
Loxahatchee River
Cypress Creek
Cypress Creek Trail
Jupiter Inlet
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107L
107M
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67
62
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60
51
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40
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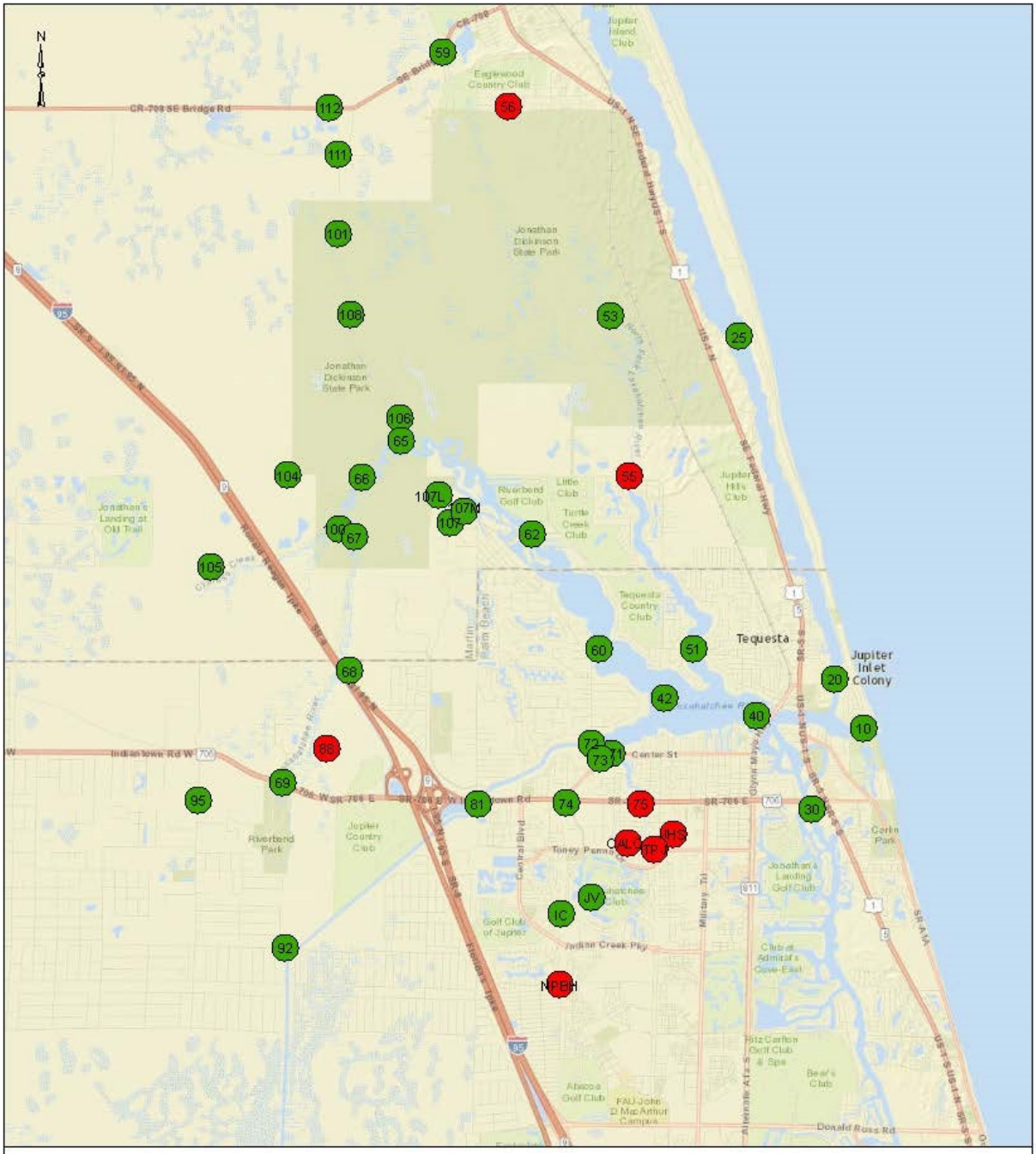
72
73
T
Center St
69
95
81
74
75
30
IHS
CALS
TP
JV
IC
92
NPBH
Indiantown Rd W
SR-706 W
SR-706 E
Central Blvd
Military Tri
Indian Creek Pky
Donald Ross Rd
Riverside Drive
Dyer Mayo Rd
Eastern Blvd
Beaver Trail
Dixie Hwy
Federal Hwy
Ocean Blvd
SR-A1A
CR-708 SE Bridge Rd
SE Bridge Rd
US-1 N SE Federal Hwy
US-1 S
SR-5
SR-706 E
SR-706 W
95
1
706
811
TOTAL NITROGEN RESULTS
Scored to current or proposed Department of Environmental Protection Numeric Nutrient Criteria for each site.
Loxahatchee River District
Water Quality Monitoring Program
www.Loxahatcheeriver.org/reports.php
(561) 747-5700
March 2016
GOOD
POOR
Text on each point is
Station name/number

Figure 5.4



TOTAL PHOSPHORUS RESULTS

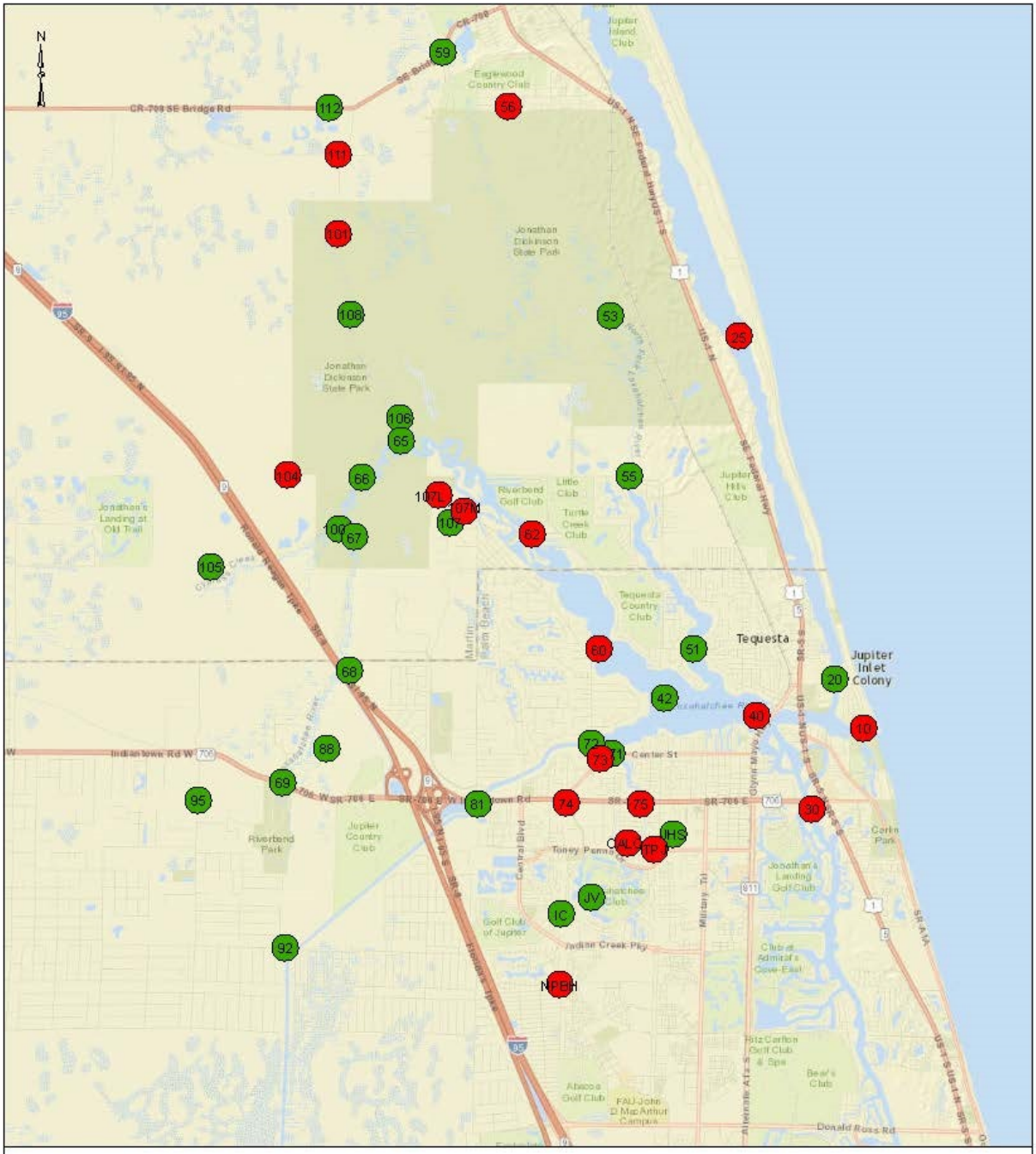
Scored to current or proposed Department of Environmental Protection Numeric Nutrient Criteria for each site.

Loxahatchee River District
Water Quality Monitoring Program
www.Loxahatcheeriver.org/reports.php
(561) 747-5700

March 2016

GOOD
POOR
Text on each point is Station name/number

Figure 5.5



CHLOROPHYLL RESULTS

Scored to current or proposed Department of Environmental Protection Numeric Nutrient Criteria for each site.

Loxahatchee River District
Water Quality Monitoring Program
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March 2016

GOOD
POOR
Text on each point is Station name/number

Town Surface Water RO Concentrate Discharge Water Quality Impact Analysis

The Town's reverse osmosis (RO) water treatment system generates a by-product water stream of concentrated Floridan Aquifer raw water. This RO concentrate is returned to the environment through a surface water discharge to the C-18 Canal approximately 2,000 feet north of the water plant site. The discharge facility consists of a submerged pipe that runs perpendicular across the bottom of the canal, and is designed with 3-inch port holes across the top of the pipe to maximize diffusion into the canal. The RO concentrate has a salinity that is about ½ of the average tidal portion of the C-18 Canal water quality. The outfall was originally permitted in 1989 and has operated continuously as the RO concentrate disposal outfall since 1990. Most recently, the permit renewal application filed in 2008 was granted and last renewed in 2012.

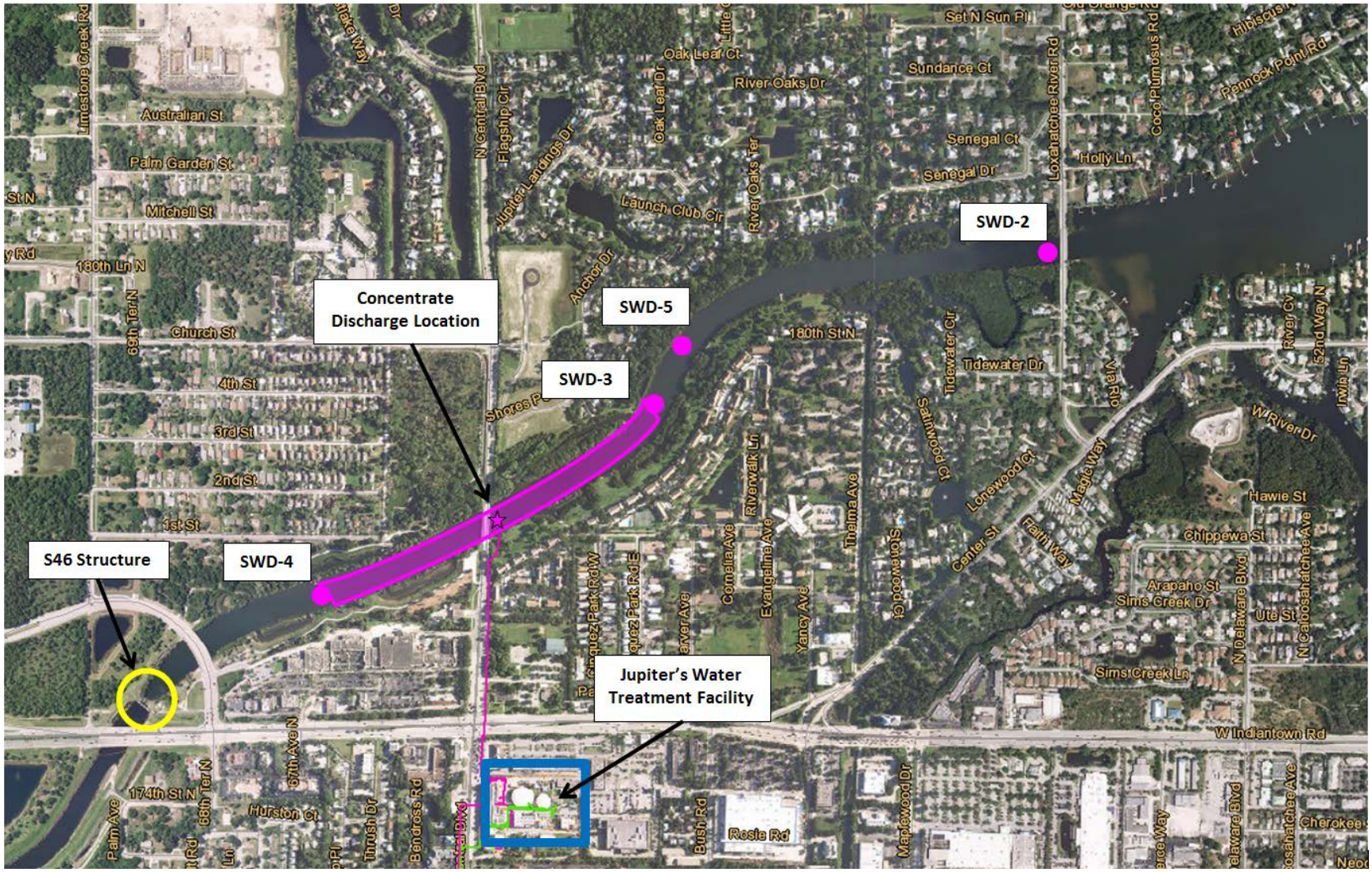
Location of Reverse Osmosis Concentrate Discharge East of Central Blvd. Bridge

Figure 5.6 shows the concentrate discharge location along with the associated mixing zone: 400 meters east and west of the discharge location. Also pictured in **Figure 5.6** are the permit specified monitoring locations, which are described below:

- EFF-1: monthly monitoring location collected from the RO concentrate prior to discharge
- SWD-2: monthly monitoring location downstream of the concentrate discharge collected near Loxahatchee River Road Bridge
- SWD-3: monthly monitoring location 400 meters downstream of the concentrate discharge collected at the eastern edge of the mixing zone
- SWD-4: monthly monitoring location 400 meters upstream of the concentrate discharge collected at the western edge of the mixing zone
- SWD-5: quarterly monitoring location 500 meters downstream of the concentrate discharge collected 100 meters from the eastern edge of the mixing zone

Figure 5.6

RO Concentrate Discharge Location and Water Quality Monitoring Stations



In addition to monitoring requirements, the surface water discharge permit specifies water quality limitations in the effluent for dissolved oxygen, pH, hydrogen sulfide and total copper as well as biannual chronic and acute whole effluent toxicity evaluations. The permit has established a 400 meter mixing zone east and west of the discharge location where there are limits for fluoride, gross alpha particle activity and combined radium 226+228.

Location of Reverse Osmosis Concentrate Discharge

The Town has consistently met the limitations, monitoring requirements and other conditions set forth by this permit with the exception of mixing zone fluoride exceedances. Data review and statistical analysis led to the conclusion that the exceedances of the fluoride limit were directly related to increases in background concentrations of fluoride in the C-18 Canal rather than any changes in the concentrate water quality. FDEP issued an Administrative Order (AO) concurrent with the 2012 permit renewal establishing a schedule for securing the appropriate relief mechanism regarding fluoride in the C-18 Canal. The Town is currently in compliance with the requirements established under the issued AO.

Although for 26 years the Town has responsibly overseen discharge of the RO concentrate and subsequent water quality monitoring, with the ongoing implementation of Numeric Nutrient Criteria (NNC) and Total Maximum Daily Load (TMDL) regulations there is concern about the presence of total nitrogen (TN) in the RO concentrate and the associated effects of nutrient loading into the C-18 Canal. The C-18 Canal flows into the Southwest Fork of the Loxahatchee

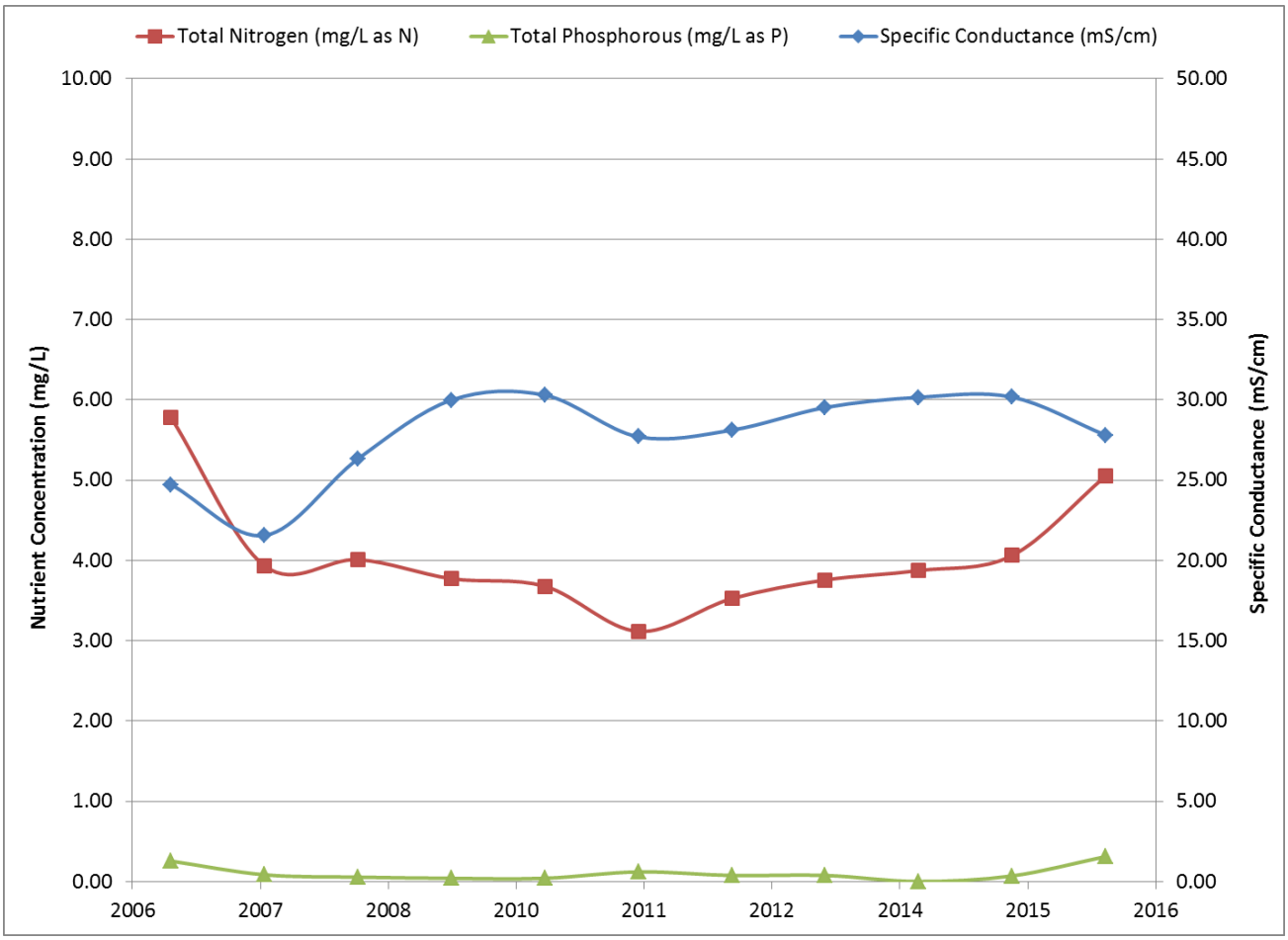
River (SW Fork), which has recently been classified as impaired by FDEP. For assessment purposes, FDEP has divided the Loxahatchee Basin into water assessment areas with unique **W**ater **B**ody **ID**entification (WBID) numbers; the SW Fork is WBID 3226C. Currently, FDEP has established criteria for nutrients, TN and total phosphorous (TP), and nutrient response, chlorophyll *a*, which often serves as an indicator for algae. These criteria are summarized in Table 5.2. The Town in cooperation with multiple Loxahatchee River Stakeholders is working with FDEP to establish a Reasonable Assurance Plan (RAP) to address impairment of the Loxahatchee River.

Table 5.2
Estuary-Specific Numeric Nutrient Criteria (Ch. 62-302.532, F.A.C.)

	Total Phosphorous	**Total Nitrogen**	**Chlorophyll *a***
Loxahatchee River Estuary (Southwest Fork)	0.075 mg/L	1.26 mg/L	5.5 µg/L

Water quality of the RO concentrate has remained relatively consistent over the past decade with an average TN of 4.0 ± 1.4 mg/L; TP remains low to undetected in the concentrate and is not considered significant. Specific conductance, TN and TP of the RO concentrate have been illustrated as annual averages in **Figure 5.7**.

Figure 5.7
Annual Average of TN, TP and Specific Conductance in the RO Concentrate



Historically, TN levels in WBID 3226C are within FDEP specified NNC; however, chlorophyll *a* levels do exceed established limits in this segment of the river. In addition, there are, at times, exceedances of TP. TN, TP and chlorophyll *a* are monitored monthly at stations SWD-3 and SWD-4. These are located at the edges of the mixing zone: 400 meters east (downstream) and west (upstream) of the discharge location. Trends in water quality for TN, TP and chlorophyll *a* are summarized in **Figures 5.8**, **5.9**, and **5.10**. **Figure 5.8** shows that average annual TN remains relatively constant and is well within Florida Department of Environmental Protection's numeric nutrient criteria. On the other hand, **Figures 5.9** and **5.10** demonstrate that TP and chlorophyll *a* levels vary considerably upstream and downstream of the RO concentrate despite consistency in the quality of the discharge water. It is also important to note that while the RO

concentrate has a measurable discharge of TN, the TP contribution in the discharge is considered negligible. Comparison of RO concentrate water quality and resulting quality within the discharge mixing zone suggest that other sources of nutrient loading influence this water segment and certainly contribute to downstream observations of impairment.

Figure 5.8

Water Quality Trends: Total Nitrogen on an Average Annual Basis

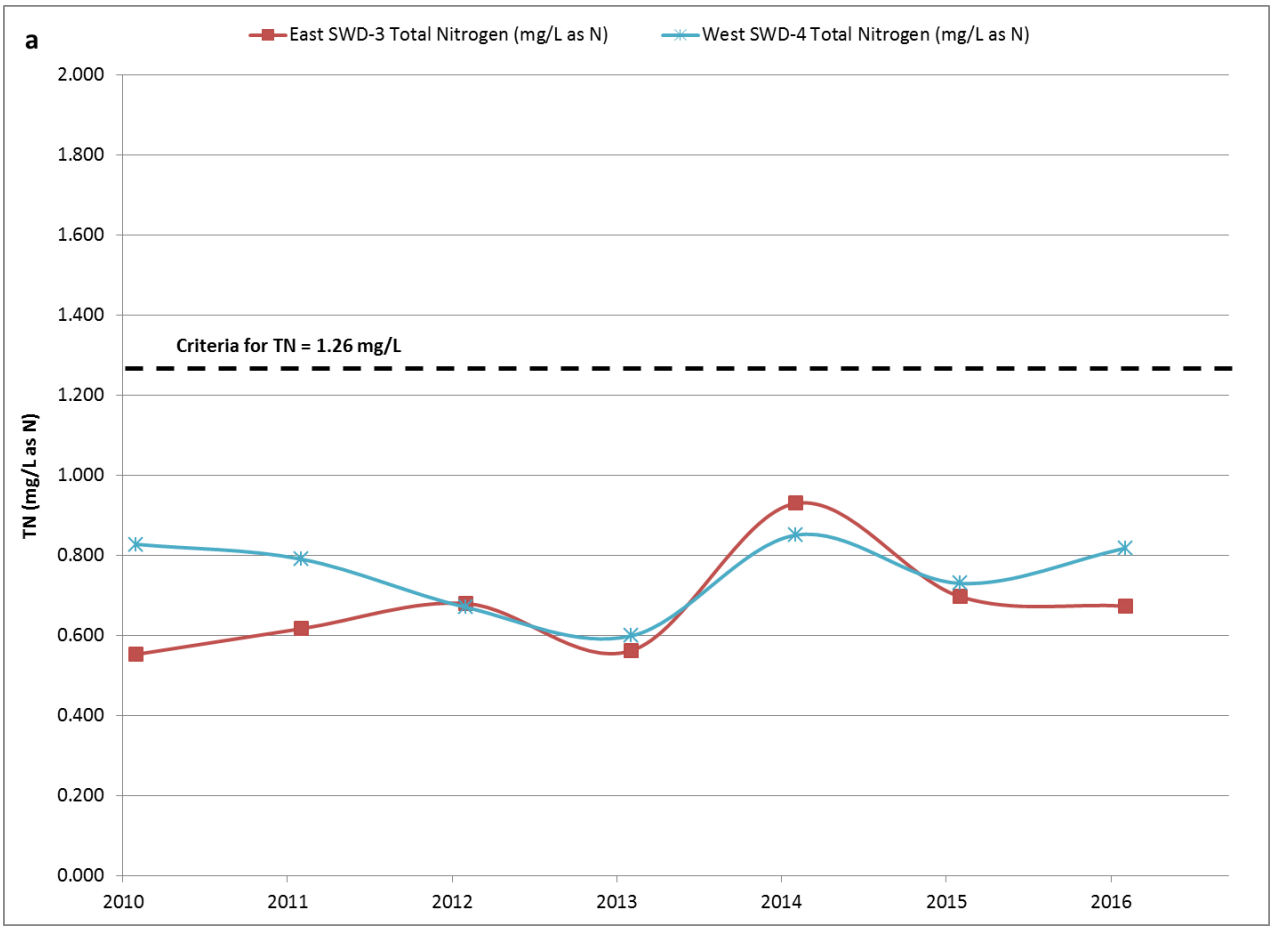


Figure 5.9
Total Phosphorous

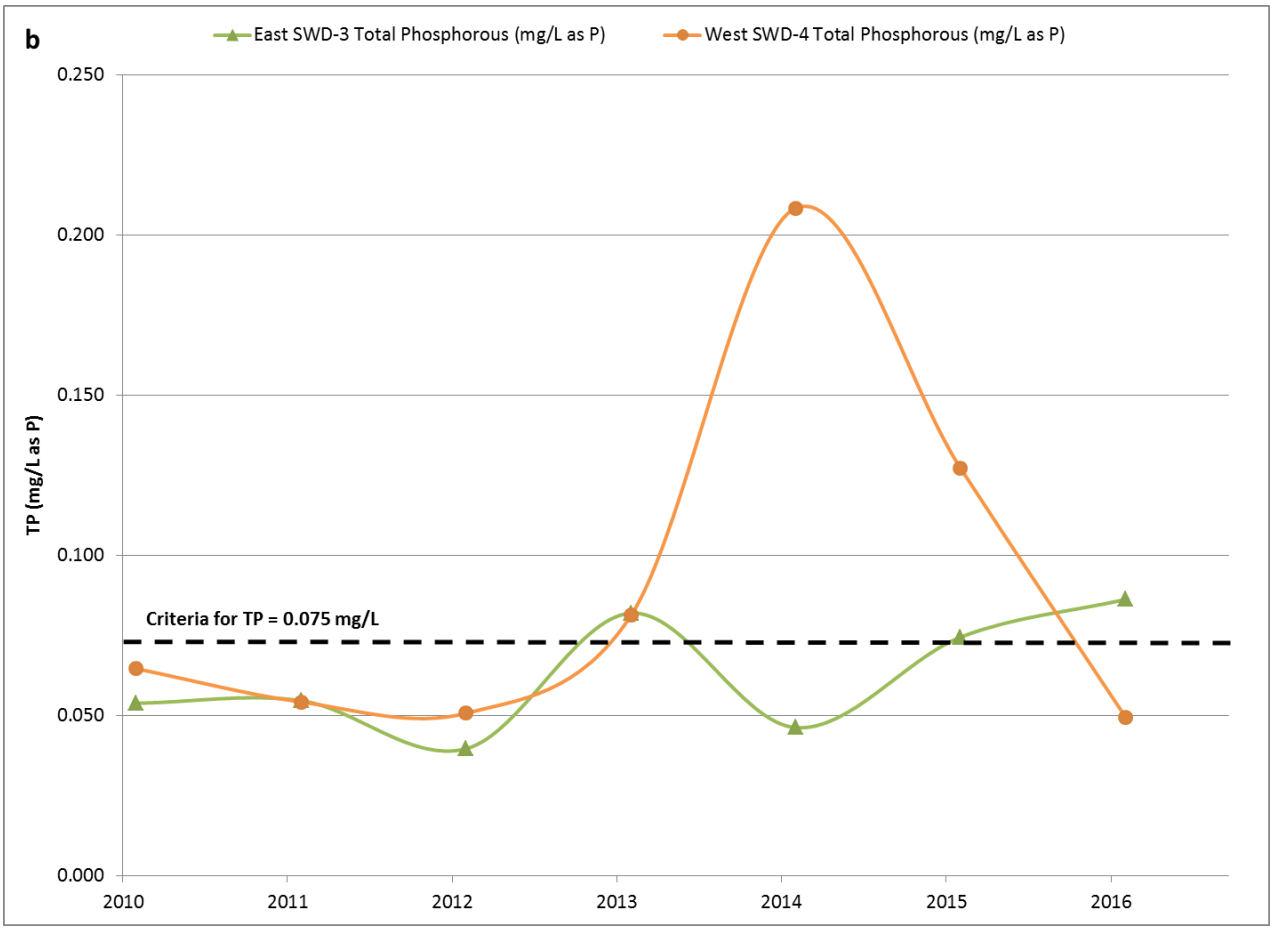
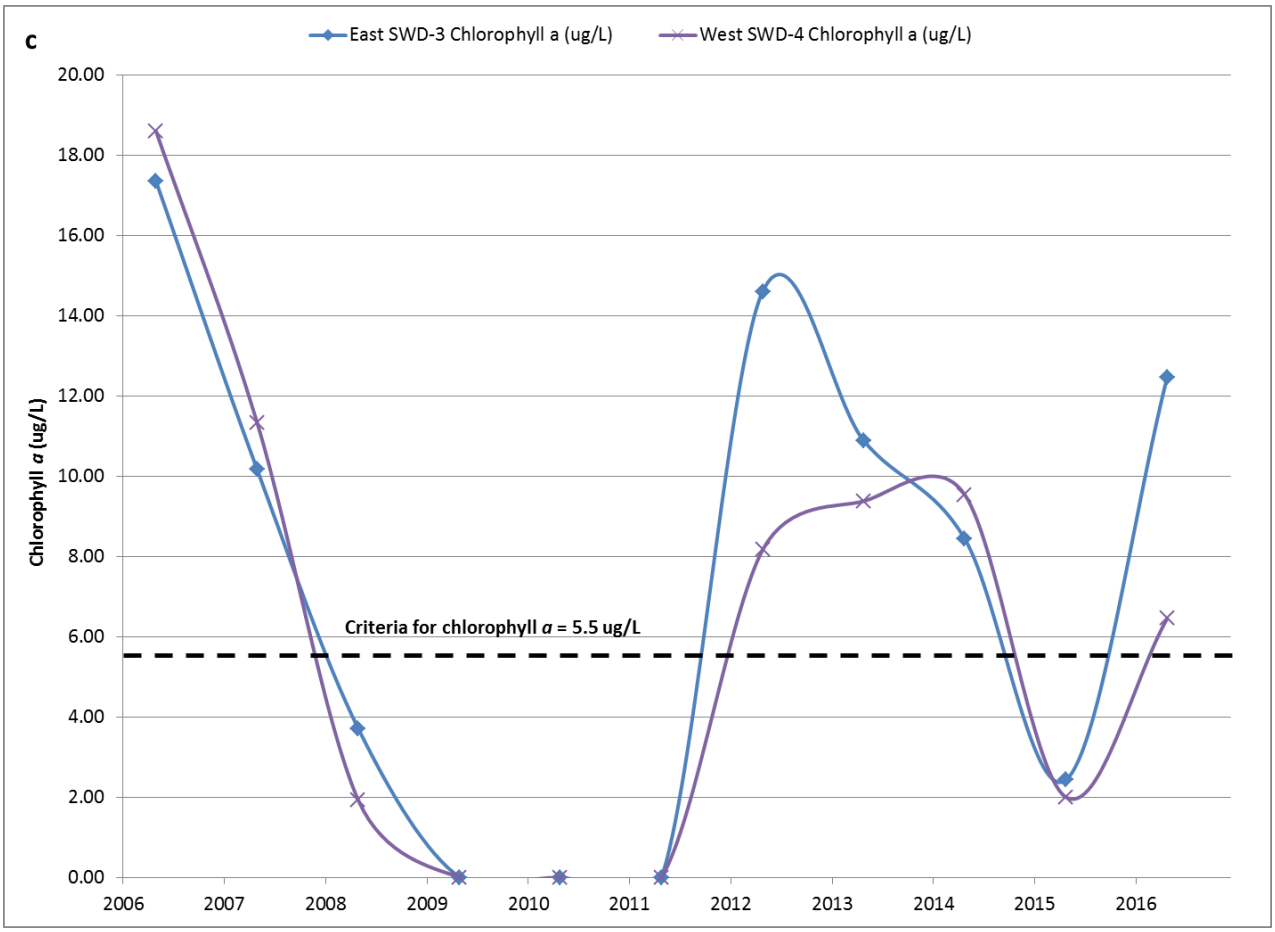
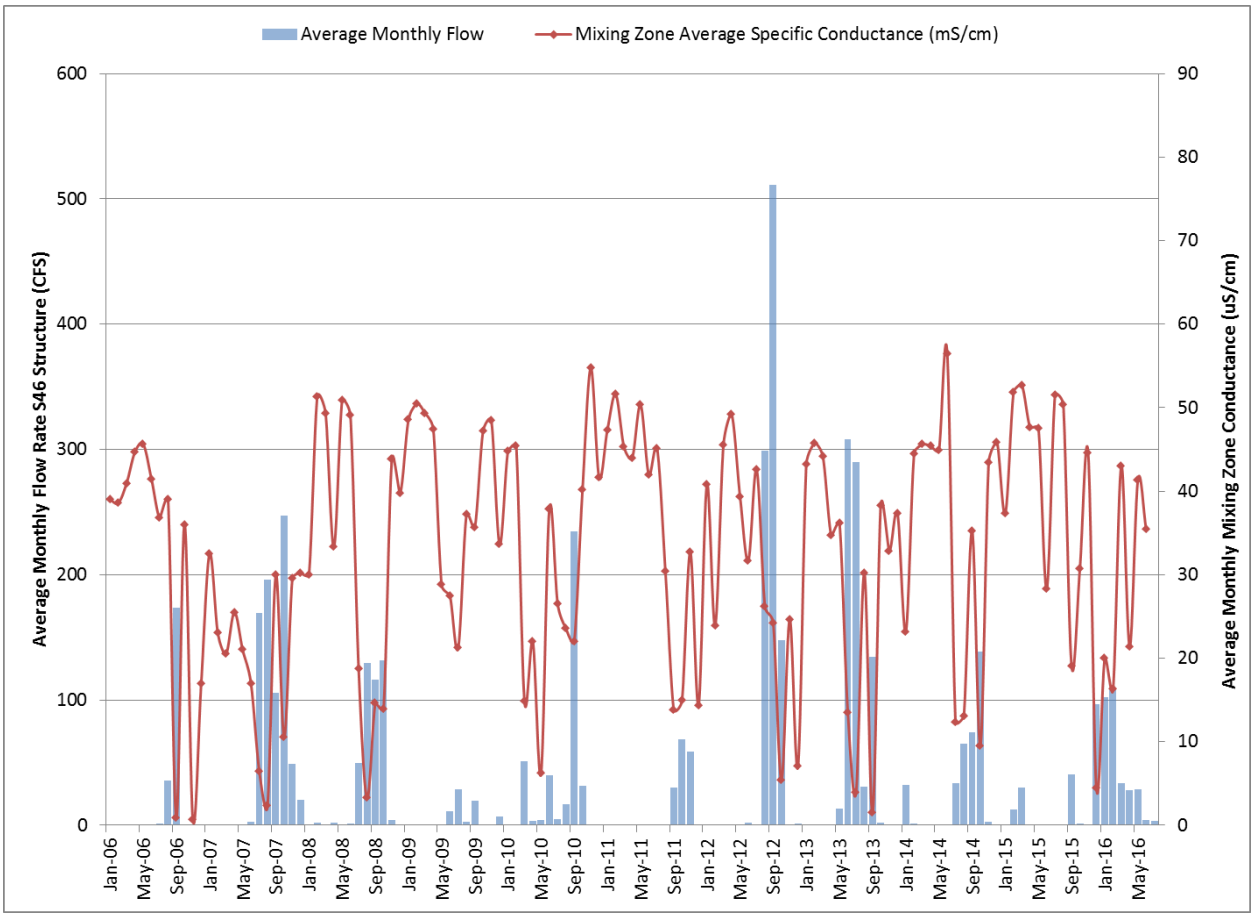


Figure 5.10
Water Quality Trends: Chlorophyll on an Average Annual Basis



To better understand the complex ecology of this water system, consideration should be given to other potential sources of nutrient loading from the surrounding area including stormwater runoff and discharges from the South Florida Water Management District's S46 structure, which is directly upstream of the concentrate discharge location. **Figure 5.11** illustrates average monthly flow in cubic feet per second (CFS) from the S46 structure along with specific conductance within the discharge mixing zone.

