Town of Lantana

Final

10 Year Water Supply Facilities Work Plan Update

September 2014

MATHEWS CONSULTING

CIVIL ENGINEERS

Town of Lantana

10-Year Water Supply Facilities Work Plan

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Section 1
Introduction

Section 1

Introduction

1.1 Project Background

Adopted by the 1985 Florida Legislature, the "*Local Government Comprehensive Planning and Land Development Regulation Act*" (reference Chapter 163, Part II, F.S., also known as Florida's *"Growth Management Act"*) requires all of Florida's 67 counties and 410 municipalities to adopt Local Government Comprehensive Plans that guide future growth and development. Comprehensive plans contain chapters or "elements" that address future land use, housing, transportation, infrastructure, coastal management, conservation, recreation and open space, intergovernmental coordination, and capital improvements.

The existing Town of Lantana Comprehensive Plan was last updated in 2008. At that time, a 10-year water supply facilities work plan was adopted to coordinate with South Florida Water Management District's (SFWMD) Lower East Coast (LEC) Water Supply Plan.

1.2 Project Purpose and Scope

The purpose of this report is to update the Town's "*10-Year Water Supply Facilities Work Plan"* in order to keep the Town current with overall planning strategies and projection data. The Town's updated Work Plan will be used to coordinate with SFWMD and their recent update to the LEC Water Supply Plan which was adopted by the SFWMD governing board in September 2013. The Town has 18 months from the date of adoption to revise their Comprehensive Plan to incorporate the updated 10-Year Work Plan. The following tasks were completed under this scope of work:

- *Data Collection and Needs Assessment* – updated Town population projections, reviewed historical water demand and consumption data, established updated water LOS (Level of Service) for per capita demands, and assessed future water needs and projected future demands based on population and development projections for the water system.

- *Water System Condition Assessments* – conducted field investigations of the water system components (including storage, pumping and distribution facilities), identified known problems within the system and assessed the condition of the components for renewal and replacement requirements.

- *Hydraulic Modeling* – updated the Town's hydraulic model of the water distribution system and assessed its capacity to accommodate future water demands and fire flow requirements.

- *Final Report* – documented the above tasks and prepared a recommendation of upgrades, recommended implementation schedule, and construction cost estimates.

Detailed results of these activities are listed in subsequent sections of this Report.

Section 2

Overview of Lantana's Existing Water Supply System

Section 2

Existing Water Supply System

2.1 Service Area

The Town of Lantana is a coastal community located in central Palm Beach County, Florida. The Town's service area includes approximately 2.83 square miles of residential and light commercial property with a year round population of approximately 10,000 and a seasonal population of approximately 13,500. The Town's service area is generally framed by Interstate 95 to the west, the S. Ocean Boulevard to the east, City of Lake Worth city limits to the north, and Hypoluxo Road to the south. The Town provides potable water to all of the residents within the Town limits. (Refer to Appendix A).

2.2 SFWMD Water Use Permit

The Town's existing Water Use Permit No. 50-00575-W was issued by the South Florida Water Management District (SFWMD) in March 14, 1996 and was renewed in July 2008. The current permit provides for an annual allocation of 906.73 million gallons per year (MGY) and a maximum monthly allocation of 88.358 million gallons. The cornerstone for the issuance of this permit was Lantana's cooperative commitment to protect the surficial Biscayne Aquifer from salt water intrusion. Lantana recognized the effectiveness of restricting irrigation water use as a means to reduce the withdrawal of groundwater. As a result, the Town adopted an ordinance mandating a limit to irrigation to two days per week for all customers. This ordinance is a full-time, non-emergency, and non-water shortage water use restriction.

The other method of protecting the groundwater from salt water intrusion is to move the Town's center of groundwater pumping further west with the construction of two (2) new water supply wells west of Interstate 95. This "western wellfield" plan was accepted by the SFWMD and incorporated as part of the Town's water use permit renewal. The new wells were completed in 2010 and are currently in operation.

2.3 Raw Water Sources

The Biscayne Aquifer is the surficial aquifer that is utilized by the Town of Lantana for its raw water supply. The Town owns and operates ten (10) existing raw water supply wells to supply raw water to the water treatment plant for treatment, storage, and distribution. These wells range from 80 to 130 feet deep and consist of casings that are 12-inch to 17.4-inch in diameter. The raw water is withdrawn by submersible turbine pumps that discharge through a raw water collection and transmission system. The raw water piping sizes are between 4-inch and 12-inch in diameter. There are three (3) wells located on the water treatment plant site, and seven (7) that are located within the Town limits of Lantana. The total wellfield capacity is approximately 14.26 MGD, but is limited to an average daily withdrawal of 2.48 MGD and a maximum daily withdrawal of 2.89 MGD per the SFWMD water use permit described above in Section 2.2.

2.4 Treatment and Storage Facilities

The Town owns and operates the Town of Lantana Water Treatment Plant (WTP) which provides potable water to the Town's service area. The treatment processes consist of Aeration, Dual-Media Filtration, Disinfection, Ammoniation, Ion Exchange Softening, and Anion Exchange (for organic and color removal). The plant has a maximum daily flow capacity of 4.0 MGD.

The Town has two (2) 1.0 million gallon storage tanks located at the water treatment plant to provide a total storage capacity of 2.0 million gallons. There are no storage tanks located off-site. The Town's existing water storage volume is sufficient to meet the required 25% of maximum capacity of the water treatment plant, plus fire flow demand (Ref: FDEP Rule 62-555, F.A.C). These flows result in volumes of water that equate to the sum of 1.0 mgd plus 180,000 gallons for fire flow demand (1,500 gpm @ 2 hour duration), for a total required storage volume of 1.18 MG.

2.5 Water Distribution System and Interconnects with Other Municipalities

The water distribution system consists of a piping network covering approximately 1,800 acres or 2.8 square miles, and is essentially built-out. The piping network is made up of 4-inch to 14-inch piping. The majority of the piping is 6-inch and 8-inch diameter. The system is described in further detail in Section 4 and Section 5 of this report. The water distribution system is supplied by three (3) 150 Hp high service water distribution pumps. An atlas of the water distribution system is provided in Appendix A.

Eight (8) interconnects exist between the Town of Lantana and neighboring water suppliers as listed in Table 4.1. These interconnects can be used to maintain water supply within the Town during emergency conditions, or to provide emergency water to the neighboring utility from the Town of Lantana. Currently, one of the interconnects with the City of Lake Worth, IC-2, is disconnected.

2.6 Domestic Self-Supply Systems

Domestic self-supply systems are private water wells used by customers for their own domestic water supply source. These private systems are regulated by the Palm Beach County Environmental Control Rule II (ECR II), which is implemented and enforced through the Palm Beach County Health Department. The ECR II requires private water systems to connect to an approved community water system if there is an available water main within 100 feet in a public right-of-way (ROW) or easement abutting the property on which the building(s) are located.

There are a few, isolated individual homes within the Town of Lantana's service area that use private wells for water supply. Currently, the Town does not require connection to the Town's water system, but encourages connection on a voluntary basis. Due to the few numbers of these private systems, connection of these systems will not affect or impact the Town's projected water supply needs.

2.7 Conservation Program

The Town of Lantana implemented a Water Conservation Program which includes the following elements:

- Irrigation Ordinance

  The Town's Code, Chapter 10.5 "Landscaping" includes Section 10.5-23 which restricts landscape irrigation to the hours of 5:00 p.m. to 9:00 a.m.

  Also, the Town's Code, Chapter 21, Sections 21-61 through 21-69 includes "Water Conservation and Regulation", which protects the water resources of the Town from the harmful effects of over utilization during periods of water shortage and allocates available water supplies by assisting the SFWMD in the implementation of its water shortage plan.

  The Town of Lantana further enhanced its water conservation program through adopting Ordinance No. O-04-2008 on February 25, 2008. This ordinance imposes year-round restrictions on surficial water used for irrigation. The ordinance includes full-time, non-emergency, and non-shortage water use restrictions that allow two days per week (for each customer) of irrigation throughout the Town. More stringent restrictions will be in effect in the event that they are imposed by the SFWMD. This year round water restriction was adopted by the Town Council in an effort to optimize its current water use allocation and to preserve the integrity of the Town's water supply wells from deterioration resulting from salt water intrusion, and was an integral part of the successful receipt of its 20-year water use permit from the SFWMD.

- Xeriscape Ordinance

  The Town's Code, Chapter 10.5 "Landscaping" encourages the use of Xeriscape principles within its service area.

- Ultra-low Volume Plumbing Fixtures

  The Florida Building Code, Plumbing section requires the use of low volume plumbing fixtures for all local governments. The Town follows the requirements of the State Building code, and adopts the codes following adoption of same by the Board of County Commission.

- Water Conservation Rate Structure

  The Town implements a conservation-based increasing block rate structure as a means of reducing demands.

- Leak Detection Programs

  It is the policy of SFWMD to encourage public water supply systems to have no more than 10% unaccounted-for water losses in the distribution system. The Town calculates on a monthly basis and reports annually unaccounted for water loss in the distribution system in accordance with the WUP Limiting Condition No. 21. The town's current unaccounted for water losses in the

distribution system is approximately 4.5% Since this is below the target 10%, the Town has not implemented a formal leak detection program.

- Rain Sensor Devices

The Town's Code, Chapter 10.5 "Landscaping" includes Section 10.5-23 which requires the installation of rain sensor devices on all automatic irrigation systems.

- Public Education Programs

The Town promotes water conservation through handouts and newsletters.

2.8 Reuse

The Town of Lantana's wastewater treatment is provided by the East Central Regional Water Reclamation Facility (ECRWRF) located in West Palm Beach, Florida. The Town's wastewater is conveyed to the ECRWRF through Lake Worth's, Palm Beach County's and the City of West Palm Beach's wastewater collection and transmission systems. The ECRWRF is approximately 12-miles northwest of Lantana. There are no facilities in the vicinity of Lantana that provide reuse water from the ERCWRF. Currently, reuse water is not an alternative water supply that is available to Lantana from the ERCWRF or any other water reclamation facility.

2.9 Regional Water Supply Issues

The Town of Lantana shares common goals with the Lower East Coast Region such as lowering per capita water use, increasing conservation and continuing reclaimed water efforts.

The Town implemented an extensive CIP and R&R program which includes water main replacement, Water Treatment Plant maintenance, and high service pump maintenance to increase efficiency and reduce water loss to the Town's water main system.

In order to continually achieve lower per capita water use, the Town created a strong water conservation program which includes strict irrigation hours, limited surficial pumping for irrigation, a water shortage plan (to assist SFWMD during drought), a xeriscape ordinance, ultra-low volume plumbing fixtures, block rate structure (to decrease demand), leak detection programs, rain sensor devices with automatic irrigation shut-off, and a public education program.

The Town of Lantana sends its wastewater flow to the City of Lake Worth which then pumps the combined wastewater to the East Central Regional Water Reclamation Facility (ECRWRF). The ECRWRF treats wastewater from the City of Lake Worth, the City of West Palm Beach, the City of Riviera Beach, Palm Beach County and the Town of Palm Beach. A portion of the ECRWRF's wastewater is converted to reclaimed water which is used by Florida Power and Light for cooling water for their power plant located on SR 80. Lantana participates in this regional group to promote the use of reclaimed water as an alternative water supply source.

Town of Lantana 10 Year Water Supply Facilities Work Plan

Section 3

Potable Water Needs Assessment

Section 3

Potable Water Needs Assessment

3.1 Population Projections

Each year, the Bureau of Economic and Business Research (BEBR) at the University of Florida prepares the official population projections, in five-year intervals, for each Florida county. Since BEBR issues only a single countywide figure for each county, the Planning Division of the Palm Beach County (PBC) Planning Department annually allocates these figures to smaller geographies for localized planning efforts.

PBC prepares the Population Allocation Model every other year as a tool for long-range service delivery planning in Palm Beach County. Ch. 163.3177(1)(f)3, F.S., requires that each comprehensive plan be based upon population projections published by the Office of Economic and Demographic Research (OEDR) or generated by the local government based upon professionally acceptable methodology. The OEDR publishes the projections prepared by BEBR. PBC utilizes the OEDR/BEBR medium range projectiosn for the County's Population Allocation Model.

The population projections developed for the Town of Lantana are based on the PBC Planning Departments' 2013 Population Allocation Model. The projected population for the Town of Lantana service area was estimated by overlaying a map of Lantana's service area onto PBC's GIS base map containing population segregated into TAZs (refer to Figure 3-1). Population projections for the entire Town were developed by assessing a percentage of service area located within each TAZ and summing the population projections of the individual TAZs within the overall service area. The population forecast worksheets are included in Appendix B, and a summary of the final population projections are included in Table 3.1.

