Appendix A Cost Analysis

Monterey Subdivision Water Main Estimated Construction Costs

December 1, 2019

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
1	MOBILIZATION/DEMOBILIZATION	1	LS	$ 75,000.00	$ 75,000.00
2	MAINTENANCE OF TRAFFIC	1	LS	$ 75,000.00	$ 75,000.00
3	PRE AND POST CONSTRUCTION VIDEO	7,500	LF	$ 0.42	$ 3,150.00
4	CONSTRUCTION STAKING AND RECORD DRAWINGS	1	LS	$ 30,000.00	$ 30,000.00
5	POLLUTION/EROSION CONTROL	1	LS	$ 3,000.00	$ 3,000.00
6	FURNISH AND INSTALL 6" PVC WATER MAIN	7,500	LF	$ 10.40	$ 78,000.00
7	FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY	10	EA	$ 3,554.00	$ 35,540.00
8	FURNISH AND INSTALL 12" X 6" TAPPING SLEEVE AND VALVE	5	EA	$ 2,916.00	$ 14,580.00
9	FURNISH AND INSTALL 6" MJ 90 DEG BEND	4	EA	$ 88.00	$ 352.00
10	FURNISH AND INSTALL 6" MJ TEE	1	EA	$ 132.00	$ 132.00
11	FURNISH AND INSTALL SAMPLE POINTS	8	EA	$ 190.00	$ 1,520.00
12	FURNISH AND INSTALL 6" MJ GATE VALVE	5	EA	$ 963.00	$ 4,815.00
13	FURNISH AND INSTALL 2" FILL/FLUSH ASSEMBLY	2	EA	$ 2,489.00	$ 4,978.00
14	FURNISH AND INSTALL SHORT SINGLE WATER SERVICE	5	EA	$ 416.00	$ 2,080.00
15	FURNISH AND INSTALL SHORT DOUBLE WATER SERVICE	39	EA	$ 464.00	$ 18,096.00
16	FURNISH AND INSTALL LONG SINGLE WATER SERVICE	3	EA	$ 735.00	$ 2,205.00
17	FURNISH AND INSTALL LONG DOUBLE WATER SERVICE	30	EA	$ 784.00	$ 23,520.00
18	PRESSURE TESTING & CHLORINATING NEW WATER MAINS	7,500	LF	$ 1.00	$ 7,500.00
19	ASPHALT ROADWAY	600	SY	$ 50.00	$ 30,000.00
20	WATER SERVICE (METER TO HOUSE)	146	EA	$ 1,000.00	$ 146,000.00
Estimated Total =					**$ 555,468.00**
				20% Contingency	$ 111,093.60
				TOTAL	**$ 666,561.60**

City of Stuart

WTP PFC Treatment System

Preliminary (90%) Opinion of Probable Construction Costs (OPC) - AACEI Level 3 Estimate

	Full 4.0-4.5 MGD Capacity			
ITEM	**QUANTITY**	**UNIT**	**UNIT PRICE**	**TOTAL**
Mob/Demob, Bonds and Insurance (8%)	1	Lump Sum	$112,124	$112,124
Site Work and Restoration	1	Lump Sum	$10,000.00	$10,000
Horizontal Split Case Pumps and Motors	2	Each	$32,000.00	$64,000
Vessel Slab, supports, compaction	75	CY	$350.00	$26,250
16x8 FL Tee	4	Each	$3,500.00	$14,000
16-inch piping (raw, treated)	120	Linear Foot	$185.00	$22,200
10-inch Piping (IX vessels)	160	Linear Foot	$145.00	$23,200
8-inch piping (pump discharge)	40	Linear Foot	$115.00	$4,600
20x16 wet tap, preparation	1	Each	$12,500.00	$12,500
10-inch Grooved End Butterfly Valves	20	Each	$850.00	$17,000
10-inch FL Butterfly Valves	6	Each	$1,300.00	$7,800
10-inch Flange Tee	6	Each	$4,200.00	$25,200
10-inch check valves	4	Each	$3,800.00	$15,200
10-inch DI Grooved Tee	16	Each	$1,750.00	$28,000
10-inch DI Grooved 90-degree Bend	12	Each	$1,100.00	$13,200
16x10 GE Tee	4	Each	$10,000.00	$40,000
Flanged 10-inch DIP	5	Linear Foot	$275.00	$1,375
Steel Vessels with Fittings	4	Each	$80,500.00	$322,000
Air Release Assembly	4	Each	$750.00	$3,000
10-inch Flange Tube Meter	4	Each	$4,400.00	$17,600
Ion Exchange Resin	1808	Cubic Feet	$240.00	$433,920
Topping/Guard	452	Cubic Feet	$125.00	$56,500
Installation, rinsing of resin	1	Each	$6,500.00	$6,500
Initial water quality testing	1	Each	$2,500.00	$2,500
Bag Filter Vessel	2	Each	$18,000.00	$36,000
Instrumentation and Small Diameter Process Piping, Valves, Etc.	1	Lump Sum	$10,500.00	$10,500
Electrical	1	Lump Sum	$180,000.00	$180,000
Instrumentation and Controls	1	Lump Sum	$8,500.00	$8,500
SUBTOTAL				$1,401,545
CONTINGENCY (15%)				$350,386
Mob/Demob				$112,124
TOTAL				**$1,864,055**

Opinion of Probable Project Cost by Bid Package - Phase 2

City of Stuart
Alternative Water Supply Plan
UPZ+RO

Prepared by: George A. Brown, PE
Prepared on: April 20, 2018

All Cost Opinions are in 2018 Dollars

Bid Package 1: Wells (Phase 2)

Item	Quantity	Units	Unit Cost	Extended Cost
Well FA-1 (UPZ Production Zone)	1	EA	$ 1,700,000	$ 1,700,000
Subtotal - Bid Package 1				**$ 1,700,000**
Contingency (30%)				$ 510,000
Convert WRF IW-2 to T&P Well	1	EA	$ 2,000,000	$ 2,000,000
Construction Cost Subtotal - Bid Package 1				**$ 4,210,000**
Engineering / Administration (20%)				$ 842,000
Opinion of Probable Project Cost - Bid Package 1				**$ 5,052,000**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 3,536,400	**$ 7,578,000**