Figure 5.11
Average monthly flow rate (CFS) from S46 structure with average specific conductance (mS/cm) in discharge mixing zone



The specific conductance within the mixing zone typically ranges between 30.0 and 40.0 mS/cm, which is consistent with the salinity expected for the estuary. When S46 discharge flows are the highest, specific conductance in the C-18 Canal has decreased to levels consistent with fresh water standards. While introduction of freshwater flows into the C-18 Canal, alone, is not detrimental to the estuary, significant flows from the S46 correspondingly lead to increased loading of TN and TP to the C-18 Canal and downstream SW Fork. Research has shown that the relationship between nutrient concentrations and chlorophyll *a* are common in nature, as elevated nutrient concentrations often drive algal blooms, preventing sunlight and dissolved oxygen from reaching aquatic life including oyster beds and seagrass. **Figure 5.12** illustrates the relationship between annual discharges from the S46 structure and average annual chlorophyll *a* concentrations in the discharge mixing zone. There is an apparent relationship between these parameters wherein years with the highest S46 discharges also correspond to increased chlorophyll *a* concentrations. This correlation does not imply a direct cause and effect

relationship; however, it warrants investigating the need for and benefit of determining threshold flow volumes that can be tolerated by the SW Fork of the Loxahatchee River.

Figure 5.12

Total annual discharge (Mgal) from S46 structure with average annual chlorophyll *a* levels in discharge mixing zone

Overall, definitive conclusions cannot be made regarding the significance of the RO concentrate discharge and the influence it has on the quality of water in the C-18 Canal and downstream SW Fork. The ecology of this estuary is complex with multiple factors contributing to its current impaired state including climate change, urbanization, habitat destruction, and increased nutrient loading. Continued monitoring is recommended in order to better quantify and identify specific cause and effect relationships between nutrients and chlorophyll *a*. This way the remediation efforts can be implemented so as to provide the greatest benefit.

III. Jones and Sims Creek Water Quality Master Plan

Jones and Sims Creeks, which are tributaries of the Southwest Fork of the Loxahatchee River, have historically been shown to be impaired. The main impairments include Fecal Coliform bacteria, Enterococci, and Chlorophyll α. In addition to these three parameters, certain reaches within Jones Creek also fail to meet the FDEP surface water quality criteria for Total Phosphorus (TP) and Dissolved Oxygen (DO). Based on an analysis of the drainage basins, it was determined that pollution within both creeks was primarily a result of nonpoint sources rather than point sources.

The Fecal Coliform exceedances caused the greatest concern relative to other pollutants when analyzing the pollutant sources within the drainage basins. Observed levels commonly exceeded the FDEP water quality criteria by a significant margin, indicating that levels were typically not close to being compliant with the outlined criteria. The FDEP water quality criteria for Class II waterbodies limits levels to 800 Colony Forming Units (CFU) per 100 mL of sample. However, the Total Maximum Daily Load (TMDL) for the Southwest Fork of the Loxahatchee River sets a more stringent single sample level to 43 CFU/100 mL.

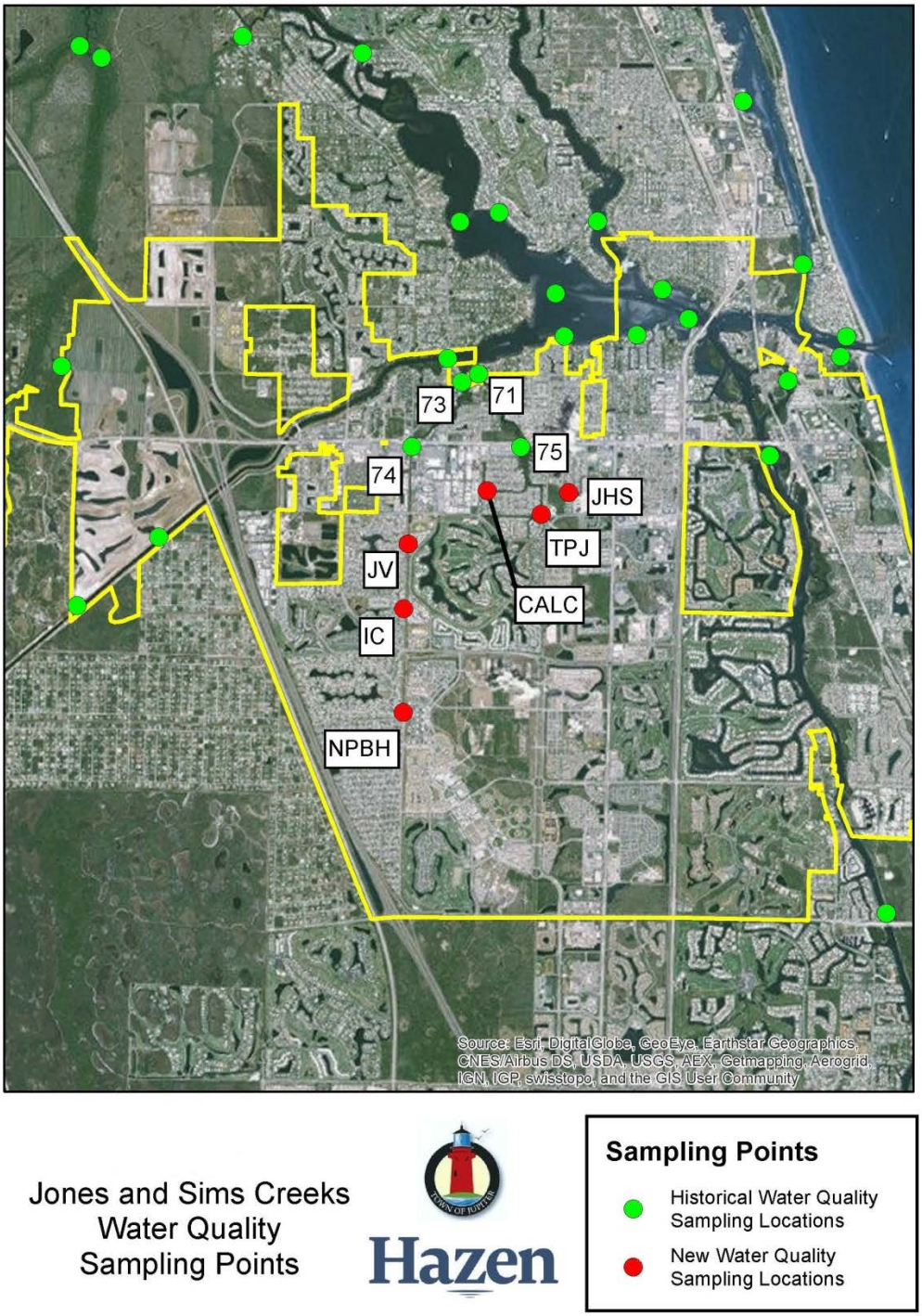
Two active septic tanks exist within the Sims Creek basin, though elevated Fecal Coliform levels were commonly observed throughout both creeks. This indicates that the primary source of pollution is likely from other sources, with septic tanks being a potential secondary source. The lack of point sources within the basin indicates nonpoint sources as being the primary source for the bacteria. As such, the proposed near future improvements within the drainage area are largely programmatic rather than structural.

Based on the limited data available on Fecal Coliform and Enterococci levels within the Jones and Sims Creek basins, additional sampling was proposed in order to more accurately identify the location(s) of the nonpoint pollutant sources. This additional sampling would help determine whether or not structural improvements should or could be utilized to help improve the water quality in both creeks and where programmatic efforts should be focused. The additional advantage of collecting water quality data from new sampling locations is the greater assurance that structural and/or programmatic improvements incorporated into the basin would have an appreciable impact on the observed pollutant levels. This assumes the collected samples would indicate more specific locations where the pollutants are originating from. Due to the higher capital cost of structural improvements relative to the costs for programmatic improvements, this greater detail relative to the source of pollutants within the basins may help assist in better placement of future structural improvements.

The Town was proactive in implementing additional water quality sampling points and in partnership with the Loxahatchee River District (LRD) began sampling at additional locations

within the Jones and Sims Creek watersheds. The new sampling points are depicted in **Figure 5.13**.

Figure 5.13



A summary of the data collected at the four historical sampling points is provided in **Figure 5.14** while the water quality results from samples collected at the new locations are provided in **Figure 5.15** and **Figure 5.16**.

Figure 5.14

Fecal Coliform Levels Measured at Locations Historically Used for Water Quality Sampling

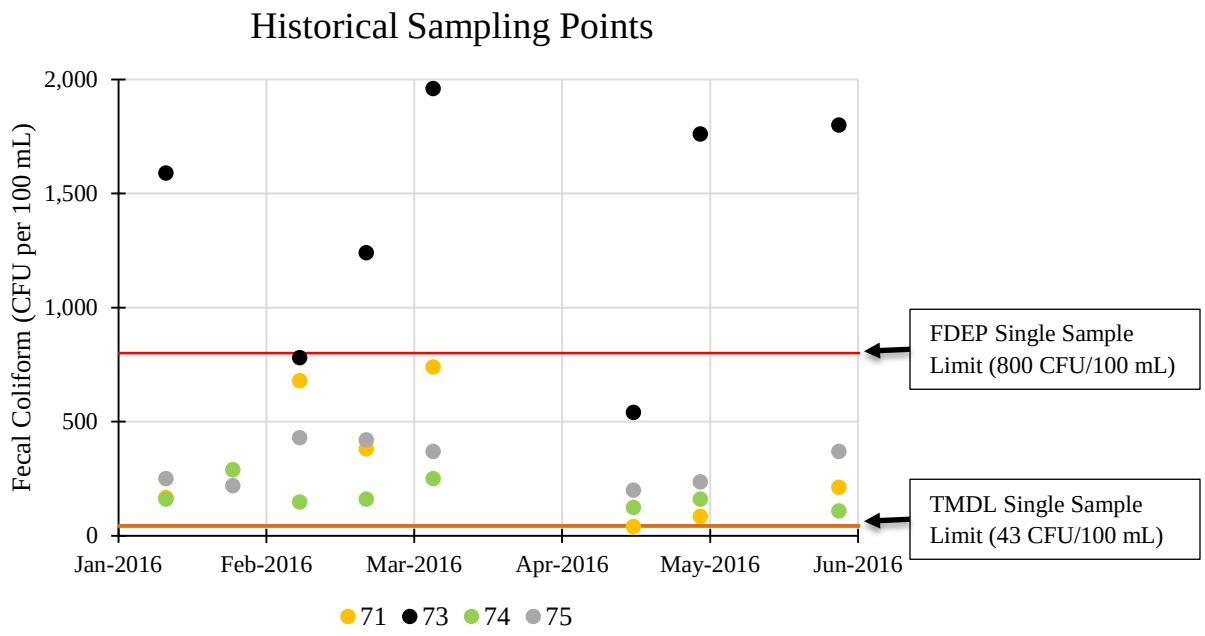


Figure 5.15

Fecal Coliform Levels Measured at New Sampling Locations in Sims Creek

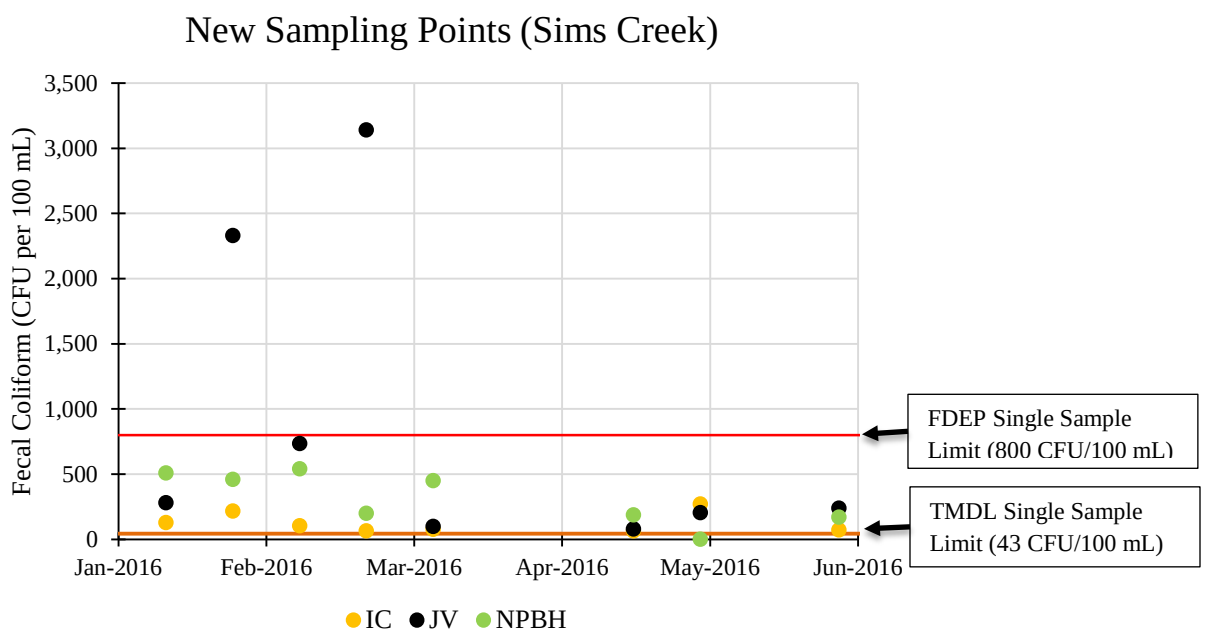
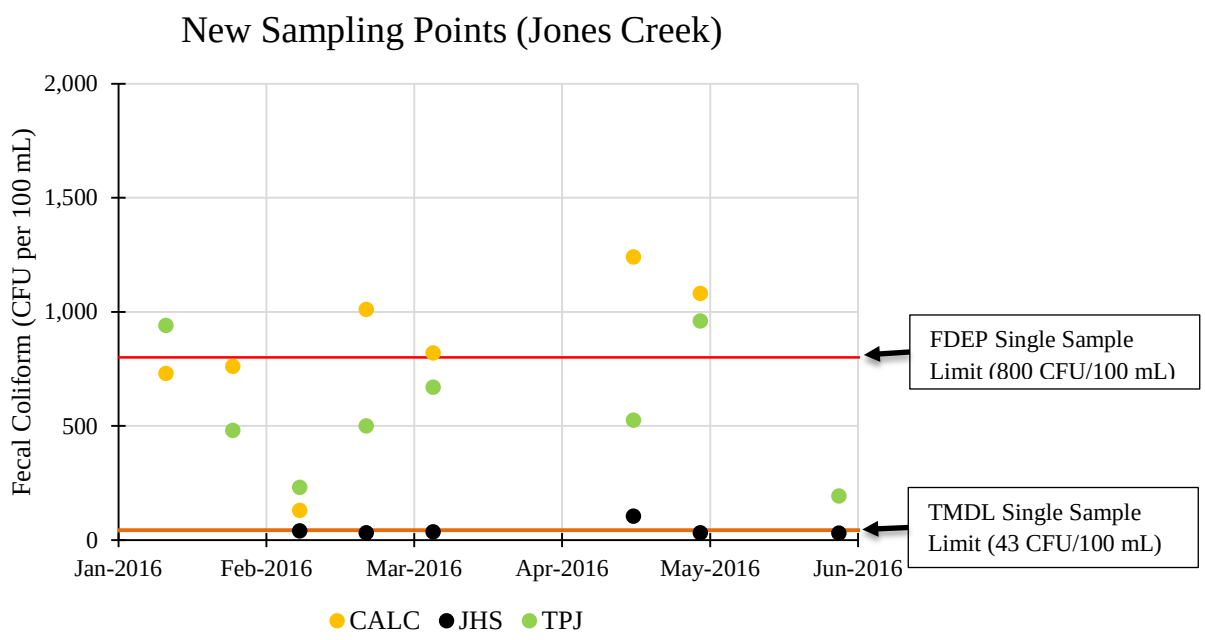


Figure 5.16
Fecal Coliform Levels Measured at New Sampling Locations in Jones Creek



While the additional data collected in Jones and Sims Creek are limited thus far, levels commonly exceed the single sample limit of 43 CFU/100 mL outlined in the TMDL for the Southwest Fork of the Loxahatchee River. Though less frequently, levels also exceed the single sample limit of 800 CFU/100 mL required for Class II waterbodies with no TMDL established. It is recommended that the pollutant levels be compared with rainfall data as the number of samples increases in order to identify potential drivers associated with the pollutant concentrations, particularly during events when exceedances are observed. When reviewing long term historical data in both creeks, elevated Fecal Coliform levels were loosely correlated with rainfall. More specifically, large rainfall events which followed extended dry periods often resulted in elevated bacteria levels observed in the receiving waters in the days following the rainfall event. This could be explained by the gradual accumulation of pollutants during dry periods and the subsequent scouring which occurs during runoff of stormwater. It is recommended that samples be collected from the new sampling locations for a minimum of one calendar year in order to identify potential seasonal variations in water quality before drawing conclusions on the pollutant source(s).

Fecal Coliform exceedances are not commonly observed at other water quality monitoring stations within the Town's limits (see **Figure 5.13** for sampling locations) and it is therefore unlikely that the observed exceedances within the Jones and Sims Creek basins are a result of pollution from other areas within the Southwest Fork basin. Monitoring station 73 (Sims Creek)

typically exhibits the highest sustained bacteria levels compared to the other sampling locations. This is likely due to the sampling location's proximity to two active septic systems within the basin.

IV. Coastal Resiliency and Climate Change

The potential impacts of climate change and sea level rise will likely cause numerous challenges for the Town, including:

- Localized flooding due to tidal back flow into low lying areas
- Inland flooding due to reduced drainage capacity
- Property damage from flooding and coastal erosion
- Salt water intrusion into fresh water aquifers which currently serve as drinking water supplies

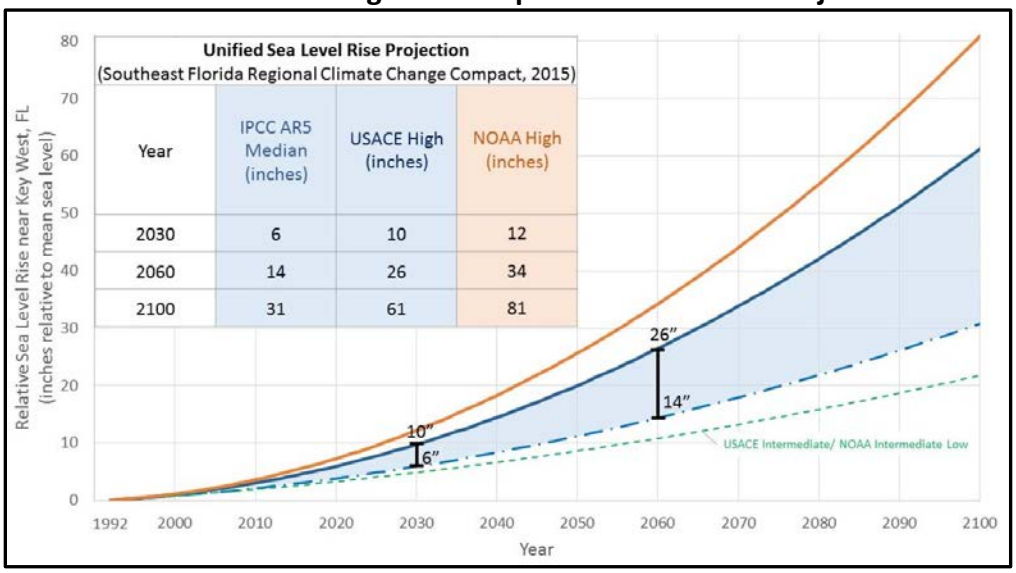
The Stormwater Utility has been proactive in identifying ways to address impending sea level rise (SLR). Since much of the Town's stormwater network discharges directly to tidal water bodies or is indirectly affected by tidal conditions, increases in tidal water levels can stress the stormwater system by effectively reducing its capacity. While the measures required to combat the effects of sea level rise are expected to be costly, proactively preparing for its effects will allow the Town to approach the issues in a more methodical and cost-effective manner.

The Southeast Florida Regional Compact (Compact) was established in order to address the challenges faced by the region relative to the impacts of climate change and sea level rise. The Compact was created by Broward, Miami-Dade, Monroe, and Palm Beach Counties in January, 2010 and allows for increased coordination for mitigation and adaptation activities across county lines. On December 15, 2015, the Town Council adopted Resolution No. 86-15 endorsing and affirming the Compact's efforts. The Compact published the Unified Sea Level Rise Projection [Southeast Florida Regional Climate Change Compact, 2015], which estimates the rate at which SLR is expected to occur. The estimated rates are highly variable. Based on current greenhouse gas emission rate trends, the rise in 2017 sea levels is expected to range from 2 to 3 inches by 2030, 10 to 22 inches by 2060, and 27 to 54 inches by 2100 (**Figure 5.17**). Due to the high level of uncertainty in the magnitude and timing of the increase, it is recommended that the Town implement a phased approach when addressing the impacts associated with elevated seas.

It is recommended that the Town begin proactively addressing sea level rise by investing in planning, phased infrastructure improvements, and code changes to increase resiliency and

instill confidence within the community. If actions are not implemented in preparation for sea level rise, significant adverse impacts could be experienced. Examples of the potential economic impacts include increased flood damage to Town infrastructure, reductions in property values, and increased capital cost for incorporating improvements (relative to the capital cost associated with a phased approach).

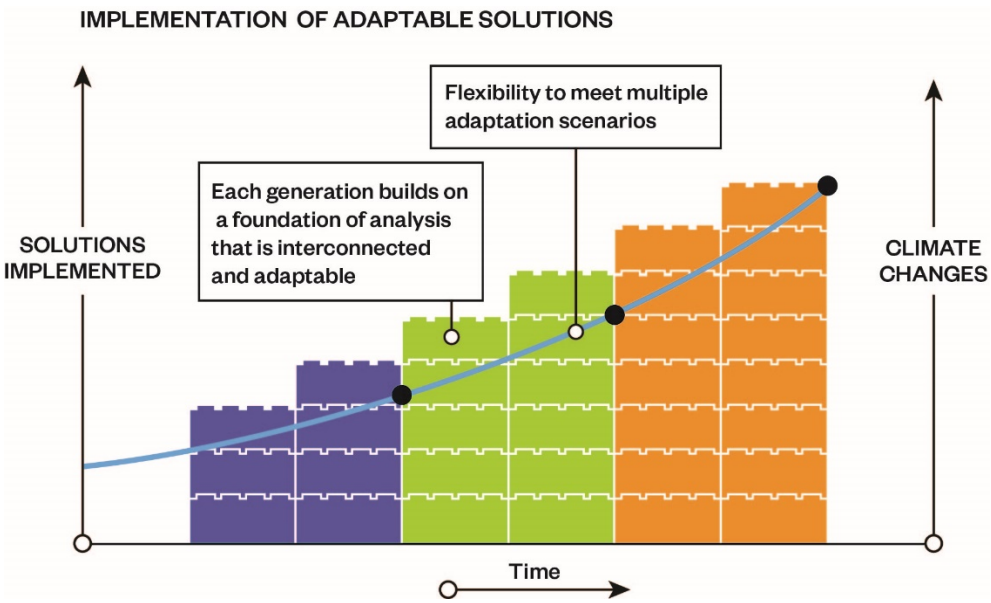
Figure 5.17
Southeast Florida Regional Compact Sea Level Rise Projections



Infrastructure Improvements

Infrastructure improvements incorporated by the Town are inherently necessary when considering SLR. These improvements should be incorporated when routine maintenance or replacement of existing stormwater infrastructure is necessary. Future conditions should be evaluated when determining whether or not improvements to the existing stormwater management system should be made which would allow the Town to be more resilient to the effects of SLR. Proactively determining improvements which would be required with higher sea level conditions would likely prove to be a more cost-effective approach compared to incorporating improvements throughout the Utility when it is a critical need. This cost savings is a result of being able to incorporate improvements with the purpose of increasing resiliency to SLR during scheduled maintenance or construction. Examples of infrastructure improvements include, but are not limited to, pumping capacity and backflow prevention at outfalls to tidal water bodies, increased retention using exfiltration trenches or retention/detention ponds to compensate for reduced network capacity, and construction of tidewater barriers (e.g., sea walls).

It is important that infrastructure constructed for improving the resiliency of the Town be adaptable, allowing for future additions and improvement as sea levels rise. This will prevent the need for future reconstruction of infrastructure. It is also important that infrastructure be constructed with appropriate timing in order to prevent it from aging unnecessarily before being utilized for preventing the impacts of SLR. Solutions for SLR should be implemented in the manner illustrated below, in a phased approach with the nature of the improvements being timed based on the progression of SLR.



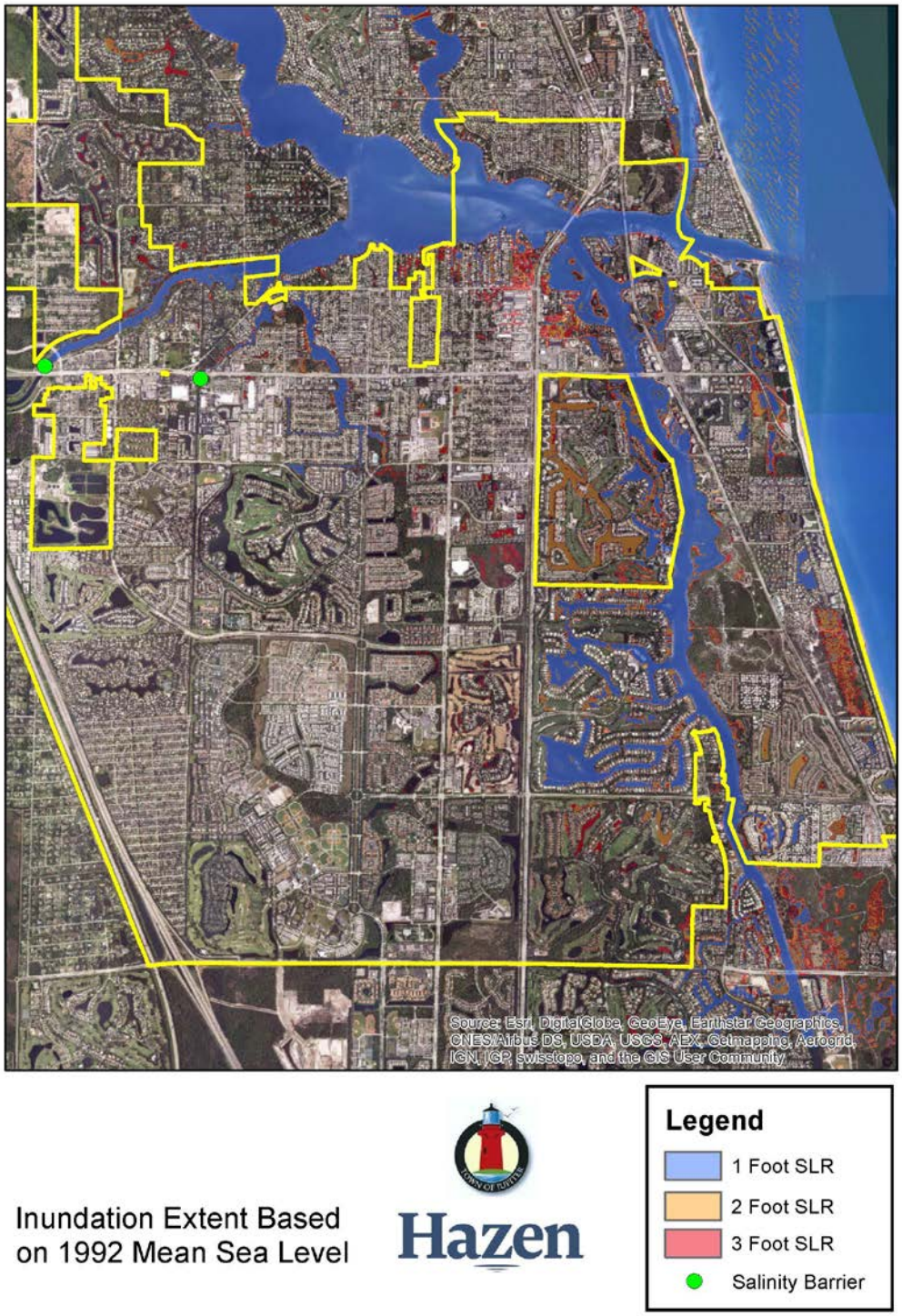
Location of Affected Areas

Identifying areas most susceptible to flooding due to SLR is critical for prioritizing future improvements.

A higher resolution elevation surface was created various sea level conditions in order to identify areas where future flooding is a concern. For the purposes of evaluating the inundation risk at the Town level, an elevation grid size of 5 feet by 5 feet was created using available LiDAR data, currently the most detailed and accurate method of creating digital elevation models. The inundated areas were identified based on elevation alone and without consideration of head losses in the drainage system or storm surge associated with tropical storms.

The inundation extent for the three SLR scenarios using the higher resolution elevation surface is illustrated in **Figure 5.18**.

Figure 5.18



Inundation Extent Based on 1992 Mean Sea Level

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A comparison of the inundation extents estimated using the Compact's results and the results from using a 5 foot by 5 foot elevation surface indicates the results are similar for both cases.