Figure 3-1
Town of Lantana Service Area and TAZ Map

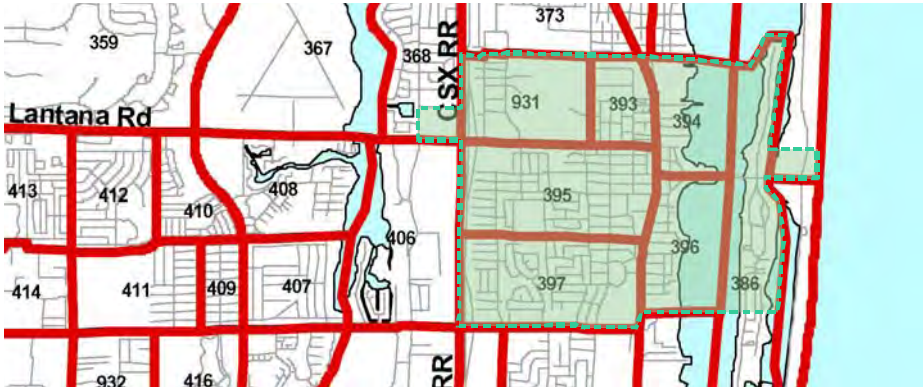


Table 3.1
Town of Lantana Population Projections through 2023

TAZ	% in Area	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
368	-	14	14	14	14	14	14	14	14	14	14	14	14
385	15%	428	431	431	432	433	435	435	437	437	440	444	446
386	56%	437	435	438	440	443	445	447	450	452	455	457	460
393	100%	749	744	748	753	756	759	762	765	768	775	782	789
394	100%	1,218	1,213	1,220	1,227	1,232	1,236	1,241	1,245	1,250	1,256	1,263	1,269
395	100%	3,219	3,200	3,205	3,211	3,216	3,221	3,226	3,231	3,236	3,246	3,255	3,265
396	100%	630	625	627	628	629	630	631	632	633	635	637	639
397	100%	2,984	2,963	2,966	2,969	2,972	2,975	2,978	2,981	2,985	2,993	3,001	3,010
931	100%	857	852	853	853	854	855	856	857	858	861	864	867
Total		10,536	10,476	10,502	10,528	10,549	10,571	10,591	10,613	10,633	10,675	10,717	10,758

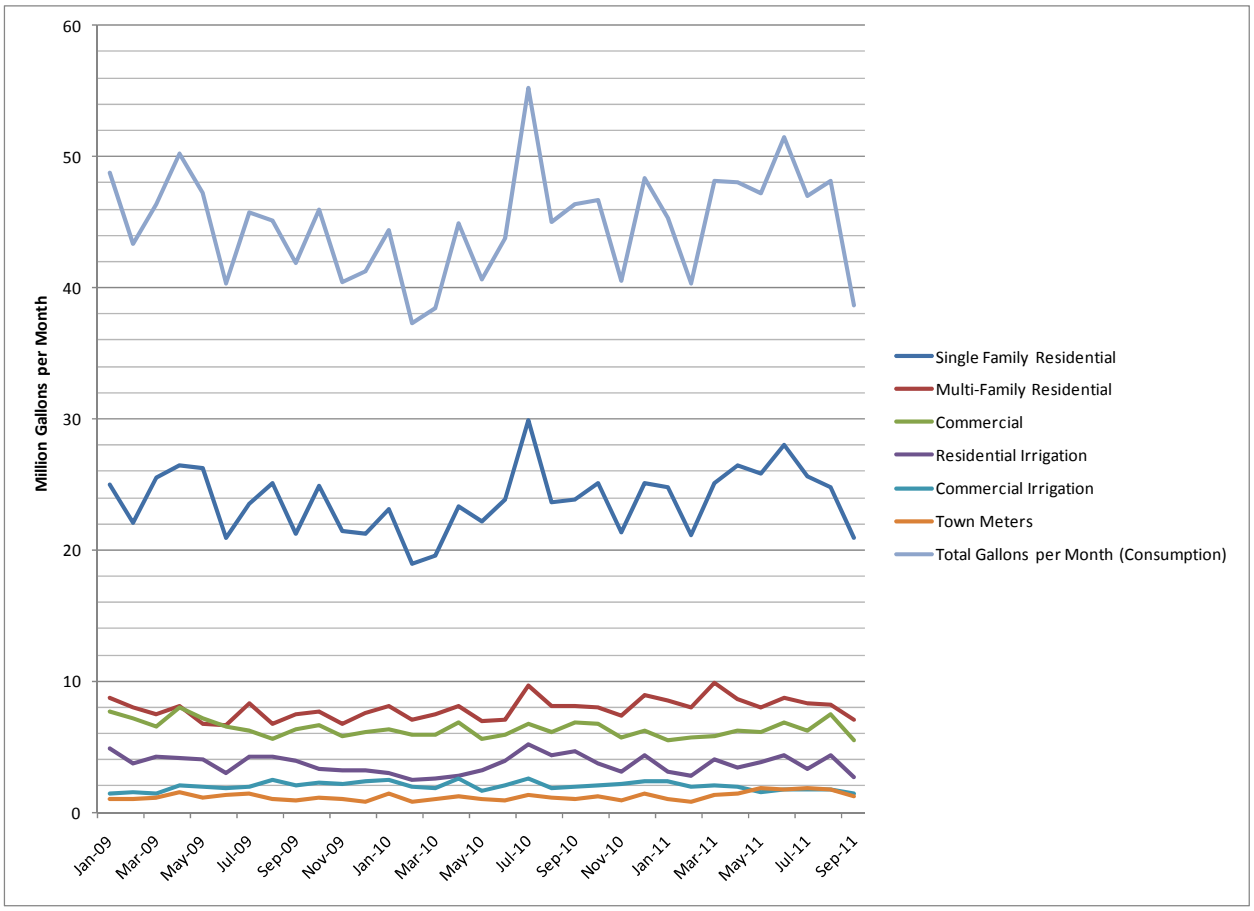
*Source PBC Planning Department 2013 Population Allocation Model

3.2 Historical Potable Water Demands and Levels of Service

Two and a half years of data, January 2009 to September 2011, was evaluated to establish recent historical potable water demands for the Town of Lantana. Consumption data records from the Town's billing accounts, as well as raw and finished water flow data from the Town's water treatment plant operation records were reviewed and summarized.

Consumption data was organized into the following sub-categories: Single-family residential, Multi-family residential, Commercial, and Town meters. Lantana's historical customer water demands by customer class are summarized and shown in Figure 3-2. A complete summary of the Town's historical potable water consumption data is provided in Appendix C. Calculated single family, multi-family, and commercial water demands do not include irrigation usage.

Figure 3-2
Town of Lantana Historical Customer Water Demands by Customer Class



Based upon the historical demand evaluation, Table 3.2 shows the Levels of Service are established for the Town:

Table 3.2
Town of Lantana Historical Potable Water Levels of Service

Service Item	Value
Water Demand w/o Irrigation	
Single Family Residential Water Demand	303 gal/day/unit
Multi-Family Residential Water Demand	120 gal/day/unit
Commercial Water Demand	721 gal/day/unit
Water Demand w/ Irrigation	
Single Family Residential Water Demand	332 gal/day/unit
Multi-Family Residential Water Demand	140 gal/day/unit
Commercial Water Demand	946 gal/day/unit
Other LOS Criteria	
Average Person per Household*	2.45
Aggregate Per Capita Finished Water Demand	159 gal/day/capita
Max Day : Average Day Demand Factor	1.44
Instantaneous Peak : Max Day Demand Factor	1.99
Minimum Water Distribution System Pressure at Peak Hour Flow	45 psi
Minimum Water Distribution System Pressure at Fire Flow Condition	20 psi
Minimum Fire Flow Requirements	1,000 gpm Residential 1,500 gpm Commercial

**Note: Per U.S. Census 2010 data.*

3.3 Future Redevelopment and Annexation Areas

The Town of Lantana service area encompasses 2.8 square miles and is predominantly "built-out". Future land area changes are anticipated to be minimal, and the Town has adopted a policy of limiting redevelopment, maintaining existing low density housing within the Town and retaining the current "Lantana scale of development."

As of the completion of this report, the Town has four (4) potential development/redevelopment projects. The redevelopment of the A.G. Holley site is currently underway and will require the site to be served potable water directly from the Town's potable water distribution system, in lieu of the previous on-site water treatment system. Table 3.3 shows the potential proposed water demands for Town-wide redevelopment.

Table 3.3
Proposed Redevelopment Water Demands

Project Name	Use	SF	# Units / Beds	# of students	Flow (gpd)
Holiday Inn Express	Hotel		62		15,066
Lakeside Point	Commercial	2,250			450
AG Holley Hospital Site	Retail	308,815			17,850
	Restaurant	32,285			33,600
	Bank	3,500			1,750
	Pharmacy	15,000			1,750
	School			1,100	5,600
	Multifamily Res		620		151,900
		Total Flow (Finished) for Redevelopment			227,966

**Use and flow for vacant commercial parcel based most recent redevelopment option submitted to the Town of Lantana.*

3.4 Water Demand Projections

As a result of the Irrigation Ordinance for permanent water restrictions passed by the Town Council in February, 2008, the Town observed a significant decrease in water use. Water use reductions ranging from 10% to 20% were observed throughout the Town as a result of limiting irrigation to two times a week and this trend has continued into present day.

The 2008 Water Supply Plan calculated an aggregate per capita water demand (raw) at 222 gallons per capita per day used. Due to continued water restrictions and community-wide conservation education, the current aggregate per capita water demand (raw) is calculated to be 174 gallons per capita per day used.

The population projections established under Section 3.1 were coupled with the projected Levels of Service established under this Section 3.4 to develop water demand projections for the Town. The water demand projection worksheet is listed below in Table 3.4.

Table 3.4
Town of Lantana Water Demand Projections

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Population	10,536	10,476	10,502	10,528	10,549	10,571	10,591	10,613	10,633	10,675	10,717	10,758
% Growth		-0.57%	0.25%	0.25%	0.20%	0.21%	0.19%	0.21%	0.19%	0.39%	0.39%	0.38%
Projected Avg Raw Water Flow, MGD	1.88	1.87	1.88	1.88	2.14	2.15	2.15	2.15	2.16	2.16	2.17	2.18
Projected Max Day Raw Water Flow, MGD[1]	2.71	2.70	2.70	2.71	3.08	3.09	3.09	3.10	3.11	3.12	3.13	3.14
Projected Max Month Raw Water Flow, MGD[3]	2.14	2.12	2.13	2.13	2.43	2.43	2.44	2.44	2.45	2.45	2.46	2.47
Projected Avg Finished Water Flow, MGD	1.68	1.67	1.67	1.68	1.91	1.91	1.92	1.92	1.92	1.93	1.94	1.94
Projected Max Day Finished Water Flow, MGD[1]	2.42	2.40	2.41	2.42	2.75	2.75	2.76	2.76	2.77	2.78	2.79	2.80
Projected Avg Consumed Water Flow, MGD[2]	1.60	1.59	1.60	1.60	1.82	1.82	1.83	1.83	1.83	1.84	1.85	1.85
Projected Max Day Consumed Water Flow, MGD [1]	2.31	2.29	2.30	2.30	2.62	2.63	2.63	2.63	2.64	2.65	2.66	2.67

* Starting in Year 2016, projected Finished Water Flows include potable water demands for the Town's redevelopment projects.

1. Projected Max Day = Avg. Day x 1.44 Max Day Factor
2. Projected Avg Consumed Water = Avg Finished Water minus 4.65% water loss
3. Projected Max Month=Avg Month x 1.134 Max Month Factor

Based on the projections presented above, the Town is anticipated to have a total finished water demand (average day) of 1.94 MGD and a maximum day demand of 2.80 MGD in the Year 2023. This is a reduction in the proposed flows from the 2008 study, which estimated 2.08 MGD average day flow and 2.89 MGD maximum day flow by year 2018. Again, this can be contributed to the Town's conservation efforts.

The water treatment plant currently has a permitted capacity of 4.0 mgd, which provides for sufficient capacity to meet the Town's needs. However, the plant capacity is limited by the volume of raw water which is permitted to be withdrawn by the South Florida Water Management District (SFWMD) through the Town's Water Use Permit (WUP). The current WUP allows for withdrawal of 907 million gallons per year, which is equivalent to an average daily withdrawal of 2.48 MGD, with a maximum monthly allocation of 88.358 million gallons (equivalent to 2.90 MGD maximum month average daily flow). Based on the projections above, the current permit is sufficient to meet the 10-year water supply needs of the Town (through Year 2023).

It is projected that the raw water capacity of the current WUP will meet the water supply needs of the Town for the 20-year duration of the permit (through the Year 2028) and beyond. After 2028, the Town will need to consider the following issues:

- The Town should re-evaluate its potable water consumption prior to Year 2028 to determine if an increase in raw water withdrawal is necessary.

- The Town of Lantana is located within the South Florida Water Management District's (SFWMD) Lower East Coast (LEC) Water Supply Plan. The Town is required to submit annual aggregate per person per day potable water demands. As part of ongoing conservation, the LEC plan is charged with ensuring potable water supply to the region and identifying potential alternative water supplies.

Subsequent sections of this report evaluate the condition and capacity of the Town's distribution system to meet the future water demand needs.

Section 4

Water System Condition Assessment

Section 4

Water System Condition Assessment

4.1 Background

As previously noted, the Town's potable water service area encompasses a 2.8 square mile coastal region in central Palm Beach County. The Town's existing water distribution and fire hydrant system are provided in Appendix A and Appendix D.

The Town's water distribution system consists of the following major components:

- Water Plant Equipment and Piping
- Storage Tanks
- High Service Distribution Pumps
- Distribution System
- Fire Hydrants
- Interconnects (with neighboring utilities)

A field investigation was performed for each of these major components to assess condition and to identify improvements needed to meet the Town's future water demand conditions.

4.2 Water Plant Equipment and Piping

The Town's Water Treatment Plant was completely rehabilitated in 2004, which included the construction of brand new filters, ion exchange, anion exchange and chemical systems. The treatment plant is in very good condition. However, there are several areas throughout the water treatment plant where new paint or coatings are recommended. A few examples are provided in the following photos. It is recommended that a thorough inspection of coatings and corrosion be performed and corrected. Preventative maintenance can reduce the damaging effects of corrosion which will eliminate the need for future major repairs.

Corrosion on ion tank hatch and piping.

Corrosion on support of ammonia tank and regulator.

Persistent leak at corner of concrete filer.

4.3 Storage Tanks

The Town of Lantana has two (2) 1.0 million gallon storage tanks located at the water treatment plant to provide a total storage capacity of 2.0 million gallons. There are no storage tanks located off-site.

The oldest storage tank was constructed in 1968 and was constructed of welded steel plates. Prior to 2013, the storage tank was in fair condition for its age and some repairs to the protective coating were recommended. Corrosion was visible under the overhang where the roof and sidewalls join together, on the ladder brackets, and on the base of the tank. There were signs of significant galvanic corrosion on the flange bolts for the associated piping.

Two (2) 1 million gallon storage tanks, concrete tank in foreground, steel tank in background

According to the tank inspection report performed in 2010, repairs to the protective coating were recommended inside of the steel storage tank within the next year. Significant corrosion was visible on the welds, and on a few locations on the roof. In some areas, 90% of the interior lining was missing near the bottom of the tank. Removal of the existing tube safety climb and installation of a cable safety climb device as well as a ladder-guard was recommended. The exterior of the tank was recommended to be recoated with a urethane paint system. Per Health Department standards (ref. 62-655, F.A.C.), potable water tank inspections are required every 5 years, with the next inspection for the Town of Lantana due in 2015.