Bid Package 2: Wellhead and Pipelines (Phase 2)

Item	Quantity	Units	Unit Cost	Extended Cost
Wellhead	1	EA	$ 650,000	$ 650,000
10-inch HDPE Raw Water Pipeline	700	LF	$ 120	$ 84,000
10-inch HDPE Concentrate Disposal Pipeline	5,800	LF	$ 120	$ 696,000
Air Release Valves	6	EA	$ 10,000	$ 60,000
Subtotal - Bid Package 2				**$ 1,490,000**
Contingency (30%)				$ 447,000
Construction Cost Subtotal - Bid Package 2				**$ 1,937,000**
Engineering / Administration (20%)				$ 387,400
Opinion of Probable Project Cost - Bid Package 2				**$ 2,324,400**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 1,627,080	**$ 3,486,600**

Bid Package 3: Reverse Osmosis WTP (Phase 2)

Item	Quantity	Units	Unit Cost	Extended Cost
Membrane Plant	1,000,000	gpd	$5.70	$5,710,000
Subtotal - Bid Package 3				**$ 5,710,000**
Contingency (30%)				$ 1,713,000
Construction Cost Subtotal - Bid Package 3				**$ 7,423,000**
Engineering / Administration (20%)				$ 1,484,600
Opinion of Probable Project Cost - Bid Package 3				**$ 8,907,600**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 6,235,320	**$ 13,361,400**

TOTAL OPINION OF PROBABLE PROJECT COST	**$ 16,284,000**

Notes:

1. Stage: Planning

2. Estimate Class per AACE International Recommended Practice 18R-97: Class 5

3. Accuracy Range: +50% to -30%

4. This cost estimate has been prepared for guidance in project evaluation and implementation from the information available at this stage of the estimate. The final costs of the project will depend on actual labor and material cost, competitive market conditions, final project scope, implementation schedule, and other variable conditions. As a result, the final project costs will vary from the estimate presented herein.

Issued: April 20, 2018 by George A. Brown, PE

Opinion of Probable Project Cost by Bid Package - Phase 3

City of Stuart
Alternative Water Supply Plan
UPZ+RO

Prepared by: George A. Brown, PE
Prepared on: April 20, 2018

All Cost Opinions are in 2018 Dollars

Bid Package 1: Wells (Phase 3)

Item	Quantity	Units	Unit Cost	Extended Cost
Well FA-2 (UPZ Production Zone)	1	EA	$ 1,700,000	$ 1,700,000
Subtotal - Bid Package 1				**$ 1,700,000**
Contingency (30%)				$ 510,000
Construction Cost Subtotal - Bid Package 1				**$ 2,210,000**
Engineering / Administration (20%)				$ 442,000
Opinion of Probable Project Cost - Bid Package 1				**$ 2,652,000**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 1,856,400	**$ 3,978,000**

Bid Package 2: Wellhead and Pipelines (Phase 3)

Item	Quantity	Units	Unit Cost	Extended Cost
Wellhead	1	EA	$ 650,000	$ 650,000
10-inch HDPE Raw Water Pipeline	1250	LF	$ 120	$ 150,000
Air Release Valves	6	EA	$ 10,000	$ 60,000
Subtotal - Bid Package 2				**$ 860,000**
Contingency (30%)				$ 258,000
Construction Cost Subtotal - Bid Package 2				**$ 1,118,000**
Engineering / Administration (20%)				$ 223,600
Opinion of Probable Project Cost - Bid Package 2				**$ 1,341,600**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 939,120	**$ 2,012,400**

Bid Package 3: Reverse Osmosis WTP (Phase 3)

Item	Quantity	Units	Unit Cost	Extended Cost
Membrane Plant	1,000,000	gpd	$1.43	$1,430,000
Subtotal - Bid Package 3				**$ 1,430,000**
Contingency (30%)				$ 429,000
Construction Cost Subtotal - Bid Package 3				**$ 1,859,000**
Engineering / Administration (20%)				$ 371,800
Opinion of Probable Project Cost - Bid Package 3				**$ 2,230,800**

Estimate Range	
Low Estimate	High Estimate
-30%	50%
$ 1,561,560	**$ 3,346,200**

TOTAL OPINION OF PROBABLE PROJECT COST	**$ 6,224,400**

Notes:

1. Stage: Planning

2. Estimate Class per AACE International Recommended Practice 18R-97: Class 5

3. Accuracy Range: +50% to -30%

4. This cost estimate has been prepared for guidance in project evaluation and implementation from the information available at this stage of the estimate. The final costs of the project will depend on actual labor and material cost, competitive market conditions, final project scope, implementation schedule, and other variable conditions. As a result, the final project costs will vary from the estimate presented herein.

Issued: April 20, 2018 by George A. Brown, PE

Opinion of Probable Project Cost by Bid Package - Phase 4

City of Stuart
Alternative Water Supply Plan
UPZ+RO

Prepared by: George A. Brown, PE
Prepared on: April 20, 2018

All Cost Opinions are in 2018 Dollars

Bid Package 1: Wells (Phase 4)

Item	Quantity	Units	Unit Cost	Extended Cost
Well FA-3 (UPZ Production Zone)	1	EA	$ 1,700,000	$ 1,700,000
Subtotal - Bid Package 1				**$ 1,700,000**
Contingency (30%)				$ 510,000
Construction Cost Subtotal - Bid Package 1				**$ 2,210,000**
Engineering / Administration (20%)				$ 442,000
Opinion of Probable Project Cost - Bid Package 1				**$ 2,652,000**

Estimate Range	
Low Estimate	**High Estimate**
-30%	50%
$ 1,856,400	**$ 3,978,000**