Based on the Town-wide inundation extent, the areas where SLR is of greatest concern appear to be those shown in **Figure 5.19**.

Figure 5.19

Inundation Extent Based on 1992 Mean Sea Level

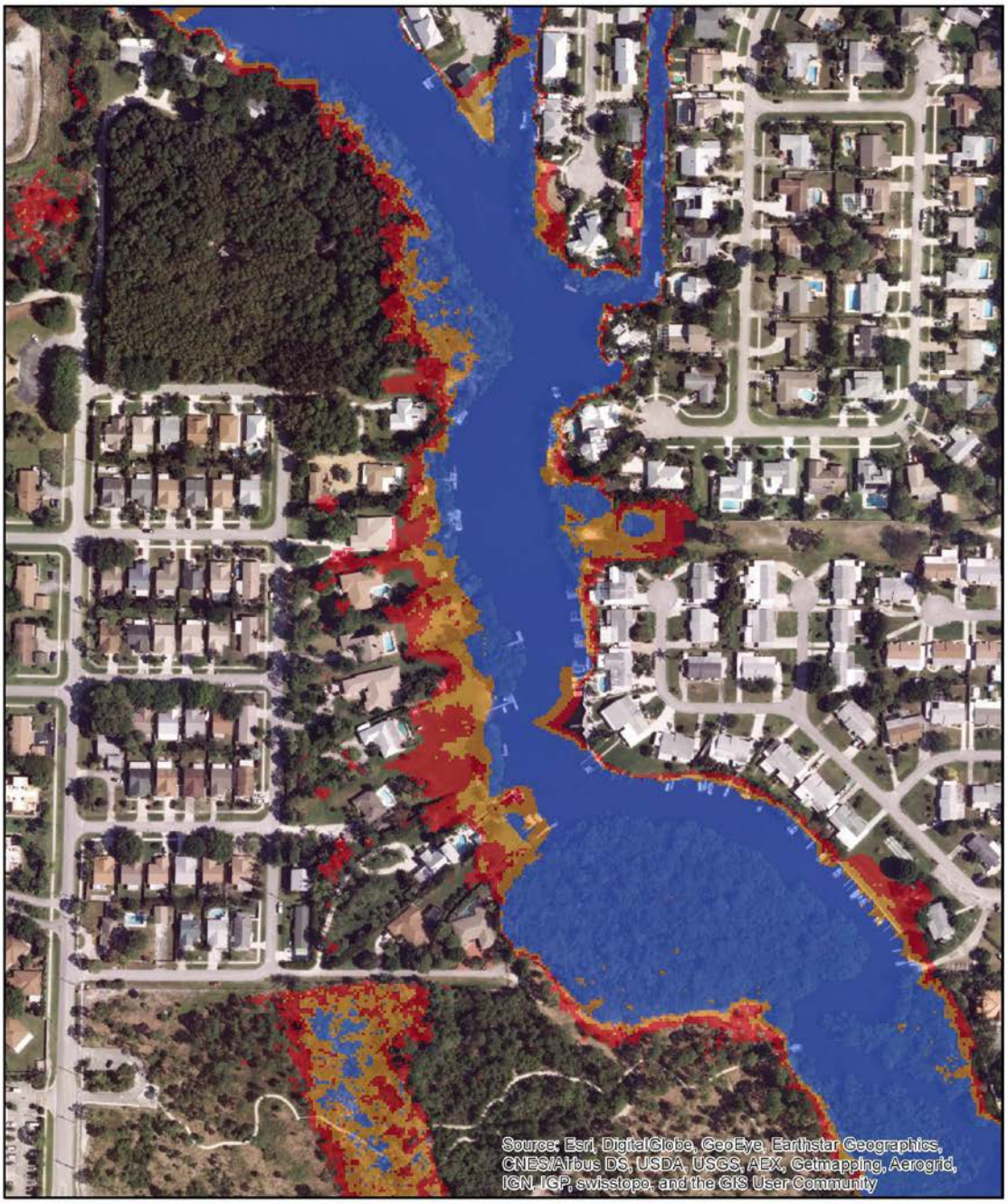
Hazen

Legend

- 1 Foot SLR
- 2 Foot SLR
- 3 Foot SLR

Other areas within the Town's limits appear to be at limited risk of being impacted by SLR. However, some residential structures which abut Jones Creek (**Figure 5.20**) and Sims Creek (**Figure 5.21**) may experience increased nuisance flooding as the average sea level elevation increases.

Figure 5.20



Inundation Extent Based on 1992 Mean Sea Level Jones Creek

Hazen

Legend

- 1 Foot SLR
- 2 Foot SLR
- 3 Foot SLR

Figure 5.21

Inundation Extent Based on 1992 Mean Sea Level Sims Creek

Hazen

Legend

- 1 Foot SLR
- 2 Foot SLR
- 3 Foot SLR

Increases in flooding frequency are also expected near Carlin Park (**Figure 5.22**). However, due to the limited infrastructure in this area, protecting Carlin Park should not take precedence over the other areas at risk of flooding. Since the bathtub analysis approach disregards the hydraulic impact of increased tailwater elevations, head losses in the conveyance system, and storm surge, the actual extent and severity of flooding may be greater than what is depicted in the provided figures.

Figure 5.22

Inundation Extent Based on 1992 Mean Sea Level Carlin Park

Hazen

Legend

- 1 Foot SLR
- 2 Foot SLR
- 3 Foot SLR

It is recommended that the Town begin considering detailed hydrologic/hydraulic modeling which incorporates the Town's stormwater infrastructure in order to more accurately estimate the impacts associated with rising sea levels. Taking into account head losses associated with the conveyance system would likely result in more expansive predicted inundation than the scenario associated with the bathtub analyses completed above.

Method to Assess Asset Vulnerability and Criticality

Although the impacts of SLR to the Town are relatively localized, it would be unreasonable to assume the Town could appropriately prepare for elevated sea levels in a short period of time. Not only could this be financially difficult since the infrastructure improvements associated with SLR preparedness are immense, but (assuming initiation of action is delayed) doing so may not improve the resiliency of the most vulnerable areas until the effects of SLR have already been incurred. Improvements to at-risk areas should be constructed in a modular manner, allowing for future improvements to be incorporated, and should only be constructed when the time is appropriate (e.g. not excessively in advance of when the infrastructure would be required). A tentative list of areas where, based on available LiDAR data, inundation is likely to occur is provided below. This list should serve as an initial list of areas which may be considered Adaptation Action Areas until more detailed hydrologic/hydraulic modeling is completed for the system.

- Seminole Ave Pump Station Basin and Yacht Club Estates (**Figure 5.19**)
- Portions of Jones Creek (**Figure 5.20**)
- Portions of Sims Creek (**Figure 5.21**)
- Carlin Park (**Figure 5.22**)

Asset vulnerability should be determined based on the probability of flooding while accounting for changes in rainfall intensity and increasing tailwater conditions associated with rising sea levels. While the bathtub model approach used in the formation of the figures above is acceptable for planning level identification of vulnerable areas, hydrologic/hydraulic modeling is necessary to more accurately estimate the potential impacts of SLR.

Asset criticality is related to the function of the asset. For example, utilities, emergency response networks, or major highway systems are all critical assets and greater priority should be placed on these assets for flood protection. An additional layer of analysis should also be considered by the Town, which is the asset capital cost for replacement and/or maintenance. Assuming broad sweeping responses to SLR may not be economically possible, a phased approach which considers the asset cost, importance, and level of risk to flooding is recommended.

Regulatory and Code Considerations

Taking regulatory action or altering existing codes may not provide an immediate benefit to the Town, but doing so would allow for the phased improvement of Town infrastructure and reduce placement of additional investment at risk. Regulatory actions help insure that private and public assets are properly protected against climate change impacts expected during their useful life, resulting in more sound investments. These actions would more effectively increase the overall level of preparation by the Town relative to climate change. Many coastal municipalities in South Florida are beginning to view climate change as an imminent threat to the economy and existing infrastructure and have begun incorporating changes in their codes and regulations to prepare for future conditions. Furthermore, the South Florida Regional Planning Council (SFRPC) has outlined policy options for adaptive planning for SLR which are not specific to certain municipalities and can instead be applied more generally with all coastal communities faced with SLR [South Florida Regional Planning Council, 2013].

Examples of regulatory and code considerations outlined by the SFRPC are as follows:

- Identify Adaptation Action Areas (AAAs) which is an "optional comprehensive plan designation for areas that experience coastal flooding and are vulnerable to the related impacts of rising sea levels for the purpose of prioritizing funding for infrastructure needs and adaptation planning." [South Florida Regional Planning Council, 2015].
- Apply AAA overlay zones to establish areas with stricter and/or additional criteria for future development.
- Include additional floodplain development restrictions above the National Flood Insurance Program minimum standards. Possible restrictions include altering the use restrictions within the 100-year floodplain or design requirements within the 500 year floodplain.
- Limit public spending for building and/or maintaining infrastructure within the 100 or 500 year floodplains.
- Require 2 feet or more of freeboard for new structures within a tidally influenced 500 year floodplain.
- Provide landowners with incentives such as Transfer of Development Right programs to encourage practices which help mitigate the impacts of SLR.
- Implement building restrictions to limit what is allowed to be built on a property after being damaged or destroyed by natural conditions.

- Impose impact fees within an AAA for all future residential and non-residential development. These fees would help offset the cost of various necessary improvements required within the AAA as a result of SLR.

While other regulatory and/or code changes could be used by the Town to help in the preparation for SLR, the preceding list should act as a guide for Town staff when evaluating which measures to implement. If the listed actions (or actions similar to those listed) are incorporated into the Town's plan to prepare for SLR, immediate improvements relative to the Town's resilience to SLR are not expected. Instead, improvements will occur gradually as redevelopment and new construction continue. This is acceptable since the Town is being proactive in identifying opportunities for mitigating the impacts of SLR. By starting early, sufficient time will be provided to allow the benefits associated with the stricter regulations and codes to be fully realized.

Rainfall Intensity and Existing Level of Service

Gradual increases in global temperatures have not only resulted in sea level rise due to melting of arctic ice, but have also resulted in weather pattern changes. Changes in weather patterns have been characterized by fewer total rainfall events with a higher average intensity. In the Southeast region of the United States, the number of extreme precipitation events (specified as being greater than 6 inches per day) recorded between 1985 and 2014 was 53% greater than the number of events recorded between 1955 and 1984 [Dourte *et al.*, 2015]. While high intensity events occur much more frequently, rainfall events ranging in intensity between 3 to 6 inches per day were shown to occur only 5% more often during the same timeframes [Dourte *et al.*, 2015]. Fewer rainfall events with intensities of less than 3 inches per day were measured following 1985 than there were between 1958 and 1984 [Dourte *et al.*, 2015]. While these changes in rainfall intensities are representative of the entire Southeast Region, changes in rainfall intensity in South Florida are thought to be similar. For example, frequency of heavy rainfall events (top 10% in terms of depth) were shown to increase in the tropics while average rainfall events (25-75% in terms of depth) were shown to decrease in frequency between 1979 and 2003 [Lau and Wu, 2006].

Changes in rainfall intensity, frequency, and duration result in potential changes to the stormwater network's level of service. It is likely that despite the Town being proactive, increased nuisance flooding in low lying areas or areas with insufficient drainage is likely. The Town's current level of service relative to flooding frequency is included in **Table 5.3**. This level of service is specified in the Guide for Development Design and Construction Standards – Water and Stormwater [Town of Jupiter Utilities, 2014].

Table 5.3
Current Town of Jupiter Flooding Level of Service

Structure / Facility	Level of Service Criteria
Houses and Buildings	No flooding in 100 year, 72 hour storm
Arterial Roads	Half of Road Width Dry in 25 year, 72 hour storm
Collector Roads	Entire Road Width Dry in 10 year, 24 hour storm
Local Roads	Flooding allowed at road crown in 10 year, 24 hour storm

Definitions of the Town facilities referenced above are as follows:

Arterial Road – Divided or undivided, relatively continuous routes that primarily serve through traffic, high traffic volumes, and long average trip lengths. Traffic movement is of primary importance, with abutting land access of secondary importance. Arterials include expressways without full control access, US numbered routes, and principal state routes.

Collector Road – a road satisfying one or both of the following requirements: (1) carries traffic from local streets to the major system of arterial streets and expressways and which may provide access to abutting properties or (2) a street that collects the traffic from multiple local streets and carries the traffic to another through road collector or major system or arterial streets and expressways.

Local Road – A road that is: (1) a dead end, (2) looped with a single access off of a collector or arterial street, or (3) a through street that is not required to receive and pass traffic from another street.

Eganfuskee Street October 17, 2016 King Tide Flooding

With changes in weather patterns occurring and in turn the design storm depth effectively increasing, much of the existing stormwater infrastructure may not meet its originally designed Level of Service (LOS). This reduction in LOS can be attributed to increases in rainfall intensity and tailwater conditions (primarily associated with rising sea levels). Therefore, it is recommended that the Town's Flooding LOS be reevaluated and adjusted as necessary to account for changing rainfall intensities and tailwater conditions. The LOS should be adjusted if it is economically difficult to achieve the current LOS criteria as a result of the changes in hydrologic/hydraulic conditions associated with SLR and climate change.

Jupiter Inlet October 17, 2016 King Tide Flooding

Section IV References

Dourte D. R., C. W. Fraisse, W. L. Bartels. “Exploring Changes in Rainfall Intensity and Seasonal Variability in the Southeastern U.S. Stakeholder Engagement, Observations, and Adaptation.” *Climate Risk Management 7* (2015): 11-19.

Lau, K-M., and H-T. Wu. "Detecting trends in tropical rainfall characteristics, 1979–2003." *International Journal of Climatology* 27.8 (2007): 979-988.

South Florida Regional Planning Council. “Adaptation Action Areas Guidebook”. (2015).

South Florida Regional Planning Council. “Adaptation Action Areas: Policy Options for Adaptive Planning for Rising Sea Levels”. (2013).

Southeast Florida Regional Climate Change Compact. “Unified Sea Level Rise Projection – Southeast Florida”. (2015).

Town of Jupiter Utilities. “Guide for Development Design and Construction Standards – Water and Stormwater”. (2014).

V. Recertification Program for Existing Stormwater Management Systems

Jupiter West Plaza

It is recommended that the Town begin implementing a surface water permit recertification program in order to ensure permitted stormwater management systems are being operated and maintained in accordance with their respective South Florida Water Management District (SFWMD) permit conditions. For systems which do not have a SFWMD permit due to their size, verification of the original drainage calculations and engineering drawings associated with the Town permit should be compared to the system's current conditions. As part of the recertification program, permittees would be required to have their stormwater management infrastructure inspected by a Florida professional engineer to verify compliance with the permit conditions while also identifying any changed conditions which may affect the system's performance. This program is currently being successfully implemented throughout Broward County and is regulated by the County and local drainage districts.

When operating the program, the Town would require that permits be renewed every five years only if the Town in its opinion possesses probable cause that the stormwater management system is not functioning as originally designed and constructed. Not only would this help the Town by likely improving the water quality and water quantity level of service provided by the stormwater management system, but it would also be beneficial for the permittees as it helps minimize the chance of flooding on the property. By requiring routine maintenance the useful life of the system would effectively increase, which could save the permittee significant capital. Examples of the steps associated with the permit renewal process include, but are not limited to, ensuring structures and grates are clear of obstructions, check depth of material/debris in pipe, and check for alterations to the stormwater management system. Most importantly, the program would be implemented to ensure no alterations to retention/detention facilities or control structures have taken place without the required authorization.

Failure of a permittee to comply with the five year permit renewal program would first result in the issuance of a noncompliance letter issues to the permittee. A violation letter would then be issued to the permittee if actions are not taken following receipt of the noncompliance letter.

Violation fees could then be levied against the permittee if deemed necessary by the Town. In addition to fees, issuance of additional permits could be withheld until the permittee meets the surface water permit renewal requirements. Agencies such as the North Springs Improvement District (NSID) and South Broward Drainage District (SBDD), which currently operate permit renewal programs, have historically experienced minimal noncompliance cases. If a permittee failed to comply with the renewal requirement, the Town would have the ability to conduct an in-house inspection of the private drainage system and recover the costs of inspection and/or corrective actions taken through fees charged to the permittee.

The benefits of implementing this program are significant for the Town, as the additional maintenance of stormwater systems may reduce the need for future capital improvements. In order to help promote the program, various measures could be taken by the Town when it is first implemented. For example, the renewal fee could be waived or set at a reduced amount to lessen the financial impact on the permittee.

Communicating with the permittees to make them aware of the potential economic benefit(s) associated with maintaining their stormwater systems on a regular basis would also be beneficial. The primary economic benefits which may result from the additional stormwater network maintenance include reduced flood damage and extended useful life of the drainage infrastructure.

Jupiter West Plaza

VI. Neighborhood Infrastructure Equity Program

Within the Town, many residential communities and commercial properties have retained their drainage system ownership and maintenance responsibilities.

Over the past decade, many residential homeowner and property owner associations have petitioned the Town requesting that the Town assume ownership and maintenance responsibility for the publicly accessible streets.

During the Town's development, dedication of ownership and responsibility for the continued maintenance of the roadway and connected drainage system followed no logical standard.

Beginning in 2010, the Town initiated a program, known as the Infrastructure Equity Program, to develop equitable methodology for the Town's to assume maintenance and/or ownership of these facilities from private communities. In general, the Town Council established that the transfer of responsibility for the stormwater management infrastructure would be acceptable provided that extraordinary maintenance neglect is addressed in addition to the community providing the Town funding for renewal and replacement relative to the then current level of depreciation of the facilities. The Neighborhood Infrastructure Equity Study dated August 2007 quantifies the infrastructure that potentially would be subject to transfer to the Town's ownership and maintenance responsibility, its current condition and an estimate of its stormwater management renewal and replacement (R&R) funding requirements.

As of this date, the communities of New Haven, The Island at Abacoa, Martinique, Jupiter Village, Valencia, Tuscany, Hammock Trace and Cambridge, have acted to transfer their facilities to the Town. Meanwhile, the following neighborhoods have also initiated the transfer process:

- Colony of Maplewood
- Somerset
- Clocktower Hammock
- Osceola Woods
- Indian Creek (Stillwater Ph V)

Meanwhile, at least another 33 communities have expressed interest or have the potential to enter the program.

It is important to note that the Neighborhood Infrastructure Equity Program originally was formulated to adequately address the added stormwater related capital revenue requirements (accumulated depreciation/renewal and replacement) of these systems, up to the point of transference to the Town's ownership. However, it does not take into account the future renewal and replacement funding needs of these systems or the added operation and maintenance costs associated.

Further complicating matters in 2015, the R&R contributions provided by communities opting into the program that were intended to fund the accumulated renewal and replacement liability for just stormwater assets was redirected to the Town's General Fund. This change not only has created a deficit in the Stormwater Funds reserve requirement but also has led to compounding negative effect financially from a cash flow basis within the Stormwater Enterprise Fund. As more communities opt into the asset transfer program, significant pressure will result on the financial well-being of the Stormwater Utility.

Table 5.4 provides a status report on the renewal and replacement contribution and additional maintenance expenses associated with the program.

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Table 5.4

Infrastructure Equity Program

Contributions Deposited Within Stormwater Fund

Neighborhoods Turned Over	Effective Date	1st Maint Year	1st Maint Yr Maint Costs	Term in Years	Depreciation Collection Details: Total Amount	Annual Amount	Total Collected	Balance to be Collected
New Haven	08/11/11	2012	$ 14,465	10	$ 121,043	$ 12,104	$ 60,522	$ 60,522
Island at Abacoa	08/08/13	2014	4,719	9	40,124	4,000	16,124	24,000
Martinique	11/18/14	2015	10,471	10	61,950	6,195	12,390	49,560
Total Stormwater Fund			$ 29,655		$ 223,117	$ 22,299	$ 89,036	$ 134,082

Contributions Deposited Within General Fund/Capital Projects Fund

Neighborhoods Turned Over	Effective Date	1st Maint Year	1st Maint Yr Maint Costs	Term in Years	Depreciation Collection Details: Total	Annual	Total Collected	Balance to be Collected
Jupiter Village	08/18/15	2016	$ 14,784	10	$ 373,078	$ 33,025	$ 108,878	$ 264,200
Valencia	08/18/15	2016	5,124	5	45,450	9,090	9,090	36,360
Tuscany	08/18/15	2016	11,372	10	106,650	10,665	10,665	95,985
Hammock Trace	12/15/15	2016	1,792	6	24,650	4,930	2,465	22,185
Cambridge at Abacoa	12/15/15	2016	13,941	10	114,200	11,420	11,420	102,780
Total Neighborhoods Turned Over			$ 47,013		$ 664,028	$ 69,130	$ 142,518	$ 521,510

Neighborhoods Applied Under Program	Effective Date	1st Maint Year	1st Maint Yr Maint Costs	Term in Years	Depreciation Collection Details: Total	Annual
Colony	2017	2018	$ 1,763	10	$ 24,685	$ 2,469
Somerset At Abacoa	2017	2018	1,094	10	5,005	501
Clocktower Hammock	2017	2018	2,935	10	15,737	1,574
Osceola Woods	2017	2018	4,227	10	26,733	2,673
Indian Creek (Stillwater Ph V)	2017	2018	2,025	10	27,674	2,767
Total Neighborhoods Applied Under Program			$ 12,044		$ 99,834	$ 9,983

Neighborhoods with Potential to Apply Unc	Effective Date	1st Maint Year	1st Maint Yr Maint Costs	Term in Years	Depreciation Collection Details: Total	Annual
Indian Creek (Arrowhead Ph I)	2018	2019	$ 2,115	10	$ 30,655	$ 3,066
Indian Creek (Augusta Townhomes Ph	2018	2019	1,956	10	21,438	2,144
Indian Creek (Eagle Ridge Ph VIII A&B)	2018	2019	8,103	10	108,984	10,898
Indian Creek (Harvest Moon Ph III A)	2018	2019	1,077	10	23,144	2,314
Indian Creek (Monterey Ph IV B)	2018	2019	1,117	10	23,450	2,345
Indian Creek (Muirfield Ph XI)	2018	2019	2,994	10	34,928	3,493
Indian Creek (Ph III B)	2018	2019	2,075	10	50,912	5,091
Indian Creek (Pinecrest)	2019	2020	4,091	10	45,304	4,530
Indian Creek (Raintree Ph X)	2019	2020	3,191	10	43,603	4,360
Indian Creek (Wandering Trail Ph IX)	2019	2020	4,213	10	54,760	5,476
Indian Creek (Wingfoot)	2019	2020	2,086	10	24,973	2,497
Jupiter Lakes Condos	2019	2020	2,429	10	45,627	4,563
Jupiter Lakes Villas	2019	2020	2,867	10	52,831	5,283
Jupiter Ocean Rc	2019	2020	3,735	10	63,420	6,342
Jupiter Plantation	2019	2020	5,600	10	99,302	9,930
Wood Duck	2020	2021	1,883	10	31,161	3,116
Chasewood North	2020	2021	3,752	10	66,695	6,670
Jupiter Bay	2020	2021	6,722	10	100,572	10,057
Jupiter Dunes	2020	2021	2,717	10	38,071	3,807
Jupiter Lakes Townhomes	2020	2021	682	10	13,751	1,375
Bluffs Marina	2020	2021	5,288	10	75,379	7,538
Maplecrest	2020	2021	2,992	10	48,590	4,859
Riverwalk	2020	2021	6,196	10	88,120	8,812
Woodland Estates	2021	2022	9,199	10	119,077	11,908
Laurel Oaks	2021	2022	2,043	10	33,125	3,313
Park Place	2021	2022	1,083	10	14,027	1,403
Privateer Pointe	2021	2022	726	10	13,313	1,331
Sims Creek	2021	2022	5,788	10	69,948	6,995
Gables	2021	2022	4,963	10	48,577	4,858
Owl Pointe	2021	2022	590	10	6,011	601
Paseos	2021	2022	24,744	10	172,080	17,208
Indian Creek (Greenbrier)	2021	2022	4,423	10	58,654	5,865
Indian Creek (Keystone Ph VII)	2021	2022	5,374	10	74,020	7,402
Total Neighborhoods with Potential to Apply Under Program			$ 136,814		$ 1,794,502	$ 179,450

Notes:

Program terms for New Haven (used as standard for other neighborhoods):

100 year life for pipes; 70 year life for other structures (R&R evaluations: 70 year life for pipes and other structures; 30 year life for pump stations)

Pay 50% of accumulated depreciation, equal installments, over 10 year period, 0% interest

Depreciation values based on the estimated replacement cost (in approximately 2007)

VII. Inlet Village Comprehensive Stormwater Management System

In 2004, with the likelihood of higher density redevelopment occurring in Jupiter Inlet Village, the Town obtained a conceptual permit from the South Florida Water Management District to address stormwater management in the Village in a comprehensive and integrated manner. The primary goals of the permit were as follows:

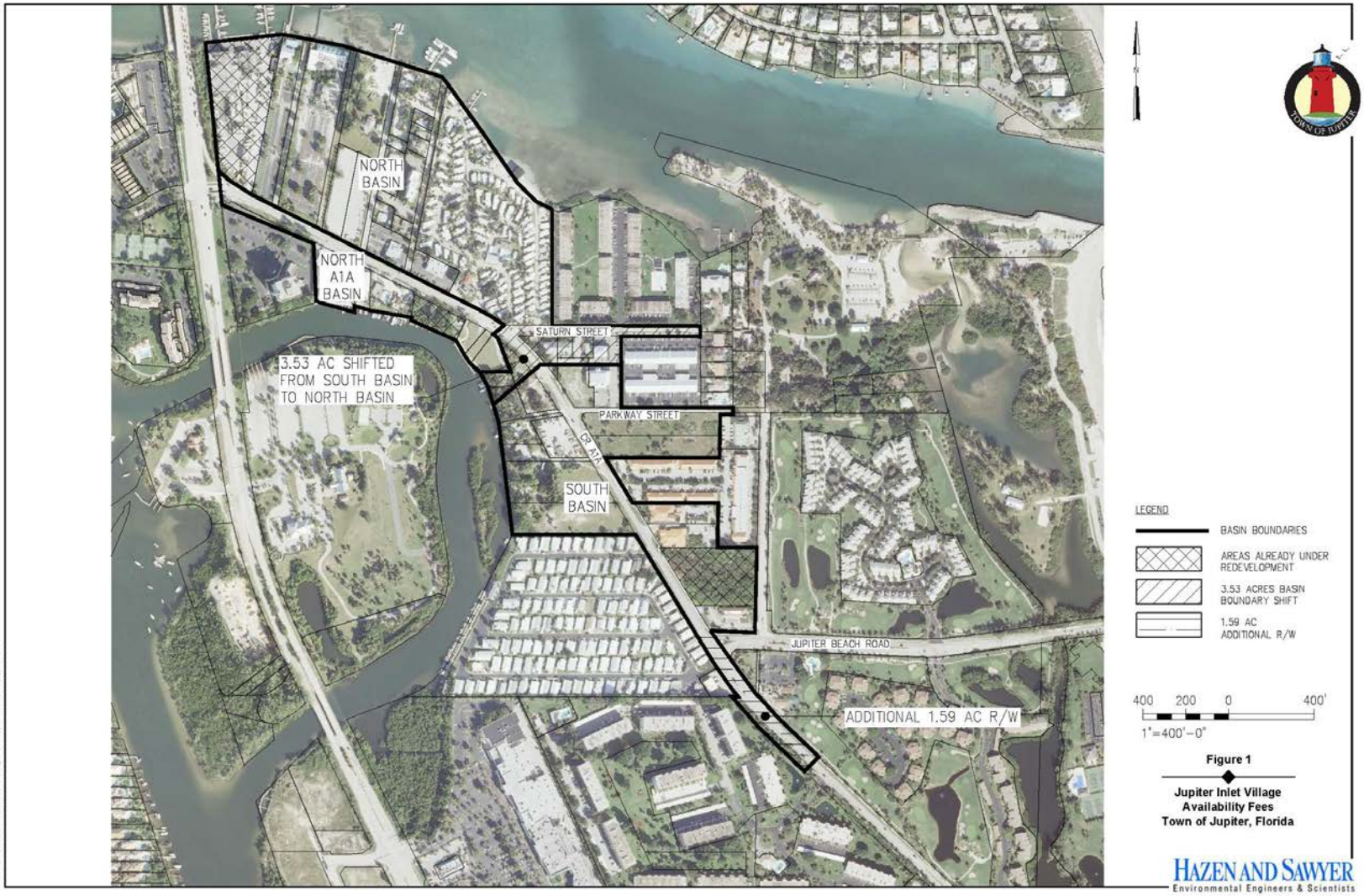
- Establish agency pre-approved requirements for providing stormwater management in the redevelopment area
- Establish a system that would increase "developability" of each land parcel
- Allow residents and businesses in the Village to realize the cost savings and maintenance benefits associated with a regional system

Resulting key benefits of the permit included the following:

- Developer must only provide ½" of on-site pretreatment before discharging to the regional system
- Impervious lot coverage may be up to 85%
- System can be built in modular fashion as redevelopment occurs

The stormwater management basins included within this system are defined within **Figure 5.23** below.

Figure 5.23


NORTH BASIN
NORTH A1A BASIN
3.53 AC SHIFTED FROM SOUTH BASIN TO NORTH BASIN
SATURN STREET
PARKWAY STREET
CR A1A
SOUTH BASIN
JUPITER BEACH ROAD
ADDITIONAL 1.59 AC R/W
LEGEND
BASIN BOUNDARIES
AREAS ALREADY UNDER REDEVELOPMENT
3.53 ACRES BASIN BOUNDARY SHIFT
1.59 AC ADDITIONAL R/W
400 200 0 400'
1"=400'-0"
Figure 1
Jupiter Inlet Village
Availability Fees
Town of Jupiter, Florida
HAZEN AND SAWYER
Environmental Engineers & Scientists

In general, the system shall consist of a vast network of exfiltration trench/piping, underlying the streets, that connects to several outfalls to the Intracoastal Waterway. These best management practices enhance stormwater runoff quality. The system enables the first flush of runoff to be retained allowing sediments, nutrients and pollutants to percolate into the ground and the cleaner water to be conveyed at a slower, more controlled rate to the outfalls. To recover the expense of constructing the system, the Town opted to charge an availability fee levied at the time of redevelopment on a per acre basis.

Exfiltration trenches have been constructed in the South Basin which provide the full required water quality treatment volume associated with the expected redevelopment of the basin. To date approximately 52% of the required water quality treatment volume has been provided in the North Basin through the construction of exfiltration trenches along A1A and Yarborough Street. The remainder of the treatment volume is to be provided via constructed exfiltration trenches along Love Street, Clemons Street, Saturn Street and future streets within the former Suni Sands site as redevelopment occurs. Depending on the degree of redevelopment, additional volume attenuation may be required to satisfy the water quantity component for both basins. The Town is working with the SFWMD to update the storage volume ledger as construction and redevelopment occurs in order to ensure the appropriate treatment/storage volume is provided throughout the Inlet Village.

The current availability fee rates within the three Inlet Village subbasins are as follows:

- North Basin = $37,480/acre
- North/A1A Basin (part of North Basin in conceptual permit) = $29,632/acre
- South Basin = $36,145/acre

With the recent reconstruction of A1A and Parkway Street within the Village a significant portion of the system cost has been incurred in advance of much of the redevelopment. Although the system's merits are greatly beneficial and prudent, it does impose a significant financial burden on the relatively small Stormwater Enterprise Fund.

VIII. Future Capital Needs Assessment

The following is an overview of upcoming projects planned for the purposes of improving flood protection and water quality treatment throughout the Town within the five year planning horizon. These projects are planned for improving the level of service for the existing stormwater system and for providing treatment of runoff with the intent of enhancing the local receiving waters. The Seminole Avenue Drainage Basin has historically experienced flooding issues and improvements to assist in resolving those issues are proposed. Water quality treatment in Pine Gardens North and the Inlet Village is also set to be improved. Descriptions of the stormwater projects currently being proposed within the Town's limits are provided below.

a. Seminole Avenue Drainage Basin Improvements

Runoff from the Seminole Avenue Drainage Basin is discharged to a detention area via the Seminole Avenue Pump Station which then discharges to tide in the main embayment of the Loxahatchee River. The basin is predominantly commercial / industrial land use with small residential areas.

Previous analyses of the pump station and conveyance to the pump station indicated that the capacity of the conveyance system is inadequate for the flows experienced in the system. More specifically, the storm sewer transporting water north towards the Seminole Pump Station beneath Center Street restricts flow during significant rainfall events. Two changes are being proposed to improve flood protection, provide redundancy, and improve water quality before discharge to the Loxahatchee River occurs.

1. *Increase Water Quality Treatment at Pump Station Discharge*

   The Town currently owns a vacant parcel (Alma's Place) located northeast of the Seminole Avenue Pump Station. This area could be utilized to provide increased water quality treatment of stormwater prior to being discharged to the Loxahatchee River. While the existing Seminole Pump Station detention pond provides water quality benefits by reducing sediment and nutrient levels in the water column, additional polishing of runoff can be achieved by incorporating the vacant parcel into the system.