Inoperable isolation valve was stuck in the closed position.

Significant corrosion on top hatch. Replacement is recommended.

The valve used to isolate the two storage tanks was previously not operable. There was also severe corrosion on the bolts for above ground piping and valves attached to the tank. It was recommended to consider stainless steel bolts, isolation washers, and cathodic protection to minimize the corrosion rate.

In Spring of 2014, the Town completed a total rehabilitation of the steel ground storage tank. The improvements to the tank included complete sandblasting of the interior, repairs to the interior structural beams, recoating the interior and exterior surfaces of the tank, replacement of the roof top hatch, repairs to the access ladders, replacement of corroded flange nuts/bolts to associated piping, and replacement of the below-grade isolation valve.

The newest storage tank was constructed in 1985 and is a concrete tank manufactured by Crom Corporation. This storage tank is in good condition. No obvious repairs are necessary.

Sufficient water storage volume must be maintained by public water utilities in order to accommodate daily water demand requirements plus provide adequate volume for fire flow requirements. Water storage requirements are provided in the following criteria:

- DEP Regulations Rule 62-555, F.A.C. *"Permitting, Construction, Operation and Maintenance of Public Water Systems"* require water storage tank capacity equal to 25% of maximum-day water demand, plus fire flow demand.

Using the maximum capacity of the water treatment plant (4.0 mgd), this equates to 1.0 mgd plus 180,000 gallons for fire flow demand (1,500 gpm @ 2 hour duration), for a total required storage volume of 1.18 mgd. The Town's existing water storage volume is sufficient to meet those requirements.

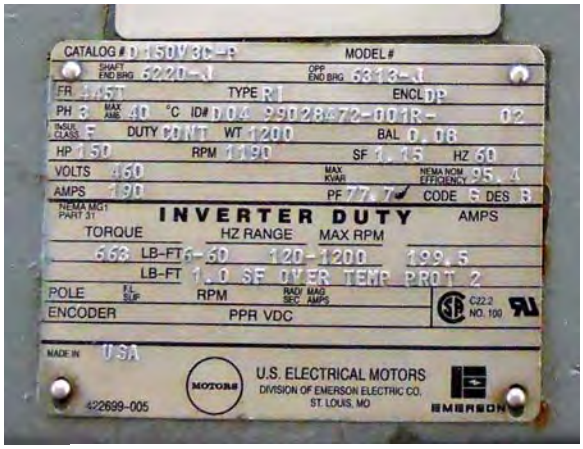
4.4 High Service Distribution Pumps

The water distribution system is supplied by three (3) 150 Hp pumps rated at approximately 3,000 gpm @ 125 ft TDH (60 psi) each. The firm capacity of the pumping system is 8.64 mgd (with one pump out of service). The projected 2023 peak flow is 5.09 mgd (2.56 mgd max. day x 1.99 PF = 5.09 mgd), and thus the pumps have adequate capacity to serve the future needs of the Town.

Each of the high service pumps are horizontal split case pumps with 12" suction and 10" discharge manufactured by WDM Pumps (now owned by Ruhrpumpen.)

High service pumps with 150 Hp variable speed motors.

The pumps were originally installed with 125 Hp motors in 1995, but the motors were replaced with 150 Hp motors and variable frequency drives in 2000. The pumps are in good condition with evidence of some surface corrosion.



High service pump motor nameplate

High service pumps variable speed drives

Due to the age of the pumps, motors, and drives, replacement should be considered in the Capital Improvement Plan. It is possible that higher efficiency equipment may be available when these items are replaced.

4.5 Distribution System

The potable water distribution system consists of a piping network covering approximately 1,800 acres or 2.8 square miles. The network is made up of 4-inch to 14-inch diameter piping, with the majority being 6-inch and 8-inch diameter. The oldest water mains were installed in 1962. These water mains are asbestos cement, and they were installed behind the homes along utility easements. Most of the water mains were installed in the 1980's and 1990's. These water mains are a mix of ductile iron and PVC materials.

Although most of the existing water mains are in good condition, the 8-inch WM that crosses the Intracoastal waterway between Atlantic Drive and Ocean Boulevard on the south side of E. Ocean Avenue is heavily corroded and is in need of exterior coating.

Backflow preventers are installed and maintained on fire lines and irrigation systems at commercial facilities and appear to be in good condition.

According to staff, there are no known major deficiencies or condition problems with the potable water distribution piping system. The performance of the water distribution system was modeled for this assessment and the results are described in Section 5.

Heavily corroded 8" WM crossing lagoon on the south side of E. Ocean Avenue and east of the Intracoastal Waterway

Close-up of the area with the most severe corrosion

Fire line and back flow preventers on west side of Gateway Arms Condos

Fire line and back flow preventers on south side of Lantana Elementary School

Fire line and back flow preventers on north side of Costco Tire Center

Fire line and back flow preventers behind Costco

4.6 Fire Hydrants

There are approximately 354 fire hydrants located with the Town's water distribution service area. The existing fire hydrants throughout the Town's water distribution system vary in age and type, but most fire hydrants appear to be in working condition and easily accessible. Some hydrants appear to have less than the recommended clearance of 15" from the ground to the bottom of the nozzle.

Due to budget cuts, the utility staff has not been able to keep up with hydrant testing, maintenance, and painting. Town staff estimates that approximately 40 hydrants need to be replaced and approximately 25 hydrants need repair due to leakage past the main valve which keeps the upper barrel pressurized. Almost all of the hydrants need to be cleaned and painted. Many of the hydrants have paint that is cracked and peeling with a significant amount of rust. The old paint, which may contain lead, needs to be removed and a more durable painting system should be used. It is recommended that the Town consider using a hydrant service contractor to perform annual maintenance on the hydrants.

Fire hydrant at 1445 W. Jennings St. Paint has been removed by weed eater.

Fire hydrant at 1429 W. Hardee St. Paint is peeling and significant corrosion at base of hydrant.

Fire hydrant at N. Ridge Rd. Paint is peeling and significant corrosion is present.

Fire hydrant on E. Central Blvd. Paint is peeling and some rust is visible.

Fire hydrant at 602 S. Lake Dr. has insufficient ground clearance and needs to be repainted.

Fire hydrant on Milton St. east of S. Federal Hwy. has insufficient ground clearance, a significant amount of rust, and needs to be repainted.

Fire hydrant on S. 13th Pl. north of W. Drew St. has insufficient ground clearance and needs to be repainted.

Fire hydrant at 1319 Caribbean Way has insufficient ground clearance and needs to be repainted.

4.7 Interconnects

Eight interconnects exist between the Town of Lantana and neighboring water suppliers as listed in **Table 4.1.** These interconnects can be used to maintain water supply within the Town during an emergency situation, or to provide emergency water to the neighboring utility. All of the interconnects are in good condition; IC-2 has been disconnected by the City of Lake Worth. It is recommended that the Town re-establish the connection in order to have a working interconnect at that location.

In order to keep the interconnects in good operating condition, valves should be exercised on a regular basis. Also, the ductile iron piping in the meter vaults for IC-7 and IC-8 should be cleaned and painted. Mild surface rust was present at the time of the inspection.

Table 4.1
Town of Lantana Emergency Water Interconnects

Interconnect No.	Connecting Utility	Size	Metered (Y/N)	Location	Condition
IC-1	City of Lake Worth	6”	N	Ridge Road (NW)	Good
IC-2	City of Lake Worth	6”	N	N. Federal Highway (N)	Disconnected
IC-3	A. G. Holley Hospital	6”	N	Andrew Redding Road(N)	Good
IC-4	Manalapan Township	6”	N	Hypoluxo Road (S)	Good
IC-5	Manalapan Township	6”	N	S.E. Atlantic Drive (SE)	Good
IC-6	Manalapan Township	8”	N	S.R. A-1-A Ocean Boulevard (E)	Good
IC-7	City of Boynton Beach	8”	Y	S. 13th Court (SE)	Good
IC-8	City of Boynton Beach	8”	Y	San Castle Boulevard (SE)	Good

IC-1 Lake Worth: Interconnect on Ridge Road just north of Shirley Court.

IC-1 Lake Worth: Close-up photo of interconnect on Ridge Road.

IC-2 Lake Worth: Blow-off located at northern end of service area south of 18th Ave. on S. Olive Ave. Interconnect has been disconnected.

IC-2 Lake Worth: Close-up photo of blow-ff valve.

IC-3 A. G. Holley: Interconnect on A.G. Holley site on Flamingo Drive.

IC-3 A. G. Holley: Close-up photo of interconnect valve.

IC-4 Manalapan: Interconnect south of Hypoluxo Road on Overlook Road

IC-5 Manalapan: Interconnect and fire hydrant at south end of S.E. Atlantic Drive.

IC-6 Manalapan: Interconnect on A-1-A and Ocean Blvd.

IC-6 Manalapan: Close-up photo of interconnect valve.

IC-7 Boynton Beach: Metered interconnect north of Hypoluxo Road on S. 13th Court.

IC-7 Boynton Beach: Inside metered interconnect north of Hypoluxo Road on S. 13th Court.

IC-8 Boynton Beach: Metered interconnect on south of Hypoluxo Road on San Castle Blvd.

IC-8 Boynton Beach: Inside metered interconnect south of Hypoluxo Road on San Castle Blvd.

4.8 Summary of Assessment Findings and Recommendation of Improvements

Based upon the results of the field investigations, the Town's water distribution system, in general, is in good condition. In order to maintain long-term operation of the system, the following improvements are recommended:

- Considering the steel ground storage tank is 44 years old, replacement of the tank may be required in the next 10 to 15 years depending on the degradation of the tank due to corrosion over time.
- Provide new exterior coating on 8-inch WM crossing the lagoon, east of the Intracoastal Waterway. Consider replacement or lining of this WM due to the severity of corrosion. The pipe could be damaged during maintenance.
- Replace Fire Hydrant No. 57 at Prospect Road, just east of N. Federal Highway.
- Replace and/or repair hydrants as needed on an annual basis, clean and repaint existing hydrants, and accelerate hydrant testing program. Consider using a hydrant service contractor to make annual improvement to hydrants.
- Reconnect IC-2 emergency interconnect with Lake Worth on N. Federal Highway.
- Clean and repaint water plant equipment, as necessary, due to corrosion.

In addition to the water distribution system improvements identified above, one (1) capital improvement program (CIP) and renewal & replacement (R&R) item for the raw water system and the water treatment plant is listed here to ensure those improvements are captured within the costs and scheduling of this report, and for the CIP and R&R project identification required as part of the Comprehensive Plan Update. Those improvements are listed as follows:

- *WTP Anion/Ion Exchange Systems* - the anion exchange and ion exchange systems at the water treatment plant require resin replacement every 5 to 7 years (initial estimate). Longer resin life (10-15 years) may be attainable based on operation and water quality performance of the exchange systems. The exchange systems were placed into operation late 2004, putting the current resin age at 10 years. Based on current treatment performance of the resin, it is estimated the resin will need replacement between years 10 and 15. Since resin replacement tends to be an expensive R&R item, budgeting ahead of time will ensure funds are available at the time of replacement.

Detailed costs and scheduling associated with all of these improvements are provided in Section 6.

Section 5

Water System Hydraulic Model

Section 5

Water System Hydraulic Model

5.1 Model Development

In 2008, the Town of Lantana contracted with Mathews Consulting (MC) to perform a 10-Year Water Supply Facilities Work Plan. At that time a computerized hydraulic model of the Town's water distribution system was developed for the existing water distribution system using Bentley's WaterCAD® hydraulic modeling software. The model was created utilizing water main and fire hydrant atlases that depicted the size and locations of all existing water mains and the location and identification number of all existing fire hydrants. Elevations of the water distribution system (within 5-ft. intervals) were determined and incorporated into the model by utilizing the latest USGS Quarter Quad topographic map of Lantana. The model was completed, tested and calibrated as part of the 2008 10-Year Water supply Facilities Work Plan.

The hydraulic model for this update utilized the original model as a base. MC then met with experienced Town staff to determine the level of improvements that had occurred since the original model was created. These improvements were incorporated into the model. Refer to Appendix E for a layout of the model piping network.

This hydraulic model uses the Hazen-Williams equation for pressure head loss through the pressure pipes. Table 5.1 shows the relative roughness coefficient or C-factors applied to the pipes through this hydraulic model.

Table 5.1
Hydraulic Model C-factors

MATERIAL	INSTALLATION DATE	C-FACTOR
PVC	After 1980	140
PVC	Before 1980	130
D.I.	After 1990	130
D.I.	Before 1990	120
A.C.	After 1980	130
A.C.	Before 1980	120

5.2 Model Performance Criteria

The criteria that determines whether a water distribution system and its representative hydraulic model is satisfactory or requires improvements is typically defined by its ability to deliver required peak hour flow rates, as well as the ability to deliver fire flow rates at a minimum system pressure during Maximum Daily Flow.

The minimum required fire flow at 20 psi is referred to as NFF_{20}. These fire flow requirements for Lantana were determined by contacting Palm Beach County Fire Rescue (PBCFR), as PBCFR is the fire protection provider for the Town of Lantana. PBCFR reported that the Town has an ISO fire protection rating of PC4, and the water distribution system is required to provide the flow rates and pressure listed in Table 5.2 for fire protection to maintain this ISO rating:

Table 5.2
Town of Lantana ISO Fire Flow Requirements

	Needed Fire Flow @ 20 psi (min.) pressure (NFF_{20})
Residential	1,000 gpm (min)
Non-Residential	1,500 gpm (min)

Ref: 2005 Florida Fire Prevention Code (based on NFPA 1)

The Town's WTP is equipped with water distribution pumps that have variable speed motors, which allows a constant pressure to be maintained at the WTP as demands vary. For the purpose of this analysis, the system was modeled as if the WTP was being operated at a normal pressure of 63 psi.