Bid Package 2: Wellhead and Pipelines (Phase 4)

Item	Quantity	Units	Unit Cost	Extended Cost
Wellhead	1	EA	$ 650,000	$ 650,000
10-inch HDPE Raw Water Pipeline	1600	LF	$ 120	$ 192,000
Air Release Valves	6	EA	$ 10,000	$ 60,000
Subtotal - Bid Package 2				**$ 902,000**
Contingency (30%)				$ 270,600
Construction Cost Subtotal - Bid Package 2				**$ 1,172,600**
Engineering / Administration (20%)				$ 234,520
Opinion of Probable Project Cost - Bid Package 2				**$ 1,407,120**

Estimate Range	
Low Estimate	**High Estimate**
-30%	50%
$ 984,984	**$ 2,110,680**

Bid Package 3: Reverse Osmosis WTP (Phase 4)

Item	Quantity	Units	Unit Cost	Extended Cost
Membrane Plant	1,000,000	gpd	$1.43	$1,430,000
Subtotal - Bid Package 3				**$ 1,430,000**
Contingency (30%)				$ 429,000
Construction Cost Subtotal - Bid Package 3				**$ 1,859,000**
Engineering / Administration (20%)				$ 371,800
Opinion of Probable Project Cost - Bid Package 3				**$ 2,230,800**

Estimate Range	
Low Estimate	**High Estimate**
-30%	50%
$ 1,561,560	**$ 3,346,200**

TOTAL OPINION OF PROBABLE PROJECT COST	**$ 6,289,920**

Notes:

1. Stage: Planning

2. Estimate Class per AACE International Recommended Practice 18R-97: Class 5

3. Accuracy Range: +50% to -30%

4. This cost estimate has been prepared for guidance in project evaluation and implementation from the information available at this stage of the estimate. The final costs of the project will depend on actual labor and material cost, competitive market conditions, final project scope, implementation schedule, and other variable conditions. As a result, the final project costs will vary from the estimate presented herein.

Issued: April 20, 2018 by George A. Brown, PE

CITY OF STUART - AWS EVALUATION
ANNUAL OPERATIONS AND MAINTENANCE COST BY PHASE

All O&M costs are in 2018 dollars

Description	Annual Cost		
	Phase 2	Phase 3	Phase 4
	2022-2026	2027-2031	2032-2040
Power			
Florida Wells	$ 41,203	$ 82,405	$ 123,608
RO System Equipment	$ 103,430	$ 197,151	$ 298,732
Chemical Injection	$ 2,747	$ 2,747	$ 2,747
Tranfer Pumps	$ 3,582	$ 7,164	$ 10,746
Concentrate Pumps	$ 3,448	$ 6,896	$ 10,343
Subtotal	**$ 154,000**	**$ 296,000**	**$ 446,000**
Chemicals			
Sulfuric Acid	$ 56,533	$ 113,067	$ 169,600
Scale Inhibitor	$ 16,308	$ 32,615	$ 48,923
Sodium Hydroxide	$ 48,706	$ 97,411	$ 146,117
Corrosion Inhibitor	$ 9,692	$ 19,383	$ 29,075
Carbon Dioxide	$ 4,566	$ 9,132	$ 13,698
RO Cleaning	$ 17,500	$ 35,000	$ 52,500
Subtotal	**$ 153,000**	**$ 307,000**	**$ 460,000**
Replacements			
Cartridge Filter Elements	$ 12,000	$ 16,000	$ 20,000
RO Membrane Elements	$ 22,000	$ 43,000	$ 65,000
Subtotal	**$ 34,000**	**$ 59,000**	**$ 85,000**
Maintenance			
Wellfield Pumps	$ 5,000	$ 6,250	$ 7,813
Transmission Mains	$ 8,000	$ 9,500	$ 11,500
RO System Components	$ 10,000	$ 15,000	$ 20,000
Chemical Systems	$ 5,000	$ 5,000	$ 5,000
Misc. Electrical, I&C	$ 5,000	$ 6,500	$ 8,000
Deep Injection Well	$ 5,000	$ 5,000	$ 5,000
Subtotal	**$ 38,000**	**$ 47,000**	**$ 57,000**
Contingency (10%)	$ 37,900	$ 70,900	$ 104,800
Total Annual Cost	**$ 417,000**	**$ 780,000**	**$ 1,153,000**
Total Unit Operating Cost ($/kgal)	**$ 1.14**	**$ 1.07**	**$ 1.05**

Appendix B Source Water Assessment and Protection Program

DIVISION 5. - WELLFIELD PROTECTION [24]

Sec. 4.141. - Short title; applicability; construction.
Sec. 4.142. - Purpose and intent.
Sec. 4.143. - Definitions.
Sec. 4.144. - Applicability.
Sec. 4.145. - Regulated area maps.
Sec. 4.146. - Regulated areas.
Sec. 4.147. - Prohibited activities within regulated areas.
Sec. 4.148. - Requirements within the regulated areas.
Sec. 4.149. - Other activities.
Sec. 4.150. - Exemptions.
Sec. 4.151. - Wellfield protection permits.
Sec. 4.152. - Restrictions on new activity permits and licenses.
Sec. 4.153. - Protection of future wells.
Sec. 4.154. - Enforcement.
Secs. 4.155—4.180. - Reserved.

Sec. 4.141. - Short title; applicability; construction.

4.141.A This division shall be known as the "Wellfield Protection Ordinance."

4.141.B All provisions of this division shall be effective within the incorporated and unincorporated areas of Martin County, Florida, and shall set restrictions, constraints, and prohibitions to protect existing and future public potable water supply wells from degradation by contamination from deleterious substances.

4.141.C This division shall be liberally construed to effectuate the purposes set forth herein.

(Code 1974, § 12-100; Ord. No. 428, pt. 2, 7-27-1993; Ord. No. 437, pt. I, 3-8-1994)

Sec. 4.142. - Purpose and intent.