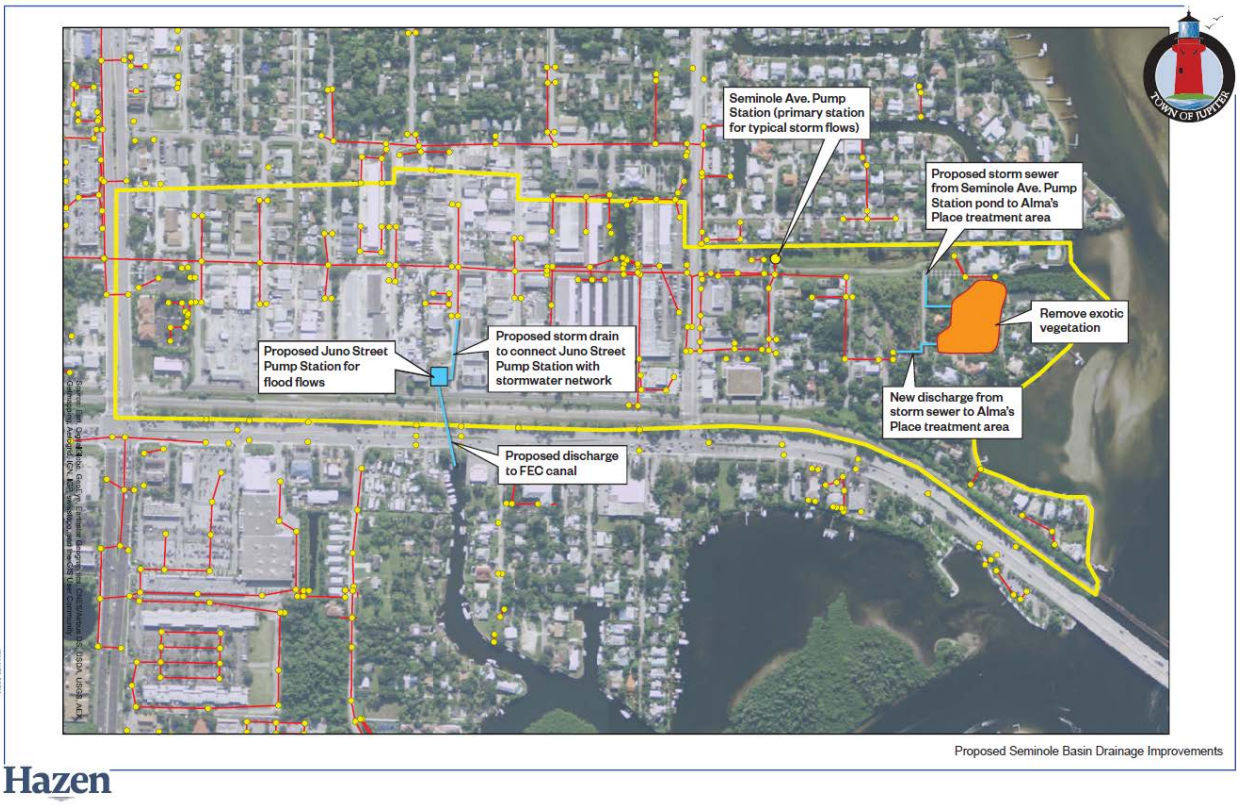
   In addition to the improved water quality treatment, the additional conveyance necessary to route water from the existing detention area to the Town's parcel would provide redundancy which would prevent drainage issues should one of the discharge points to the Loxahatchee River be blocked with debris and thus restrict flow.

2. *Reroute Drainage to Second Discharge Location*

   Currently flooding problems exist south of Center Street due to inadequately sized piping connecting these areas to the Seminole Avenue Pump Station. Rather than resizing existing piping beneath Center Street to improve the capacity of the system, an additional outfall and pump station (Juno Street Pump Station) could be constructed to discharge to the FEC Canal. This additional outfall would be constructed by directionally drilling beneath Dixie Highway, the FEC Railroad, and Alternate A1A at Juno Street. Although no land is currently owned by the Town allowing for this to occur, the lot located at the southwest corner of Juno Street and Dixie Highway appears to only be used for vehicle storage and purchasing a portion of the lot or securing an easement to conduct these improvements may be feasible. A conceptual depiction of the proposed improvements is provided as **Figure 5.24**.

The Juno Street Pump Station would effectively double the discharge capacity from the basin and would typically only be operated during flood conditions. Doing so would maximize the water quality treatment provided by the existing detention area near the Seminole Avenue Pump Station. It is expected that SLR will reduce the discharge capacity out of the Seminole Avenue Pump Station detention area as tailwater elevations increase. Therefore, having a second discharge location (and increased capacity) may prove to be critical as SLR progresses. A second pump station may also be more cost effective compared to increasing the system's capacity by either replacing existing storm sewers or incorporating parallel lines. Redundancy is also provided with the construction of an additional pump station which is critical should the existing Seminole Avenue Pump Station fail.

Figure 5.24
Proposed Seminole Basin Drainage Improvements



Previous master plans have recommended improvements to the Seminole Basin in order to alleviate flooding. The original 1996 Master Plan recommended improvements to the existing Seminole Pump Station which had an estimated cost of $1.3 million ($1.9 million in 2016 dollars). This option included the addition of a third pump to the existing pump station in order to increase the capacity and also included changes to the drainage network in order to reduce bottlenecks in the system. However, modeling indicated that up to 1 foot of flooding on some local roadways would still occur during a 10 year, 72 hour storm event. The incorporation of a second pump station in the south portion of the basin is estimated to cost a total of approximately $2,174,500. The primary benefits to expending additional capital rather than incorporating the improvements described in the 1996 Master Plan are as follows:

1. The new facility would provide redundancy in the system, which is critical if the Seminole Pump Station were to fail or if discharge from the Seminole detention pond were blocked or clogged, reducing the discharge rate.
2. By locating the facility in the south end of the basin, the discharge points will be effectively spaced. This reduces the average travel time/distance required to transport runoff to the basin discharge point. If flooding were to occur, this reduction in travel time would allow flooding to recede more quickly than only

increasing the capacity of the Seminole Pump Station and/or bottlenecks in the system and would reduce the total headloss within the system.

3. The Seminole Pump Station was constructed in 1983. Therefore, the construction of Juno St. Pump Station increases the effective useful life of the critical infrastructure within the basin.

b. Dubois Watershed/Carlin Park Weir

The Carlin Park Weir, which is operated by Palm Beach County, is used for separating the tidal portions of the Dubois Watershed from non-tidal portions (to the south of the structure). The Palm Beach County Department of Health has historically recorded high bacteria levels in the basin, particularly near the mouth of the basin.

Detailed sampling conducted at different points within the basin confirm that the elevated fecal coliform levels may be impacted by rainfall, with levels increasing following significant rainfall events. Samples also indicate that the highest levels are typically observed in the headwaters of the basin. Fecal coliform counts typically decrease during rising tide (likely due to dilution) but increase as the tide recedes. According to the Health Department, it is commonly perceived that the source of bacteria is derived from water fowl and other wildlife upstream. Typically, bacteria levels increase in the basin immediately after a significant rainfall event as upstream sources flow to tide. To maintain a more consistent flow through the entire slough, flows over the weir are periodically increased by lowering the control elevation (weir). Early reports reflect that this has led to improved water quality in the lagoon.

The Town will continue working cooperatively with the LRD and Palm Beach County Parks to further evaluate and address the issue to the extent possible.

c. Elsa and Paulina Road Infrastructure

The Yacht Club Estates Basin is bounded generally by FEC railway to the West and Sawfish Bay, Intracoastal Waterway, and FEC Canal along its north, east, and south boundaries (**Figure 5.25**). Nuisance flooding has been observed within the basin along Elsa Road, Paulina Road, and Yacht Club Drive. The current flooding is rainfall driven. However, as sea level rises the flooding is likely to be worsened due to elevated tailwater conditions.

The areas which experience rainfall driven flooding are void of stormwater infrastructure. The encroachment of private property amenities into the right of way of the flooded streets would make the incorporation of swales or other surface conveyance measures difficult. Therefore, it is recommended that storm sewers be constructed in the area and drainage be discharged via a new outfall structure to the Intracoastal Waterway. It is recommended that the discharge facilities be constructed in a manner which allows for the easy installation of a submersible

pump near the storm sewer discharge at a later date to accommodate/allow discharge when sea level rise (SLR) begins negatively affecting gravity drainage within the basin.

Figure 5.25
Yacht Club Estates Proximity Map

The estimated design and construction cost for the drainage improvements is approximately $756,000.

In order to gain access to the waterway to discharge collected stormwater runoff, an easement would be necessary. Due to the closely spaced nature of the houses in the area, alternate outfall locations do not exist at this time. The proposed placement of the Elsa Road improvements is illustrated in **Figure 5.26**.

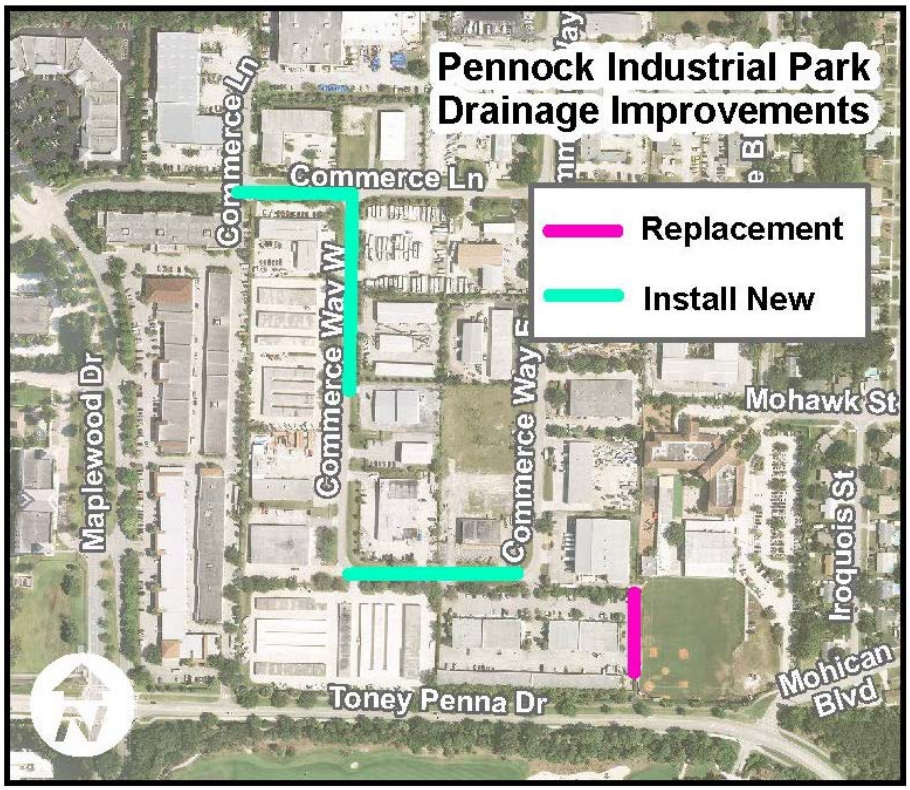
Figure 5.26
Location of Proposed Drainage Improvements in Yacht Club Estates Basin

d. Pennock Industrial Park Improvements

Commerce Way West located within Pennock Industrial Park does not consistently meet the Town's level of service and the roadway consistently floods during rainfall events due to lack of drainage infrastructure. In order to improve drainage in the area, construction of a stormwater system on Commerce Way West and Commerce Lane in Pennock Industrial Park is proposed.

The project will include construction of a storm sewer with reinforced concrete pipe, installation of drainage structures, and construction of exfiltration trenches for enhanced water quality treatment of stormwater runoff (**Figure 5.27**). In addition to new infrastructure, replacement of approximately 200 feet of existing storm sewer will be included. The replaced infrastructure includes failing 60-inch diameter high density polyethylene pipe/exfiltration trench which serves the main trunk line to convey drainage from the Pennock Industrial Park system into the Toney Penna system. The project supports the Town's Strategic Plan of Fiscal Responsibility and Safety by managing the renewal and replacement of stormwater assets to provide well maintained infrastructure to accommodate redevelopment to establish levels of service safely and reliably meeting all regulatory requirements. The estimated cost of this project is approximately $463,500.

Figure 5.27
Location of Proposed Drainage Improvements – Pennock Industrial Park



e. Pine Gardens North Water Quality Improvements

In order to increase the level of water quality benefit provided by the stormwater management system in the Pine Gardens North basin, construction of exfiltration trenches within existing right of way is proposed for FY 2020. These improvements are similar to what was designed in the Pine Gardens South basin. Exfiltration trenches help increase infiltration of stormwater during rain events, therefore reducing nuisance flooding and pollutant loads discharged to receiving waters. The estimated design engineering and construction cost for the described improvements is approximately $305,000.

The additional stormwater treatment volume provided by the construction of exfiltration trenches in the Pine Gardens North neighborhood could be used to support permitting of an additional outfall to the FEC canal. This outfall may be constructed to resolve capacity issues within the Seminole Avenue Pump Station network, but additional water quality treatment may be required since the collected stormwater would no longer be routed through the existing detention area north of the Seminole Avenue Pump Station. The proposed typical exfiltration trench profile is illustrated below as **Figure 5.28**. It is also possible that certain green infrastructure elements such as bioswales (**Figure 5.29**) could be incorporated to augment the proposed exfiltration trenches.

Figure 5.28 Typical Exfiltration Trench Construction

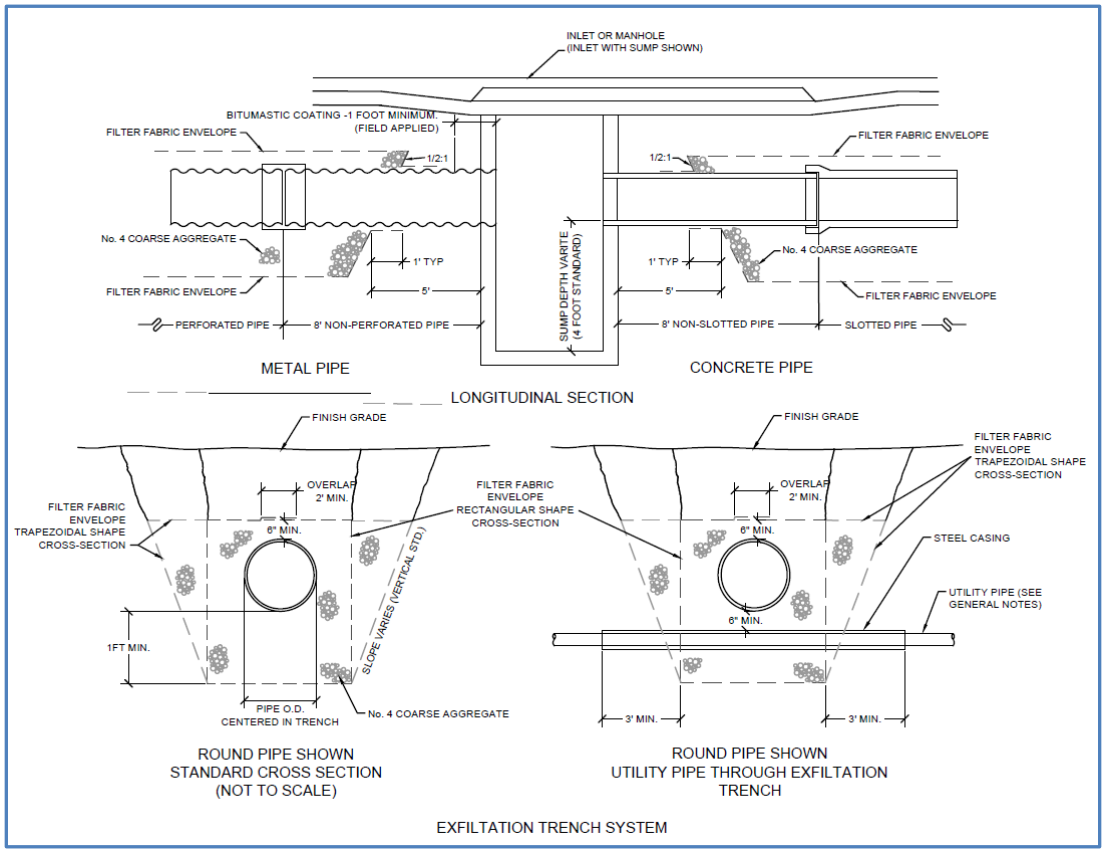


Figure 5.29 Potential Green Infrastructure Measure (Bioswale)

f. Completion of Inlet Village Stormwater Management System

Improvements are planned which would incorporate exfiltration trenches and additional stormwater conveyance infrastructure to complete the master Surface Water Management Plan within the Inlet Village. The additional infrastructure would help improve the flood protection level of service in the Inlet Village and would also increase the water quality treatment volume, effectively reducing pollutant loads discharged to the Jupiter Inlet. Cost recovery for the improvements will be secured through stormwater availability fees associated with the area's redevelopment. The fees are based on the cost incurred by the Town to provide sufficient water quality treatment for the redevelopment of areas shown in **Figure 5.30**.

The estimated cost of improvements remaining to be constructed is approximately $559,000.

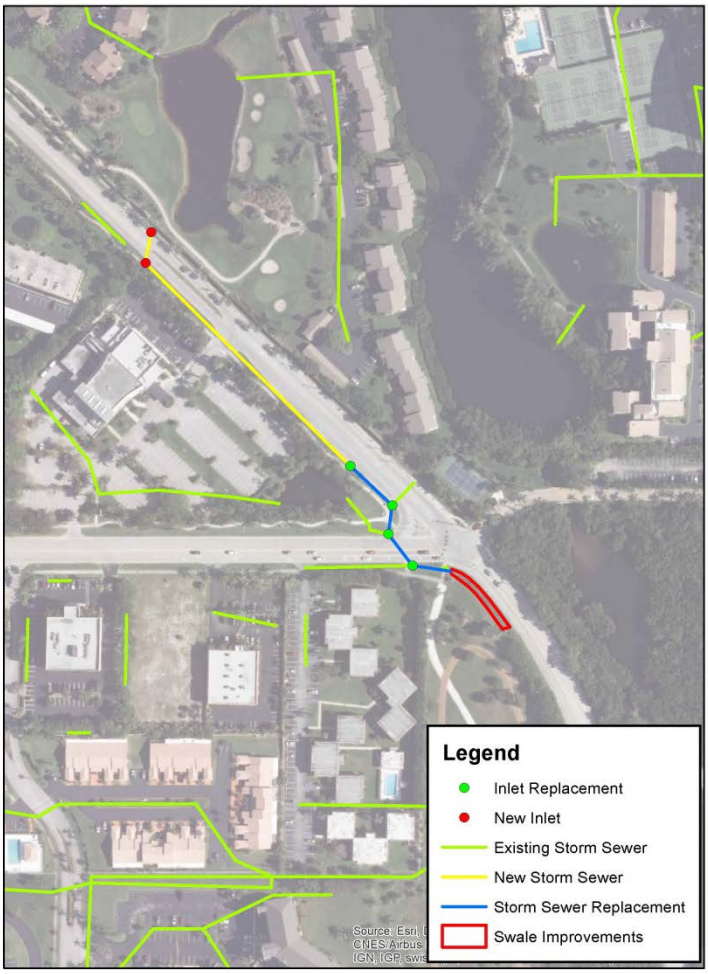
Figure 5.30

Basin Delineation for Determination of Inlet Village Availability Fees

g. A1A / Indiantown Road SW Improvements

Flooding issues have historically been experienced at the intersection of Indiantown Road and A1A during moderate rainfall events. The Town and Palm Beach County are working collaboratively to resolve the issue in advance of plans to reconstruct Indiantown Road west of this intersection. In order to resolve these issues, improvements to the County's drainage system are necessary. Improvements will consist of enlarging the existing drainage swale which is located adjacent to A1A and which ultimately discharges to the Dubois Watershed (**Figure 5.34**). Furthermore, capacity improvements to existing storm sewers and construction of additional storm sewers will be included in the drainage improvements. The estimated engineering design and permitting fees to be paid by the Town total approximately $54,000 with an estimated construction phase cost to be paid for by the County being approximately $592,000.

Figure 5.31
Location of Proposed Drainage Improvements at Indiantown Road and A1A



IX. 25 Year Capital Plan

The Town's utility system provides heightened emphasis on long-range capital and financial planning in its operation. As part of this effort, a 25 year planning horizon is viewed in which operational and capital finances are projected in order to manage for long term sustainability of the system.

Table 5.5 depicts the 25 year capital plan for the stormwater utility incorporating the updated information as generated for this 2017 Master Plan Update. The balance of the section of the plan will serve to detail the notable changes to the capital plan as a result of recent studies performed as part of this planning process.

Table 5.5

Capital Improvement Projects	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total 2017 to 2041
Urban Stormwater Management System Rehab	$ -	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 420,000	$ 10,080,000
Private Stormwater Improvement Grants	63,353	65,254	67,211	69,228	71,304	73,443	75,647	77,916	80,254	82,661	85,141	87,695	90,326	93,036	95,827	98,702	101,663	104,713	107,854	111,090	114,423	117,855	121,391	125,033	128,784	2,309,804
Stormwater System Rehabilitation	117,626	119,405	422,987	126,677	130,477	134,392	138,423	142,576	146,853	151,259	155,797	160,471	165,285	170,243	175,351	180,611	186,029	191,610	197,359	203,279	209,378	215,659	222,129	228,793	235,657	4,528,326
SW Management System Redevelopment Grants	64,694	65,673	67,643	69,672	71,763	73,915	76,133	78,417	80,769	83,192	85,688	88,259	90,907	93,634	96,443	99,336	102,316	105,386	108,547	111,804	115,158	118,613	122,171	125,836	129,611	2,325,580
Utility Billing Services & Enterprise Asset Mgt System	-	-	-	-	-	-	-	-	63,339	-	-	-	-	-	-	-	-	-	85,122	-	-	-	-	-	-	148,461
Asset Maintenance Program	124,691	465,681	233,676	298,958	782,864	936,069	124,581	670,108	132,168	158,822	165,010	946,777	148,756	316,652	280,561	1,276,059	260,441	268,255	927,586	1,026,562	1,163,960	194,093	199,916	205,914	212,091	11,520,251
Elsa and Paulina Roads Infr Impr (to coincide w/water improv.)	756,245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	756,245
A1A & ITR Intersection SW Design	27,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,000
Saturn Street Infrastructure Improvements	-	350,369	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350,369
Future Suni Sands Side Street Drainage Improve	-	208,825	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	208,825
Pine Gardens North Drainage & Distribution Improvements	-	-	-	712,088	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	712,088
Seminole Basin Impr - Reroute Drainage to 2nd Dischrg Location	-	-	-	2,174,461	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,174,461
Pennock Industrial Park Drainage Improvements	-	-	-	-	463,710	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	463,710
Total Projects	$ 1,153,609	$ 1,695,207	$ 1,211,517	$ 3,871,084	$ 1,940,118	$ 1,637,819	$ 834,784	$ 1,389,017	$ 923,383	$ 895,934	$ 911,636	$ 1,703,202	$ 915,274	$ 1,093,565	$ 1,068,182	$ 2,074,708	$ 1,070,449	$ 1,089,964	$ 1,846,468	$ 1,872,735	$ 2,022,919	$ 1,066,220	$ 1,085,607	$ 1,105,576	$ 1,126,143	$ 35,605,120

Chapter 6: Financial Forecast and Recommendations

I. Financial Forecasts and Recommendations

This section of the Stormwater Master Plan provides a discussion of the financial forecast to i) present the basis for the funding of the capital program as identified in the plan, including the adequacy of the availability fees; ii) evaluate trends in the expenditure requirements to be funded from rates (rate sufficiency and potential changes in rates to fund such expenditures); and iii) estimate the projected financial position of the Stormwater Utility based on the forecast of assumptions regarding growth, inflation, and other factors, and other observations for consideration by the Council. The overall purpose of this analysis is to provide additional information for strategic and business planning purposes as it evaluates the capital funding and stormwater service plans. This forecast is intended to be dynamic and will be adjusted yearly as part of the annual budget and capital planning process.

a. Capital Expenditure Overview

The capital plan as identified in the Stormwater Master Plan, which also includes projects that have previously been approved by the Council in prior periods, is shown on **Table 6.2** on the following page and as summarized on **Table 6.1** below. The capital plan includes the following expenditures by functional type:

Table 6.1

Summary of Stormwater Capital Projects – Fiscal Years 2017 – 2041 ($000s) [1]

	2017 to 2021	2022 to 2026	2027 to 2031	2032 to 2036	2037 to 2041	Totals	Percent
Summary of Capital Expenditures:							
Expansion-related Projects	$279	$---	$---	$---	$---	$279	0.78%
Renewals, Replacements, and Rehabilitation Projects	7,249	3,899	3,785	5,902	4,188	25,023	70.28%
General Operating (budgetary) Projects	676	782	907	1,051	1,219	4,635	13.02%
Contributions and Grant Projects	1,667	1,000	1,000	1,000	1,000	5,667	15.92%
Total Capital Expenditures	$9,871	$5,681	$5,692	$7,954	$6,407	$35,605	100.00%

[1] Amounts derived from Table 6.2 on following page.

As can be seen above, the majority of the identified capital expenditures identified in the Stormwater Master Plan are for renewals, replacements, rehabilitation, improvements, and upgrades ("renewals and replacements") of the stormwater utility enterprise (the "Stormwater

Utility") (approximately 67% of the identified capital costs). This would be expected since the majority of the Stormwater Utility service area encompasses the Town limits and is essentially in a built-out condition from both a service availability and a facility need standpoint. This is further amplified by the fact that during the next 30 years, most of the installed assets are expected to have reached their average service lives and will begin to need replacement or upgrades in order to continue to provide stormwater service. It should be noted that the capital costs shown on **Table 6.2** include an allowance for inflation at 3.0% annually beginning in Fiscal Year 2018 to account for the then future cost of the capital needs placed upon the Stormwater Utility. The 3.0% factor is representative of the average annual increase in construction costs as reported by the *Engineering News Record*, which tracks such changes in cost over the past twenty years. The increased capital requirements will need to be funded primarily from Stormwater Utility operations (rates) since the majority of the capital costs are classified as renewals and replacements as well as debt being incurred by the system. This will result in the need for the recognition of annual transfers to the Renewal and Replacement Fund and other capital reserves, which will be critical to the ability to fund the improvements while limiting the need to issue additional bonds / debt above amounts already identified in the capital financing plan and as considered fiscally prudent for the Stormwater Utility.

Table 6.2
Summary of Capital Improvement Plan – Fiscal Years 2017 – 2014

Capital Project Description	Project Type	Fiscal Year Planning Period 2017 to 2021	2022 to 2026	2027 to 2031	2032 to 2036	2037 to 2041	Total Planning Period
Urban Stormwater Management System Rehab	Renewals, Replace. & Rehab	$880,000	$1,100,000	$1,100,000	$1,100,000	$1,100,000	$5,280,000
Urban Stormwater Management System Rehab	RR – Contributions / Grants	800,000	1,000,000	1,000,000	1,000,000	1,000,000	4,800,000
Private Stormwater Improvement Grants	RR – Contributions / Grants	336,350	389,921	452,025	524,022	607,486	2,309,804
Stormwater System Rehabilitation	Renewals, Replace. & Rehab	917,172	713,503	827,147	958,888	1,111,616	4,528,326
SW Management System Redevelopment Grants	Operating	339,445	392,426	454,931	527,389	611,389	2,325,580
Utility Billing Services & Enterprise Asset Mgt System	Renewals, Replace. & Rehab	-	63,339	-	85,122	-	148,461
Asset Maintenance Program	Renewals, Replace. & Rehab	1,905,870	2,021,748	1,857,756	3,758,903	1,975,974	11,520,251
Elsa and Paulina Roads Infrastr Improve (to Coincide w/Water Improv.)	Renewals, Replace. & Rehab	756,245	-	-	-	-	756,245
A1A & ITR Intersection SW Design	Renewals, Replace. & Rehab	27,000	-	-	-	-	27,000
Saturn Street Infrastructure Improvements	Expansion	175,185	-	-	-	-	175,185
Saturn Street Infrastructure Improvements	Expand – Contributions / Grants	175,185	-	-	-	-	175,185
Future Suni Sands Side Street Drainage Improvements	Expansion	104,413	-	-	-	-	104,413
Future Suni Sands Side Street Drainage Improvements	Expand – Contributions / Grants	104,413	-	-	-	-	104,413
Pine Gardens North Drainage & Distribution Improvements	Renewals, Replace. & Rehab	356,044	-	-	-	-	356,044
Pine Gardens North Drainage & Distribution Improvements	RR – Contributions / Grants	356,044	-	-	-	-	356,044
Seminole Basin Impr - Reroute Drainage to 2nd Dischrg Location	Renewals, Replace. & Rehab	2,174,461	-	-	-	-	2,174,461
Pennock Industrial Park Drainage Improvements	Renewals, Replace. & Rehab	231,855	-	-	-	-	231,855
Pennock Industrial Park Drainage Improvements	Contributions / Grants	231,855	-	-	-	-	231,855
Total Projects		$9,871,535	$5,680,937	$5,691,859	$7,954,324	$6,406,465	$35,605,120
Percent of Total		27.72%	15.96%	15.99%	22.34%	17.99%	100.00%

The capital improvement program forecast recognizes that the level of the expenditure needs will fluctuate over time (generally an increasing trend) as assets reach their useful service life (many of the primary Stormwater Utility assets are relatively new relative to the type of capital facilities [lines] within the Town limits, being in service less than thirty (30) years). The primary projects recognized during the financial forecast include the following:

Table 6.2
Summary of Primary Stormwater Utility Capital Projects [1]

Project Description	Amount (Rounded)	Fiscal Year of Expenditure
Urban Stormwater System Rehabilitation	$10,080	Annually for Period
Stormwater System Rehabilitation	4,528	Annually for Period
Asset Maintenance Program	11,520	Annually for Period
Pine Gardens North Drainage and Distribution Improvements	712	2020
Elsa and Paulina Roads Infrastructure Improvements	756	2017
Seminole Basin Improvements	2,174	2020

[1] Amounts derived from Table 6.2.

b. Long–Term Cash Flow Projections and Financial Position

In order to evaluate the funding of the capital program and the financial position of the Stormwater Utility, a detailed financial forecast was prepared. At the end of this section are financial projections for the Stormwater Utility. The analysis was for a twenty-five (25) year period ending Fiscal Year 2041 (representing the change from the estimated Fiscal Years 2017 to 2041 and referred to as the "Forecast Period") and includes annual projections of gross revenues, operating expenses, payment of the annual debt service requirements on the outstanding Stormwater Utility indebtedness (the "Debt Service Requirement") and the funding of the capital expenditures which is a primary driver relative to system costs and the need for rates. Projected revenue includes those from the application of the stormwater fees, other operating revenues earned by the Stormwater Utility, interest income on the available unrestricted funds maintained by the Town, and other miscellaneous revenues derived from Stormwater Utility operations. Additionally, projections of service availability fees were also recognized since this represents a financial resource to the Stormwater Utility and are used to fund expansion-related capital projects within Inlet Village (since these fees represent contributions from the Village).

The development of the financial forecast required certain assumptions with respect to conditions, which may occur in the future. While we believe the assumptions are reasonable for the preparation of the financial forecast, they are dependent upon future events and actual conditions may differ from those assumed. The following is a summary of the primary assumptions recognized in the development of the financial forecast.

1. Projected fee revenue for the Stormwater Utility were based on growth projections in customers / equivalent residential dwelling units ("ERUs") which recognizes the estimated remaining equivalent residential developable units / properties that are considered available for connection as identified in the master plan. The customer forecast was based on historical growth trends and the recognition that the remaining units / properties in the stormwater service area will connect (develop) over time and become active accounts of the stormwater system.

   Additionally, the financial forecast includes the following rate adjustments:

   i. A customer (ERU) growth rate of approximately 0.3% compounded annually during the Forecast Period with a higher growth rate occurring during the first halve of the period until the service area is considered built-out in Fiscal Year 2031; no additional normal ERU growth was assumed after this Fiscal Year in the financial forecast.

   ii. In order to fund the revenue requirements or expenditures of the Stormwater Utility, which are discussed later in this section and which are primarily driven by the capital needs of the system, a series of rate adjustments have been recognized. The following rate adjustments were assumed for the financial forecast presented in this section:

Table 6.4
Annual Rate Adjustments Recognized During Forecast Period

Implementation Period	Percent Adjustment
Fiscal Year 2017 (Adopted)	2.10%
Fiscal Years 2018 to 2021	7.00%
Fiscal Years 2022 to 2034	3.50%
Fiscal Years 2035 to 2041	2.50%

   iii. It should be noted that the rate adjustments assumed above include allowances for the price index inflation adjustments, no additional index or

rate adjustment above what is presented above was assumed for the Forecast Period.

2. Interest income has been estimated on balances in certain funds created by the Town, including balances in the Revenue Fund (operating reserves) and the Renewal and Replacement (capital) Fund. An assumed average interest earnings rate of approximately 0.18% in Fiscal Year 2018, which was assumed to increase to 2.00% by Fiscal Year 2030, was recognized and applied to the average account balances projected during the Forecast Period. The low rates of interest was continued based on recent trends and the recognition that interest earnings are somewhat speculative and that the primary revenue and source of expenditure funding should be from annual rate revenues, a recurring and stable funding source.