The system performance criteria for normal system operation was established by MC and summarized and listed in Table 5.3 below:

Table 5.3
Town of Lantana Water Distribution System Performance Criteria

Flow Condition	Minimum System Pressure (psi)
MDF	55
PHF	45

5.3 Base Demand Distribution

The Town's water distribution service area was divided into 27 "zones" or sub-areas. The historical customer demand analysis presented in Section 3.2 was used to distribute the customer's demands evenly to all of the water demand junctions within each of the 27 zones. This was accomplished by sorting the customer data by address and assigning each customer account to a designated "zone". The next step consisted of summing the historical water demands or flow within each zone and dividing each zone's flow by the number of model junctions within each zone to determine each junction's demand rate per zone. The individual zone demand rates were applied to each junction and established as the base demand distribution of the model. This "base demand" was used as the initial run of the model. The historical billing data from January 2009 - September 2011 was used in this exercise.

5.4 Model Calibration

Calibration of a hydraulic model is important in order to validate the model's output and provide confidence that the model is accurately representing the performance of the system. The modeling effort for this is an update to an existing model that was built for the 2008 Water Supply Plan Update. The existing model was calibrated using a series of field flow tests and comparing the results to the model output. The relative roughness coefficient, or C Factor, was also adjusted to better simulate the field conditions.

The Town has not experienced significant changes in pressures in the system, therefore the existing model was used as a base model and not recalibrated. There were two locations that new water main (N. Atlantic Avenue and Bicentennial Park) had been installed after the initial model was built. The piping configuration and revised water flow was incorporated in the model.

5.5 Model of Future Conditions

The "base demand" model described above was modified to analyze future condition by applying the future water demand projections and piping improvements required to meet fire flow requirements of the system. Models were developed to represent future average daily flow (ADF) conditions, maximum daily flow (MDF) conditions, peak flow (IPF) conditions, and fire flow conditions.

The peaking factor applied for this Study is modified from the standard peak hour flow (PHF). Industry standard historically reveals a PHF:ADF factor to be approximately 2.0. As previously stated, the Town has successfully implemented conservation programs, one of which requires automatic irrigation systems to run during off-peak (overnight) hours. The Town provided flow data from the plant's finished water flow meter which consisted of a flow measurement every 10 seconds for every third day during six (6) months over the Study period. This was a tremendous amount of data that required analysis. The PHF data was extracted from the historical water treatment plant flows by determining the peak hour flow for each day and dividing for the overall average flow for the day. The results showed the high flow conditions to be concentrated. In order to better emulate the actual peak flow demand of the Town's distribution system, the "instantaneous peak flow" (IPF) was extracted from the flow data by determining the actual peak flow for each day. All of the peak flow was averaged for the Study period and the average instantaneous flow was divided by the

average daily flow for the study period. The IPF:ADF factor resulted in 1.99. This factor is applied to the projected maximum daily flows to calculate anticipated future peak flow conditions.

The demand projections described in Section 3.4 were allocated globally throughout the model for the "Town build-out demand" condition. This approach stresses the system to reveal any future deficiencies of the system. The future water demand projections presented in Section 3.4 were the basis used to increase the base model demands by using a ratio of the future demand compared to the base 2011 demand. In addition to the future demand projections, a leakage rate of 4.5% was also added to the future demand projections based on reported values from the WTP records. The leakage rate represents unaccounted for water loss in the system downstream of the plant's finished water meter and prior to the customer's meter. The unaccounted for water percentage is based on the Town's historical water loss accounting reporting.

The maximum daily flow (MDF) system demand was determined and distributed throughout the model similarly to the future demand projections by multiplying the ADF by the ratio of ADF to MDF presented in Section 3.2. This ratio or peaking factor for MDF is 1.44. The peak flow (IPF) for this analysis was determined by multiplying a peak factor of 1.99 by the MDF.

5.6 Model Performance

The Town's goal for peak hour flow is to maintain a system pressure greater than 45 psi. The model produced very good results for future peak hour conditions, as system pressures range between 52 and 63 psi during future peak hour, MDF flow conditions (refer to Appendix E).

5.7 Fire Flow Analysis

As described in Section 5.5, satisfying the fire flow requirements of a water distribution system is typically the design limiting condition of the system. This is the case for the Town's water distribution system. The WaterCAD® hydraulic modeling software is very useful and well adapted for this analysis. The fire flow requirements of the system are incorporated into the model so that a fire flow demand range is applied to each hydrant until the upper limit of the range is met and the minimum system pressure is reported; or, the available fire flow at that hydrant is reported for when any other junction in the system decreases to 20 psi. This available fire flow at 20 psi is referred to as AFF_{20}. For this analysis, the upper limit for the fire flow analysis was set at 3,000 gpm.

The initial model runs showed that the existing water distribution system performs very well. The results found three (3) areas to be deficient. The deficiencies were identified by fire hydrants that are not meeting the performance requirements reported in Section 5.2. The deficiencies occur in the existing system (e.g. the deficiencies are not a result of future demand projections).

The first deficiency is the result of fire hydrant H-65 on South Dixie Highway being supplied flow through approximately 500 LF of 4-inch pipe. This fire hydrant is located at the Hypoluxo Road boundary of Lantana's town limits. The AFF_{20} at this hydrant according to the model is 565 gpm. This fire hydrant was not tested in the annual flow testing for the Town. The commercial property that fronts the water main is

undeveloped. The Town is aware of this deficiency and will not allow development to occur prior to improving the water main.

The second deficiency shows the south portion of the barrier island does not meet the 1,000 gpm minimum NFF_{20} requirement, with only approximately 612 gpm (MDF) AFF_{20} at fire hydrant H-21 (southern most hydrant) in the existing scenario. The model shows that future 2022 flows provide only 607 gpm (MDF) $AFF_{20.}$ The minimum improvements necessary to correct the deficiencies in the south end of the island are described in the Summary of this section.

The third deficiency is fire hydrant H-128 located at the northeast area of the Publix development on Lantana Road, just east of I-95 and west of Andrew Redding Road. This fire hydrant is connected to a 4-inch water loop with a section of 8-inch pipe that connects on each end to 6-inch water mains. The fire hydrant fails to meet the non-residential required NFF_{20} of 1,500 gpm. The model output shows that the AFF_{20} is 1,145 gpm.

Fire hydrant flow testing reports, dated 2009, indicate that Fire Hydrants No. 60, 61 and 62 have low residual flow. These hydrants are located on a dead-end section of 6-inch water main. The model does not show low pressure concerns for these hydrants. It is recommended that the Town continue to perform annual hydrant testing and monitor these hydrants for low pressure results.

5.8 Summary of Model Results and Recommendation of Improvements

The performance of the Town's water distribution system, with a few exceptions, proves to be excellent for providing the required NFF_{20}. The hydraulic model demonstrates that much of the system exceeds the minimum NFF_{20} described in Section 5.2. The three (3) areas of concern are:

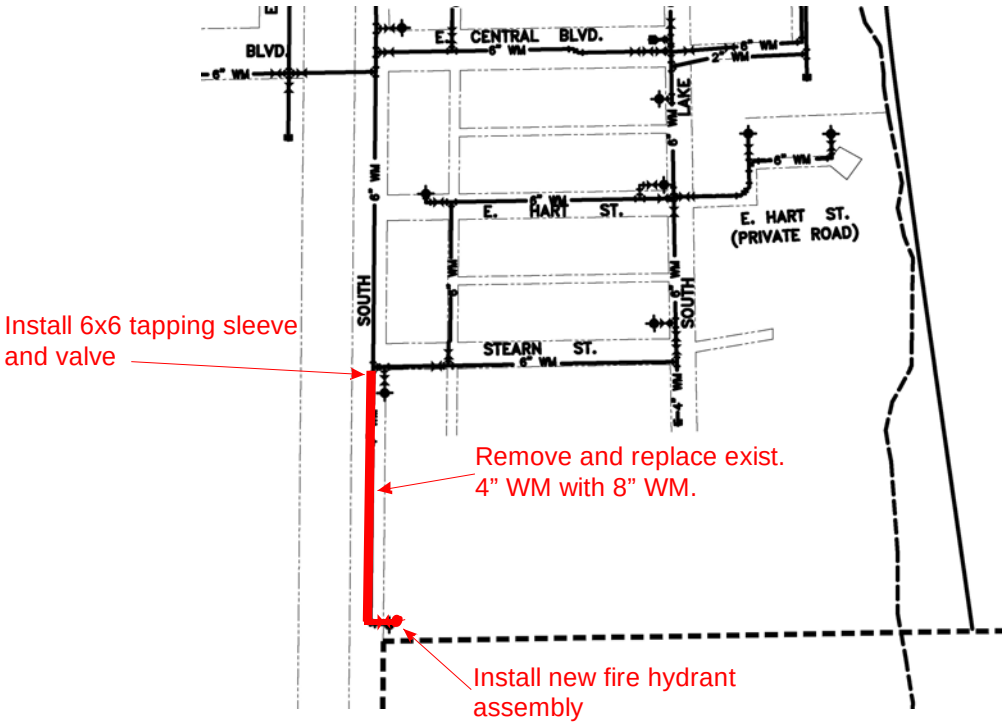
- The fire hydrant (H-65) at the end of South Dixie Highway near Hypoluxo Road which does not provide the NFF_{20} of 1,500 gpm.
- The southernmost portion of the Barrier Island that is at the end of relatively small and long water main which does not provide the NFF_{20} requirement of 1,000 gpm at 20 psi.
- The fire hydrant (H-128) at the northeast corner of the Publix development located just west of the A.G. Holley Hospital on West Lantana Road which does not provide the NFF_{20} of 1,500 gpm at 20 psi.

In the previous Water Supply Plan, completed in 2008, the northern half of the barrier island, along North Atlantic Drive, was found to be deficient. The Town recently replaced the water main along N. Atlantic Drive with a 6-inch water main. Construction was completed in August 2012. With these improvements, the model now shows there is sufficient fire protection flow to this area. The previous report also suggested adding an additional fire hydrant at the east end of E. Ocean Boulevard to achieve fire flow protection. This fire hydrant has been installed and is operable.

The first deficiency and recommended improvement involves the replacement of an existing dead-end 4-inch water main that terminates at fire hydrant H-65 on South Dixie Highway adjacent to an undeveloped parcel of land. The AFF_{20} for this hydrant is approximately 565 gpm. The hydrant serves a vacant parcel of

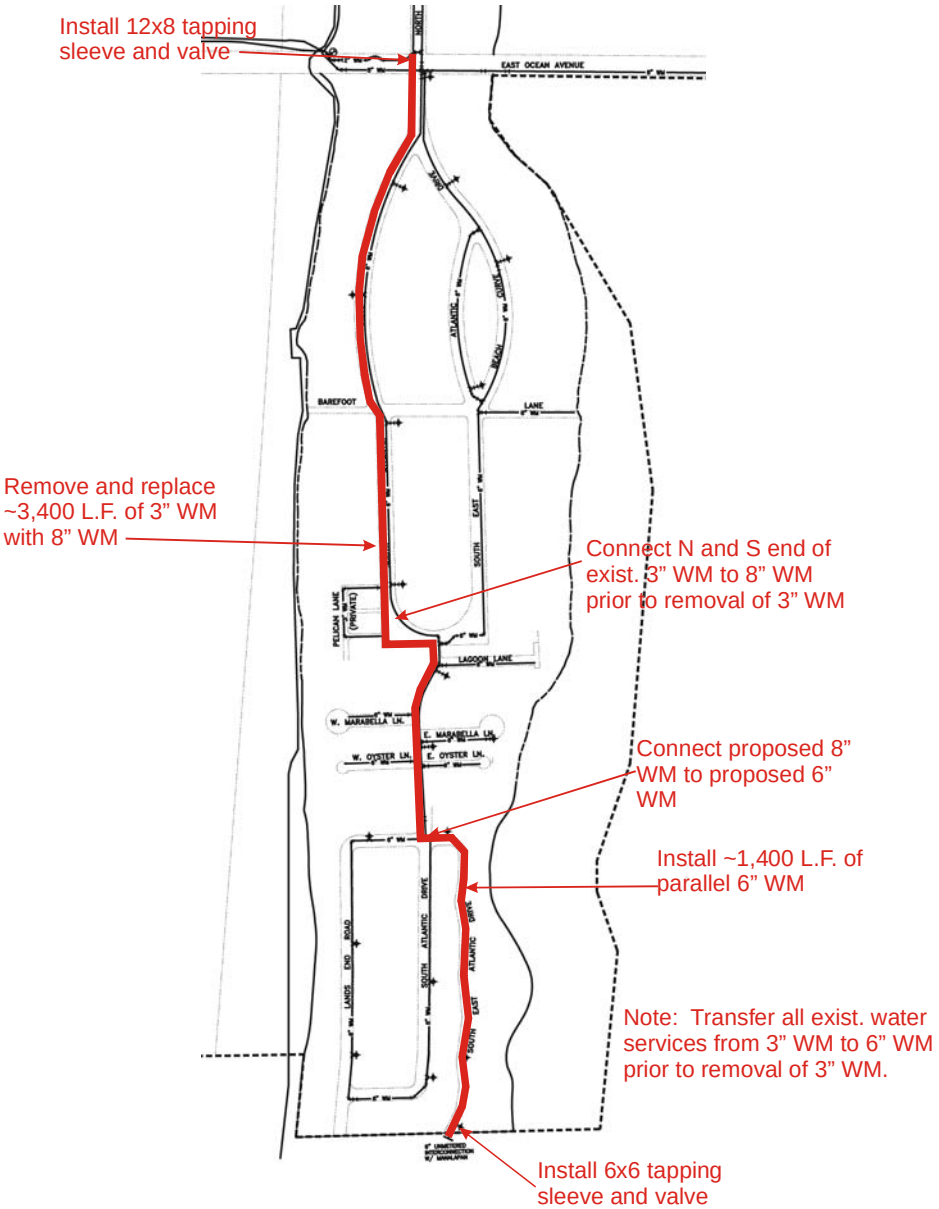
land. Should this property be developed, the Town could require this pipe to be built by the developer as it only benefits that parcel. The length of this 4-inch water main is approximately 500 LF, and an 8-inch replacement pipe will provide approximately 1,919 gpm of AFF_{20} (refer to Figure 5-1). If the developer requires an AFF_{20} greater than 1,919 gpm, looping this water main through the undeveloped parcel and back to South Lake Drive and Stearn Street will maximize the AFF_{20} to this parcel. The cost of that additional water main loop should be the responsibility of the developer.