The purpose and intent of this division is to protect the health and welfare of the residents and visitors of the County by providing criteria for regulating deleterious substances and contaminants, and by regulating the design, location and operation of development and activities which may impair existing and future public potable water supply wells.

(Code 1974, § 12-101; Ord. No. 428, pt. 2(A), 7-27-1993)

Sec. 4.143. - Definitions.

For the purposes of this division, the following terms are defined:

Aquifer means a groundwater-bearing geologic formation or formations that are saturated and permeable enough to yield significant quantities of water.

CERCLA means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended.

DEP means the Florida Department of Environmental Protection.

EPA means the United States Environmental Protection Agency.

Groundwater means water that fills all the unblocked voids of underlying material below the natural ground surface, which is the upper limit of saturation, or water which is held in the unsaturated zone by capillarity.

Nonresidential activity means any activity which occurs in any building, structure, or open area which is not used primarily as a private residence or dwelling.

Person means any natural person, individual, public or private corporation, firm, association, joint venture, partnership, municipality, governmental agency, political subdivision, public officer or any other entity whatsoever or any combination of such, jointly or severally.

Petroleum product includes fuels (gasoline, diesel fuel, kerosene, and mixtures of these products), lubricating oils, motor oils (new and used), hydraulic fluids and other similar petroleum products.

Protection zone means that area surrounding a public potable water supply well that is protected by the provisions of this division.

Public potable water supply well means wells withdrawing potable water from the surficial aquifer that serve and are operated by regional water systems. For purposes of this division, "regional water systems" shall mean any municipality, special district, County-owned or other water systems that have a DEP rated capacity of at least 500,000 gpd (0.5 MGD) and a South Florida Water Management District (SFWMD) individual water use permit.

Regional water system means a system [of] either government-owned or investor-owned potable water facilities that provide water, for a fee, to specific geographic areas within the County. These systems are designed and located so as to offer service to a relatively large area. This term is not intended to designate a single, County-wide potable water system.

Regulated area means that area within the zone of protection surrounding each public potable water supply well.

Regulated substances means:

1. Substances which are classified as one or more of the following:
   a. A priority toxic pollutant and hazardous substance by EPA (40 CFR 122.21).
   b. A hazardous substance by EPA under CERCLA (40 CFR 302).
   c. An extremely hazardous substance by EPA (40 CFR 355, appendices A and B).
   d. A hazardous waste (40 CFR part 261, subpart D) and hazardous constituents (40 CFR appendix VIII).
   e. A degradation product which is toxic and includes petroleum-based products.
   f. A restricted use pesticide pursuant to F.S. ch. 487, as set forth in F.A.C. chs. 5E-2 and 5E-9, and having the following physical characteristics:

(1) Prone to be persistent in the environment; or

(2) Water-soluble or prone to pass downward through surface soils, to enter into and mix with groundwater, and transported by the movement of groundwater.

2. Regulated substances shall include, but are not limited to, those set forth in the list entitled "Public Potable Well Water Supply Regulated Substances," which shall be maintained by the Growth Management and the Utilities Departments.

Retail sales activities means an establishment that is licensed for retail sales and that stores or handles consumer products that contain regulated substances, for resale in their original unopened containers.

Secondary containment shall mean a level of containment that is external to and substantially separate from the primary containment, which will prevent the contained material from being discharged and will allow for leak detection capability between the two levels of containment.

SFWMD means the South Florida Water Management District.

Well means a hole sunk into the earth for the distinct purpose of reaching a supply of potable water for drinking.

(Code 1974, § 12-102; Ord. No. 428, pt. 2(B), 7-27-1993)

Cross reference— *Rules of interpretation, § 1.5.*

Sec. 4.144. - Applicability.

This division shall apply within all incorporated and unincorporated areas of the County. The provisions shall set restrictions, constraints and prohibitions to protect existing and future public potable water supply wells from degradation by contamination from deleterious substances.

(Code 1974, § 12-103; Ord. No. 428, pt. 2(C), 7-27-1993)

Sec. 4.145. - Regulated area maps.

4.145.A. The regulated area maps shall illustrate existing and future public potable water supply wells and their zones of protection and shall be reviewed and, if necessary, updated annually to include any amendments, additions, or deletions which are adopted by the Board of County Commissioners. Any entity that operates a well protected by this division shall assist the County in preparing the regulated area maps by delivering to the County a surveyed location sketch of each well and corresponding protection zone. Every development approval package that contains a site for a public potable water supply well shall include a resolution adding the well site to the County's regulated area maps. These maps shall be maintained by the Utilities Department and shall be on file with the Growth Management Department.

4.145.B. The boundaries of the wellfield protection areas reflect the best hydrogeologic information available as of the date of the map. Where these bounds are in doubt or in dispute, the burden of proof shall be upon the owner(s) of the land in question to show where the boundaries should be properly located. At the request of the owner(s), the County may engage a professional geologist, hydrogeologist, engineer, or other qualified expert trained and experienced in hydrogeology to determine more accurately the location and extent of an aquifer or recharge area, and may charge the owner(s) for the entire cost of the investigation.

(Code 1974, § 12-104; Ord. No. 428, pt. 2(D), 7-27-1993)

Sec. 4.146. - Regulated areas.

The regulated areas comprise three zones, protection zone 1, protection zone 2, and protection zone 3. The effective date for zone 3 requirements is January 1, 1997. The size of the regulated areas is provided by resolution of the Board of County Commissioners.

(Code 1974, § 12-105; Ord. No. 428, pt. 2(E), 7-27-1993)

Sec. 4.147. - Prohibited activities within regulated areas.

4.147.A *Regulated substances.* Nonresidential activities, other than retail sales and offices exempted by section 4.149.A, B, which store, handle, produce or use any regulated substance within protection zone 1 shall be prohibited if its quantities are greater than those listed in section 4.150.H.

4.147.B *Septic tanks.* Nonresidential septic tank drainfields shall not be located within 200 feet of a public potable water supply well.