3. Beginning in 2010, the Town initiated the Infrastructure Equity Program to develop an equitable process to assume the ownership and maintenance of roadways and connected drainage systems from private owner associations and communities. In general, the Town established that the transfer of responsibility for the stormwater management infrastructure would be acceptable provided that extraordinary maintenance neglect was addressed in addition to the community providing the Town funding for facility renewals and replacements relative to the then current level of depreciation. There were 45 communities that were identified that may participate in the transfer process; approximately 13 communities have been either accepted into the program or have applied / initiated the transfer process and 33 communities have expressed an interest or have the potential to enter the program. Beginning in Fiscal Year 2015, the renewal and replacement contributions provided by the communities that opted into the transfer program to fund the accumulated renewal and replacement liability were redirected to the Town's General Fund and are no longer considered as a financial resource of the Stormwater Utility. The financial forecast assumes only the contributions from those private communities that had been accepted into the program prior to the Fiscal Year 2015; the remainder of the liability payments was assumed to be a resource transferred to the General Fund and has not been assumed as a future benefit of the Stormwater Utility. The total estimated payments to be received from the communities for the Forecast Period (all assumed to be collected by 2030 or in the first half of the Forecast Period) was estimated to be $2.514 Million of which now the Stormwater Utility is estimated to receive only $0.118 Million. This change in

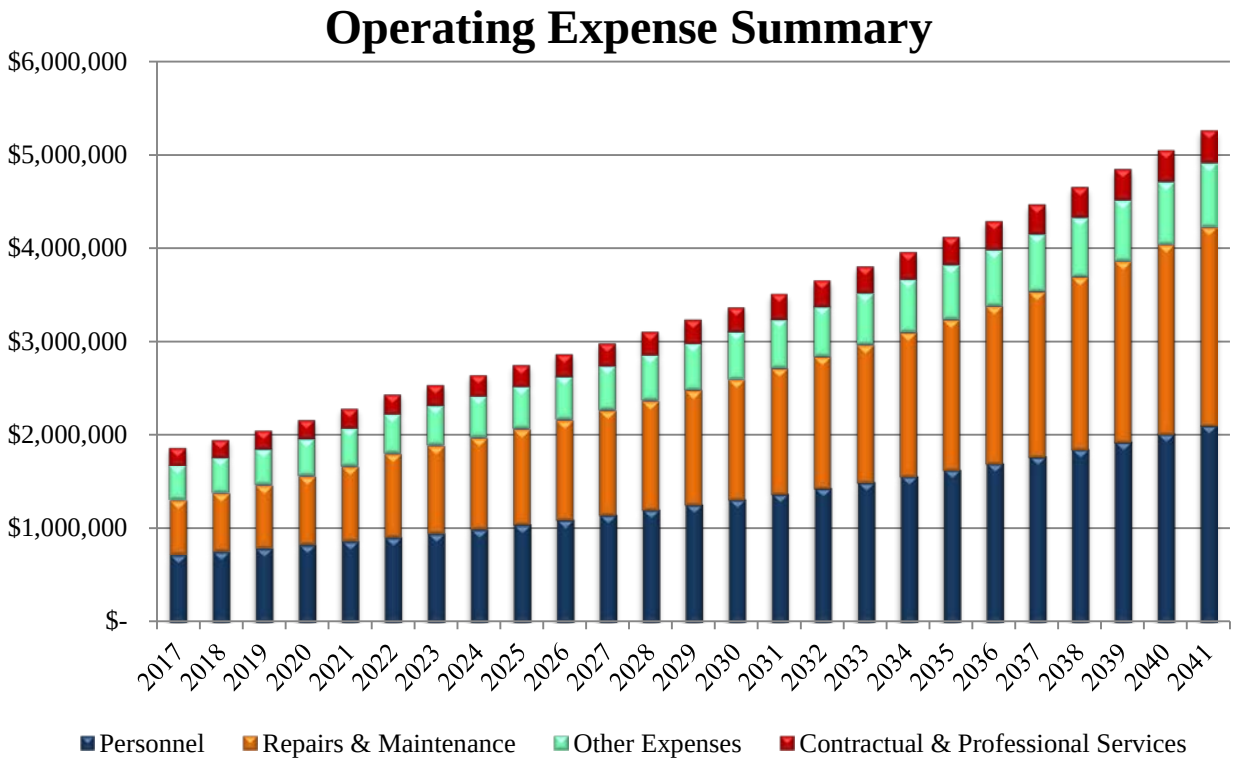
policy will place a financial strain on the utility and is a supporting reason why Stormwater Utility rates are recommended to be increased in the early portion of the Forecast Period as previously discussed. In order to limit rate adjustments over the Forecast Period (including the reduction in the term of the initial rate phasing plan) and recognizing that the payments relate to stormwater capital recovery, the redirection of these payments back to the Stormwater Utility would be recommended and should be reconsidered by the Town.

4. The Town receives service availability fees from Inlet Village in accordance with the provisions of Ordinance No. 26-10 adopted by the Town Council on May 4, 2010 (the "Inlet Village Ordinance") which related to the funding of stormwater improvements in the respective service area. Based on the terms of the Inlet Village Ordinance, the Town shall receive system availability charges for the construction of stormwater management facilities within the Inlet Village CRA limits; all fees received by the Town shall be dedicated to improvements within the Village CRA limits. Service availability fees from Inlet Village were based on projected development in the Village CRA limits, recent trends in availability fee collection and the allocated capital expenditures in the service area. It was assumed, based on discussions with the Town, that the Stormwater Utility would receive approximately $51,300 annually in annual capital contributions through Fiscal Year 2037.

5. Projected operating expenses are based on various factors such as projected expense increases due to inflation and projected changes in expenses associated with anticipated changes in operations. The escalation was based on historical trends, projections of inflation prepared by the Congressional Budget Office, and other factors. The escalation rates ranged from 2.5% (general inflation) to 7.5% for health insurance expenses. Salaries and Benefits were increased by approximately 4.0% through 2026 and then reflected a declining trend in adjustment due to employees capping out in terms of salary adjustments, changes resulting from changes in the work force, and other factors.

   During the Forecast Period, the change in operating expenses averaged approximately 4.4% annually since a major driver of the expenses for the Stormwater Utility is associated with personnel and repairs and maintenance which accounts for approximately 75% percent of the total operating expenses and these costs are required (e.g., set by regulation, uncontrollable as to cost,

etc.) for ongoing utility operations and service. This can be seen below for the Forecast Period:



6. The forecast of operating expenses includes a cost allocation payment to the General Fund to account for expenses accounted for in the General Fund that are allocable to the Stormwater Utility. The budgeted payment for the Fiscal Year 2017 is $118,100; this payment was assumed to remain constant during the Forecast Period. Any increase in the payment without a corresponding revenue increase would serve to reduce operating margins and the ability of the utility to annually make transfers for renewal and replacement-related capital expenditures.

7. Although considered a system operating expense for financial reporting purposes, depreciation and amortization expenses have not been recognized as an operating expense since such amounts represent non-cash expenses and the fees for service are based on a cash-flow / funding needs basis. In lieu of depreciation and amortization expenses, the financial forecast recognizes the

annual funding of the Renewal and Replacement Fund and the payment of principal on bonds issued to fund capital expenditures of the Stormwater Utility.

8. In 1997, the Town originally secured a loan from a local financial institution in the principal amount of $1,080,000 to finance drainage facility improvements for the Stormwater Utility. As of October 1, 2016, a total principal amount of $54,000 is estimated to be outstanding (the "Outstanding Loan") with principal being paid on January 1st and July 1st of each year during the repayment term; the loan matures on July 1, 2017. Interest payments on the loan represent a variable rate structure and are based on 74% of the one month LIBOR rate recalculated each month while the loan is outstanding. The loan repayment requirements included in this Report for the Outstanding Loan was based on the principal amortization schedule as contained in the loan documents and recent trends in historical interest expense paid (assumes no material change in the one month LIBOR rate during the remainder of the term of the Outstanding Loan). The repayment of the loan is presented on a "gross" basis (i.e., not net of interest earnings on any sinking fund deposits for loan repayment) and are based on a monthly funding basis for the loan as the liability is incurred (an accrual basis) as opposed to when the loan repayment requirements are actually paid. Subsequent to July 1, 2017, no debt service payments will be required on this loan.

9. The capital program as identified on Table 6.2 was funded based on: i) the nature of the project (e.g., expansion-related); ii) the availability of funds to the Town for project funding; iii) the timing of the capital projects; and iv) the policy to maintain an adequate cash balance in the operating and capital funding reserves. With respect to the operating reserves (working capital) and in order to maintain an "AA" credit rating, a minimum liquidity fund balance equal to 180 days of operating expenses is recommended and was recognized. For the Renewal and Replacement Fund, the maintenance of a minimum ending balance of approximately $580,000 (adjusted annually for inflation), which is equal to approximately the annual depreciation expense at the beginning of the Forecast Period is recommended and was targeted. When one looks at the funds collectively, it is recommended that a total reserve balance recognizing between $3 million and $4 million is prudent and is recommended.

The following table summarizes the capital program funding plan recognized in the financial forecast by five-year forecast period increments:

Table 6.5
Capital Project – Funding Plan

		Recognized Funding Plan			
Forecast Period – Capital Expenditures	Total Capital Projects [1]	Renewal & Replacement Fund	Service Availability Fee Fund	Operating Fund and Contributions	External Funds – Bonds
FY 2017 – FY 2021	$9,871,535	$3,051,936	$279,597	$2,343,291	$4,196,711
FY 2022 – FY 2026	5,680,937	2,395,301	---	1,782,347	1,503,289
FY 2027 – FY 2031	5,691,859	3,784,903	---	1,906,956	---
FY 2032 – FY 2036	7,954,324	5,902,913	---	2,051,411	---
FY 2037 – FY 2041	6,406,465	4,187,590	---	2,218,875	---
Total Forecast Period	$35,605,120	$19,322,643	$279,597	$10,302,880	$5,700,000
Percent of Total CIP	100.0%	54.27%	0.78%	28.94%	16.01%

[1] Amounts shown based on information presented on Table 6.2.

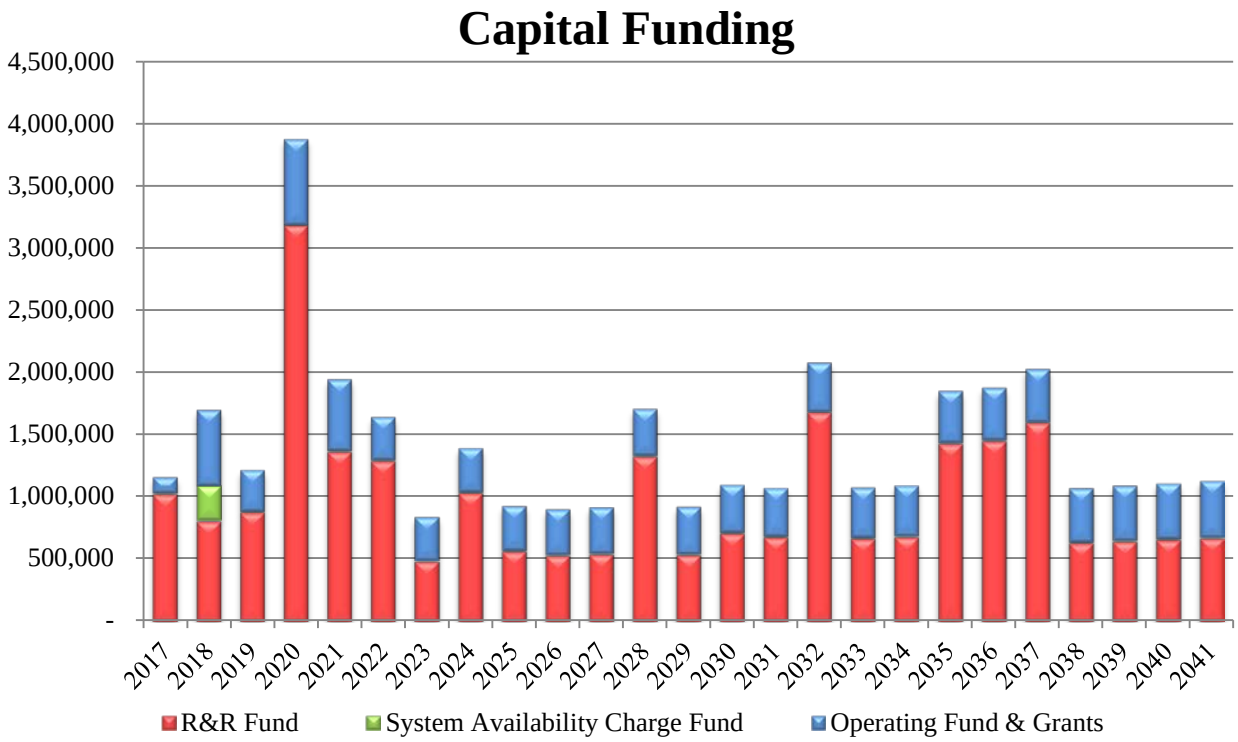
As can be seen above, approximately $19.3 Million or 54% of the assumed capital expenditure program will be funded from the Renewal and Replacement Fund (derived from deposits from annual operations). There are essentially no expansion-related projects anticipated for the extension of stormwater service during the Forecast Period (with the exception of two projects assumed for Fiscal Year 2018, which was the Saturn Street Infrastructure Improvements and the Suni Sands North Drainage and Distribution Improvements totaling $559,194) based on current service and regulatory requirements.

A significant component associated with the funding of the capital program is the continued deposits to the Renewal and Replacement Fund ("R&R Fund"), the annual funding that is critical to the financial health of the Stormwater Utility. For the Fiscal Year 2017 (first year of Forecast Period), the forecast recognizes an initial deposit to the fund of approximately $583,000 and then increased annually thereafter for construction cost increase allowances of 3.0%. This level of R&R Fund deposits was previously presented to the Town Council as part of the R&R Fund evaluation a few years ago and which was then established at $500,000 based on the installed assets and service lives for the utility; the increase in the deposit is due solely to the application of the capital inflation index over time. It is appropriate to fund the R&R Fund annually from operations

since this matches the use of the stormwater facilities by the existing customer base and the need to replace such facilities at the end of the useful service life of such assets (a depreciation expense equivalent). It should be noted that the annual funding of the R&R Fund in relationship to annual depreciation expense has become a key indicator with the credit rating agencies since the more "equity-based" capital funding a utility has, the less risk on the utility in terms of funding capital improvements coupled with the need to issue additional bonds. We would recommend that the Town consider continuing this level of R&R funding in the future, which we think is prudent and promotes the long-term stability of rates to the Town's customers. This capital funding level is further discussed below regarding the review of certain key financial ratios associated with the evaluation of the projected financial position of the Stormwater Utility.

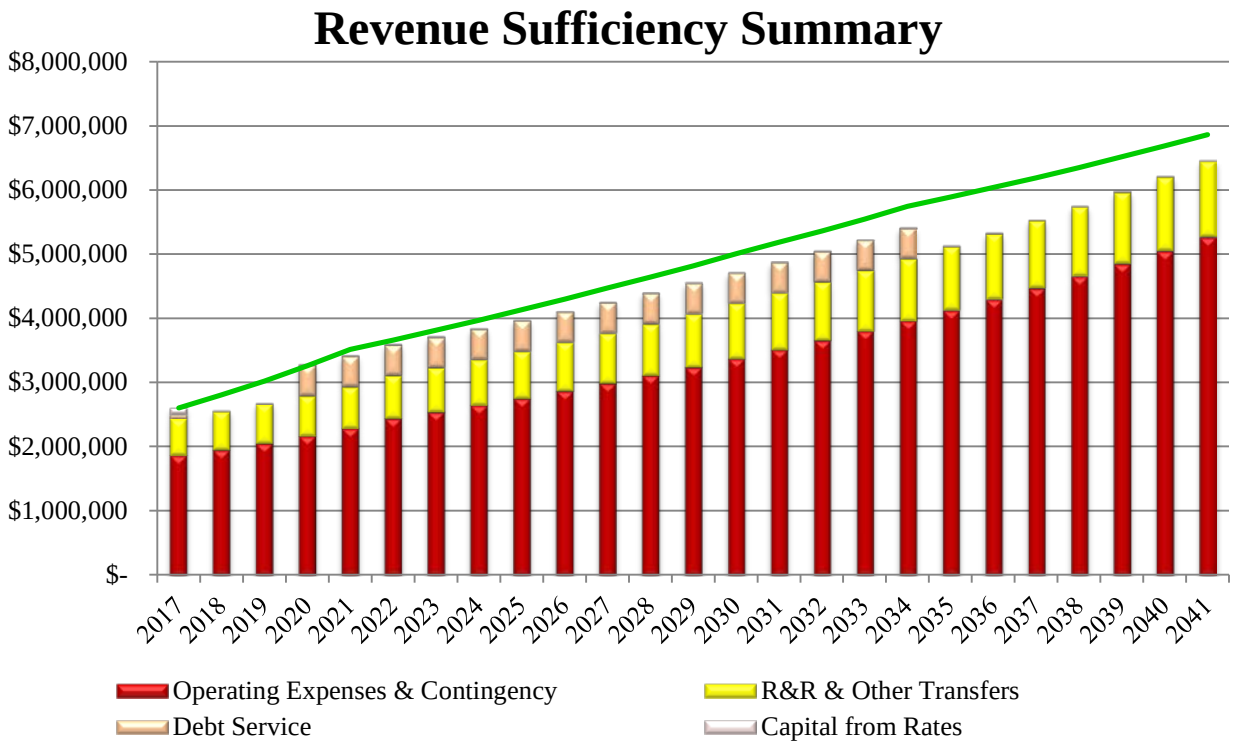
During the near term of the Forecast Period, the Stormwater Utility will need to secure or issue debt to finance a portion of the capital program. This is a direct result of capital expenditure needs being greater than the Stormwater Utility cash flow coupled with the need to preserve operating and capital reserves to maintain a strong fiscal position and allow for the long term funding of the capital improvement program. The issuance of the debt will also allow the Town to phase in Stormwater Utility rate adjustments over a multi-year period for the benefit of the stormwater customers. Subsequent to the Fiscal Year 2017, the Stormwater Utility will no longer have any long-term debt liability; the issuance of the additional debt will not burden the System and is prudent from a long-term rate sustainability objective. In order to reduce the cost of issuing debt and to provide an earnings benefit to the Water System, it has been assumed that the Stormwater Utility will borrow $5.73 million from available unencumbered funds on deposit in the Water System during Fiscal Year 2020 (resulting in a projected fund deposit of $5.70 million). In order to maintain an arms-length transaction, it was assumed that the loan would have a fifteen (15) year term at an annual average interest rate of 2.75% which would result in an annual loan repayment of $471,345 (assumes level loan repayment schedule, see discussion later in this section that illustrates the payments assumed for the Forecast Period).

Based on the primary assumptions discussed above, the following figure illustrates the capital appropriation forecast and corresponding funding sources for the Stormwater Utility for the Forecast Period:



As can be seen above, the capital program varies from year to year primarily due to when assets reach their useful service life and must be replaced. As can be seen above, there is a significant capital expenditure requirement identified for the Fiscal Year 2020 and that is the reason for the recommendation to finance this capital need from inter-fund borrowings from the Water System as previously discussed.

Based on the assumptions discussed above regarding the funding requirements of the Stormwater Utility and as previously mentioned, the forecast assumes the need for immediate rate adjustments above an annual allowance for indexing. This is primarily due to the need to fund the identified capital needs of the utility. The following is a summary of the projected revenue compared to the total estimated revenue requirements / expenditure funding needs for the Forecast Period as reflected in the financial forecast (with emphasis being placed on the near-term needs of the utility).



In the development of the financial forecast, a projection of certain other financial ratios was developed to evaluate the projected financial position of the Stormwater Utility. The analysis includes a series of charts and figures prepared to provide the Town with a visual representation of the financial and statistical trends in the selected financial ratios or benchmarks anticipated for the Stormwater Utility over the Forecast Period. The performance ratios discussed below considered the credit rating rationale or findings identified by Fitch Ratings and Standard and Poor's ("S&P") with respect to their review of the water utility credit for the Town in Fiscal Year 2013, which was assumed to be applicable to the Stormwater Utility, which recognized the following:

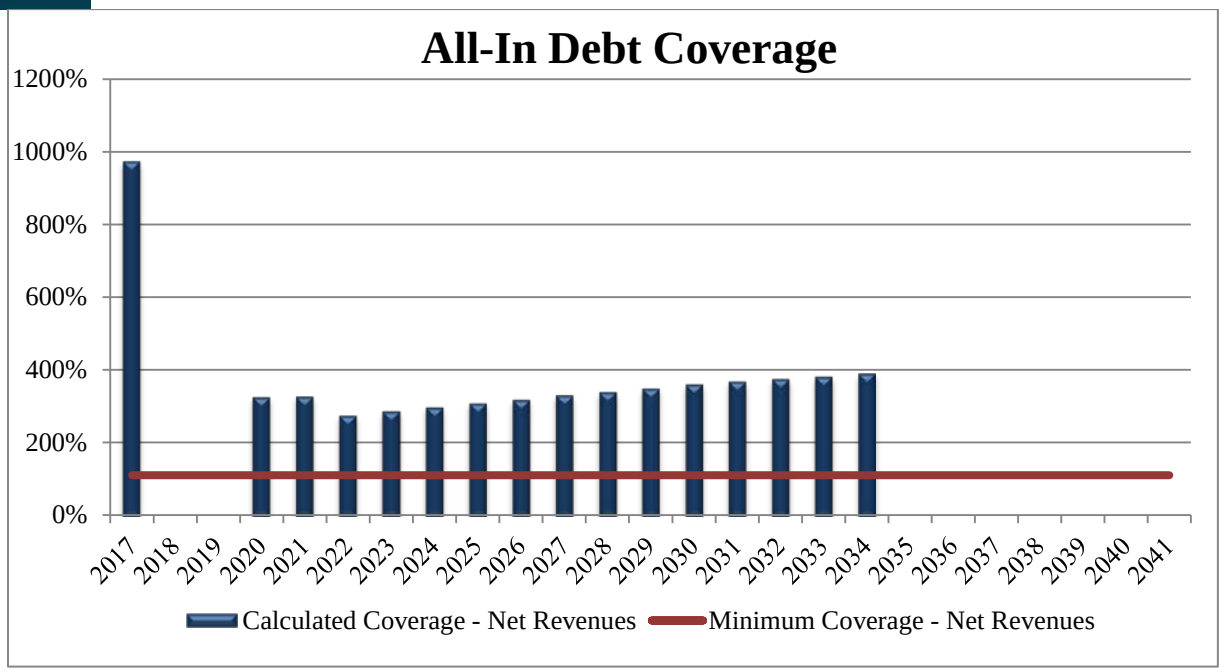
- Strong financial margins with a strong debt service coverage;
- A high liquidity position;
- Manageable capital plan that excludes additional debt issuance;
- Manageable capital plan with a balanced debt burden per customer served;
- Strong customer base with rates being very competitive relative to regional utilities; and
- Strong financial management policies and stewardship.

The key rating driver identified by Fitch Ratings and S&P in their reports was "sustained financial performance at current high levels" and is the key business principal relative to the financial evaluation included herein. The following is a brief description of other financial ratios and financial results evaluated for the Town's consideration based on the primary assumptions mentioned above.

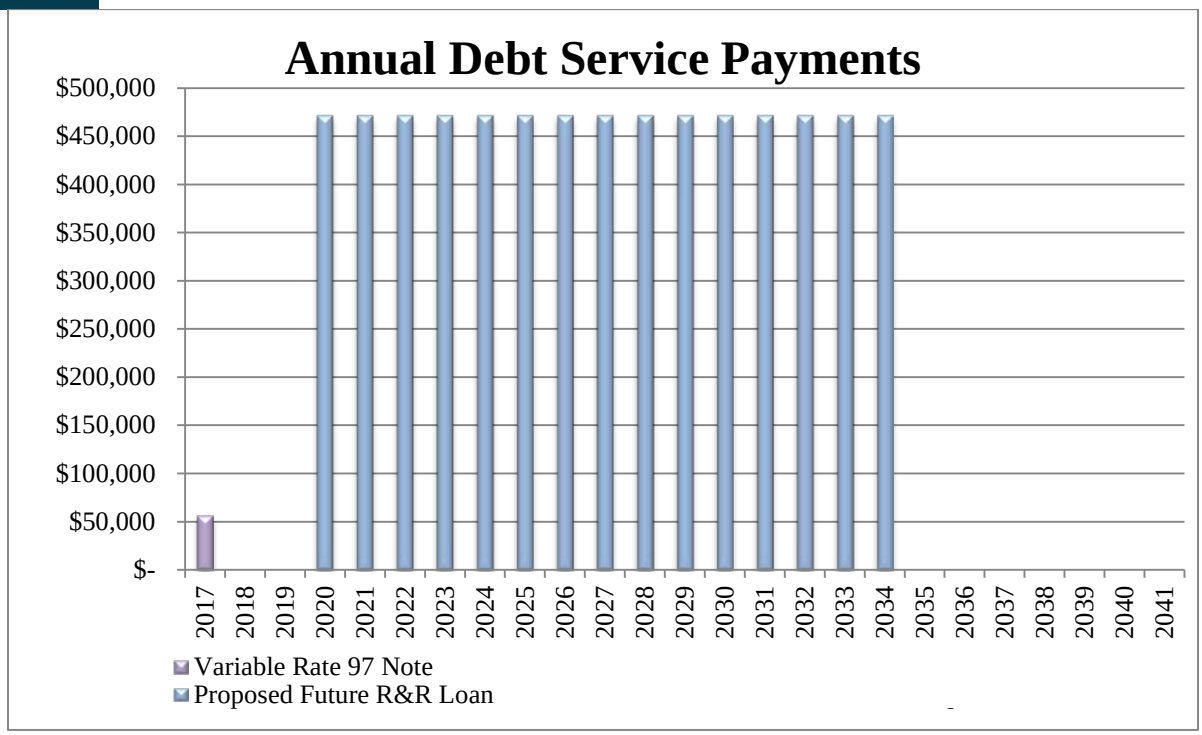
Debt Service Coverage Ratio

An important component in the development of a financial forecast is the determination of the ability of the monthly rates to pay the annual loan or debt service payments allocable to a utility; the higher this ability (ratio) to meet the payments, generally the stronger the financial credit will be. As previously discussed, after the Fiscal Year 2017, there will be no outstanding debt allocated to the Stormwater Utility; this will provide future leveraging capability to fund the ongoing capital improvement needs of the utility. In order to fund the future capital needs, it has been assumed that the Stormwater Utility will secure a $5.73 million inter-fund loan from the Water Utility in Fiscal Year 2020. It should be noted that even with this additional debt, the projected amount of debt liability for the Stormwater Utility is low; representing approximately sixteen percent (16%) of the net plant in service for the utility (reported as of September 30, 2015). To the extent that changes in regulation or unknown major capital expenditures are further required during the Forecast Period, this ratio could become more critical to the Town.

Although the debt service coverage ratio is not a critical ratio for the Stormwater Utility at this time (since no debt is outstanding that is being rated by the credit rating agencies), it is a key ratio considered by credit rating agencies and has been presented for informational purposes. The debt coverage ratio is calculated by dividing the annual net revenue (gross revenue less operating expenses) without system availability charges by the annual debt service payment each year and illustrates the financial margin (ability) of Stormwater Utility revenues to meet current total debt service payments (the higher the percent, the stronger the ratio):



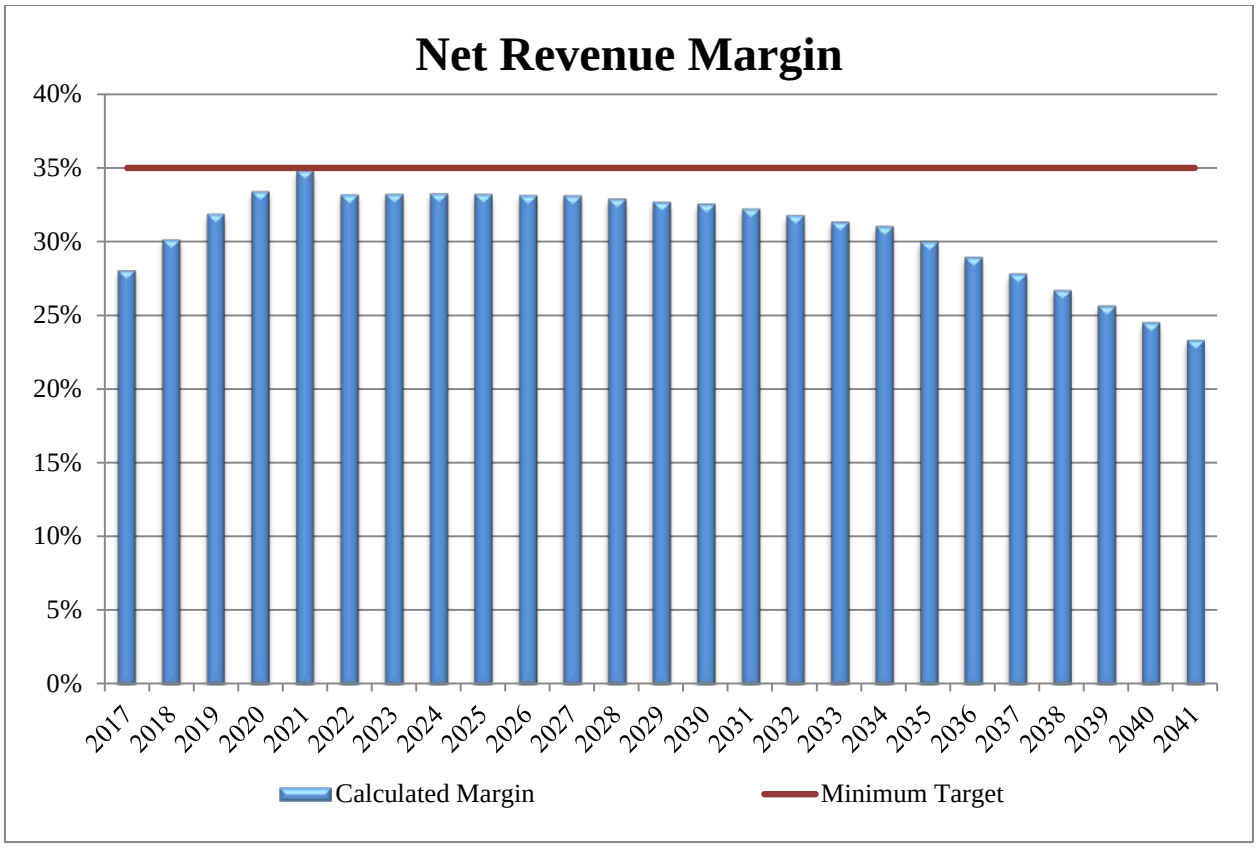
As can be seen above, the debt coverage ratio is anticipated to be favorable during the term that the assumed inter-fund loan is outstanding. The primary reason for the favorable debt coverage ratio is due to: i) having a low amount of the leveraging of funding of the net plant in service from the use of debt; coupled with ii) having a favorable capital re-investment rate from utility operations which is considered subordinate to the payment of the debt requirements. As can be seen below, the only debt assumed for the Forecast Period is the inter-fund loan between the Water and the Stormwater Utilities.



Projected Net Revenue Margin

The net revenue margin ratio is a measure of a utility system's ability to meet its operating expenses and indicates the net contribution margin estimated to be earned by the Stormwater Utility. The contribution margin represents the amount of net revenues from operations that are available to meet the other utility expenditure requirements after the payment of the operating expenses (e.g., primarily for deposits to the Renewal and Replacement Fund to fund capital re-investment in the utility). Since the service availability charges are for the reimbursement of capital expenditures and not operating revenue, such charges are not included in the evaluation of the net revenue margin. A relatively low net revenue margin ratio (for example, twenty-five percent) indicates that a large portion of operating revenue is used to pay operating expenses. A high net revenue margin ratio (for example, forty-five percent) indicates a significant portion of operating revenues is available for Stormwater Utility expenditures other than the payment of operating expenses. A minimum target of thirty-five percent (35%) was assumed since it relates to the Moody's Investors Service median for water utilities for this ratio and was assumed to be representative for stormwater management programs as well. As can be seen below and assuming

the implementation of the recommended rate adjustments, the net revenue margin ratio is projected to decrease during the Forecast Period.