Figure 5-1
Hydrant H-65 Improvements



The south area of the Island, from where South Atlantic and South East Atlantic Drive intersect, does not meet the minimum NFF_{20} requirement of 1,000 gpm. Increased pressure at the WTP is not feasible for mitigating this issue. Therefore, a new pipe is required from East Ocean Ave. to fire hydrant H-21 in order to meet the minimum NFF_{20} for the existing and future conditions. The construction of approximately 3,400 LF of 8-inch watermain and 1,400 LF of 6-inch watermain from E. Ocean Avenue, south along Atlantic Drive, ultimately to fire hydrant H-21 will provide the required NFF_{20} for this area. The 8-inch watermain will replace the existing 3-inch watermain from E. Ocean Blvd to Lands End Rd. The proposed 6-inch watermain will run parallel to the existing 6-inch watermain from Lands End Rd to H-21 (refer to **Figure 5-2**).

Figure 5-2
South Island Improvements



The third deficiency discovered through this analysis is the result of a fire hydrant connected to a 4-inch loop at the Publix development on Lantana Road between I-95 and Andrew Redding Road. This fire hydrant does not provide the NFF_{20} of 1,500 gpm at 20 psi. It is recommended to install a new fire hydrant approximately 60-feet north of the existing fire hydrant (H-128). The construction would include a tapping the existing 10-inch water main on Andrew Redding Road and extending approximately 200-feet of 6-inch water main (refer to Figure 5-3). The existing fire hydrant (H-128) should be removed, with Fire Department approval, after the completion of the new fire hydrant installation. The installation of this new hydrant will require an easement from Publix over the new pipe from the Andrew Redding right-of-way to the new hydrant.

Figure 5-3
Hydrant H-128 Improvements

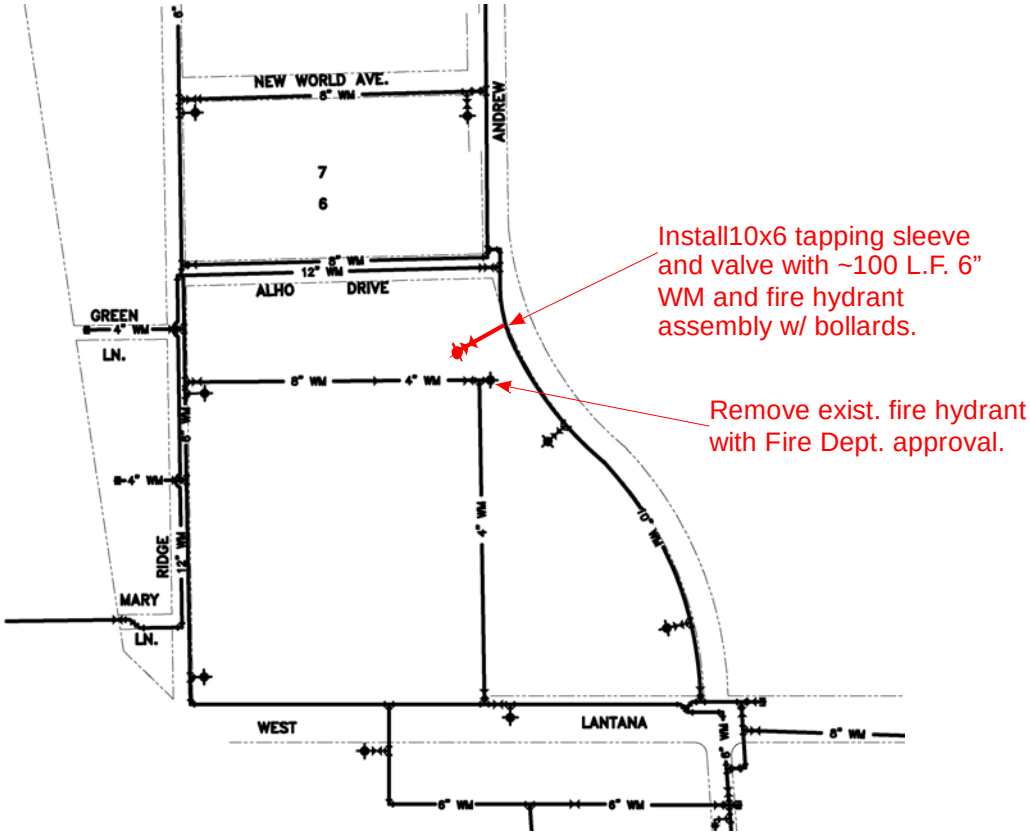


Table 5.5 summarizes the changes necessary to meet the performance criteria established for the Town's water distribution system. Cost analysis worksheets for the improvements are included in Appendix F. These projects are necessary to mitigate each specific issue noted in Table 5.5.

It should be noted that future water demand projections are met at the projected LOS without these improvements. These projects are optional improvements to the Town's water distribution system as they represent improvements that are needed to fulfill the minimum residential fire flow requirements at the current ISO rating of PC4. As an alternative to implementing these projects, the Town could accept a lower ISO rating.

Hydrant H-65 improvements are not a critical issue with the water distribution system, as the parcel that would benefit from this construction is vacant, and this item will most likely be the responsibility of the developer that chooses to occupy this parcel. This project was included in the CIP for reference only.

Table 5.5
Recommended Water Distribution System Improvements based on Hydraulic Model Results

	Area and Issue	Improvement or System Change	Capital Cost
1.	H-65, 500 LF of 4-inch water main $<$1,500 gpm NFF_{20}	Further investigation to confirm issue. If confirmed, replace 4-inch pipe with 8-inch (min) pipe size	$60 K
2.	South end of South Atlantic Drive $\leq$ 1,000 gpm NFF_{20}	Construct 3,400 LF of 8-inch and 1,400 LF of 6-inch water main from E. Ocean Blvd. to fire hydrant H-21. Remove existing 3-inch water main from E. Ocean Blvd. to Lands End Rd.	$640 K
3.	Publix H-128, water main loop $<$1,500 gpm NFF_{20}	Install a new fire hydrant tapped off the 10-inch water main on Andrew Redding Road	$19 K

Note: These improvements are necessary to mitigate existing deficiencies in the system, satisfy the build-out demand of the system and correct the fire flow deficiencies discovered in this system.

Section 6

Summary and Recommendations

Section 6

Summary and Recommendations

6.1 Report Summary and Recommended Capital Improvements Program

A summary of the Lantana Comprehensive Plan Water Element Update report tasks and findings is presented below:

- The Town's population is forecasted to grow from a population of 10,476 in 2013 to 10,758 in 2023.
- Based on analysis of historical data and review of overall Town goals and objectives, the Town's existing Potable Water Levels of Service (LOS) were determined to be as follows:

Service Item	Value
Water Demand w/o Irrigation	
Single Family Residential Water Demand	303 gal/day/unit
Multi-Family Residential Water Demand	120 gal/day/unit
Commercial Water Demand	721 gal/day/unit
Water Demand w/ Irrigation	
Single Family Residential Water Demand	332 gal/day/unit
Multi-Family Residential Water Demand	140 gal/day/unit
Commercial Water Demand	946 gal/day/unit
Other LOS Criteria	
Average Person per Household*	2.45
Aggregate Per Capita Finished Water Demand	159 gal/day/capita
Max Day : Average Day Demand Factor	1.44
Instantaneous Peak : Max Day Demand Factor	1.99
Minimum Water Distribution System Pressure at Peak Hour Flow	45 psi
Minimum Water Distribution System Pressure at Fire Flow Condition	20 psi
Minimum Fire Flow Requirements	1,000 gpm Residential 1,500 gpm Commercial

**Note: Per U.S. Census 2010 data.*

- As a result of the Ordinance No. O-04-2008 for permanent water restrictions, the Town has observed a significant decrease in water use throughout the Town. Water use reductions ranging from 10% to 20% have been observed.

- Future redevelopment within the Town is anticipated to be minimal. All anticipated redevelopment, including the proposed redevelopment for the A.G. Holey Site, is included in the projections.

- Finished water demands for the Town are anticipated to increase from 1.67 mgd (ADF) and 2.40 mgd (MDF) in 2013 to 1.78 mgd (ADF) and 2.56 mgd (MDF) in 2023.

- The Town's raw water supply and treatment system have sufficient capacity to meet the potable water needs through 2023. The Town's SFWMD water use permit (WUP) dictates the maximum volume of raw water that is permitted to be withdrawn. There is sufficient capacity with the proposed WUP renewal allocation to meet the Town's needs through the duration of the permit (expires Year 2028). After that date, the Town will need to re-assess the water demands and potentially pursue a WUP allocation increase through SFWMD, or consider alternatives water supply sources, such as bulk water agreements with neighboring utilities, to serve future increases in the potable water demands.

- The Town's water distribution system is in very good condition, and no major deficiencies were found. There are six (6) recommendations in order to maintain long-term operation of the system:

  - Considering the steel ground storage tank is 44 years old, replacement of the tank may be required in the next 10 to 15 years depending on the degradation of the tank due to corrosion over time.

  - Provide new exterior coating on 8" WM crossing the lagoon, east of the Intracoastal Waterway. Consider replacement or lining of this WM due to the severity of corrosion. The pipe could be damaged during maintenance.

  - Replace Fire Hydrant No. 57 at Prospect Road, just east of N. Federal Highway.

  - Replace and/or repair hydrants as needed, clean and repaint existing hydrants, and accelerate hydrant testing program. Consider using a hydrant service contractor to bring hydrants to an acceptable standard.

  - Reconnect IC-2 emergency interconnect with Lake Worth on N. Federal Highway.

  - Clean and repaint water plant equipment as necessary due to corrosion.

- *WTP Anion/Ion Exchange Systems* – The anion exchange and ion exchange systems at the water treatment plant require resin replacement every 5 to 7 years (initial estimate). Longer resin life (10-15 years) may be attainable based on operation and water quality performance of the exchange systems. The exchange systems were placed into operation late 2004, putting the current resin age at 10 years. Based on current treatment performance of the resin, it is estimated the resin will need replacement between years 10 and 15. Since resin replacement tends to be an expensive R&R item, budgeting ahead of time will ensure funds are available at the time of replacement.

- The hydraulic model developed for this report predicts there is sufficient capacity in the Town's existing distribution system to meet peak hour flows and minimum system pressures through 2023.

- The Town of Lantana PC4 ISO rating fire flow requirements were reported to be as follows:

	Needed Fire Flow @ 20 psi (min.) pressure (NFF_{20})
Residential	1,000 gpm (min)
Non-Residential	1,500 gpm (min)

Ref: 2005 Florida Fire Prevention Code (based on NFPA 1)

- In order to meet these fire flow requirements of the PCR ISO rating through build-out conditions, it is recommended the Town make the following improvements:

  - Replace the fire hydrant (H-65) and construct approximately 500 LF of 8-inch water main at the end of South Dixie Highway near Hypoluxo Road.

  - Construct approximately 1,400 LF of 6-inch watermain and 3,400 LF of 8-inch watermain along South Atlantic Drive from East Ocean Boulevard to the southern Town limit (H-21). The proposed water main will replace approximately 3,400 LF of 3-inch water main and run parallel to approximately 1,400 LF of existing 6-inch water main.

  - Install a new fire hydrant and associated piping, tapped off of Andrew Redding Road, at the rear of the Publix shopping plaza on Lantana Road.

The recommended water system 10-Year Capital Improvement Program (CIP) and Renewal and Replacement (R&R) Program (major items) are summarized below in Table 6.1. The 10-year CIP and R&R Program schedule and budget by year is provided in Table 6.2. Cost analysis worksheets for the improvements are included in Appendix F.

Table 6.1

Town of Lantana Water System Recommended 10-Year Capital Improvement Program and Renewal and Replacement Program

	Area and Issue	Improvement or System Change	Type	Capital Cost	Completion Date
1	Steel Ground Storage Tank	Replace steel ground storage tank	R&R	$619,164	2023
2	8-inch WM at the Intracoastal crossing	Provide new coating on pipe.	R&R	$7,048	2014
3	Fire Hydrant No. 57	Replace hydrant to provide accessibility.	R&R	$4,400	2014
4	IC-2 Emergency Interconnect with Lake Worth	Reconnect piping	R&R	$9,350	2015
5	Fire hydrant maintenance	Provide on-going annual cleaning, painting, and repair as required to keep hydrants in good operating condition.	R&R	$20,824	Annually
6	WTP maintenance	Provide on-going annual cleaning, painting, and repair to keep all equipment in good operating condition.	R&R	$31,000	Annually
7	WTP Anion and Ion Exchange Systems	Replace resin.	R&R	$417,362	2017 - 2018
8	H-65 (S. Dixie Hwy) does not meet AFF_{20}	Construct approximately 500 LF of 8-inch water main and install a new fire hydrant. (This work can potentially be paid for by the Developer of the vacant parcel the hydrant serves.)	CIP	$61,512	2015
9	South Atlantic Drive does not meet AFF_{20}	Construct approximately 1,400 LF of 6-inch water main and 3,400 LF of 8-inch water main along S. Atlantic Drive from E. Ocean Ave. to H-21.	CIP	$678,835	2015-2016
10	H-128 (Publix plaza on Lantana Road) does not meet AFF_{20}	Install a new fire hydrant, tapped off of the existing 10-inch water main located on Andrew Redding Rd.	CIP	$18,920	2013
11	Replace High Service Pump's VFDs	Replace the three VFDs associated with the high service pumps. One VFD to be replaced annually.	CIP	$37,950	2013-2015

Table 6.2
Town of Lantana Water System Recommended 10-Year CIP and R&R Program Schedule and Budget by Year