4.147.C *Stormwater retention/detention areas.* Stormwater retention/detention areas (wet), as defined by the SFWMD (volume VI, section 3.2.2.4), shall not be located within 300 feet of a public potable water supply well.

4.147.D *Wastewater effluent discharges.* Wastewater treatment plant effluent discharges, including but not limited to percolation ponds, spray irrigation, surface water discharge, land application, or drainfields, shall not be located within 500 feet of a public potable water supply well unless otherwise allowed in accordance with DEP 17-610.

4.147.E *Nonresidential use of regulated substances.* If a nonresidential building proposes to contain, use, handle or store regulated substances and is located partially within a protection zone, then the entire building shall be governed by the restrictions applicable to that zone or to the more restrictive zone, if two zones are covered.

4.147.F *New wells.* No new wells shall be constructed within 200 feet of an existing or proposed public potable water supply well, except for the following purposes:

1. Wells constructed by a public utility for water production or groundwater monitoring;
2. Wells constructed to replace existing wells to meet additional standards;
3. Wells or test borings required as part of an approved contamination assessment plan where contamination exists or is suspected; or
4. Wells or test borings required as part of an approved remedial action plan to prevent further groundwater contamination; and
5. Serves individual household residence.

4.147.G *Negative water supply impacts.* No development shall be approved that negatively impacts a public potable water well (see SFWMD volume III regulations). Impacts shall include potential supply limitations by excessive drawdown, saltwater contamination, or other quality problems.

(Code 1974, § 12-106; Ord. No. 428, pt. 2(F), 7-27-1993; Ord. No. 437, pt. II, 3-8-1994)

Sec. 4.148. - Requirements within the regulated areas.

4.148.A *Protection zone 1.* Nonresidential activities containing regulated substances shall be subject to the following requirements except as exempted by this division.

1. *Inventory.* Prepare and record an inventory of regulated substances.
2.

Containment of regulated substances. Leakproof trays under containers, floor curbing or other containment systems to provide secondary liquid containment shall be installed. The containment shall be of adequate size and construction to handle all spills, leaks, overflows, and rainfall until appropriate action can be taken. The specific design and selection of materials shall be sufficient to preclude any regulated substance loss to the external environment. Containment systems shall be sheltered so that the intrusion of rainfall is prevented. The owner/operator may choose to provide adequate and appropriate liquid collection methods rather than sheltering only after approval of the design by the County Utility Department's Technical Services Division. These requirements shall apply to all areas of use, production, and handling, to all storage areas, to loading and off-loading areas, and to aboveground and underground storage areas. A generic list of secondary containers shall be provided. The list is provided by resolution of the Board of County Commissioners. Containers that require construction or containers beyond the scope of the list shall warrant certification by a professional engineer.

3. *Emergency collection devices.*
   a. Vacuum suction devices, absorbent scavenger materials or other devices shall be present on-site or available within two hours (one hour in zone 1) by contract with a cleanup company in sufficient magnitude or capacity to control and collect the existing total quantity of regulated substances. Employees shall be trained to use the equipment. The equipment shall be inspected and tested on a regular basis to assure that it is in working order. The presence of such emergency collection devices shall be indicated in the operating permit application for existing activities.
   b. If emergency devices are to remain on-site, then a generic list of emergency collection devices shall be provided. The list is provided by resolution of the Board of County Commissioners. Devices that are beyond the scope of the list shall warrant certification by a professional engineer registered in the State of Florida. The professional engineer shall certify that the emergency collection devices are sufficient to control and collect the existing total quantity of regulated substances. Certification shall be provided to the County Utility Department's Technical Division upon applying for an operating permit. The owner shall provide an affidavit stating that the emergency collection devices shall remain on-site.
4. *Emergency plan.* An emergency plan shall be prepared and filed with the operating permit application indicating the procedures that will be followed if a regulated substance is spilled. The plan is to control and collect all such spilled material in such a manner as to prevent as much spillage as possible from reaching any storm or sanitary drains or the ground.
5. *Regular maintenance of containment and emergency equipment.* Regular maintenance procedures shall be established for the quarterly in-house inspection, testing and maintenance of containment and emergency equipment. Such procedure shall be in writing, a regular checklist and schedule of maintenance shall be established, and a log shall be kept of inspections and maintenance. Such logs and records shall be kept up-to-date and available for inspection by the County Utility Department's Technical Services Division.
6. *Inspection.*
   a. A responsible person designated by the permittee who stores, handles, uses or

produces the regulated substances shall check, every day of operation, for breakage or leakage of any container holding the regulated substances. Electronic sensing devices may be employed as part of the inspection process, provided the sensing system is checked daily for malfunctions.

b. The manner of daily inspection shall not necessarily require physical inspection of each container provided the location of the containers can be inspected to a degree that reasonably assures the County Utility Department's Technical Services Division that breakage or leakage can be detected by the inspection. Monitoring records shall be kept and made available to the County Utility Department's Technical Division at all reasonable times for examination.

7. *Reporting spills.* For the purpose of this division, any spill in excess or equal to the threshold limits (see section 4.150.H.1) of a regulated substance shall be reported by telephone to the County Utility Department's Technical Division within 24 hours of discovery of the spill. Cleanup shall commence immediately upon discovery of the spill. A full written report including the steps taken to contain and clean up the spill shall be submitted to the County Utility Department's Technical Division within 15 days of discovery of the spill. A section of the report shall also include a prevention plan to reduce the recurrence of another spill. If the property is being leased, then a certified letter shall be sent to the landowner, informing the owner of the spill.