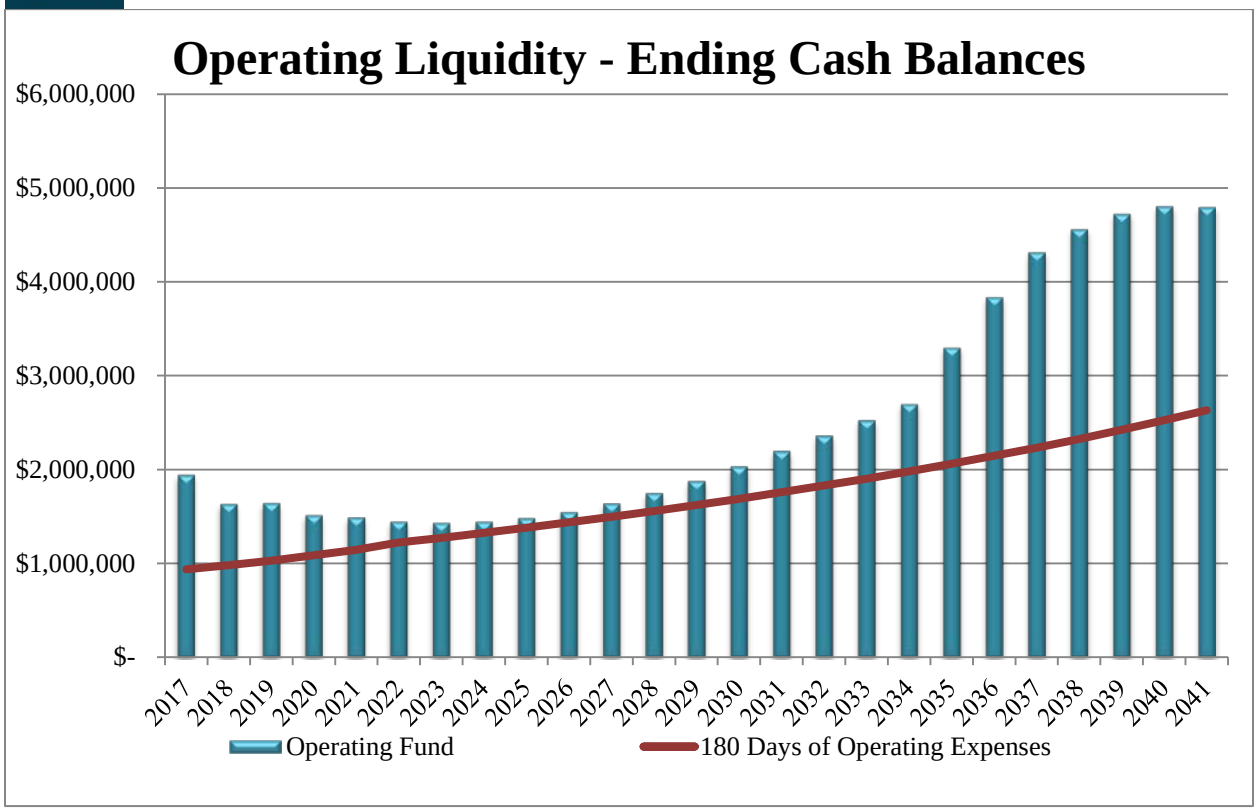


Although a higher net revenue margin ratio is recommended for the latter part of the Forecast Period, one must recognize that the amount of debt service payments (a driver for a higher net revenue ratio) is projected to significantly decline in the latter part of the Forecast Period and therefore there is less pressure to have a higher ratio. However, it must be recognized that the future rate increases may be required in the future as the net revenue margins continue to decline and the need to continue to fund ongoing capital from Stormwater Utility operations continues. The reason for the decline in the net revenue margin ratio is due to: i) the service area achieving a built-out condition essentially at Fiscal Year 2027 which results in rate revenue growth resulting only from the application of the annual price index and ii) the projection of operating expenses increasing at a growth rate greater than the price index assumption. This trend will need to be monitored closely in the future by the Town to assure that sufficient funds are available to finance the capital re-investment

requirements of the Stormwater Utility. In addition, as previously mentioned, the ratio does not include service availability charges that may be realized since they represent non-operating revenues associated with the recovery of prior capital expenditures for the Inlet Village CRA. If the contributed revenue was recognized, the ratio would be more favorable but would still illustrate a declining margin for the Stormwater Utility.

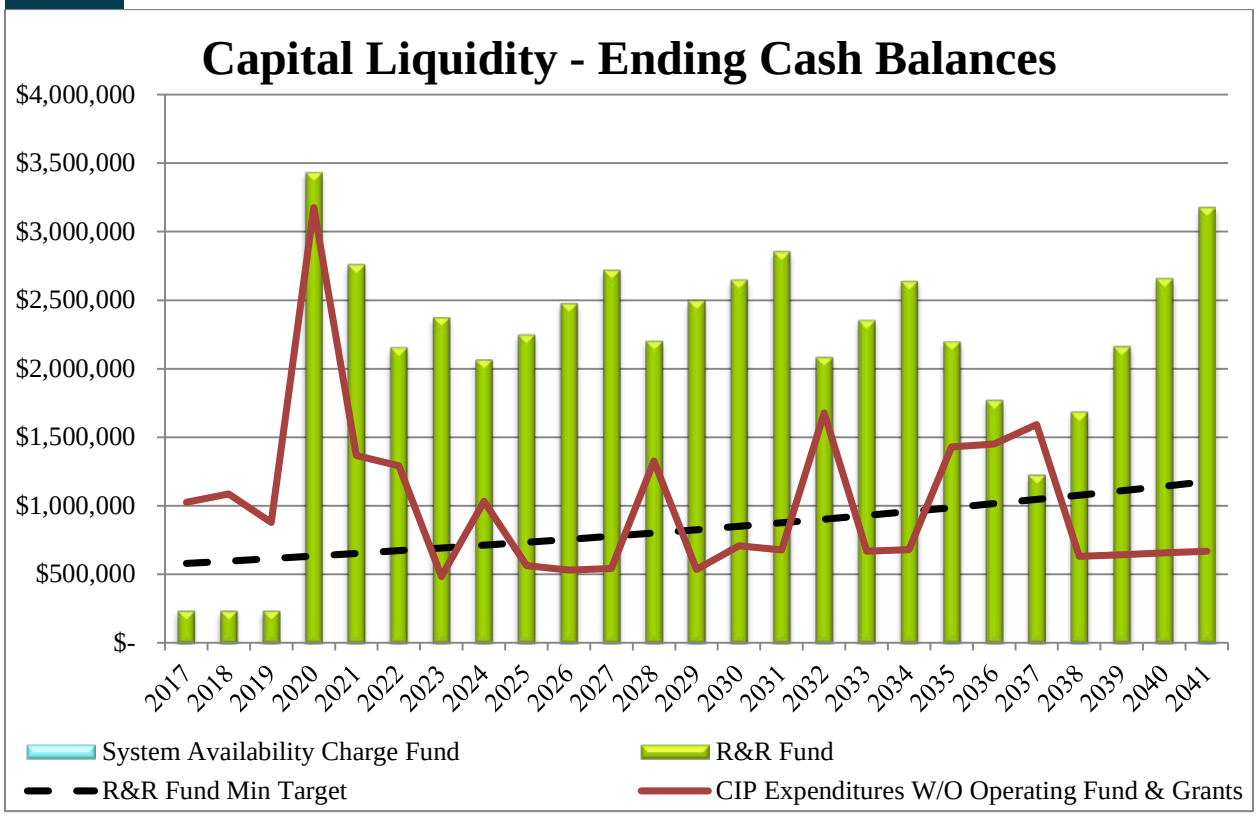
Liquidity (Cash) Position

A major credit component deals with the amount of liquidity a utility maintains relative to working capital (operating) and capital reserves. With respect to working capital reserves, a minimum target of 180 days of operating expenses is recommended, which was considered appropriate for a mature utility (generally includes a service area that is becoming built-out, with limited customer growth and the inability to expand the service area). Specifically, an operating reserve balance ranging from $1.0 million (2017) to $2.6 million (2041) is recommended and would be exclusive of any capital reserves maintained by the Town for the Stormwater Utility. Further, it would be considered prudent for the working capital reserves to be higher if a low net revenue margin is being experienced in order to provide a rate stabilization / financial risk hedge on operations and to provide emergency reserves in the event of force majeure incidents (e.g., a major storm event). The following figure summarizes the projected working capital reserves for the Forecast Period based on the assumptions delineated earlier in this section of the Stormwater Master Plan:



As can be seen above, in the early portion of the Forecast Period, the available working capital reserves are approximating the target working capital reserve, which is only achieved through the use of the inter-fund loan to fund the identified capital needs of the Stormwater System (i.e., without the use of the loan, the need to either increase rates higher than assumed and / or the use of reserves would be required with an anticipated reduction in the liquidity being the probable result).

In addition to working capital reserves that are for ongoing operations and the payment of debt financing, the Stormwater Utility should also maintain a capital reserve to accrue funds for ongoing renewals and replacements but to also have funds for extraordinary or unplanned capital expenditures that occur from time to time. Further, the capital reserve would allow for the continuity of funding the capital program since funds would be available in advance of appropriation such that the Utility Department can more effectively plan for capital expenditures (e.g., bundling of projects to achieve a better price bid). The following figure summarizes the projected capital reserves for the Forecast Period based on the assumptions delineated earlier in this section of the Stormwater Master Plan:



As can be seen on the figure above, for the first three years of the Forecast Period, the balance in the Renewal and Replacement Fund is well below the minimum recommended target balance. This is a direct result of the limited capital contribution margin being generated from rates in relation to the identified expenditure needs of the System. As a result, projected rate increases above inflation coupled with transfers from Utility reserves is required to i) fund the immediately identified capital needs and to phase rates over time. However, beginning in Fiscal Year 2020, the Renewal and Replacement Fund capital reserves generally increase over time during the Forecast Period which is due, in part, to the continued indexing of the fund deposit at 3.0%, consistent with the capital expenditure inflation allowance, coupled with the deposit to the fund and the use of the proceeds from the inter-fund loan during Fiscal Years 2020 to 2022. It should be noted that the higher balances shown in 2021 and 2022 does include loan proceeds that are yet to be expended. By using the loan to fund the majority of the capital needs during the Fiscal Years 2020 to 2022, this will allow the utility to increase the funds on deposit through the annual Renewal and Replacement Fund deposit process and will allow the utility to essentially maintain a $2 million fund balance for many years during the Forecast Period, thus providing a capital funding hedge in the event that improvements or

significant repairs are required. The maintenance of the Renewal and Replacement Fund balance, which includes increasing deposit amounts over time, is prudent in order to match the basis for capital funding with the then capital costs being incurred for the utility and is recommended. However, as can be seen on the figure, the ending balance in the Renewal and Replacement Fund in Fiscal Year 2037 approximates the fund target as the Stormwater Utility assets continue to reach their useful service lives. The Renewal and Replacement Fund capital reserve target was estimated to equate to $500,000 which was the target balance based on a review of the facility assets and service lives presented to the Town in the 2012 Stormwater Master Plan, indexed for the inflation on the cost of construction (essentially reflects the maintenance of the minimum policy level initially presented to the Town).

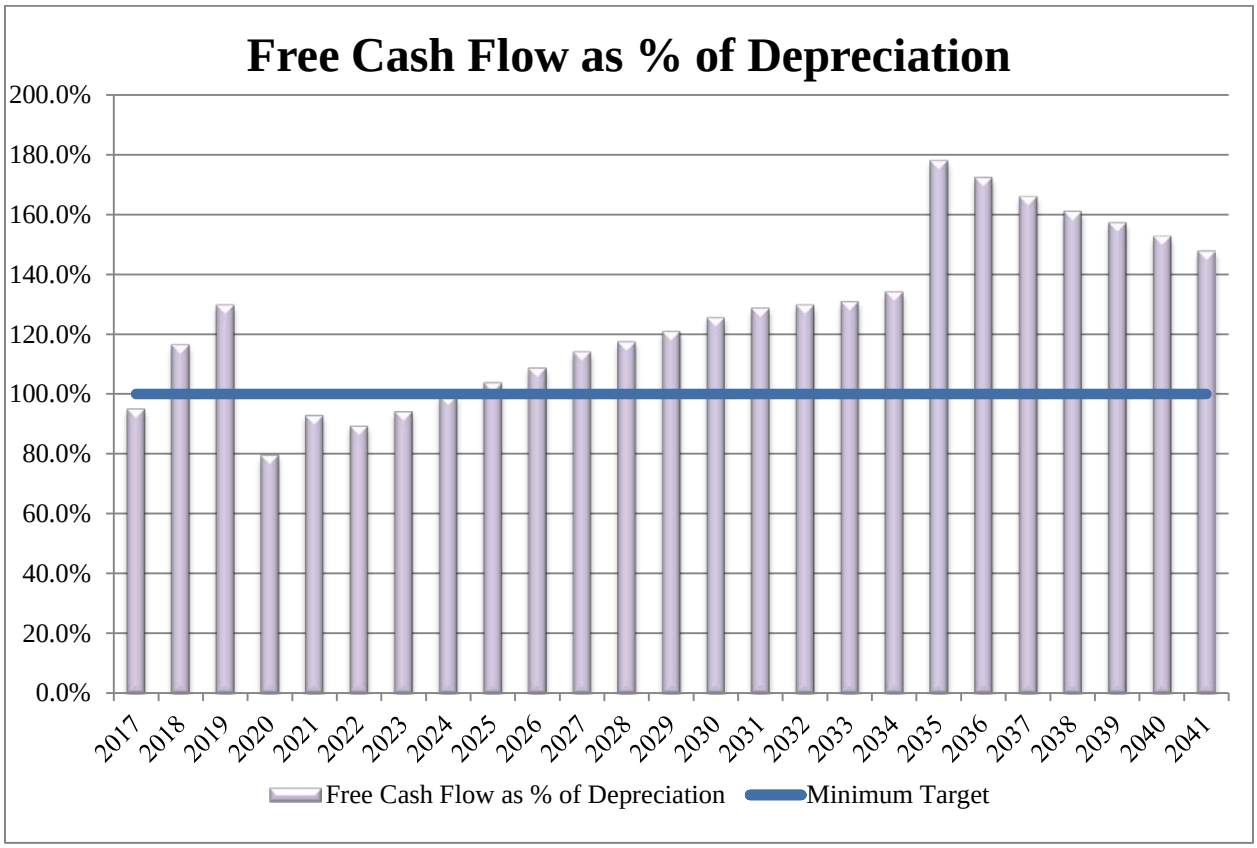
In addition to the Renewal and Replacement Fund, the Town is also receiving system availability charge funds from Inlet Village in order to reimburse the Town for capital expenditures made for the benefit of the CRA. The funds received (realized) from these contribution charges for the Forecast Period were assumed to be deposited into the operating funds of the utility since it represents a reimbursement of capital costs which were funded from available reserves of the Stormwater utility and should be available to finance other capital projects of the Stormwater Utility.

Free Cash as a Percent of Depreciation

A key ratio recently identified by the credit rating agencies is the "free cash as a percent of depreciation" which measures the amount of net revenues available after the payment of debt service and other required transfers (absent the Renewal and Replacement Fund, which is a capital fund). The ratio indicates the annual financial capacity to maintain facilities at current levels of service from existing cash flows. The issue being addressed by the rating agencies is whether there are the proper resources generated annually to maintain utility plant such that there is less risk in the need to issue additional bonds or secure additional loan or due to increased expenditures funded from net revenues due to the need for emergency capital / repairs and maintenance expenditures. As can be seen below, the ratio is projected to be favorable and indicates that annual re-investment in the System is adequately being accomplished based on current funding objectives.

It should be noted that the reason for the increase in the ratio in the first several years of the Forecast Period is due to the implementation of the 7.0% rate phasing plan with the objective to increase the capital re-investment levels for overall system sustainability and to limit future debt. As can be seen below for the Fiscal Year that the capital loan is secured in 2020, the ratio declines as a result of the substitute of the available cash flow

with debt service payments. The capital funding ratio is projected to increase during the Forecast Period as planned to enable pay-as-you-go funding for capital and major repair / rehabilitation expenditures, especially since the service area is planned to be essentially built-out by the end of the Forecast Period.



c. Rate Comparisons

A primary indicator used by credit rating agencies, neighboring utilities, and the Town's peers is the comparability of the rates for monthly stormwater service. Generally, a utility that has a strong financial and rate implementation policy has competitive rates. Table 6.6 provides a comparison of the monthly stormwater fee charged by the Town to a standard single family residential unit (represents the majority of accounts served by the Town). Also included on the comparison are the stormwater fees charged by other neighboring jurisdictions presented on an ERU-basis (single-family equivalent residential unit). Additionally the comparison shows the level of service for each jurisdiction to impute the average cost per 1,000 square feet to provide a more comparative analysis. This information was obtained from a survey performed by the Florida Stormwater Association dated June 2016 as well as other information provided by the

local governments surveyed. As can be seen in the comparison, the fees currently charged by the Town for stormwater service are lower than the average of the sixteen jurisdictions surveyed from both a total monthly bill basis and rate per 1,000 square feet impervious surface basis.

Table 6.6
Comparison of Typical Monthly Bills for Stormwater Service [1]

Description	Comparison of Bills for Stormwater Service		
	Stormwater Fees	Level of Service/ Sq. Footage	Stormwater Fees per 1,000 Sq. Ft.
Town of Jupiter			
Existing Rates as of October 1, 2015	$4.55	2,651	$1.7163
Proposed Rates Effective October 1, 2016	4.65	2,651	1.7541
Other Surveyed Florida Utilities: [2]			
City of Boca Raton	$3.22	2,837	$1.1350
City of Boynton Beach	5.00	1,937	2.5813
City of Delray Beach	5.33	2,502	2.1303
City of Fort Lauderdale	4.10	N/A	N/A
City of Fort Pierce	4.50	2,186	2.0586
City of Hollywood	3.22	2,250	1.4311
City of Lake Worth	6.30	1,748	3.6041
City of Melbourne	3.67	2,500	1.4680
City of Port St. Lucie	12.75	2,280	5.5921
Riviera Beach Utility District	9.00	1,920	4.6875
City of Stuart	3.95	3,707	1.0656
City of Sunrise	6.82	1,884	3.6200
City of Tamarac	9.19	1,830	5.0219
Village of Tequesta	7.13	2,506	2.8452
Village of Wellington	19.00	N/A	N/A
City of West Palm Beach [3]	13.17	2,171	6.0663
Other Surveyed Florida Utilities' Average	$7.27		

[1] Unless otherwise noted, amounts shown reflect stormwater rates in effect beginning August, 2016, per the *Stormwater Utility Rates* document prepared by the Florida Stormwater Association and other information provided by the local governments surveyed.
[2] Utility reports charges on an annual basis. However, for the purposes of this comparison, charge shown is reflected on a monthly basis.
[3] Amounts shown reflect the rates in effect on October 1, 2016.

In the development of the financial forecast, a primary rate assumption included the annual implementation of the price index rate adjustment. The application of the index: i) allows the utility a recurring basis to maintain utility revenue margins and promote overall financial performance; ii) is considered as a prudent financial and management policy by the rating agencies; iii) limits the need for large rate adjustments in the future since rates are marginally

increased annually for the customer's benefit; iv) allows the utility to achieve the highest credit rating which reduces the overall cost of borrowing for the long-term benefit of the customers and the Town; v) is acceptable to the customers since there is no significant change in rates and no material impact on the affordability of stormwater service to such customers; and vi) generally results in the lowest rates over the long-term. The Town implemented the price index for these reasons and such application has assisted the Town in securing the highest financial credit rating. By not implementing the price index, the utility loses the "time value of money" relative to the financial impact to the System and places the utility in a fiscally greater financial risk position (e.g., results in the inability to fund capital over the long-term coupled with the need to issue more debt beyond what may be considered prudent for the utility). For example, a 2% index assumed for the first year of the Forecast Period generates an additional $1.5 million in additional funds over the 25-year Forecast Period. This indexing benefit is increased as an index adjustment is applied each year coupled with the compounding effect over the 25-year period. The application of the index promotes the sustainability of the utility for the long-term in terms of revenue generation and funds availability and use.

As previously mentioned and even with the historical application of the price index to the Stormwater Utility rates by the Town, it is projected that the Town will need to increase rates above the annual consumer price index (assumed at 2.5%) for the next several years. Specifically, it is recommended that the Stormwater Utility rates be increased by 7.0% annually for the Fiscal Years 2018 to 2021 to allow the utility to increase operating margins, fund the capital improvement program and the associated debt to be incurred from the assumed inter-fund loan identified in the forecast, and to maintain a strong financial credit rating. This rate adjustment recognizes the inclusion of the estimated annual price index adjustment assumed at 2.1% per year. In addition, it should be noted that each 1% increase in Stormwater Utility rates currently produces approximately $26,000 in additional rate revenue (based on estimated Fiscal Year 2017 revenues). Assuming the application of the proposed rate adjustments identified for the financial forecast, the rates in the last year of the rate phasing period (i.e., 2021) will still be competitive with the rates charged by neighboring local governments (as of September 2016 with many raising rates during the comparison period) as shown below:

Table 6.7
Comparison of Average Monthly Residential Bill

Fiscal Year	Percent Adjustment	Monthly Rate
Town of Jupiter		
Fiscal Year 2017 (Adopted)		$4.65
Fiscal Year 2021	7.00% Annually	6.10
Other Surveyed Florida Utilities' Average – As of September 2016		$7.27

d. Observations and Recommendations

Based on the financial evaluation as presented herein in support of the funding of the anticipated capital needs of the Stormwater Utility, we offer the observations and recommendations:

1. The Stormwater Utility should set policy consistent with the Water System, which will result in a financial position that would equate to a strong utility credit (assumed to be at least an "AA" credit rating). In addition to providing consistent financial policies for the benefit of the enterprise funds, this should: i) promote stability in long-term rate competitiveness; ii) limit the risk to the utility due to market changes such as increased regulations; iii) allow for future debt borrowing at lowest interest costs; and iv) provide benefit to the overall credit rating of the Town.

2. The Stormwater Master Plan identifies the need to fund approximately $35.6 Million in capital expenditures and rehabilitation for the Fiscal Years 2017 to 2041 time frame. The majority of the capital expenditures is for renewals and replacements (approximately 70% of the total identified needs) and is attributable to utility infrastructure reaching its useful service lives during the Forecast Period. This is typical for a mature system which the Stormwater Utility is now transitioning in (from a growth-related system) and for the stormwater utilities in the South Florida area.

3. Renewal and replacement-related capital expenditures generally benefit existing customers since the assets are in service to serve such customers. Prudent utility business practices suggest that the funding of such expenditures should be from an annual deposit to a capital fund (i.e., Renewal and Replacement Fund) in order to match asset use to asset replacement. This is generally considered as a

"depreciation equivalent." It is recommended that the Town annually fund a deposit to the R&R Fund at the amounts identified in the financial forecast as follows:

i. Maintain annual deposit of approximately $580,000 for the Fiscal Year 2017; and

ii. Increase the deposit by the construction cost index as published annually in the *Engineering News Record* (not less than 3.0%) to account for changes in construction costs.

4. The Town should increase Stormwater Utility rates by 7.00% annually for the Fiscal Years 2018 through 2021 to allow the utility to increase operating margins, fund the capital improvement program and the associated debt to be incurred from the assumed inter-fund loan identified in the forecast, and to maintain a strong financial credit rating. Based on a local utility rate survey, this rate adjustment should not affect the competitiveness of the rates when compared to the rates charged by other local governments in the Southeast Florida area. The financial plan recognizes that the Town has directed the payments estimated to be received from the Infrastructure Equity Program to the General Fund; such payments in prior evaluations were assumed to be a financial resource of the Stormwater System. In order to limit rate adjustments over the Forecast Period (including a possible reduction in the term of the initial rate phasing plan) and recognizing that the payments relate to stormwater capital recovery, the redirection of the Infrastructure Equity Program payments back to the Stormwater Utility would be recommended and should be reconsidered by the Town.

5. After the rate phasing plan through 2021, the Town should continue to annually index the stormwater rates to maintain net revenue margins and provide funds for renewals and replacement capital projects. The indexing of rates is critical to the financial forecast and strong financial position of the Stormwater Utility. The financial forecast assumes an annual 3.5% price index adjustment effective each October 1st beginning in Fiscal Year 2022, which is higher than the estimated Consumer Price Index assumptions of 2.5%. This is due to the need to fund increasing operating expenses and renewals and replacements, which are anticipated to increase at this rate as well during the Forecast Period. The

financial plan does recognize a decrease in the rate index in 2035 after the inter-fund loan is paid and as the liquidity balances increase.

Recognizing the need for continued rate adjustments to maintain the overall revenue sufficiency of rates and that there is no specific stormwater index used in the industry, it is recommended that the Town adopt a price index that is equal to the greater of the Consumer Price Index or the assumed indexing percentages noted above. This approach would more closely align with the financial forecast yet allow for the recovery of costs if inflation rates significantly increase. This rate phasing plan should be closely monitored as a significant regulatory or capital event could still result in a financial strain on the utility.

6. The Town should update the financial forecast every 1 to 3 years to monitor trends and changes in Stormwater Utility operations and capital needs to evaluate business and rate strategies in order to maintain the financial position of the Stormwater Utility.

Table 6.8
Cash Flow Analysis

Line No.	Description	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
1	**Growth % of Stormwater Utility Charges Over Prior Yr**	102.9%	107.8%	107.8%	107.8%	107.7%	104.2%	104.1%	104.1%	104.0%	104.0%	103.8%	103.6%	103.6%	103.6%	103.6%	103.5%	103.5%	103.5%	102.5%	102.5%	102.5%	102.5%	102.5%	102.5%	102.5%
2	**Adjusted Operating Fund Balance**	$ 2,332,621	$ 1,947,127	$ 1,637,582	$ 1,647,488	$ 1,518,490	$ 1,493,894	$ 1,450,894	$ 1,435,509	$ 1,449,249	$ 1,488,000	$ 1,551,503	$ 1,644,227	$ 1,754,449	$ 1,882,682	$ 2,034,849	$ 2,198,627	$ 2,362,672	$ 2,527,234	$ 2,702,299	$ 3,299,830	$ 3,840,995	$ 4,318,090	$ 4,561,761	$ 4,727,421	$ 4,808,450
3	Add: Operating Income Excluding GF Xfers & FCA	847,159	959,267	1,076,430	1,194,834	1,321,323	1,310,897	1,360,851	1,412,100	1,460,013	1,505,598	1,549,107	1,585,439	1,622,572	1,659,454	1,695,705	1,730,520	1,765,916	1,801,770	1,781,974	1,759,168	1,731,958	1,698,827	1,660,447	1,616,637	1,566,791
4	Less: General Fund Transfers & Full Cost Allocation	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)	(118,100)
5	Add: Int Earned in Prior Periods on Oper Fund Bal	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	Add: Other Non-Oper Income (Grants & Other)	-	479,597	200,000	556,044	431,855	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
7	Add: Debt/Bond Proceeds for Operating Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Less: Debt Service	(56,000)	-	-	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	(471,345)	-	-	-	-	-	-	-
9	Less: Capital Project Expenditures	(128,047)	(610,524)	(334,854)	(694,944)	(574,922)	(347,358)	(351,780)	(356,333)	(361,023)	(365,853)	(370,829)	(375,954)	(381,233)	(386,670)	(392,270)	(398,038)	(403,979)	(410,099)	(416,401)	(422,894)	(429,581)	(436,468)	(443,562)	(450,869)	(458,395)
10	Less: Capital Equipment Expenditures	(105,500)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)	(16,000)
11	Less: Capitalized Salaries	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Less: Transfers to R&R Fund	(583,019)	(600,510)	(618,525)	(637,081)	(656,193)	(675,879)	(696,155)	(717,040)	(738,551)	(760,708)	(783,529)	(807,035)	(831,246)	(856,183)	(881,868)	(908,324)	(935,574)	(963,641)	(992,550)	(1,022,327)	(1,052,997)	(1,084,587)	(1,117,125)	(1,150,639)	(1,185,158)
13	Less: Additional Transfer to R&R Fund	(420,244)	(182,277)	(235,239)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	Less: Transfer to Availability Fee Fund	-	(225,474)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15	Add: Transfer fr Availability Fee Fund	176,478	-	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	-	-	-	-
16	Less: Transfers to CIP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
17	Less: Reimbursement to Water Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18	Less: Reserves for R&R and Storm Fund	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)	(120,000)
19	Less: Working Capital for Operations @ 16.67% (2mos)	(439,236)	(441,413)	(460,504)	(510,551)	(534,777)	(561,892)	(578,798)	(596,116)	(614,305)	(632,658)	(651,636)	(672,218)	(693,544)	(714,954)	(737,296)	(761,605)	(786,787)	(811,719)	(838,503)	(869,358)	(901,712)	(934,483)	(967,596)	(1,002,283)	(1,038,628)
20	Adj: Adjustment to Tie to Financial Statement	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Oper. Funds Avail. for Future CIP before Int. Income	1,386,112	1,071,694	1,062,064	881,619	831,605	745,491	710,841	703,949	721,213	760,208	820,444	900,287	996,827	1,110,158	1,244,949	1,387,008	1,528,077	1,669,374	2,233,994	2,741,593	3,185,836	3,507,279	3,639,825	3,686,167	3,638,960
23	Add Interest Income	1,779	4,475	4,920	6,319	7,512	23,511	25,869	29,184	32,482	38,637	52,146	61,943	72,311	89,736	96,382	94,059	92,370	101,206	107,334	110,043	110,542	-	-	-	-
24	Oper Fund Bal Incl Working Capital & Reserves	1,947,127	1,637,582	1,647,488	1,518,490	1,493,894	1,450,894	1,435,509	1,449,249	1,488,000	1,551,503	1,644,227	1,754,449	1,882,682	2,034,849	2,198,627	2,362,672	2,527,234	2,702,299	3,299,830	3,840,995	4,318,090	4,561,761	4,727,421	4,808,450	4,797,588
25	**Renewal & Replacement Fund Balance**	240,000	240,000	240,600	240,721	3,431,291	2,760,027	2,155,640	2,374,986	2,065,537	2,247,923	2,478,550	2,721,272	2,201,059	2,498,264	2,647,552	2,853,508	2,085,162	2,354,266	2,638,042	2,200,525	1,773,011	1,232,670	1,687,505	2,162,585	2,658,517
26	Add: Annual Contribution to R&R Fund	583,019	600,510	618,525	637,081	656,193	675,879	696,155	717,040	738,551	760,708	783,529	807,035	831,246	856,183	881,868	908,324	935,574	963,641	992,550	1,022,327	1,052,997	1,084,587	1,117,125	1,150,639	1,185,158
27	Add: Additional Transfer from Operating Fund	420,244	182,277	235,239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	R&R Reserve																									
	Add: Int Earned Prior Periods on R&R Fund Bal																									
	Add: Grant Revenue																									
28	Add: Infrastructure Equity Program Cash Receipts	22,299	22,299	22,299	22,299	22,299	10,195	6,195	6,195	6,195	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
29	Add: Debt/Bond Proceeds for R&R	-	-	-	5,700,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Less: Capital Project Expenditures	(1,025,562)	(805,086)	(876,663)	(3,176,140)	(1,365,196)	(1,290,461)	(483,004)	(1,032,684)	(562,360)	(530,081)	(540,807)	(1,327,248)	(534,041)	(706,895)	(675,912)	(1,676,670)	(666,470)	(679,865)	(1,430,067)	(1,449,841)	(1,593,338)	(629,752)	(642,045)	(654,707)	(667,748)
31	Adj: Adjustment for Balance Sheet Items - AP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33	Net R&R Funds Avail for Future CIP before Int	240,000	240,000	240,000	3,423,961	2,744,587	2,155,640	2,374,986	2,065,537	2,247,923	2,478,550	2,721,272	2,201,059	2,498,264	2,647,552	2,853,508	2,085,162	2,354,266	2,638,042	2,200,525	1,773,011	1,232,670	1,687,505	2,162,585	2,658,517	3,175,927
34	Add Interest Income	-	600	721	7,329	15,440	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	R&R Fund Balance After Adjustment	240,000	240,600	240,721	3,431,291	2,760,027	2,155,640	2,374,986	2,065,537	2,247,923	2,478,550	2,721,272	2,201,059	2,498,264	2,647,552	2,853,508	2,085,162	2,354,266	2,638,042	2,200,525	1,773,011	1,232,670	1,687,505	2,162,585	2,658,517	3,175,927
36	**Availability Fees/Inlet Village Fund Balance**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37	Add: Annual Contribution to Inlet Village Fund	176,478	54,123	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	51,274	-	-	-	-
	Add: Int Earned Prior Periods on Inlet Village Fund Bal																									
38	Less: Capital Project Expenditures	-	(279,597)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	Add: Transfer from Operating Fund	-	225,474	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
40	Less: Transfer to Operating Fund	(176,478)	-	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	(51,274)	-	-	-	-
41	Adj: Adjustment for Balance Sheet Items - AP	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	Net Inlet Village Funds Avail before Int	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
44	Add Interest Income	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	Availability Fees/Inlet Village Fund Balance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	Total Fund Balance at Year End	$ 2,187,127	$ 1,878,182	$ 1,888,209	$ 4,949,781	$ 4,253,920	$ 3,606,534	$ 3,810,494	$ 3,514,786	$ 3,735,922	$ 4,030,052	$ 4,365,498	$ 3,955,507	$ 4,380,946	$ 4,682,400	$ 5,052,134	$ 4,447,834	$ 4,881,499	$ 5,340,341	$ 5,500,355	$ 5,614,005	$ 5,550,760	$ 6,249,266	$ 6,890,006	$ 7,466,966	$ 7,973,514

Notes:

(1) Transfers for the Microsoft Enterprise Agreement. Total project cost is $500,715 and includes funding from Water and general revenue.

(2) Per Resolution 48-10, annual R&R reserve funding deposit goal is $500,000.

(3) Minimum R&R reserve balance goal is $500,000.

(4) Minimum fund balance goal is $3,000,000.