Project No.	Project Name	Total Cost	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Project 1	Replace Steel Ground Storage Tank	$619,164											$619,164
Project 2	Provide Coating on 8-inch WM Crossing Intracoastal	$7,048		$7,048									
Project 3	Replace Fire Hydrant No. 57	$4,400		$4,400									
Project 4	Re-connect IC-2 Emergency Interconnect with Lake Worth	$9,350			$9,350								
Project 5	Perform Annual Fire Hydrant Maintenance	$229,068	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824
Project 6	Annual WTP Maintenance (cleaning, painting, and repair)	$341,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000
Project 7	Replacement Resin for WTP Anion and Ion Exchange Systems	$417,362					$208,681	$208,681					
Project 8	H-65 Watermain Replacement	$61,512			$61,512								
Project 9	South Atlantic Drive Watermain	$678,835			$339,417	$339,417							
Project 10	H-128 Watermain Replacement	$18,920	$18,920										
Project 11	Replace VFDs for High Service Pumps	$37,950	$12,650	$12,650	$12,650								
		$2,424,609	**$83,394**	**$75,923**	**$474,754**	**$391,242**	**$260,505**	**$260,505**	**$51,824**	**$51,824**	**$51,824**	**$51,824**	**$670,988**

Appendix A

Town of Lantana Water Distribution System Map

N
0 200 400 600 1000
SCALE IN FEET
LEGEND
WATER MAIN
GATE VALVE
FIRE HYDRANT
BLOW-OFF VALVE
AIR RELEASE VALVE
EXISTING WATER DISTRIBUTION SYSTEM
UPDATED APRIL 2012
TOWN OF LANTANA
MATHEWS CONSULTING
CIVIL ENGINEERS
477 S. Rosemary Avenue, Suite 330, West Palm Beach, Florida 33401
Phone: 561-655-6175 ● Fax: 561-655-6179
www.mathewsconsultinginc.com
SOLID WASTE AUTHORITY OF PALM BEACH COUNTY
ACCESS ROAD
SEABOARD COAST LINE R.R.
FLORIDA EAST COAST R.R.
SEACREST BLVD.
EAST OCEAN AVENUE
LANTANA ROAD
SILVER SANDS LN.
WELL NO. 7
WELL NO. 8
WELL NO. 9
WELL NO. 10
WELL NO. 11
WELL NO. 12
WELL NO. R

Appendix B

Town of Lantana Population Forecast Worksheet

Appendix B
Town of Lantana Population Projections
Source: 2013 Palm Beach County Planning Department Population Allocation Model

Original Data

TAZ		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
368		1,898	1,908	1,912	1,917	1,925	1,934	1,943	1,951	1,960	1,968	1,976	1,983
385		2,852	2,937	2,939	2,942	2,946	2,950	2,954	2,958	2,962	2,983	3,003	3,024
386		775	771	776	781	785	789	793	797	802	806	810	815
393		749	744	748	753	756	759	762	765	768	775	782	789
394		1,218	1,213	1,220	1,227	1,232	1,236	1,241	1,245	1,250	1,256	1,263	1,269
395		3,219	3,200	3,205	3,211	3,216	3,221	3,226	3,231	3,236	3,246	3,255	3,265
396		630	625	627	628	629	630	631	632	633	635	637	639
397		2,984	2,963	2,966	2,969	2,972	2,975	2,978	2,981	2,985	2,993	3,001	3,010
931		857	852	853	853	854	855	856	857	858	861	864	867
Total		15,181	15,212	15,247	15,281	15,316	15,350	15,385	15,420	15,454	15,523	15,592	15,661

Forecasted Population based on Average Growth Rates per TAZ Area

TAZ	% in Area	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
368	-	14	14	14	14	14	14	14	14	14	14	14	14
% Growth			0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
385	15%	428	431	431	432	433	435	435	437	437	440	444	446
% Growth			0.63%	0.09%	0.32%	0.14%	0.37%	0.14%	0.37%	0.14%	0.70%	0.69%	0.47%
386	56%	437	435	438	440	443	445	447	450	452	455	457	460
% Growth			-0.51%	0.66%	0.65%	0.53%	0.52%	0.52%	0.52%	0.52%	0.55%	0.54%	0.54%
393	100%	749	744	748	753	756	759	762	765	768	775	782	789
% Growth			-0.73%	0.62%	0.62%	0.40%	0.39%	0.39%	0.39%	0.39%	0.90%	0.89%	0.88%
394	100%	1,218	1,213	1,220	1,227	1,232	1,236	1,241	1,245	1,250	1,256	1,263	1,269
% Growth			-0.42%	0.57%	0.57%	0.37%	0.37%	0.37%	0.36%	0.36%	0.51%	0.51%	0.50%
395	100%	3,219	3,200	3,205	3,211	3,216	3,221	3,226	3,231	3,236	3,246	3,255	3,265
% Growth			-0.59%	0.18%	0.18%	0.16%	0.16%	0.16%	0.16%	0.16%	0.29%	0.29%	0.29%
396	100%	630	625	627	628	629	630	631	632	633	635	637	639
% Growth			-0.74%	0.23%	0.23%	0.15%	0.15%	0.15%	0.15%	0.15%	0.32%	0.31%	0.31%
397	100%	2,984	2,963	2,966	2,969	2,972	2,975	2,978	2,981	2,985	2,993	3,001	3,010
% Growth			-0.73%	0.10%	0.10%	0.11%	0.11%	0.11%	0.11%	0.11%	0.28%	0.28%	0.28%
931	100%	857	852	853	853	854	855	856	857	858	861	864	867
% Growth			-0.54%	0.08%	0.08%	0.10%	0.10%	0.10%	0.10%	0.10%	0.36%	0.36%	0.36%
Total		10,536	10,476	10,502	10,528	10,549	10,571	10,591	10,613	10,633	10,675	10,717	10,758

Appendix C

Town of Lantana Historical Potable Water Consumption Summary

Appendix C
Historical Potable Water Demand

Date	Finished Water MG/Month		Raw Water MG /Month	
	2011	2012	2011	2012
Jan	44.18	56.83	53.055	58.258
Feb	42.25	49.97	50.805	52.889
March	47.81	57.71	57.757	58.847
April	48.66	54.44	60.254	56.312
May	51.67	51.12	61.903	54.305
June	51.00	47.33	58.068	46.136
July	49.27	55.56	56.327	50.617
August	46.14	51.65	49.441	53.834
Sept	43.48	45.78	49.526	49.561
Oct	51.47	57.26	55.751	63.076
Nov	50.53	53.39	50.624	61.696
Dec	53.77	52.34	56.533	56.375

Date	Finished Water Avg Day/Month (MGD)		Finished Water Max. Day/Month (MGD)		Raw Water Avg Day/Month (MGD)	
	2011	2012	2011	2012	2011	2012
Jan	1.43	1.83	1.66	2.13	1.71	1.88
Feb	1.51	1.72	2.02	1.97	1.81	1.89
March	1.54	1.86	1.88	2.13	1.86	1.90
April	1.62	1.82	1.94	2.17	2.01	1.88
May	1.67	1.65	2.08	2.03	2.00	1.75
June	1.70	1.58	2.29	1.90	1.94	1.54
July	1.59	1.79	2.21	2.18	1.82	1.63
August	1.49	1.67	1.94	2.15	1.59	1.74
Sept	1.45	1.53	1.75	1.72	1.65	1.65
Oct	1.66	1.85	1.93	2.45	1.80	2.03
Nov	1.68	1.85	1.97	2.52	1.69	2.06
Dec	1.73	1.69	2.01	2.00	1.82	1.82

	2011	2012	Average
Average Finished Water (MGD)	1.59	1.74	1.66
Finished Water Max Day (MGD)	2.29	2.52	
Max Month Raw Water (MMF)	61.90	63.08	
Max Day : Avg Day - by Year	1.44	1.45	1.44
Average Raw Water (MGD)	1.81	1.81	1.81
MMF Raw: AMF Raw (MG)	1.13	1.14	1.13
Avg Finished: Avg Raw- by Year*	87.87%	95.68%	91.78%

*Avg Finished:Avg Raw is significantly higher for 2012 than for previous years. Data from 2009-2012 was averaged and the result, 89.14%, will be applied in the Water Demand Projections.

Appendix C
Historical Potable Water Demand

Water Loss Calculation	
Finished Water Sum (January 2009-September 2011)	1,555.16
Consumption Sum (January 2009-September 2011)	1,482.78
Calculated Water Loss	4.65%

	Population	Finished Water (MGD	Capita Demand GPD (Finished)
Population 2011	10,434	1.59	152.39
Population 2012	10,464	1.74	166.28
Average 2011-2012			159.34
Calculated Avg. Aggregate per Capita Demand (Consumption) (Calculated Finished Water - water loss)			151.93
Calculated Avg. Aggregate per Capita Demand (Raw)			173.58

Appendix C
Town of Lantana
Historical Potable Water Consumption Data

	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
Single Family Residential												
Total Gal/Month	25,028,000	22,043,000	25,535,000	26,499,000	26,268,000	20,946,000	23,582,000	25,100,000	21,237,000	24,932,000	21,494,000	21,199,000
Total MG/Month	25.03	22.04	25.54	26.50	26.27	20.95	23.58	25.10	21.24	24.93	21.49	21.20
Avg GPD/Month	807,355	787,250	823,710	883,300	847,355	698,200	760,710	809,677	707,900	804,258	716,467	683,839
Avg GPD/Year	777,502											
Total No. of Units	2,598											
Avg Gal/Unit	299											
Avg Gal/Unit (Jan '09- Sept '11)	303											
People Per Household	2.45											
Avg. Residential Per Capita Per Day	124											
Total SF Irrigation Gal/Month	2,353,000	2,226,000	2,550,000	2,416,000	2,390,000	1,826,000	2,793,000	2,522,000	2,404,000	2,142,000	1,900,000	2,073,000
Total SF Irrigation MG/Month	2.353	2.226	2.55	2.416	2.39	1.826	2.793	2.522	2.404	2.142	1.9	2.073
Average GPD by Month	75,903	79,500	82,258	80,533	77,097	60,867	90,097	81,355	80,133	69,097	63,333	66,871
Avg GPD/Month for Study Period	76,464											
Avg SF + Irrigation GPD for Study Period	862,842											
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)	332											
Multi- Family Residential												
Total Gal/Month	8,693,000	7,976,000	7,477,000	8,125,000	6,756,000	6,590,000	8,275,000	6,773,000	7,436,000	7,709,000	6,692,000	7,533,000
Total MG/Month	8.69	7.98	7.48	8.13	6.76	6.59	8.28	6.77	7.44	7.71	6.69	7.53
Avg GPD/Month	280,419	284,857	241,194	270,833	217,935	219,667	266,935	218,484	247,867	248,677	223,067	243,000
Avg GPD/Year	246,911											
Total No. of Units	2,180											
Avg Gal/Unit	113											
Avg Gal/Unit (Jan '09- Sept '11)	120											
Total MF Irrigation Gal/Month	2,501,000	1,498,000	1,640,000	1,719,000	1,603,000	1,162,000	1,434,000	1,673,000	1,504,000	1,191,000	1,307,000	1,137,000
Total MF Irrigation MG/Month	2.501	1.498	1.64	1.719	1.603	1.162	1.434	1.673	1.504	1.191	1.307	1.137
Average GPD by Month	80,677	53,500	52,903	57,300	51,710	38,733	46,258	53,968	50,133	38,419	43,567	36,677
Avg GPD/Month for Study Period	43,914											
Avg MF + Irrigation GPD for Study Period	304,872											
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)	140											
Commercial												
Total Gal/Month	7,699,000	7,135,000	6,514,000	7,978,000	7,115,000	6,550,000	6,238,000	5,578,000	6,342,000	6,606,000	5,845,000	6,130,000
Total MG/Month	7.699	7.135	6.514	7.978	7.115	6.55	6.238	5.578	6.342	6.606	5.845	6.13
Avg GPD/Month	248,355	254,821	210,129	265,933	229,516	218,333	201,226	179,935	211,400	213,097	194,833	197,742
Avg GPD/Year	218,777											
Total No. of Units	290											
Avg Gal/Unit	754											
Avg Gal/Unit (Jan '09- Sept '11)	721											
Total CO Irrigation Gal/Month	1,436,000	1,541,000	1,461,000	2,016,000	1,906,000	1,893,000	1,969,000	2,499,000	2,018,000	2,290,000	2,184,000	2,383,000
Total CO Irrigation MG/Month	1.436	1.541	1.461	2.016	1.906	1.893	1.969	2.499	2.018	2.29	2.184	2.383
Average GPD by Month	46,323	55,036	47,129	67,200	61,484	63,100	63,516	80,613	67,267	73,871	72,800	76,871
Avg GPD/Month for Study Period	65,313											
Avg CO + Irrigation GPD for Study Period	274,444											
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)	946											
Gallons per Month (Total Consumption)												
Single Family Residential	25,028,000	22,043,000	25,535,000	26,499,000	26,268,000	20,946,000	23,582,000	25,100,000	21,237,000	24,932,000	21,494,000	21,199,000
Multi-Family Residential	8,693,000	7,976,000	7,477,000	8,125,000	6,756,000	6,590,000	8,275,000	6,773,000	7,436,000	7,709,000	6,692,000	7,533,000
Commercial	7,699,000	7,135,000	6,514,000	7,978,000	7,115,000	6,550,000	6,238,000	5,578,000	6,342,000	6,606,000	5,845,000	6,130,000
Residential Irrigation	4,854,000	3,724,000	4,190,000	4,135,000	3,993,000	2,988,000	4,227,000	4,195,000	3,908,000	3,333,000	3,207,000	3,210,000
Commercial Irrigation	1,436,000	1,541,000	1,461,000	2,016,000	1,906,000	1,893,000	1,969,000	2,499,000	2,018,000	2,290,000	2,184,000	2,383,000
Town Meters	1,045,000	978,000	1,154,000	1,493,000	1,136,000	1,321,000	1,445,000	1,015,000	897,000	1,108,000	1,042,000	817,000
Total Gallons per Month (Consumption)	48,755,000	43,397,000	46,331,000	50,246,000	47,174,000	40,288,000	45,736,000	45,160,000	41,838,000	45,978,000	40,464,000	41,272,000