8. *Monitoring for regulated substances in groundwater monitoring wells.*

a. Groundwater monitoring well(s) shall be provided at the expense of the permittee. The criteria to determine which nonresidential activity shall install monitoring wells are provided by resolution of the Board of County Commissioners. Except for existing wells found by the division to be adequate for this provision, the required well or wells shall be installed by a State-licensed water well contractor. A leak detection system is acceptable for double-walled tanks that are consistent with the Department of Environmental Protection's regulations. Samples shall be taken by the State-certified laboratory doing the analyses, or its authorized representative following standard chain of custody procedures.

b. Analytical reports prepared by a State-certified laboratory of the quantity present in each monitoring well of the regulated substances listed in the activity's operating permit shall be filed at least annually, or more often, as determined by the County Utility Department's Technical Division, based upon site conditions and operations. If the division determines that a monitoring well (s) are required, then a proposed nonresidential activity shall have the well(s) in place at the time the certificate of occupancy is issued.

9. *Disposal manifest required.* The permittee shall maintain a disposal manifest(s) which, at a minimum, provides the name and quantity of any regulated substance disposed of by the permittee, the method and place of disposal, and the name of the person or firm who transported the regulated substance to its ultimate place of disposal. Upon request, the permittee shall make the disposal manifest available to the County utilities or solid waste department.

10. *Alterations and expansion.*

a. The County Utility Department's Technical Division shall be notified in writing prior to expansion, alteration or modification of an activity holding an operating permit. Such expansion, alteration, or modification may result from increased square footage of production or storage capacity, or increased quantities of

regulated substances, or changes in types of regulated substances beyond those square footages, quantities, and types upon which the permit was issued.

b. Excluded from notification prior to alteration or modification are changes in types of regulated substances used in laboratory or laboratories designated as such in the valid permit that do not exceed the nonaggregate limits in section 4.150.H (Quantities less than threshold limits) and that are within the generic substances listed in said permit based upon the generic substance list attached hereto and incorporated herein as exhibit A [following section 4.154].

c. Should a facility add new regulated substances that individually are below the nonaggregate limits, it shall notify the County Utility Department's Technical Division on an annual basis of the types and quantities of such substances added and the location of the use, handling, storage, and production of said substances. If the total quantity of such additions exceed the total limit, then notification is required. Any such expansion, alteration or modification shall be in strict conformity with this division.

d. Except as provided herein, any existing operating permit shall be amended to reflect the introduction of any new regulated substances resulting from the change. The reported introduction of any new regulated substance shall not prevent the revocation or revision of any existing operating permit.

e. If the County Utility Department's Technical Division thinks such introduction substantially or materially modifies, alters or affects the conditions upon which the existing operating permit was granted or the ability to remain qualified as a general exemption, then the County Utility Department's Technical Division shall notify the permittee in writing within 60 days of receipt of the permittee's notice. The notification shall state that the division proposes to revoke or revise the permit. Also, it shall state the grounds which the existing operating permit was granted or the ability to remain qualified as a general exemption, if applicable, or to continue to satisfy any conditions that have been imposed as part of a special exemption, if applicable. The County Utility Department's Technical Division shall notify the permittee in writing that the permit will be revised or revoked within 60 days of receipt of the permittee's notice.

11. *Reconstruction after catastrophe.*

a. Reconstruction of any portion of a structure or building in which there is any activity subject to the provisions of this regulation and which is damaged by fire, vandalism, riot, flood, explosion, collapse, wind, war or other catastrophe shall be in strict conformity with this division. This provision shall not apply to retail sales activities and offices governed by section 4.149

b. Any expansions or modifications or alterations shall be in conformance with paragraph 10 above.

4.148.B *Protection zone 2.* Those persons in zone 2 who store, handle, use or produce any regulated substance may continue or propose to do so in agreement with the provisions and exemptions set forth in this division. They shall be subject to the requirements as listed above under subsection A.

4.148.C *Protection zone 3.*

1. The effective date for zone 3 requirements is January 1, 1997.

2. Those activities involving the storage, handling, production or use of regulated substances in zone 3 which are in existence on the effective date of this division

[January 1, 1994], or any new activity established thereafter, unless specifically exempted, shall be subject to the following requirements:

a. *Inventory.* Prepare and record an inventory of regulated substances.

b. *Emergency collection devices.*

(1) Vacuum suction devices, absorbent scavenger materials or other devices shall be present on-site or available within two hours (one hour in zone 1) by contract with a cleanup company in sufficient magnitude or capacity to control and collect the existing total quantity of regulated substances. To the degree feasible, emergency containers shall be present and of such capacity to hold the total quantity of regulated substances and the absorbent material. Employees shall be trained to use the equipment. The equipment shall be inspected and tested on a regular basis to assure that it is in working order. The presence of such emergency collection devices shall be indicated in the operating permit application for existing activities.

(2) If emergency devices are to remain on-site, then a generic list of emergency collection devices shall be provided. The list is provided by resolution of the Board of County Commissioners. Devices that are beyond the scope of the list shall warrant certification by a professional engineer registered in the State of Florida. The professional engineer shall certify that the emergency collection devices are sufficient to control and collect the existing total quantity of regulated substances. Certification shall be provided to the County Utility Department's Technical Division upon applying for an operating permit. The owner shall provide an affidavit stating that the emergency collection devices shall remain on-site.

c. *Reporting spills.*

(1) Any spill in excess or equal to the threshold limits (see section 4.150.H.1) of a regulated substance shall be reported by telephone to the County Utility Department's Technical Division within 24 hours of discovery of the spill. Cleanup shall commence immediately upon discovery of the spill.

(2) A full written report including the steps taken to contain and clean up the spill shall be submitted to the County Utility Department's Technical Division within 15 days of discovery of the spill. A section of the report shall also include a prevention plan that is approved by the County Utility Department's Technical Services Division to reduce the recurrence of another spill. If the property is being leased, then a certified letter shall be sent to the landowner, informing the owner of the spill.

(Code 1974, § 12-107; Ord. No. 428, pt. 2(G), 7-27-1993; Ord. No. 437, pts. III, IV, 3-8-1994)

Sec. 4.149. - Other activities.