Table 6.9
Capital Improvement Plan

Line No.	Capital Improvement Projects	Funding Source	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total CIP 2017 to 2041
1	Urban Stormwater Management System Rehab	R&R	$ -	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 220,000	$ 5,280,000
2	Urban Stormwater Management System Rehab	LRPI	-	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	4,800,000
3	Private Stormwater Improvement Grants	O&M	63,353	65,254	67,211	69,228	71,304	73,443	75,647	77,916	80,254	82,661	85,141	87,695	90,326	93,036	95,827	98,702	101,663	104,713	107,854	111,090	114,423	117,855	121,391	125,033	128,784	2,309,804
4	Private Stormwater Improvement Grants	CDBG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	Stormwater System Rehabilitation	R&R	117,626	119,405	422,987	126,677	130,477	134,392	138,423	142,576	146,853	151,259	155,797	160,471	165,285	170,243	175,351	180,611	186,029	191,610	197,359	203,279	209,378	215,659	222,129	228,793	235,657	4,528,326
6	Seminole Ave Watershed Improvements	R&R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	SW Management System Redevelopment Grants	O&M	64,694	65,673	67,643	69,672	71,763	73,915	76,133	78,417	80,769	83,192	85,688	88,259	90,907	93,634	96,443	99,336	102,316	105,386	108,547	111,804	115,158	118,613	122,171	125,836	129,611	2,325,580
8	Salinity Barrier Debris Collection System	O&M	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	Utility Billing Services & Enterprise Asset Mgt System	R&R	-	-	-	-	-	-	-	-	63,339	-	-	-	-	-	-	-	-	-	85,122	-	-	-	-	-	-	148,461
10	Asset Maintenance Program - Maintenance General	R&R	124,691	465,681	233,676	298,958	782,864	936,069	124,581	670,108	132,168	158,822	165,010	946,777	148,756	316,652	280,561	1,276,059	260,441	268,255	927,586	1,026,562	1,163,960	194,093	199,916	205,914	212,091	11,520,251
11	Elsa and Paulina Roads Infrastr Improve (to coincide w/water imp	R&R	756,245	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	756,245
12	A1A & ITR Intersection SW Design	R&R	27,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	27,000
13	Saturn Street Infrastructure Improvements	Avail	-	175,185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175,185
14	Saturn Street Infrastructure Improvements	LRPI	-	175,185	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	175,185
15	Future Suni Sands Side Street Drainage Improve	Avail	-	104,413	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104,413
16	Future Suni Sands Side Street Drainage Improve	LRPI	-	104,413	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104,413
17	Pine Gardens North Drainage & Distribution Improvements	R&R	-	-	-	356,044	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	356,044
18	Pine Gardens North Drainage & Distribution Improvements	LRPI	-	-	-	356,044	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	356,044
19	Seminole Basin Impr - Reroute Drainage to 2nd Dischrg Location	R&R	-	-	-	2,174,461	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,174,461
20	Pennock Industrial Park Drainage Improvements	R&R	-	-	-	-	231,855	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	231,855
21	Pennock Industrial Park Drainage Improvements	LRPI	-	-	-	-	231,855	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	231,855
22	Total Projects		$ 1,153,609	$ 1,695,207	$ 1,211,517	$ 3,871,084	$ 1,940,118	$ 1,637,819	$ 834,784	$ 1,389,017	$ 923,383	$ 895,934	$ 911,636	$ 1,703,202	$ 915,274	$ 1,093,565	$ 1,068,182	$ 2,074,708	$ 1,070,449	$ 1,089,964	$ 1,846,468	$ 1,872,735	$ 2,022,919	$ 1,066,220	$ 1,085,607	$ 1,105,576	$ 1,126,143	$ 35,605,120
23	Total Projects - Stormwater Funded Only		$ 1,153,609	$ 1,215,610	$ 1,011,517	$ 3,315,040	$ 1,508,263	$ 1,437,819	$ 634,784	$ 1,189,017	$ 723,383	$ 695,934	$ 711,636	$ 1,503,202	$ 715,274	$ 893,565	$ 868,182	$ 1,874,708	$ 870,449	$ 889,964	$ 1,646,468	$ 1,672,735	$ 1,822,919	$ 866,220	$ 885,607	$ 905,576	$ 926,143	$ 29,937,624
	Funding by Source of Funds																											
24	Intergov - Grant Funds - Lox River Pres Init - SW	LRPI	$ -	$ 479,597	$ 200,000	$ 556,044	$ 431,855	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 200,000	$ 5,667,496
25	Intergov - Grant Funds - DCA/Palm Beach County	CDBG	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	Stormwater Fund, O&M	O&M	128,047	130,927	134,854	138,900	143,067	147,358	151,780	156,333	161,023	165,853	170,829	175,954	181,233	186,670	192,270	198,038	203,979	210,099	216,401	222,894	229,581	236,468	243,562	250,869	258,395	4,635,384
27	Stormwater Fund, R&R	R&R	1,025,562	805,086	876,663	3,176,140	1,365,196	1,290,461	483,004	1,032,684	562,360	530,081	540,807	1,327,248	534,041	706,895	675,912	1,676,670	666,470	679,865	1,430,067	1,449,841	1,593,338	629,752	642,045	654,707	667,748	25,022,643
28	Stormwater Availability Charges (Inlet Village)	Avail	-	279,597	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	279,597
32	Total Projects		$ 1,153,609	$ 1,695,207	$ 1,211,517	$ 3,871,084	$ 1,940,118	$ 1,637,819	$ 834,784	$ 1,389,017	$ 923,383	$ 895,934	$ 911,636	$ 1,703,202	$ 915,274	$ 1,093,565	$ 1,068,182	$ 2,074,708	$ 1,070,449	$ 1,089,964	$ 1,846,468	$ 1,872,735	$ 2,022,919	$ 1,066,220	$ 1,085,607	$ 1,105,576	$ 1,126,143	$ 35,605,120

Table 6.10
Asset Maintenance R and R Program

Line No.	Asset Maintenance R&R Program	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	Total Asset Mgmt. Plan 2017 to 2041
	Buildings																										
1	Field Operations Center:																										
2	Clean & Paint (every 10 yrs)	$ -	$ -	$ -	$ -	$ 26,095	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,070	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 61,165
3	Building Rehab (every 10 years)	-	-	-	-	-	-	-	-	-	22,689	-	-	-	-	-	-	-	-	-	30,492	-	-	-	-	-	53,181
	Pump Stations: Clean & Paint (every 10 yrs)																										-
4	Seminole Pump Station	9,414	-	-	-	-	-	-	-	-	-	12,396	-	-	-	-	-	-	-	-	-	16,660	-	-	-	-	38,470
5	7th Street Pump Station	9,414	-	-	-	-	-	-	-	-	-	12,396	-	-	-	-	-	-	-	-	-	16,660	-	-	-	-	38,470
	Pump Stations: Pumps/Electrical R&R (every 15 years)																										-
6	Seminole Pump Station	-	-	-	-	521,909	-	-	-	-	-	-	-	-	-	-	-	-	-	-	813,118	-	-	-	-	-	1,335,027
7	7th Street Pump Station	-	-	-	-	-	537,567	-	-	-	-	-	-	-	-	-	-	-	-	-	-	837,511	-	-	-	-	1,375,078
	Total Buildings	18,828	-	-	-	548,004	537,567	-	-	-	22,689	24,792	-	-	-	35,070	-	-	-	-	843,610	870,831	-	-	-	-	2,901,391
	Other Improvements: Maintenance of Control Structures/Piping/Detention & Retention Areas/Canals																										
8	Salinity Barrier: Clean & Paint (every 10 years)	-	-	-	-	-	35,644	-	-	-	-	-	-	-	-	-	47,903	-	-	-	-	-	-	-	-	-	83,547
9	Pine Gardens South Infrastructure	-	358,216	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	358,216
10	Jupiter Village Control Structure	-	-	122,987	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	122,987
11	Seminole Ave Drainage Area	-	-	-	126,677	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,677
12	Brentwood South Outfall	-	-	-	-	65,239	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	65,239
13	Jupiter River Estates North Detention Area	-	-	-	-	52,191	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52,191
14	Olympus Outfalls	-	-	-	-	-	241,905	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	241,905
15	Bluffs Outfalls	-	-	-	-	-	-	-	541,789	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	541,789
16	Egret Landing Outfalls	-	-	-	-	-	-	-	-	-	-	-	802,353	-	-	-	-	-	-	-	-	-	-	-	-	-	802,353
17	Old Jupiter Beach Rd Detention Area	-	-	-	-	-	-	-	-	-	-	-	-	-	85,122	-	-	-	-	-	-	-	-	-	-	-	85,122
18	Maplewood Drainage System	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87,675	-	-	-	-	-	-	-	-	-	-	87,675
19	Shores Outfalls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	903,056	-	-	-	-	-	-	-	-	-	903,056
20	Love Street Detention Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	93,015	-	-	-	-	-	-	-	-	93,015
21	Clemons Street Detention Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	95,805	-	-	-	-	-	-	-	95,805
22	Paseos Outfalls	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	749,963	-	-	-	-	-	-	749,963
23	Greenwood Detention Area	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	104,689	-	-	-	-	104,689
24	Rio Vista Canal Dredging	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	126,428	-	-	-	-	-	-	-	-	-	126,428
25	Penn Ditch Rehab	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	36,122	-	-	-	-	-	-	-	-	-	36,122
26	Jonathan's Landing Canal Dredging	-	-	-	38,003	-	-	-	-	-	-	-	-	-	51,073	-	-	-	-	-	-	-	-	-	-	-	89,076
27	Old Dixie Ditch Rehab	-	-	-	20,268	-	-	-	-	-	-	-	-	-	27,239	-	-	-	-	-	-	-	-	-	-	-	47,507
28	Other Misc. Improvements	88,219	89,554	92,241	95,008	97,858	100,794	103,818	106,932	110,140	113,444	116,848	120,353	123,964	127,682	131,513	135,458	139,522	143,708	148,019	152,460	157,033	161,744	166,597	171,595	176,742	3,171,246
29	Total Other Improvements	88,219	447,770	215,228	279,956	215,288	378,343	103,818	648,721	110,140	113,444	116,848	922,706	123,964	291,116	219,188	1,248,967	232,537	239,513	897,982	152,460	261,722	161,744	166,597	171,595	176,742	7,984,608
	Information Systems																										-
30	SCADA Upgrades	11,763	11,941	12,299	12,668	13,048	13,439	13,842	14,258	14,685	15,126	15,580	16,047	16,528	17,024	17,535	18,061	18,603	19,161	19,736	20,328	20,938	21,566	22,213	22,879	23,566	422,834
31	GIS Upgrades	5,881	5,970	6,149	6,334	6,524	6,720	6,921	7,129	7,343	7,563	7,790	8,024	8,264	8,512	8,768	9,031	9,301	9,581	9,868	10,164	10,469	10,783	11,106	11,440	11,783	211,418
32	Total Information Systems	17,644	17,911	18,448	19,002	19,572	20,159	20,763	21,387	22,028	22,689	23,370	24,071	24,792	25,536	26,303	27,092	27,904	28,742	29,604	30,492	31,407	32,349	33,319	34,319	35,349	634,252
33	Total Asset Maintenance R&R Program	$ 124,691	$ 465,681	$ 233,676	$ 298,958	$ 782,864	$ 936,069	$ 124,581	$ 670,108	$ 132,168	$ 158,822	$ 165,010	$ 946,777	$ 148,756	$ 316,652	$ 280,561	$ 1,276,059	$ 260,441	$ 268,255	$ 927,586	$ 1,026,562	$ 1,163,960	$ 194,093	$ 199,916	$ 205,914	$ 212,091	$ 11,520,251

Note: The asset maintenance program excludes major infrastructure replacement projects (>$500,000) which would be budgeted separately.

Table 6.11
Assumptions by Year for Projections

Line No.	Assumptions	Escal. Ref.	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
	Expenses																										
1	Salaries	Salaries	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
2	OT Admin	Admin-OT	132.19%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
3	OT Field	Field-OT	105.36%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
4	FICA	FICA	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	104.00%	103.90%	103.80%	103.70%	103.60%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
5	FRS	FRS	104.00%	104.00%	104.00%	104.57%	104.00%	104.00%	104.00%	104.00%	104.50%	104.00%	103.90%	103.80%	103.70%	104.00%	103.50%	103.40%	103.30%	103.20%	103.10%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
6	Health/Life Insurance	Health	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%	107.50%
7	Workers Comp	WC	103.50%	119.60%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%
8	OPEB	OPEB	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%	101.04%
9	Consumer Price Index - Gen Inflation	CPI	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%	102.50%
10	Repairs and Maintenance	Repair	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
11	Utility Costs	Utility	105.00%	105.00%	104.00%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%	103.50%
12	Gasoline	Gas	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
13	Insurance Costs	Insurance	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%	105.00%
14	Marginal Increase	Marginal	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%	101.51%
15	Constant	Constant	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
16	Customer Growth Plus Inflation	Customer		103.28%	103.27%	103.27%	103.16%	103.15%	103.15%	103.14%	103.04%	103.03%	102.83%	102.62%	102.62%	102.60%	102.56%	102.52%	102.52%	102.52%	102.52%	102.52%	102.52%	102.50%	102.50%	102.50%	102.50%
17	Change in Allowance for Doubtful Accounts	Doubtful Accts.	103.15%	107.78%	107.77%	107.77%	107.66%	104.15%	104.15%	104.14%	104.04%	104.03%	103.83%	103.62%	103.62%	103.60%	103.56%	103.52%	103.52%	103.52%	102.52%	102.52%	102.52%	102.50%	102.50%	102.50%	102.50%
18	Depreciation as a % of Total Assets		101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%	101.40%
	Other																										
19	Working Capital-% of Oper/Non-Oper Expenses		16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%	16.67%
	Revenues																										
20	Fuel Reimbursement		103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%	103.00%
21	Interest Rate on Investments		0.07%	0.25%	0.30%	0.40%	0.50%	0.60%	0.70%	0.80%	0.90%	1.00%	1.25%	1.50%	1.75%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
22	R&R Contributions		$ 583,019	$ 600,510	$ 618,525	$ 637,081	$ 656,193	$ 675,879	$ 696,155	$ 717,040	$ 738,551	$ 760,708	$ 783,529	$ 807,035	$ 831,246	$ 856,183	$ 881,868	$ 908,324	$ 935,574	$ 963,641	$ 992,550	$ 1,022,327	$ 1,052,997	$ 1,084,587	$ 1,117,125	$ 1,150,639	$ 1,185,158
23	Growth in Stormwater Utility Charges		102.86%	107.78%	107.77%	107.77%	107.66%	104.15%	104.15%	104.14%	104.04%	104.03%	103.83%	103.62%	103.62%	103.60%	103.56%	103.52%	103.52%	103.52%	102.52%	102.52%	102.52%	102.50%	102.50%	102.50%	102.50%
24	User Charge Indexing - CPI-U		2.10%	7.00%	7.00%	7.00%	7.00%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	3.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
25	Customer Growth		0.76%	0.78%	0.77%	0.77%	0.66%	0.65%	0.65%	0.64%	0.54%	0.53%	0.33%	0.12%	0.12%	0.10%	0.06%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.00%	0.00%	0.00%	0.00%
26	ERUs Connected EOY		46,210	46,570	46,930	47,290	47,600	47,910	48,220	48,530	48,790	49,050	49,210	49,270	49,330	49,379	49,411	49,421	49,431	49,441	49,451	49,461	49,471	49,471	49,471	49,471	49,471
27	Change in ERUs over prior year		350	360	360	360	310	310	310	310	260	260	160	60	60	49	32	10	10	10	10	10	10	-	-	-	-
28	Normal Growth		350	350	350	350	300	300	300	300	250	250	150	50	50	39	22	-	-	-	-	-	-	-	-	-	-
29	Service Availability Redevelopment Growth - Inlet Village Area		-	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	-	-	-	-
30	Percentage Growth in ERUs			0.78%	0.77%	0.77%	0.66%	0.65%	0.65%	0.64%	0.54%	0.53%	0.33%	0.12%	0.12%	0.10%	0.06%	0.02%	0.02%	0.02%	0.02%	0.02%	0.02%	0.00%	0.00%	0.00%	0.00%

PART 3

WORKFORCE MANAGEMENT – FIVE YEAR STAFFING PLAN

I. Overview

Consistent with the long range planning philosophies employed within the Jupiter Utility System, the senior leadership team within the operation has collectively developed and continually updated the following 5-year staffing plan. The plan responds to the changing needs and demands of the organization as it enters its 38th year of operation. Undoubtedly, the Utility has reached a stage of maturity wherein development within its service area is decreasing and cost pressures are increasing. To respond, our staffing plans need to address the following:

- **Operational Optimization** – ensure ongoing, timely, cost-effective, reliable and sustainable performance improvements in all facets of our operations. There exists a significant challenge for utility leadership to strike the perfect balance between minimizing the cost of service and maintenance of system reliability/safety.

- **Operational Resiliency** – proactively identify, assess, establish tolerance levels for, and effectively manage a full range of business risk in a way consistent with unfunded regulatory mandates, industry trends, system reliability goals, established levels of service and Town Council/customer expectations. Now more than ever, it is imperative that teamwork be enhanced with all of our stakeholders, to collectively access threats and opportunities while gaining consensus on levels of service to be provided.

- **Employee and Leadership Development** – recruit and retain a competent, motivated and adaptive workforce. Ensure that institutional knowledge is retained and improved upon over time. Support opportunities for professional development and strive to maintain an integrated and well-coordinated utility leadership team. In a time when water treatment technology is becoming dramatically more complex, our utility is now experiencing its first major wave of retirements, greatly depleting the established core of institutional knowledge created over the last 38 years. Critical processes needed to ensure continued success of our utility, include recruitment of the highest quality additions/replacements to our staff, maintenance of a competitive salary and benefit offerings to staff, heightened learning and training, enhanced mentoring programs and documentation of critical information for maximizing knowledge retention.

The Utility is organized under five (5) primary operational divisions which include Administration, Geographic Information Systems (GIS), Business Operations, Water Treatment Operations and Field Operations. Although subject to change, the following staffing plan will serve to help forecast the resource needs of our operation. This information will further serve as an input to our five (5) year budgeting process.

All in all, this planning activity has proven effective in allowing for the reallocation of resources when appropriate and predicting staffing resource needs over the 5-year forecast. The decline in system growth coupled with various process enhancements will achieve intended personnel cost savings in the Administrative, Business and Field Operations divisions. Meanwhile, heightened plant maintenance needs, regulatory reporting and growing treatment complexity have necessitated an increase in manpower at the water treatment facility. In totality, staffing levels within the Jupiter Utility System have and will remain right-sized and below norms reflected in national benchmarking studies.

II. Five Year Divisional Staffing

a. Utilities Administration/Engineering

Overview:

Utilities Administration is responsible for management of the Utility as a whole and all related engineering functions of the operation. This section of our staffing plan focuses on the responsibilities of the Director, Assistant Director, and the engineering and other technical staff who oversee these facets of the operation.

Since its acquisition in 1978, Jupiter's Utility System has experienced tremendous growth. Strategic, long range, forward planning on the part of Utilities Administration has made it possible for the Utility to meet the engineering, technological and financial demands experienced and anticipated while operating an award winning utility with rates 22% below local industry averages. Water system expansions and upgrades, as well as replacement of obsolete infrastructure and facilities, continue to be accomplished through the Utility's Community Investment Program. Increasing regulatory stringency on drinking water and stormwater quality has required the Utility to make improvements to its facilities. The design and construction of these improvements are accomplished through this division.

As the Town reaches build-out, future growth within the Utilities' service area is expected to slow down and much of the work planned for this division will shift from expansion related projects to renewal and replacement efforts. However, improvements necessary to address stricter drinking water and stormwater quality regulations and declining water quality from the Floridan Aquifer are expected to continue. Furthermore, as the South Florida Water Management District (SFWMD) continues to limit water use from the surficial aquifer and impose year round watering restrictions, the Utility will be required to expand upon its use of alternative water supplies to an even greater extent. Utility staff will continue to focus on minimizing revenue requirements through efficiency in its operations and its capital improvement program.

The Utilities CIP currently has thirty nine (39) capital improvement projects projected for the next five years (FY 2017-2021). To the extent possible, Utility staff will coordinate design and construction of these Utility CIP projects with other Town department projects, other utility service provider projects, major right of way improvement projects, and private development within the Town. The total cost of the Utility CIP projects planned for 2017-2021 is estimated to be approximately $42 million.

Utilities staff who manage design, permitting, and construction of the Utilities CIP projects is often referred to as the CIP team. The CIP team currently consists of the Director of Utilities,

Assistant Director of Utilities, Utilities Engineer, Special Projects Coordinator, and Utilities Engineering Technician. On occasion and as needed, the Senior Engineer, Water Plant Maintenance Supervisor, and Water Field Supervisor also provide assistance with CIP projects. The function of each of these positions as it relates to implementation of the Utilities Capital Improvement Program is described below. It is important to remember that the Director, Assistant Director, Utilities Engineer, and Special Projects Coordinator each have responsibilities outside of the CIP team responsibilities and do not devote one hundred percent of their time to administering the CIP projects.

General Staff Position Responsibilities:

Director of Utilities:

The Director of Utilities is responsible for planning, managing and directing the overall operations of the Town's Water and Stormwater Utilities. The essential functions of the Director include, but are not limited to, managing/monitoring Utility operations and expansion; supervising Utility Staff; ensuring that the Utility maintains compliance with federal, state, and local rules and regulations; long range and strategic planning for the Utility, consulting with Town Manager/Town Council; planning, coordinating and implementing activities with outside agencies, municipalities, and others as needed; developing, administering, and monitoring the Utility's operating and capital improvement budgets; overseeing new development including plan review; providing leadership to the Utility in public relations and networking efforts; and directing Utility Staff in applying for and securing grant funding for capital improvement projects.

Assistant Director of Utilities:

The Assistant Director of Utilities is responsible for assisting the Director as needed in planning, directing and coordinating activities of the Water and Stormwater Utilities. A major component of the responsibilities of this position includes day to day management of the Utilities' Capital Improvement Program. This consists of assisting the Director in long range and short range planning of capital projects to keep the Utility in compliance with federal, state and local rules and regulations and to meet demands of the Utility's service area; managing/coordinating with consulting engineers; designing/reviewing construction documents; obtaining permits and ensuring construction is performed in accordance with permit conditions; advertising and bidding construction contracts, reviewing, awarding, and administering construction contracts; providing guidance to Special Projects Coordinator in managing grant contracts, providing guidance to other Utilities staff in administering CIP construction contracts and construction

observation and inspection, oversight and management of Utilities CIP and general consulting budgets.

Utilities Engineer:

The Utilities Engineer is responsible for in house design of select general CIP projects and small distribution and storm water construction projects, permitting as needed of in house design projects, management of Utility computer aided drafting (CADD) library and electronic files, including design documents, bid documents, and record drawings, electronic updating of field changes to construction drawings, preparation of exhibits for permit applications and small construction projects, maintenance of the Utilities CIP construction and electronic drawing files, construction project management of Utilities CIP projects related to water transmission and distribution projects and stormwater projects including reviewing, processing, and distributing shop drawings and contractor's requests for information, contractor's pay applications, construction change orders, and other paperwork associated with the construction contracts; conducts pre-bid, pre-construction and weekly construction progress meetings and prepares meeting minutes; coordinates construction with field staff and design engineers as needed; coordinates with regulatory agencies, provides guidance to and interacts with Utilities Engineering Technician as related to construction observation and inspections; conducts substantial and final inspections; develops punch lists, reviews as-built drawings; coordinates and assists contractors with testing and start-ups; coordinates construction with other utilities/municipalities, home owners associations, and the public; and other duties as necessary to ensure that construction is performed in accordance with the contract documents, permits conditions, and other applicable rules and regulations. The Utilities Engineer also provides input to the Director and Assistant Director as needed with engineering design and plan review of transmission, distribution and stormwater CIP projects and permit applications.

Special Projects Coordinator:

In addition to providing administrative support to the Director, Assistant Director, Utilities Engineer and the Utilities Engineering Technician, the Utilities Special Projects Coordinator is responsible for providing administrative support for duties related to management and execution of CIP projects including preparation and distribution of specifications and contract documents, work orders and purchase orders to consultants, contractors, and vendors; advertisement of construction projects for bids, scheduling pre-bid meetings, conducting bid openings; preparation and distribution of pre-bid, pre-work, and weekly construction meeting minutes; receiving, tracking and distribution of construction shop drawings; updating, tracking and maintenance of CIP budgets; preparation of grant applications, management for grant

compliance, preparation of grant status reports and grant reimbursements and close out documents; maintenance of water administration and CIP project files; processing time cards; mail sorting and distribution for Utilities Administration; answering and responding to phone calls for the Utilities Administration; and other miscellaneous administrative duties as needed by the Administration Staff.

Utilities Engineering Technician (UET):

There is currently one Utilities Engineering Technician (UET) that provides the construction observation and inspection services required for the Utilities' CIP construction projects. In past years, there were two UETs, with one assigned to Utilities Administration and the other to the Water Plant projects. With the transition of one of the UETs to Water Plant Maintenance Supervisor in 2013, the remaining UET took over the majority of construction observation and inspection responsibilities. The Plant Maintenance Supervisor does provide assistance on occasion and as needed on water plant related CIP projects. In addition, the Senior Engineer, now responsible for water and stormwater field operations, and the Water Field Supervisor provide assistance to the UET on various projects as needed. It is the responsibility of the UET to monitor daily construction activities to ensure that the projects are constructed in accordance with the requirements of the contract documents and that all permit conditions and Town standards are achieved. The UET observes and inspects CIP construction projects daily, and prepares daily field reports, maintains digital photographs of construction progress, communicates with the Assistant Director of Utilities and Utilities Engineer keeping them informed of construction progress and issues, and coordinates and communicates regarding

construction efforts with contractors and Town residents and customers. The UET is instrumental in making sure construction schedules are achieved by addressing contractor's field questions, coordinating field activities such as inspections and testing, and addressing the public's concerns as they relate to specific construction projects and issues. The UET is required to attend pre-work and weekly construction progress meetings for all CIP construction projects, review contractor's pay applications in the field with the contractor, witness pressure testing, density testing, concrete pours and other major construction activities requiring observation for construction certification, inspect materials upon delivery for conformance with contract specifications and approved shop drawings, coordinate and attend start-up of constructed facilities, attend substantial and final completion walk-thrus with the contractor, develop punch lists of items to be completed for contractor's final completion can be issued, review operation and maintenance manuals and record drawings, conduct warranty inspections, and follow-up on warranty items with contractor. The UET also assists with shop drawing review, plan and specification review, provides input on sequence of operation schemes for various facilities throughout the Utility, and coordination with water plant, water field and stormwater personnel as needed during construction and start-up of new facilities.

At any given time, the UET is observing and inspecting multiple active construction projects simultaneously. The size of each project and the experience of the contractor performing the work to a great extent determines the amount of time the UET will need to dedicate to a project. Depending on the workload of the UET and the number and size of the construction projects in progress, the Utility will supplement the UET with construction observation and inspection services provided by an engineering consultant firm.

Summary:

Projected work load of the Utilities' CIP program for 2017-2021 will keep the Director, Assistant Director, Special Projects Coordinator, Utilities Engineer, and the Utilities Engineering Technician (UET) fully utilized. It is anticipated that outsourcing of some services will be required in years wherein needs outpace the capabilities of in-house staff.

Utility Administration
Staffing

2012-2013	Positions
Administration	
Director	1
Assistant Director	1
Administrative Specialist III	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2013-2014	Positions
Administration	
Director	1
Assistant Director	1
Administrative Specialist III	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2014-2015	Positions
Administration	
Director	1
Assistant Director	1
Administrative Specialist III	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2015-2016	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2016-2017	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2017-2018	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2018-2019	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2019-2020	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2020-2021	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

2021-2022	Positions
Administration	
Director	1
Assistant Director	1
Special Projects Coordinator	1
Utilities Engineering Technician	1
Utility Engineer	1
TOTAL	5

b. Utilities Geographic Information Systems (GIS)

Overview:

The GIS Division within Utilities, staffed by the GIS Manager and GIS Specialist, has the primary function of providing services to enhance access to geographic information for Utilities, staff, and citizens of the Town of Jupiter. While many tasks are performed and products are created specific to the goals of the Utilities Department, the Division also provides leadership, planning and coordination, products (output), and applications related to GIS technology for all departments and entities within the Town. The Utilities Department had both the greatest need and the foresight to enable the initial implementation of GIS at the Town.

During the last decade, significantly more "geography" was created for the Town and water service area. More hydrants, storm drains, wells, and pipes have been digitized and added to GIS databases. Currently, a third of the GIS features have also been created or managed beyond Utilities needs. As the GIS Division created applications and data access for Utilities operations, other Town Departments also envisioned similar need for GIS layers with geographic reference, shared data access, and managed records for their systems. As the anticipated necessity for both new data creation and the development of new applications wanes, the GIS Division shifts focus towards maintaining systems and streamlining processes related to geography for Utilities and the Town.

General Staff Position Responsibilities:

The GIS Manager plans and implements the GIS function within Utilities and the Town, which requires data creation and maintenance, hardware and software related tasks, coordination within the Town and with other agencies, and application development.

The GIS Specialist creates, verifies, and updates GIS data for Utilities and the Town, and creates hardcopy / output for many standard maps and atlases, and requests for additional custom products and maps.

GIS Five Year Staffing Plan:

GIS staffing is expected to remain static through the five year planning period. This is necessitated by increased GIS integration and maintenance requirements within Utilities and the Town. Staff duties continue to shift from data production, data editing, and application development, toward standard GIS operating procedures, such as data maintenance, application maintenance, regular system upgrades, and support of the increasing number of GIS users. This has proved a necessity as GIS integration and maintenance requirements have increased and are projected to continue within the Utility and the Town. Simply put, GIS is doing more, and more people are doing GIS.

Summary:

The following items remain the primary focus for GIS staff:

- Continued training for GIS staff to be able to support critical workflows, develop the user interfaces between and within systems, and meet the GIS integration requirements among various current and future systems.
- Work with all Town staff to recognize and plan for current and future data needs, by utilizing other staff or specifying requirements for outside services.
- Continue with procedural and documentation information for GIS operations.
- Continue to focus on new technology, access, and workflows for Utilities field staff, sending GIS staff out to assist with transitioning from paper to field devices.
- Make do with current staffing levels throughout five year planning horizon. Should planned delivery timelines for products be found unacceptable, temporary staff may be utilized as in the past.

Utilities Geographic Information Systems (GIS)
Staffing

2012-2013	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2013-2014	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2014-2015	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2015-2016	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2016-2017	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2017-2018	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2018-2019	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2019-2020	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

2020-2021	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

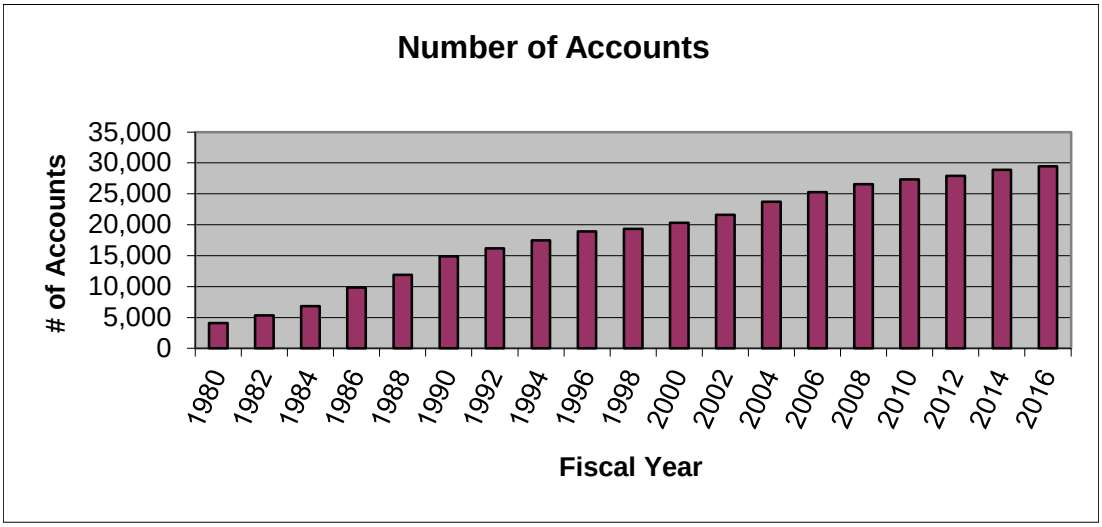
2021-2022	Positions
GIS Staffing	
GIS Manager	1
GIS Specialist	1
TOTAL	2

c. Utility Business Operations

Overview:

Utility Business Operations consists of administrative and financial functions for the Water and Stormwater Utilities. Utility Billing, Utility Collections Services and Utility Delinquency Collections teams are included within Utility Business Operations. Residential solid waste billing and collections is also accomplished by the Utility Business Office. All teams are cross trained in tasks which provide support services to the Utility and the Town as a whole.

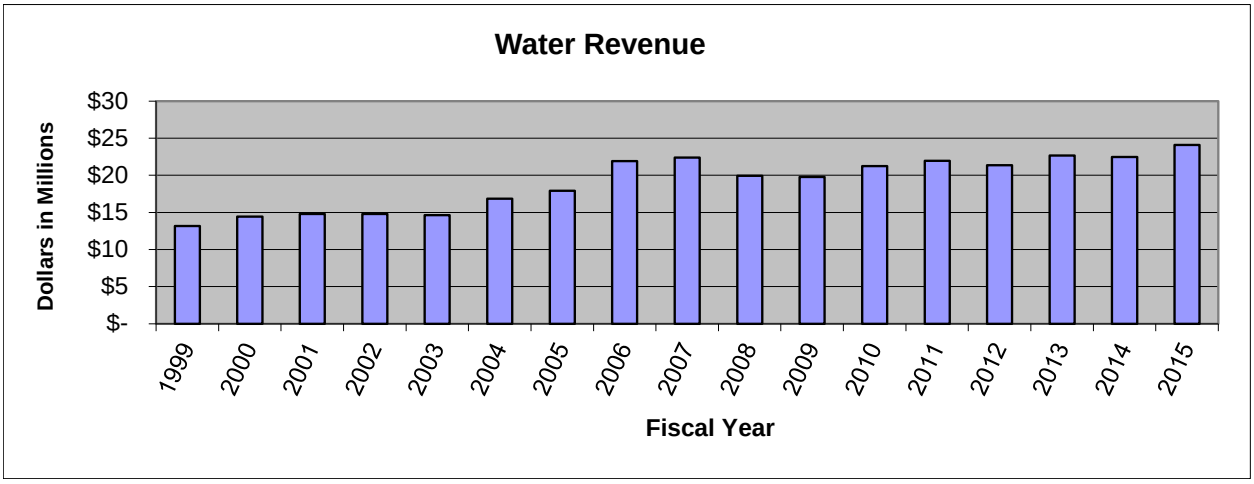
Utility Business Operations currently consists of a staff of thirteen: the Financial Operations Manager, the Customer Service & Billing Manager, the Billing Analyst, the Accountant I, the Customer Service Coordinator and eight Customer Service Representatives, including three Senior Customer Service Representatives. The Utility recommends adding one additional permanent senior customer service position within the 5 year planning horizon in order to continue to provide superior customer service and to keep up with the growth of the Town and customer demand. Providing a senior customer service position will also provide an opportunity for growth for experienced staff.