	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10
Single Family Residential												
Total Gal/Month	23,068,000	18,979,000	19,597,000	23,284,000	22,211,000	23,875,000	29,853,000	23,623,000	23,879,000	25,068,000	21,343,000	25,118,000
Total MG/Month	23.07	18.98	19.60	23.28	22.21	23.88	29.85	23.62	23.88	25.07	21.34	25.12
Avg GPD/Month	744,129	677,821	632,161	776,133	716,484	795,833	963,000	762,032	795,967	808,645	711,433	810,258
Avg GPD/Year	766,158											
Total No. of Units												
Avg Gal/Unit	295											
Avg Gal/Unit (Jan '09- Sept '11)												
People Per Household												
Avg. Residential Per Capita Per Day												
Total SF Irrigation Gal/Month	1,908,000	1,641,000	1,643,000	1,771,000	2,157,000	2,582,000	3,301,000	2,720,000	3,072,000	2,535,000	1,965,000	3,106,000
Total SF Irrigation MG/Month	1.908	1.641	1.643	1.771	2.157	2.582	3.301	2.72	3.072	2.535	1.965	3.106
Average GPD by Month	61,548	58,607	53,000	59,033	69,581	86,067	106,484	87,742	102,400	81,774	65,500	100,194
Avg GPD/Month for Study Period												
Avg SF + Irrigation GPD for Study Period												
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)												
Multi- Family Residential												
Total Gal/Month	8,136,000	7,082,000	7,426,000	8,123,000	6,936,000	7,080,000	9,612,000	8,063,000	8,103,000	7,963,000	7,420,000	8,908,000
Total MG/Month	8.14	7.08	7.43	8.12	6.94	7.08	9.61	8.06	8.10	7.96	7.42	8.91
Avg GPD/Month	262,452	252,929	239,548	270,767	223,742	236,000	310,065	260,097	270,100	256,871	247,333	287,355
Avg GPD/Year	259,771											
Total No. of Units												
Avg Gal/Unit	119											
Avg Gal/Unit (Jan '09- Sept '11)												
Total MF Irrigation Gal/Month	1,045,000	871,000	979,000	966,000	1,062,000	1,333,000	1,847,000	1,580,000	1,594,000	1,201,000	1,082,000	1,275,000
Total MF Irrigation MG/Month	1.045	0.871	0.979	0.966	1.062	1.333	1.847	1.58	1.594	1.201	1.082	1.275
Average GPD by Month	33,710	31,107	31,581	32,200	34,258	44,433	59,581	50,968	53,133	38,742	36,067	41,129
Avg GPD/Month for Study Period												
Avg MF + Irrigation GPD for Study Period												
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)												
Commercial												
Total Gal/Month	6,368,000	5,956,000	5,931,000	6,900,000	5,628,000	5,936,000	6,737,000	6,142,000	6,821,000	6,692,000	5,744,000	6,217,000
Total MG/Month	6.368	5.956	5.931	6.9	5.628	5.936	6.737	6.142	6.821	6.692	5.744	6.217
Avg GPD/Month	205,419	212,714	191,323	230,000	181,548	197,867	217,323	198,129	227,367	215,871	191,467	200,548
Avg GPD/Year	205,798											
Total No. of Units												
Avg Gal/Unit	709.65											
Avg Gal/Unit (Jan '09- Sept '11)												
Total CO Irrigation Gal/Month	2,480,000	1,992,000	1,833,000	2,596,000	1,656,000	2,054,000	2,617,000	1,791,000	1,976,000	2,075,000	2,147,000	2,317,000
Total CO Irrigation MG/Month	2.48	1.992	1.833	2.596	1.656	2.054	2.617	1.791	1.976	2.075	2.147	2.317
Average GPD by Month	80,000	71,143	59,129	86,533	53,419	68,467	84,419	57,774	65,867	66,935	71,567	74,742
Avg GPD/Month for Study Period												
Avg CO + Irrigation GPD for Study Period												
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)												
Gallons per Month (Total Consumption)												
Single Family Residential	23,068,000	18,979,000	19,597,000	23,284,000	22,211,000	23,875,000	29,853,000	23,623,000	23,879,000	25,068,000	21,343,000	25,118,000
Multi-Family Residential	8,136,000	7,082,000	7,426,000	8,123,000	6,936,000	7,080,000	9,612,000	8,063,000	8,103,000	7,963,000	7,420,000	8,908,000
Commercial	6,368,000	5,956,000	5,931,000	6,900,000	5,628,000	5,936,000	6,737,000	6,142,000	6,821,000	6,692,000	5,744,000	6,217,000
Residential Irrigation	2,953,000	2,512,000	2,622,000	2,737,000	3,219,000	3,915,000	5,148,000	4,300,000	4,666,000	3,736,000	3,047,000	4,381,000
Commercial Irrigation	2,480,000	1,992,000	1,833,000	2,596,000	1,656,000	2,054,000	2,617,000	1,791,000	1,976,000	2,075,000	2,147,000	2,317,000
Town Meters	1,409,000	754,000	1,000,000	1,251,000	963,000	864,000	1,293,000	1,127,000	977,000	1,201,000	872,000	1,440,000
Total Gallons per Month (Consumption)	44,414,000	37,275,000	38,409,000	44,891,000	40,613,000	43,724,000	55,260,000	45,046,000	46,422,000	46,735,000	40,573,000	48,381,000

	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
Single Family Residential									
Total Gal/Month	24,804,000	21,147,000	25,127,000	26,492,000	25,857,000	28,004,000	25,667,000	24,756,000	20,885,000
Total MG/Month	24.80	21.15	25.13	26.49	25.86	28.00	25.67	24.76	20.89
Avg GPD/Month	800,129	755,250	810,548	883,067	834,097	933,467	827,968	798,581	696,167
Avg GPD/Year	815,475								
Total No. of Units									
Avg Gal/Unit	314								
Avg Gal/Unit (Jan '09- Sept '11)									
People Per Household									
Avg. Residential Per Capita Per Day									
Total SF Irrigation Gal/Month	2,036,000	1,740,000	2,585,000	2,263,000	2,607,000	2,981,000	2,170,000	2,953,000	1,469,000
Total SF Irrigation MG/Month	2.036	1.74	2.585	2.263	2.607	2.981	2.17	2.953	1.469
Average GPD by Month	65,677	62,143	83,387	75,433	84,097	99,367	70,000	95,258	48,967
Avg GPD/Month for Study Period									
Avg SF + Irrigation GPD for Study Period									
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)									
Multi- Family Residential									
Total Gal/Month	8,546,000	8,046,000	9,858,000	8,645,000	8,006,000	8,754,000	8,305,000	8,153,000	7,067,000
Total MG/Month	8.55	8.05	9.86	8.65	8.01	8.75	8.31	8.15	7.07
Avg GPD/Month	275,677	287,357	318,000	288,167	258,258	291,800	267,903	263,000	235,567
Avg GPD/Year	276,192								
Total No. of Units									
Avg Gal/Unit	127								
Avg Gal/Unit (Jan '09- Sept '11)									
Total MF Irrigation Gal/Month	1,058,000	1,019,000	1,397,000	1,144,000	1,217,000	1,374,000	1,102,000	1,407,000	1,161,000
Total MF Irrigation MG/Month	1.058	1.019	1.397	1.144	1.217	1.374	1.102	1.407	1.161
Average GPD by Month	34,129	36,393	45,065	38,133	39,258	45,800	35,548	45,387	38,700
Avg GPD/Month for Study Period									
Avg MF + Irrigation GPD for Study Period									
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)									
Commercial									
Total Gal/Month	5,540,000	5,661,000	5,778,000	6,215,000	6,165,000	6,857,000	6,204,000	7,496,000	5,446,000
Total MG/Month	5.54	5.661	5.778	6.215	6.165	6.857	6.204	7.496	5.446
Avg GPD/Month	178,710	202,179	186,387	207,167	198,871	228,567	200,129	241,806	181,533
Avg GPD/Year	202,816								
Total No. of Units									
Avg Gal/Unit	699.37								
Avg Gal/Unit (Jan '09- Sept '11)									
Total CO Irrigation Gal/Month	2,328,000	1,963,000	2,037,000	1,898,000	1,580,000	1,719,000	1,698,000	1,694,000	1,448,000
Total CO Irrigation MG/Month	2.328	1.963	2.037	1.898	1.58	1.719	1.698	1.694	1.448
Average GPD by Month	75,097	70,107	65,710	63,267	50,968	57,300	54,774	54,645	48,267
Avg GPD/Month for Study Period									
Avg CO + Irrigation GPD for Study Period									
Avg Gal/Unit w/ Irrigation (Jan '09 - Sept '11)									
Gallons per Month (Total Consumption)									
Single Family Residential	24,804,000	21,147,000	25,127,000	26,492,000	25,857,000	28,004,000	25,667,000	24,756,000	20,885,000
Multi-Family Residential	8,546,000	8,046,000	9,858,000	8,645,000	8,006,000	8,754,000	8,305,000	8,153,000	7,067,000
Commercial	5,540,000	5,661,000	5,778,000	6,215,000	6,165,000	6,857,000	6,204,000	7,496,000	5,446,000
Residential Irrigation	3,094,000	2,759,000	3,982,000	3,407,000	3,824,000	4,355,000	3,272,000	4,360,000	2,630,000
Commercial Irrigation	2,328,000	1,963,000	2,037,000	1,898,000	1,580,000	1,719,000	1,698,000	1,694,000	1,448,000
Town Meters	1,037,000	794,000	1,341,000	1,405,000	1,817,000	1,769,000	1,813,000	1,723,000	1,172,000
Total Gallons per Month (Consumption)	45,349,000	40,370,000	48,123,000	48,062,000	47,249,000	51,458,000	46,959,000	48,182,000	38,648,000

Appendix D

Town of Lantana Fire Hydrant Location Map

FIRE HYDRANT LOCATION MAP

UPDATED APRIL 2012

TOWN OF LANTANA

MATHEWS CONSULTING
CIVIL ENGINEERS
477 S. Rosemary Avenue, Suite 330, West Palm Beach, Florida 33401
Phone: 561-655-6175 ● Fax: 561-655-6179
www.mathewsconsultinginc.com

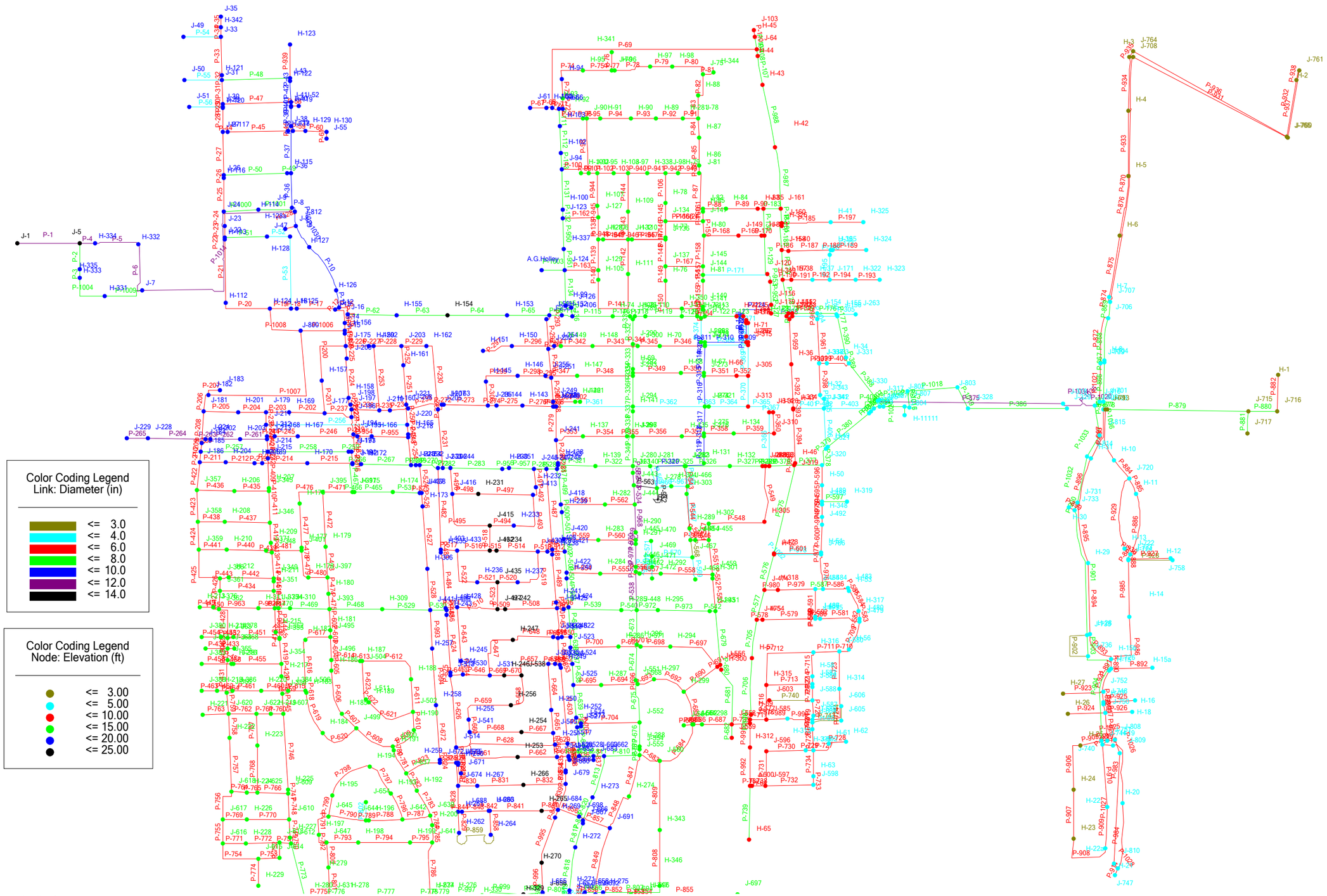
DATE	REVISIONS	BY
8/15/00	Fire Hydrant update and numbering	M.A.R.