4.149.A *Retail sales activities.* Retail sales establishments in any regulated areas that store and handle regulated substances for resale in their original unopened containers shall be subject to the requirements as listed for protection zone 1, section 4.148.A.1, 3 and 7. The criteria to determine which retail sales activities shall comply with the above requirements are provided by resolution of the Board of County Commissioners. Activities that do not meet the criteria are exempt.

4.149.B. *Offices.* Offices in any regulated areas that use regulated substances for the daily operation of the business shall be subject to the requirements as listed for protection zone 1, section 4.148.A.1, 3 and 7. The criteria to determine which offices shall comply with the above requirements are provided by resolution of the Board of County Commissioners. Offices that do not meet the criteria are exempt.

(Code 1974, § 12-108; Ord. No. 428, pt. 2(H), 7-27-1993)

Sec. 4.150. - Exemptions.

The following shall be exempt from the requirements of this division to the extent indicated:

4.150.A. *Previous approvals.* Development projects that applied for master or final plan approval before October 25, 1988, and are in compliance with the timetable and all terms of the development approval order shall be exempt from the prohibition based on the quantities of regulated substances set forth in section 4.148.A. Such activity shall be subject to all other requirements of this division.

4.150.B. *Transfer of ownership.* A new owner of an existing nonresidential activity whose intent is to operate the same business activity shall be exempt from the prohibition based on the quantities of regulated substances set forth in section 4.148.A. Such activity shall be subject to all other requirements of this division.

4.150.C. *Continuous transit.* The transportation of any regulated substance, provided that the transporting vehicle is passing or moving through protection zones 1 and 2 and the vehicle is not used for storage of regulated substances within those zones. This exemption includes the use of regulated substances in vehicle and lawn maintenance equipment provided that the regulated substance is necessary for the proper functioning of the vehicle or equipment.

4.150.D. *Vehicular fuel and lubricant use.* The use of any regulated substance solely as operating or hydraulic fuel in a vehicle or lawn maintenance equipment, as a lubricant provided that it is necessary for the proper functioning of the vehicle or equipment.

4.150.E. *Pesticides, herbicides, fungicides and rodenticides.* The application of substances used as pesticides, herbicides, fungicides and rodenticides in recreation, agriculture, pest control and aquatic weed control activities shall be exempt from the provisions of this division provided that:

1. The property owner of a nonresidential activity shall register all services to the Technical Services Division of the Utilities Department that apply pesticides, insecticides, fungicides and herbicides within protection zone 1. The licensed applicator spraying within zone 1 shall register residential and nonresidential areas that are sprayed within zone 1 on a monthly basis. A monthly report shall indicate the name of the substance sprayed, the location, and the approximate quantity of substance used in the application. This requirement does not apply to indoor applications. Licensed applicators shall obtain a wellfield protection permit.
2. Chemicals shall not be stored within protection zone 1.
3. In all regulated areas the application is in strict conformity with the use requirement as set forth in the EPA substances' registries, as indicated on the containers in which the substances are sold.

4. In all regulated areas the application is in strict conformity with the requirements as set forth in F.S. chs. 482 and 487 and F.A.C. chs. 5E-2 and 5E-9. This exemption only applies to the application of pesticides, herbicides, fungicides and rodenticides.
5. Excess application is not exempt. Manufacturer's instructions or recommendations are not to be exceeded.
6. The quantity of pesticide handled by the operator and present in zones of protection 1 and 2 does not exceed 1,000 gallons of formulation at any one time.

4.150.F. *Fertilizers.* The use of fertilizers containing any form of nitrogen, provided that the application of the fertilizer is in accordance with manufacturer's directions or in accordance with the recommendations of the County Agricultural Extension Agent.

4.150.G. *Water plants/potable water facilities.* Potable water utility activities (e.g., well construction and water treatment) that are directly related to and required for the provision of potable water service shall be exempt from this division. Maintenance and refueling of utility vehicles are not exempt.

4.150.H. *Quantities less than threshold limits.* Any nonresidential activity that uses, handles, produces or stores the following quantities of regulated substances shall be allowed if all three criteria are met:

1. The total sum of all quantities of any one regulated substance for any one nonresidential activity at a given facility, building or property at any one time does not exceed six gallons where said substance is a liquid, or 25 pounds where said substance is a solid. If the reportable quantity under EPA 40 CFR 302.4 regulations is lower (a smaller quantity is considered hazardous, toxic, etc.), then only the lower quantity will be allowed.
2. The total sum of all regulated substances for any one nonresidential activity at one facility, building or property at any one time does not exceed 100 gallons if said substances are liquids, or 500 pounds where said substances are solids, and the total sum of all quantities of any one regulated substance does not exceed the reference limits in subparagraph 1 above.
3. Where regulated substances are dissolved in or mixed with other nonregulated substances, the total volume of the mixture present shall be used to determine compliance with this division, unless it can be documented that the mixture itself does not have hazardous and toxic substance characteristics as defined herein.

(Code 1974, § 12-109; Ord. No. 428, pt. 2(I), 7-27-1993; Ord. No. 437, pts. V—VIII, 3-8-1994)

Sec. 4.151. - Wellfield protection permits.

4.151.A. *Permits required.*

1. *Wellfield protection permits.* This section provides the requirements and procedures for the issuance of permits by this division.
2. An application shall satisfy the requirements of the applicable protection zone to receive a permit. If the applicant fails to satisfy these requirements or has three citations of this division, then the County Utility Department's Technical Division may deny a permit. If the prior history of the applicant's operation demonstrates an inability

to comply with the requirements of the applicable zone, then the applicant shall not receive a permit.

3. An operating permit shall remain valid for one year for zone 1, two years for zone 2, and three years for zone 3, provided the permittee is in compliance with the terms and conditions of the permit.

4. A wellfield protection operating permit shall be renewed annually for zone 1, and every two years for zone 2, and every three years for zone 3. Applications for renewal of permit shall be made at least 90 days prior to the permit expiration date.