Since the beginning of FY 2006-2007, the Utility has added approximately 4,700 new customers. With 29,500 current customers, that is approximately one Customer Service Representative per 3,688 customers. Over the next five years, the Town is expected to add another 1,350 new customers. The Customer Service Representatives are in contact with customers approximately 59,000 times per year both by phone and in person. The Customer Service Representatives typically provide the first point of contact with the Town for new Town residents. In addition to customer service functions, the Customer Service Representatives prepare bank deposits and

perform a variety of administrative tasks related to accounts receivables, as well as researching and providing information and assistance with accounting related issues, liened accounts, foreclosures, bankruptcies, plan reviews for residential home building permits, and applying charges to accounts that have received a Certificate of Occupancy (CO). The Customer Service Representatives are responsible for all billing and collections related tasks. Compared to other utilities in the region, Jupiter Utilities customer service staffing levels are somewhat below benchmark due to the significantly higher level of service they provide. Great care is taken to ensure our customer service is at the highest level while preserving a "small town feel" to all interactions with customers. In addition, many of the benchmarked utilities employ additional staff to handle the non-customer service related tasks.

Utility	# of CSRs	# of Customers	# of Customers per CSR
City of Boynton Beach	10	36,000	3,600
City of Delray Beach	4	20,000	5,000
City of Stuart	3	5,398	1,799
City of West Palm Beach	9	34,000	3,778
Village of Wellington	4	25,000	6,250
Martin County	6	34,200	5,700
St. Lucie County	3	4,200	1,400
Seacost Utilities	5	35,500	7,100
Loxahatchee River District	4	30,000	7,500
Tequesta	2	5,040	2,520
Average	**5**	**22,934**	**4,587**
Town of Jupiter	**8**	**29,500**	**3,688**



General Staff Position Responsibilities:

Financial Operations Manager:

Oversight of all business office financial functions of the Utilities are managed by the Financial Operations Manager and supported by the Accountant I and Customer Service & Billing Manager. The Financial Operations Manager's primary responsibility is the fiscal management of the utility including financial reporting, budgeting, cash flow management and the oversight of revenue generating functions including billing and developer agreements. Other responsibilities include preparation of cash flow analyses, monthly financial reports, year-end financial reports, related statistical reports, capital contributions reports as well as monitoring connection fee payments, monitoring of CIP budgets and expenditures, asset management and preparing pre-audit documentation in concert with Town Finance staff.

Customer Service & Billing Manager:

The Customer Service & Billing Manager's administrative responsibilities include support and oversight of the daily administrative and operational functions within the customer service teams as well as ensuring departmental and Town policies are being followed. The Customer Service and Billing Manager is also responsible for developer agreement management including review and approval of site plan and permit applications made to the Town, calculation of required capacity reservation for developments, creation of new water service agreements and amendments to existing water service agreements, and creation of statements of fees due. Other functions also include budget creation and management, generating and reviewing reports, responding to escalated customer issues or inquires, and liaison with Town management, local builders and developers and at times with local, regional, state and federal regulatory agencies.

Billing Analyst:

The Billing Analyst is responsible for all billing functions and provides support to the Customer Service & Billing Manager and to the Customer Service Representatives responsible for uploading meter reads, processing exceptions, and preparing bills for printing. This position researches, analyzes and provides customer service in response to billing inquiries. The Billing Analyst also generates monthly, quarterly, and annual reports and provides reports to other agencies as required. This position reviews the setup of accounts in the customer information system to ensure proper billing. The Billing Analyst also supports the Customer Service & Billing Manager with permit, engineering, and site plan reviews as well as preparation and processing of water service agreements for developers.

Accountant I:

The Accountant I performs a variety of financial tasks for the Utility including the billing and collection of all developer related revenues and contributions, the organization and management of developer agreements, analysis and reconciliation of accounts, provides assistance with cash reconciliation processes as well as other fiscal operations. Other responsibilities include the periodic review, reconciliation and reporting of receivables and the preparation of audit work papers and lead schedules in conjunction with the audit process. The Accountant I provides direct assistance to the Financial Operations Manager and Customer Service and Billing Manager.

Customer Service Coordinator:

The primary role of the Customer Service Coordinator is to supervise and coordinate the customer service activities and the processing of documentation in the customer service, billing and field services areas within the Utility. This position provides a full range of customer service functions in support of the customer service teams, including organizing, prioritizing, assigning work, training and performance evaluations. The Customer Service Coordinator also serves as a backup to the various Utility teams and assists the Customer Service and Billing Manager with a variety of customer service functions.

Utility Billing Team:

The Utility Billing Team consists of two Senior Customer Service Representatives. This Team interrelates heavily with the four Utility Field Representatives operating out of the Field Division. The Senior Customer Service Representatives transfer meter reading data from the electronic devices to and from the utility billing software, review and edit all daily meter readings, prepare service orders for re-reads due to high reads or no reads, and edits customer accounts and meter setups to ensure proper billing. The Utility Billing team is responsible for processing daily and final billings to all customers as well as providing support services to the other Utility teams. The team's primary billing functions include preparing the bill prints and transferring the bill print files to the outsource printing vendor. Support functions include opening and sorting mail-in payments when assistance is needed, inputting payments made over the phone, and closing installation, change out, and other meter reading related service orders.

Utility Collection Services Team:

The Utility Collection Services team is primarily responsible for the collection of payments received at the payment counter and payments received in the mail, and for operation of the automated payment services provided by the Utility. The use of automated payments represents over 55% of the total payments received by the Utility. Customers may use one of many options for automated payment including online payment, bank draft, interactive voice response (IVR) and transfers of funds through E-pay services with the customer's bank.

The processing of payments by check is partially automated for checks and payment stubs received by mail and for checks received over the counter. The process requires the team to open, and sort mail, and then a remittance scanner and software is used to scan checks and payment stubs to make a digital copy. The system creates input batches that the team edits and balances, ensuring accuracy of payment information. The system creates an electronic file of check images and an electronic deposit slip that is sent to the bank electronically, in lieu of a manual deposit, and creates an electronic payment file that is transferred to the Town's cash receipts software so payment records are posted directly to the customer accounts.

The Utility Collection Services team is also responsible for daily balancing of cash drawers, daily balancing of all Utility payments received from all payment sources to the payment processor's reports, processing of lien letters, activating solid waste services and adding disposal fees, and reviewing disconnected accounts for water usage.

Utility Delinquent Collections Team

The Utility Delinquent Collections team's primary focus is collecting past due balances. Responsibilities include processing all notices and fees for delinquent customers on a daily basis, sending out automated pending disconnect notices via phone, processing turn offs for non-payment, closing turn off for non-payment and restore service orders, inputting payments made over the phone, reviewing accounts for broken arrangements, recording liens, processing bankruptcies and foreclosures, surveying customers for level of customer service satisfaction, and processing refunds on finalled accounts. The Delinquent Collections team works closely with the Utility Billing team to send late notices to the print vendor for mailing.

Summary:

Utilities Business Operations recommends adding one more permanent Senior Customer Service Representative position in FY2020 in order to continue to provide superior customer service and to keep up with the increase in Utility customers from new development and growth within the Town's Utility service area. However, it should be noted that the actual date in which this new position will be directly dependent on customer growth and service demands.

Although automation is beneficial in providing basic account information to the customer, the Town desires to preserve it's "small-town feel" and many customers want to talk directly to a customer service representative about their real life situations, including receipt of payment, high consumption, request for a time-payment plan, request for courtesy credits, or other similar customer concerns. This high level of service expectation is being met; however, the staff resources to respond are being fully utilized at this time.

It is essential to point out that although the Utility is automating certain processes within the customer service and billing area, daily operation and maintenance of that automated process continues to demand staff resources to coordinate the process, open and sort mail, and to edit and balance daily payment transactions as well as providing support to customers on the use of the automated systems. In balancing a daily batch from an online payment site, customers frequently enter incorrect account numbers which result in exceptions in the data transfer and require manual adjustment by staff. As a result, staff is manually correcting the payment information and time is spent researching to ensure payment is applied to the proper account. Additionally, the Utility continues to experience increases in customer service demands brought on by growth in the customer base, improvements to delinquent bill collections, maintenance of customer information on file, as well as liens, foreclosures and bankruptcies affecting our customers.

With the investments made in the automation of processes, the teams continue to focus on operational efficiencies to provide better customer relations and accuracy in billing, collection and meter reading systems.

Utility Business Operations
Staffing

2012-2013	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
Special Projects Coordinator	1
sub total	3
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	1
Customer Service Rep	6
sub total	8
TOTAL	11

2013-2014	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
Special Projects Coordinator	1
sub total	3
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	1
Customer Service Rep	6
sub total	8
TOTAL	11

2014-2015	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	3
Customer Service Rep	4
Billing Analyst	1
sub total	9
TOTAL	11

2015-2016	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	3
Customer Service Rep	5
Billing Analyst	1
sub total	10
Accounting	
Accountant I	1
sub total	1
TOTAL	13

2016-2017	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	3
Customer Service Rep	5
Billing Analyst	1
sub total	10
Accounting	
Accountant I	1
sub total	1
TOTAL	13

2017-2018	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	3
Customer Service Rep	5
Billing Analyst	1
sub total	10
Accounting	
Accountant I	1
sub total	1
TOTAL	13

2018-2019	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	3
Customer Service Rep	5
Billing Analyst	1
sub total	10
Accounting	
Accountant I	1
sub total	1
TOTAL	13

2019-2020	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	4
Customer Service Rep	5
Billing Analyst	1
sub total	11
Accounting	
Accountant I	1
sub total	1
TOTAL	14

2020-2021	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	4
Customer Service Rep	5
Billing Analyst	1
sub total	11
Accounting	
Accountant I	1
sub total	1
TOTAL	14

2021-2022	Positions
Administration	
Financial Operations Manager	1
Customer Service/Billing Mngr	1
sub total	2
Customer Service	
Customer Service Coordinator	1
Customer Service Rep Sr	4
Customer Service Rep	5
Billing Analyst	1
sub total	11
Accounting	
Accountant I	1
sub total	1
TOTAL	14

d. Utility Water Plant Division

Overview:

The Utility Water Plant Division consists of three groups, Water Plant Operations, Water Plant Maintenance and Certified Laboratory Teams. Currently there are 29 total employees in this Division, twenty of which are certified operators capable of running the treatment plant.

General Staff Position Responsibilities:

Administrative Support:

Administrative support at the water plant is provided by three employees, the Utilities Facilities Manager, Assistant Utilities Facilities Manager, and an Administrative Specialist II. The Utilities Facilities Manager and Assistant Manager are in responsible charge of producing drinking water and the overall operation and maintenance of the water plant and its associated on-site and off-site facilities. The Utilities Facility Manager is also responsible for the overall supervision of all water plant personnel. The Administrative Specialist provides support service to the Facility Manager, Assistant Facilities Manager, Maintenance Supervisor, Chief Water Plant Operator and the laboratory staff. In addition, the Administrative Specialist also provides support for financial services at the plant such as purchasing requisitions and invoice processing totaling more than $7,000,000/year.

Water Plant Operations Staff:

There are currently ten (9) shift water plant operators who work an eight hour rotating shift to provide 24 hour coverage of plant operations. They are responsible for operating a 14.5 mgd nanofiltration (NF) membrane treatment facility, a 13.7 mgd reverse osmosis (RO) membrane treatment facility, concentrate treatment facilities, three odor abatement systems, a 1.8 mgd ion exchange treatment facility, on and off site ground storage and high service pumping, two clearwells, transfer pumps, chemical (sulfuric acid, sodium hydroxide, gaseous chlorine, anti-scalant and corrosion inhibitor) storage and delivery systems, over 50 Surficial Aquifer wells, 12 Floridan Aquifer wells and a surface water recharge system.

The Chief Operator is responsible for providing supervisory level leadership to the operation/lab staff which includes managing and generating operator work schedules, approving vacations, conducting employee reviews, establishing guidelines for plant operation procedures and coordinating operation of the water plant with Plant Maintenance staff, the

Assistant Utilities Facilities Manager, and the Utilities Facilities Manager to ensure that the plant is producing quality water efficiently.

Water Plant Maintenance Staff:

The water plant maintenance team consists of thirteen (13) employees, the Utilities Maintenance Supervisor, five water plant maintenance operators/mechanics, one Senior SCADA System Analyst, one SCADA System Analyst, three (3) Process Controls Technicians, and two (2) plant electricians.

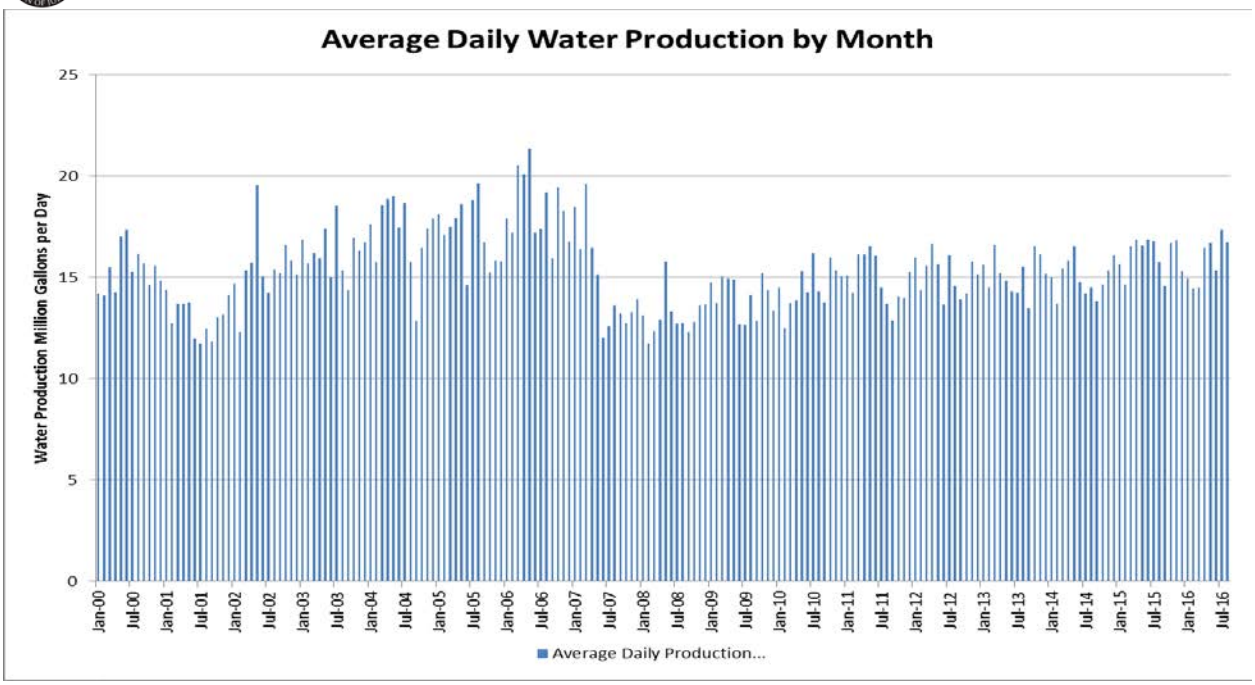
The function of the maintenance team is to provide preventative, routine, and emergency maintenance service to the water plant facilities and components enabling successful operation of the plant. On average, the maintenance operators/mechanics respond to approximately 338 work orders a month, 213 of which are preventative maintenance tasks, 30 instrument calibrations and 95 non-scheduled (emergency and no-scheduled maintenance activities). Four of the six water plant operators/mechanics perform general maintenance work as well as provide shift operator relief for approximately 187 vacation days a year and 52 days coverage of shift operator sick time. As a result, only 77 percent of their time is truly allocated toward facility maintenance. The other two operator/mechanics positions provide more technical services related to instrumentation calibration, maintenance, and replacements and motors and pumps, alignments, vibration analysis, seals and bearings, and line locates for Sunshine State One Call. The Maintenance Supervisor provides guidance and direction to the maintenance staff and is responsible for coordinating maintenance activities with Operations Staff, and the Utilities Facilities Manager. The current Maintenance Supervisor also performs the role of Utilities Engineering Technician and is responsible for the construction observation and inspection of water plant related capital investment projects as well as coordination of construction activities with water plant operations and maintenance staff.

The Senior SCADA System Analyst is responsible to oversee all technical work as it relates to the planning and coordination of the departmental automation efforts. This encompasses both the implementation and the maintenance of all automated solutions within the Utility, performing routine maintenance of equipment; maintains hard-wired SCADA networks, radio telemetry networks, and fiber optic networks, modifies existing PLC programming, creates new PLC programming and troubleshoots PLC programming. The SCADA System Analyst staff is responsible for performing technical work to install, maintain and calibrate all instrumentation, controls, programmable controllers, security and communication equipment for the water treatment plant and its facilities.

The Utilities Electricians are responsible to perform technical and skilled work involving the design, installation and maintenance of electrical and mechanical equipment/systems associated with utility plant operations, performs electrical work on utility plant equipment, systems, and related components; install, repair, replace, and maintain a variety of mechanical and electrical systems, equipment, fixtures, and related components in compliance with applicable codes.

Certified Laboratory Staff:

The Jupiter Utilities Water System Laboratory is staffed by three employees who are responsible for all sampling and reporting required by the water plant's operating permit and other associated permits and regulations including: USEPA Safe Drinking Water Act, FDEP, Palm Beach County Public Health Department, SFWMD, PBC DERM, FL DCA, USEPA NPDES Program relative to the RO concentrate discharge, the Nanofiltration Concentrate permit and other special sampling as may be required. These laboratory technicians are responsible for sampling 120 sites within the distribution system for bacteriological quality on a monthly basis. In addition, the laboratory technicians maintain an inventory of all operating supplies and place orders for supplies including chemicals necessary for use in the treatment of water (sulfuric acid, sodium hydroxide, gaseous chlorine, anti-scalant and corrosion inhibitor) routinely and as needed. Customer complaints in reference to water quality are addressed by the laboratory staff and complimentary site visits upon request are made to ensure customer confidence in our product. The laboratory staff is currently supervised by the Assistant Utilities Facilities Manager and Utilities Facilities Manager.



Summary:

The current challenge facing the Utility Water Plant Division is managing and maintaining the increase in complexity of our treatment systems, the ever changing regulatory requirements and maintenance of our exceptional history of providing the highest level of service and reliability. Furthermore, the water plant must also continue preparing for a line of succession due to the "graying" of the Water Plant staff. As such, staffing resources (Assistant Utilities Facilities Manager, Process Controls Technician, Laboratory Technician and Utilities Electrician) have been added at the plant. The utilization of the maintenance/relief operators to cover vacations and sick time can have a negative effect on maintenance activities.

The Utility has undertaken the implementation of an Asset Management Program, with the first step being the acquisition of the management software (Lucity). The software went live in March, 2016. An Asset Management Team has been formed to develop a strategy of the criticality, life cycle and valuation of the plant assets. The implementation of this plan will require an immense amount of work by the Maintenance Supervisor and our Administrative Specialist II. It is essential to add an Administrative Specialist I in FY2019 to assist and to address purchasing, timekeeping and reception to make the program a success.

To address these growing responsibilities and needs, staff continues to adapt and assume added workloads. The most critical exposure to risk remains maintenance upkeep and operating shift coverage. As a result, a fifth maintenance/relief position is recommended to be added in FY2019 to maintain a high level of service and reliability.

Utility Water Plant
Staffing

2012-2013	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Utilities Engineering Tech.	1
Process Controls Coordinator II	1
Process Controls Coordinator I	1
Process Controls Technician	1
Utilities Electrician	1
Water Plant Operator	17
Administrative Specialist II	1
Lead Operator	1
Senior Engineer	1
Water Quality/Compliance Specialist	1
TOTAL	28

2013-2014	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Utilities Engineering Tech.	1
Process Controls Coordinator II	1
Process Controls Coordinator I	1
Process Controls Technician	1
Utilities Electrician	1
Water Plant Operator	17
Administrative Specialist II	1
Lead Operator	1
Senior Engineer	1
Water Quality/Compliance Specialist	1
TOTAL	28

2014-2015	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Utilities Engineering Tech.	1
Process Controls Coordinator II	1
Process Controls Coordinator I	1
Process Controls Technician	1
Utilities Electrician	1
Water Plant Operator	17
Administrative Specialist II	1
Lead Operator	1
Senior Engineer	1
Water Quality/Compliance Specialist	1
TOTAL	28

2015-2016	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	1
Utilities Electrician	2
Water Plant Operator	17
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
TOTAL	27

2016-2017	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	16
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
TOTAL	29

2017-2018	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	16
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
TOTAL	29

2018-2019	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	17
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
Administrative Specialist I	1
TOTAL	31

2019-2020	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	17
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
Administrative Specialist I	1
TOTAL	31

2020-2021	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	17
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
Administrative Specialist I	1
TOTAL	31

2021-2022	Positions
Utilities Facilities Manager	1
Utilities Maint. Supervisor	1
Senior SCADA System Analyst	1
SCADA System Analyst	1
Process Controls Technician	3
Utilities Electrician	2
Water Plant Operator	17
Administrative Specialist II	1
Chief Operator	1
Assistant Utilities Facilities Manager	1
Laboratory Technician	1
Administrative Specialist I	1
TOTAL	31

e. Utility Field Division

Overview:

The Utility Field Division consists of two groups, Water Distribution and Stormwater Field Teams. Currently, there are twenty four (24) employees in this Division. Substantial cross training has occurred and will continue amongst the teams as responsibilities are flexed dependent upon the needs of the Utility as a whole.

General Staff Position Responsibilities:

Administrative Support:

Currently, the Administrative support is provided by five (5) employees, the Senior Utilities Engineer, two Utility Services Managers, one Administrative Specialist II, and one contractual Administrative Specialist I. The Senior Utilities Engineer assists and oversees the two operating divisions. One Utility Services Manager is responsible for the operations of the Stormwater Utility/Public Works Division while the other oversees the Water Distribution Field Operations Division. The Administrative Specialists provide support for all personnel operating from the Field Operations Center and other Utility divisions as needed. The contractual Administrative Specialist I position will continue to provide oversight to the Backflow and Cross-Connection Prevention Program, which continues to grow. We currently have over 8,000 backflow devices in the system which require routine testing and certification to comply with state regulations. The contractual Administrative Specialist I position is recommended to become a full time position in FY 2018. New construction oversight continues to be assumed by the Utility Services Managers coupled with their support staff.

Water Distribution:

The Water Distribution Team is responsible for the operation and maintenance of the distribution system. These responsibilities include field customer service, meter reading, meter installation and maintenance , large meter change outs, radio read meter conversions, piping leaks & breaks, valve repairs and maintenance, hydrant repairs and maintenance, water main taps & bores, flushing, underground piping locating services and new construction inspections. They also provide support to the Stormwater Team, and other Town staff as needed.

Currently, there is a total of 467.7 miles of water transmission and distribution pipe in the system. This is a 4% increase in the size of the distribution system since 2012. There is also an increase in the number of valves and hydrants that must be maintained. Eleven employees make up the Water Distribution Team. Even though development continues at a slower pace, additional miles of water main are added annually leading to greater workloads which may ultimately require increased staffing.

Stormwater:

The Stormwater Field Team consists of five (5) employees including the supervisor who manages the Storm Water Field Team. Many storm drainage systems in the Town of Jupiter are owned and operated by various entities. These include homeowners associations (HOAs), South Indian River Water Control District (SIRWCD), North Palm Beach Heights Water Control District (NPBHWCD), Northern Palm Beach County Improvement District (NPBCID), State of Florida Department of Transportation (FDOT), and Palm Beach County plus various privately owned and operated systems. The primary objectives of the Stormwater Team are to minimize the risk of flooding and enhance the quality of stormwater runoff.

One of the major requirements for the Stormwater Team is to meet the criteria contained in our USEPA NPDES permit. The permit has both maintenance and best management practice (BMP) criteria that must be performed and documented. The Community Rating Service Program (CRS) new updated (2013) manual requires additional documentation and inspections to ensure that the Town maintains or improves upon its present rating. Some of the responsibilities of the Stormwater team include pump station maintenance and inspections, monitoring of street sweeping, inspections of detention ponds and canals, construction site inspections for Pollution Prevention Programs (PPP), swale rehabilitation program, grate cleaning, structure repairs, surveying, customer complaint response, plan review, new construction inspections, Capital Improvement Program (CIP) support and private system inspections. They also help other Town staff as requested.

The Stormwater Field team has been able to meet the requirements of the current NPDES permit performance measures and maintain the system with frequent job sharing with public works and water field personnel. This is especially effective before and after a storm/rain event. The stormwater system has grown 23% in the length of pipe maintained and 70% in the number of structures to maintain since fiscal year 2012. A majority of the growth is due to the Neighborhood Infrastructure Equity Program. This has stretched the existing stormwater staffing resources. The street sweeping functions are currently outsourced to a private contractor. The street sweeping program has grown by 74% since 2012. This increase is the result of two factors, the first being the assumption of maintenance within neighborhood equity communities and secondly, the increase in frequency of sweeping during four winter months of the year when oak leaves are most problematic.

Lastly, a five year projection indicates the Neighborhood Infrastructure Equity Program will result in an additional 14.8 miles of roadway (16% increase) and 747 structures (14.4% increase) becoming the maintenance responsibility of the Stormwater Utility. The increase in infrastructure will require additional personnel to meet all of the requirements.

Summary:

Staffing levels over the next 5 year planning horizon are expected to require one additional employee within the Stormwater Utility Field Division in FY2019 to address growing demands and workload. Furthermore, Water Distribution will require that the contractual Administrative Specialist I position become permanent in FY2018. This position, will continue to respond to clerical demands while allowing higher paid staff to focus on their primary responsibilities in the field.

Utility Field
Staffing

2012-2013	Positions
Administration	
Utility Field Manager	2
Administrative Specialist II	1
sub total	3
Water	
Supervisor	0
Coordinator	2
Utility Worker II	6
Utility Worker I	1
Utility Field Representative	4
sub total	13
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	2
sub total	4
TOTAL	20

2013-2014	Positions
Administration	
Utility Field Manager	2
Administrative Specialist II	1
sub total	3
Water	
Supervisor	0
Coordinator	2
Utility Worker II	6
Utility Worker I	1
Utility Field Representative	4
sub total	13
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	1
sub total	4
TOTAL	20

2014-2015	Positions
Administration	
Utility Field Manager	2
Administrative Specialist II	1
sub total	3
Water	
Supervisor	0
Coordinator	2
Utility Worker II	6
Utility Worker I	3
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	2
sub total	5
TOTAL	23

2015-2016	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
sub total	4
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	2
sub total	5
TOTAL	24

2016-2017	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
sub total	4
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	2
sub total	5
TOTAL	24

2017-2018	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
Administrative Specialist I	1
sub total	5
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	2
sub total	5
TOTAL	25

2018-2019	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
Administrative Specialist I	1
sub total	5
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	2
sub total	5
TOTAL	25

2019-2020	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
Administrative Specialist I	1
sub total	5
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	3
sub total	6
TOTAL	26

2020-2021	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
Administrative Specialist I	1
sub total	5
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	3
sub total	6
TOTAL	26

2021-2022	Positions
Administration	
Utility Senior Engineer	1
Utility Field Manager	2
Administrative Specialist II	1
Administrative Specialist I	1
sub total	5
Water	
Supervisor	0
Coordinator	2
Utility Worker II	5
Utility Worker I	4
Utility Field Representative	4
sub total	15
Stormwater	
Supervisor	1
Coordinator	1
Utility Worker II	1
Utility Worker I	3
sub total	6
TOTAL	26

III. Summary and Conclusions

The projected final outcome of this analysis and planning activity is summarized below:

Town of Jupiter Utilities
Historical and Projected Staffing Levels

2012-2013	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	11
Water Treatment Operations	28
Field Operations	20
TOTAL	66

2013-2014	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	11
Water Treatment Operations	28
Field Operations	20
TOTAL	66

2014-2015	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	11
Water Treatment Operations	28
Field Operations	23
TOTAL	69

2015-2016	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	13
Water Treatment Operations	27
Field Operations	24
TOTAL	71

2016-2017	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	13
Water Treatment Operations	29
Field Operations	24
TOTAL	73

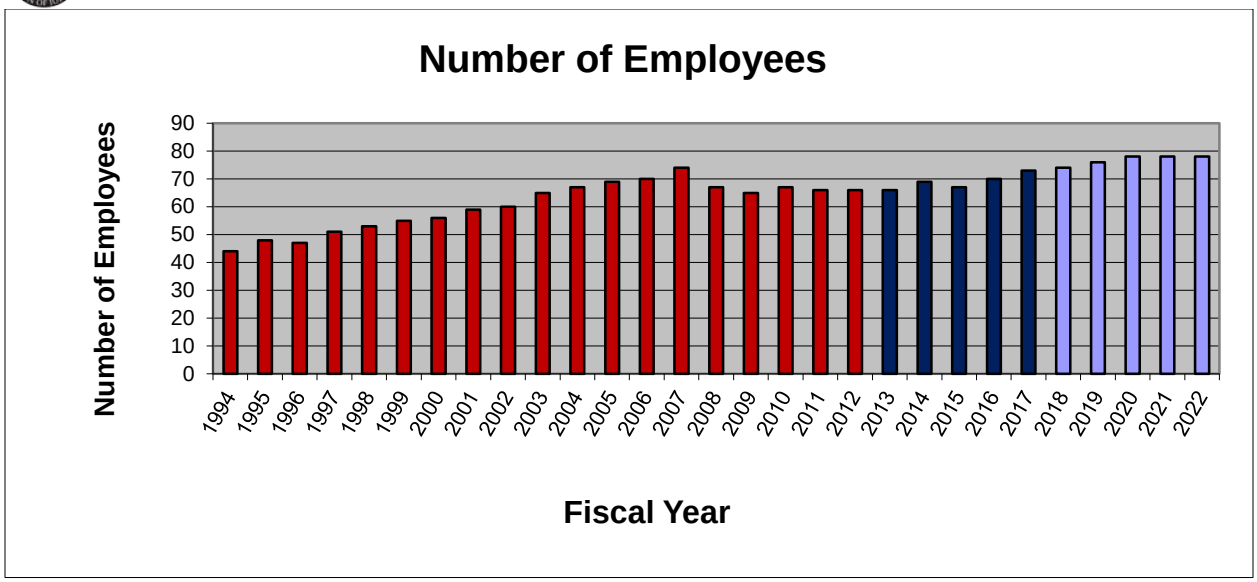
2017-2018	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	13
Water Treatment Operations	29
Field Operations	25
TOTAL	74

2018-2019	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	13
Water Treatment Operations	31
Field Operations	25
TOTAL	76

2019-2020	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	14
Water Treatment Operations	31
Field Operations	26
TOTAL	78

2020-2021	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	14
Water Treatment Operations	31
Field Operations	26
TOTAL	78

2021-2022	
Division	Positions
Administrative / Engineering	5
Geographic Information Systems (GIS)	2
Business Operations	14
Water Treatment Operations	31
Field Operations	26
TOTAL	78



Benchmarking

According to the latest American Water Works Association Performance Indicators for Water and Wastewater: 2013 Survey Data and Analyses Report; a widely used indicator of employee efficiency is million gallons per day (MGD) produced per employee.

Aggregate data for this indicator is as follows:

Top Quartile	Median	Bottom Quartile
0.33	0.25	0.16

Jupiter's Water System presently tracks equal to the industry median with 0.25 (MGD) produced per employee.

Conclusions

As can be seen, the evolution of our utility from a growth-oriented, expanding operation to one of maturity and sustainability can likely be achieved through the reallocation of resources across operational divisions. Meanwhile, net savings due to ongoing process improvements are expected to be achieved.

Lastly, it is important to note that this is a planning tool and subject to periodic revision as the environment in which we operate is under perpetual change. New, unfunded regulatory mandates or other significant operational impacts may pose additional challenges which cannot be completed or forecasted at this point in time. Furthermore, the assumed timing of staff

retirements may change yielding revisions to the plan. Regardless, in order to achieve the long term efficiencies of this plan, consideration must also be given to utility management to provide adequate training to personnel, allow for succession planning including apprenticeship hires in advance of retirements so that institutional knowledge is not diminished and flexibility to periodically contracting outside resources when peak staffing demands exceed workforce availability.

All in all, our staff is expected and has been receptive to doing more with fewer resources. System performance and reliability is at all time high levels nevertheless.