User Name : jgentons Path\Name : S:\Projects\Lantana\1613\CAD\FIREHYDRANT.dwg Date\Time : Thu, 23 Aug 2012 - 4:12pm

Appendix E

Hydraulic Model Pipe Network Maps

Scenario: 2023 IPF

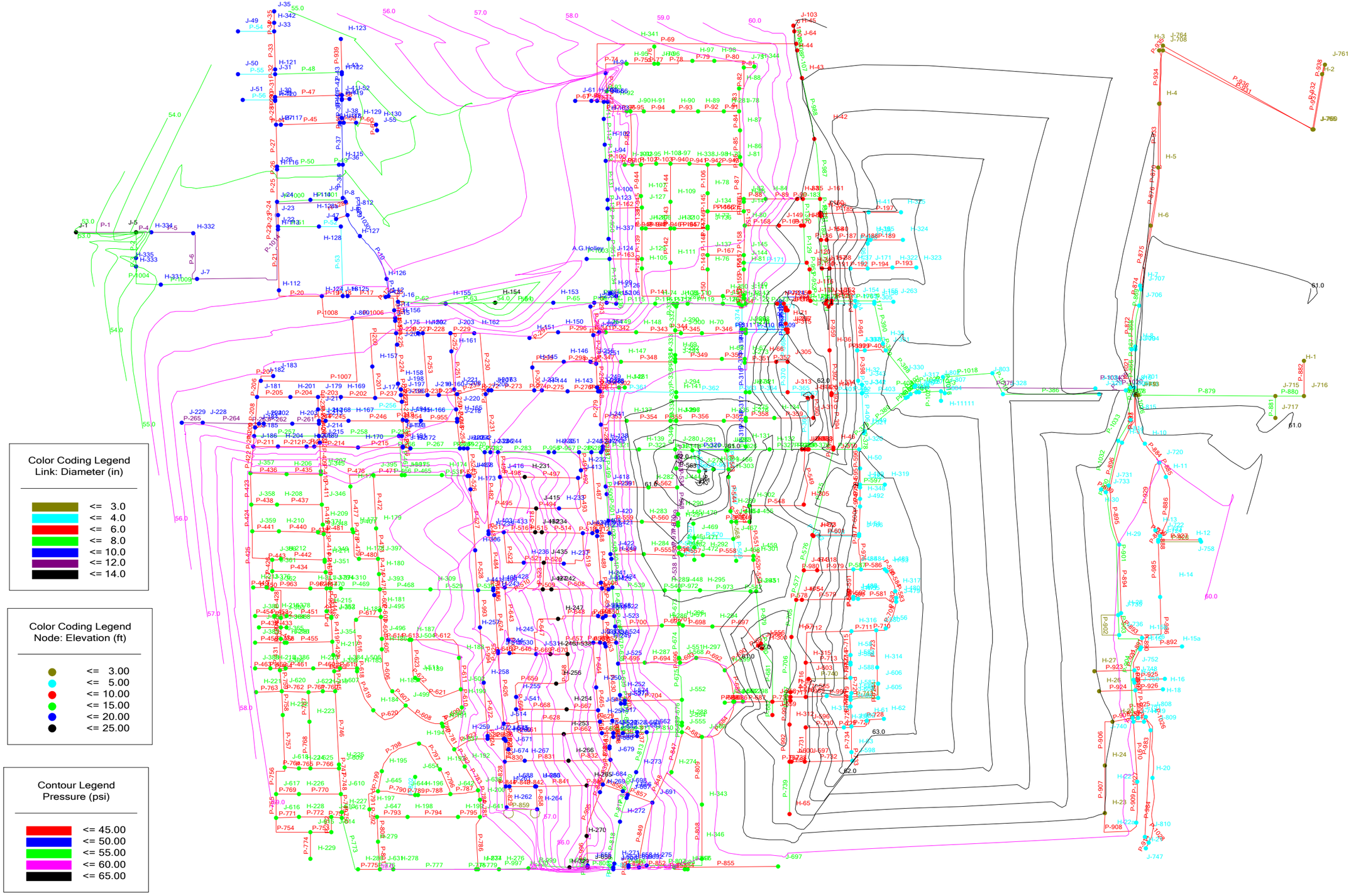


Title: Lantana Water Distribution
lantana water distribution, bsm final 1-28-13 w- i...
09/19/14 11:50:04 AM

© Bentley Systems, Inc. Haestad Methods Solution Center Watertown, CT 06795 USA +1-203-755-1666

Project Engineer: Mathews Consulting, Inc.
WaterCAD v7.0 [07.00.061.00]

Contour Plot - Pressure
Scenario: 2023 IPF



Title: Lantana Water Distribution
lantana water distribution, bsm final 1-28-13 w- i...
09/19/14 11:52:05 AM

© Bentley Systems, Inc. Haestad Methods Solution Center Watertown, CT 06795 USA +1-203-755-1666

Project Engineer: Mathews Consulting, Inc.
WaterCAD v7.0 [07.00.061.00]

Appendix F

Capital Improvement Program (CIP) Cost Analysis Worksheets

Appendix F
Town of Lantana Water Supply Plan Capital Improvement Plan - Summary

Project No.	Project Name	Total Cost	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Project 1	Replace Steel Ground Storage Tank	$619,164											$619,164
Project 2	Provide Coating on 8-inch WM Crossing Intracoastal	$7,048		$7,048									
Project 3	Replace Fire Hydrant No. 57	$4,400		$4,400									
Project 4	Re-connect IC-2 Emergency Interconnect with Lake Worth	$9,350			$9,350								
Project 5	Perform Annual Fire Hydrant Maintenance	$229,068	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824	$20,824
Project 6	Annual WTP Maintenance (cleaning, painting, and repair)	$341,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000	$31,000
Project 7	Replacement Resin for WTP Anion and Ion Exchange Systems	$417,362					$208,681	$208,681					
Project 8	H-65 Watermain Replacement	$61,512			$61,512								
Project 9	South Atlantic Drive Watermain	$678,835			$339,417	$339,417							
Project 10	H-128 Watermain Replacement	$18,920	$18,920										
Project 11	Replace VFDs for High Service Pumps	$37,950	$12,650	$12,650	$12,650								
		$2,424,609	**$83,394**	**$75,923**	**$474,754**	**$391,242**	**$260,505**	**$260,505**	**$51,824**	**$51,824**	**$51,824**	**$51,824**	**$670,988**

Project 1
Replace Steel Ground Storage Tank

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (5%)*	1	L.S.	$27,000	$27,000
Subtotal - General				**$27,000**
Mechanical/Civil				
Demolish Old Tank / Lead Paint Removal	1	L.S.	$55,000	$55,000
New Concrete Ground Storage tank	1	L.S.	$475,000.00	$475,000
Misc. Piping, Instrumentation and restoration	1	L.S.	$10,000	$10,000
Subtotal - Construction				**$540,000**
Subtotal - Construction + General				**$567,000**
5% Contingencies				**$28,350**
4% Engineering**				**$23,814**
Total Cost*:**				**$619,164**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** Engineering fees include design, permitting, bidding and construction services*
**** All costs presented in 2013 dollars.*

Project 2
Provide Coating on 8-inch WM Crossing Intracoastal

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5%)*	1	L.S.	$908	$908
Subtotal - General				**$908**
Mechanical/Civil				
Cleaning / sand blasting / lead paint abatement	1	L.S.	$4,500	$4,500
New Coating System	400	S.F.	$2.50	$1,000
Subtotal - Construction				**$5,500**
Subtotal - Construction + General				**$6,408**
10% Contingencies				**$641**
Engineering				**$0**
Total Cost:**				**$7,048**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** All costs presented in 2013 dollars.*

Project 3
Replace Fire Hydrant No. 57

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (0%)*	1	L.S.	$0	$0
Subtotal - General				**$0**
Mechanical/Civil				
Fire Hydrant Assembly	1	E.A.	$3,000	$3,000
Misc. fittings and restoration	1	L.S.	$1,000	$1,000
Subtotal - Construction				**$4,000**
Subtotal - Construction + General				**$4,000**
10% Contingencies				**$400**
Engineering				**$0**
Total Cost:**				**$4,400**

**General Conditions and Engineering costs of $0 assumes work will be performed by Town Staff in lieu of General Contractor*
*** All costs presented in 2013 dollars.*

Project 4

Re-connect IC-2 Emergency Interconnect with Lake Worth

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (0%)*	1	L.S.	$0	$0
Subtotal - General				**$0**
Mechanical/Civil				
Misc. Piping and Fittings	1	L.S.	$8,500	$8,500
Subtotal - Construction				**$8,500**
Subtotal - Construction + General				**$8,500**
10% Contingencies				**$850**
Engineering				**$0**
Total Cost:**				**$9,350**

**General Conditions and Engineering costs of $0 assumes work will be performed by Town Staff in lieu of General Contractor*

*** All costs presented in 2013 dollars.*

Project 5
Perform Annual Fire Hydrant Maintenance

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5%)*	1	L.S.	$2,681	$2,681
Subtotal - General				**$2,681**
Mechanical/Civil				
Cleaning/painting/repair	25	E.A.	$250	$6,250
Raise fire hydrant to provide proper clearance	5	E.A.	$1,000	$5,000
Misc. piping and appurtenances	1	L.S.	$5,000	$5,000
Subtotal - Construction				**$16,250**
Subtotal - Construction + General				**$18,931**
10% Contingencies				**$1,893**
Engineering				**$0**
Total Annual Cost:**				**$20,824**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** All costs presented in 2013 dollars.*

Project 6
Annual WTP Maintenance (cleaning, painting, and repair)

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (0%)*	1	L.S.	$0	$0
Subtotal - General				**$0**
Mechanical/Civil				
Cleaning and Painting	1	L.S.	$6,000	$6,000
Misc Repairs	1	L.S.	$25,000	$25,000
Subtotal - Construction				**$31,000**
Subtotal - Construction + General				**$31,000**
0% Contingencies				**$0**
Engineering				**$0**
Total Annual Cost:**				**$31,000**

**General Conditions and Engineering costs of $0 assumes work will be performed by Town Staff in lieu of General Contractor*
*** All costs presented in 2013 dollars.*

Project 7
Replacement Resin for WTP Anion and Ion Exchange Systems

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5% of Installation)*	1	L.S.	$3,768	$3,768
Subtotal - General				**$3,768**
Mechanical/Civil				
Anion Resin Material	1,118	C.F.	$310	$346,580
Ion Resin Material	680	C.F.	$50	$34,000
Installation Costs	1	L.S.	$22,835	$22,835
Subtotal - Construction				**$403,415**
Subtotal - Construction + General				**$407,183**
2.5% Contingencies				**$10,180**
Engineering				**$0**
Total Cost:**				**$417,362**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** All costs presented in 2013 dollars.*

Project 8
H-65 Watermain Replacement

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5%)*	1	L.S.	$7,920	$7,920
Subtotal - General				**$7,920**
Mechanical/Civil				
Remove 4" watermain	500	LF	$10	$5,000
Furnish and install 8-inch watermain	500	LF	$40	$20,000
Restoration	500	LF	$25	$12,500
8x8 Tap at north end of Construction	1	E.A.	$7,500	$7,500
Fire Hydrant Assembly	1	E.A.	$3,000	$3,000
Subtotal - Construction				**$48,000**
Subtotal - Construction + General				**$55,920**
10% Contingencies				**$5,592**
Engineering*				**$0**
Total Cost:**				**$61,512**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** All costs presented in 2013 dollars.*
****This project may be performed by a Developer in lieu of a Town Contractor.*

Project 9
South Atlantic Drive Watermain

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5%)*	1	L.S.	$66,883	$66,883
Subtotal - General				**$66,883**
Mechanical/Civil				
Transfer water services from 3-inch to existing 6-inch watermain	25	E.A.	$750	$18,750
Remove 3-inch watermain	3,300	LF	$10	$33,000
Furnish and install 6-inch watermain	1,400	LF	$37	$51,800
Furnish and install 8-inch watermain	3,350	LF	$40	$134,000
Restoration	4,750	LF	$30	$142,500
6" Gate Valve	1	E.A.	$1,300	$1,300
8" Gate Valve	1	E.A.	$1,500	$1,500
12x8 Tap and 8-inch valve at East Ocean Blvd	1	E.A.	$15,000	$15,000
6x6 Tie-in at south end of Construction	1	E.A.	$7,500	$7,500
Subtotal - Construction				**$405,350**
Subtotal - Construction + General				**$472,233**
25% Contingencies				**$118,058**
15% Engineering**				**$88,544**
Total Cost*:**				**$678,835**

**General Conditions include Contractor mob., demob., bonds, insurance and G.C.*
*** Engineering fees include design, permitting, bidding and construction services*
**** All costs presented in 2013 dollars.*

Project 10
H-128 Watermain Replacement

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (0%)*	1	L.S.	$0	$0
Subtotal - General				**$0**
Mechanical/Civil				
10x6 Tap	1	E.A.	$8,000	$8,000
Fire Hydrant Assembly	1	E.A.	$3,000	$3,000
Furnish and install 6-inch watermain	100	LF	$37	$3,700
Restoration	100	LF	$25	$2,500
Subtotal - Construction				**$17,200**
Subtotal - Construction + General				**$17,200**
10% Contingencies				**$1,720**
Engineering*				**$0**
Total Cost:**				**$18,920**

**General Conditions and Engineering costs of $0 assumes work will be performed by Town Staff in lieu of General Contractor*
*** All costs presented in 2013 dollars.*
****Project may require easement from Publix Center.*

Project 11
Replace VFDs for High Service Pumps

	Estimated Quantity	Unit	Unit Price	Total
General				
General Conditions (16.5%)*	1	L.S.	$0	$0
Subtotal - General				**$0**
Mechanical/Civil				
Eaton VFD	3	E.A.	$10,000	$30,000
Installation/Start-up and Programming	3	E.A.	$1,500	$4,500
Subtotal - Construction				**$34,500**
Subtotal - Construction + General				**$34,500**
10% Contingencies				**$3,450**
Engineering				**$0**
Total Cost:**				**$37,950**

**General Conditions and Engineering costs of $0 assume this project is a direct purchase & install by VFD Vendor.*
*** All costs presented in 2013 dollars.*

MATHEWS CONSULTING

CIVIL ENGINEERS