4.151.B. *Types of permits required.* The applicant shall receive all applicable permits, including the following permits in relation to wellfield protection:

1. *Wellfield protection operating permit.* Any activity coming under this regulation in zone 1 shall apply for a wellfield protection operating permit within 90 days of the effective date of this division [January 1, 1994]. Any activity in zone 2 shall apply for a permit within one year of the effective date of this division. Any activity in zone 3 shall apply for a permit within three years after the effective date of this division. A permit shall be received within 180 days of the date that the application was received.

2. *Construction permit.* Any activity that requires constructing secondary containment or installation of any other structural requirements shall obtain a construction permit from the County Utility Department's Technical Division. The applicant shall provide assurances (i.e., engineering certification, manufacturer's recommendations, etc.) that the containment has been designed, installed and is working properly. A permit is required for secondary structures by January 1995. An operating permit shall not be issued until the applicant demonstrates that the construction is operating properly.

3. *Closure permit.* When any activity coming under this regulation is to be permanently terminated, the permittee shall obtain a closure permit from the County Utility Department's Technical Division confirming that all regulated substances are to be or have been removed.

4.151.C. *Permit applications.*

1. *Wellfield protection operating permit.* Copies of reports to any other agency containing substantially similar information to that required hereunder shall constitute satisfaction of reporting required hereunder. The applicant shall submit a copy of the report to the Technical Services Division of the Utilities Department. All applications shall provide the following information:

   a. A list of the regulated substances stored, handled, used or produced in the activity being permitted, including their quantities.

   b. A detailed description of the nonresidential activities that involve the storage, handling, use or production of the regulated substances. The description shall indicate the unit quantity in which the substances are contained or manipulated and the square footage of the facility in which the activity is situated. If applicable, a professional engineer, registered and licensed in the State of Florida, shall certify that construction has been completed in a technically acceptable manner.

   c. A description of the inventory record that will be instituted to comply with the restrictions required for zones 1, 2 and 3 as set forth by this division.

   d. A description of the emergency collection devices for zones 1, 2 and 3.

   e. A description of the containment, the emergency collection containers, and the emergency plan that will be employed to comply with the restrictions required for zones 1 and 2 as set forth above. For zone 3, this particular documentation

will be required only with an application for a new wellfield protection operating permit following any spillage.

f. A description of the daily monitoring records that will be instituted to comply with the restrictions for zones 1 and 2.

g. A description of the proper and adequate regular maintenance of containment will be required for zones 1 and 2. For zone 3, this particular documentation will be required only with an application for a new wellfield protection operating permit following any spillage.

h. A description of the proper and adequate regular maintenance of emergency equipment that will be required for zones 1, 2 and 3.

i. If applicable, a description of the groundwater monitoring wells that have been or will be installed, other pertinent well construction information, or leak detection systems for double-walled tanks, and the arrangements that have been made or that will be made for certified analyses for specified regulated substances.

j. Existing nonresidential activities shall have 12 months to install structural requirements as identified in the permit. Proposed nonresidential activities shall have structural requirements in place to qualify for the certificate of occupancy.

2. *Wellfield protection closure permit.* All applications shall provide the following information:

a. A schedule of events to complete the closure of an activity that does store or did store, handle, use, or produce regulated substances. As a minimum, the following actions shall be addressed:

(1) Disposition of all regulated substances and contaminated containers.

(2) Cleanup of the activity and environs to preclude leaching of unacceptable levels of residual regulated substances into the aquifer.

(3) Certification by a professional engineer, registered and licensed in the State of Florida, that disposal and cleanup have been completed in a technically acceptable manner. The requirement for certification by a professional engineer may be waived if the applicant provides evidence to the County Utility Department's Technical Division that all of the following items are applicable:

(a) The entire operation is maintained inside the building(s) of the facility.

(b) The approved method of removing operating waste is not by septic tank, sewer mains, or floor drains.

(c) There is no evidence of spills permeating floors or environs.

(d) There are no outstanding past notices of violation from any regulatory agency concerned with hazardous, industrial or special waste.

(e) There is no evidence of past contamination in the public drinking water well(s) associated with the facility in zone 1.

(f) The applicant shall provide a sworn statement that disposal and cleanup have been completed in a technically acceptable manner.

(4) Liability of closure runs with the land.

3. *Permit conditions.* The permit conditions shall be such to comply with all the

prohibitions and restrictions as set forth in this regulation.

4.151.D. *Fee schedule.* The fees are provided by resolution of the Board of County Commissioners. All applicants within the protection zones shall pay the fees for the wellfield protection permits.

1. *Operating permit fee.* All applicants for a wellfield protection operating permit shall pay a nonrefundable operating fee. The operating fee shall be paid prior to acceptance of the permit application for review.
2. *Operating permit renewal fee.* All applicants that have an existing operating permit shall pay a fee for the annual renewal.
3. *Construction permit fee.* All applicants that are required to construct secondary containment shall pay a fee for a construction permit.
4. *Closure permit fee.* All applicants that close an activity that stores or did store, handle, use, or produce regulated substances are required to pay a fee for a closure permit.
5. *Permit transfer fee.* A fee shall be required for transfer of an operating permit or closure permit to defray the cost of processing the transfer. Application for transfer of permit is to be made within 60 days of transfer of ownership of the activity.

4.151.E. *Revocation or revision of the permit.*

1. *Revocation.* Any permit or exemption issued under the provisions of this division shall not become vested in the permittee. The County Utility Department's Technical Division may revoke any issued permit by first issuing a written notice of intent to revoke if it finds that the permit holder:
   a. Has failed or refused to comply with any of the provisions of this division, including but not limited to permit conditions; or
   b. Has submitted false or inaccurate information in the operating permit application; or
   c. Has failed to submit operational reports or other information required by this division; or
   d. Has refused lawful inspection; or
   e. Is subject to revocation under other sections (alterations and expansions, spills).

   The notice shall be sent certified mail return receipt requested, or hand delivered.
2. *Excess spillage.* A permittee's permit for zone 3 shall be revised to be in accordance with the requirements listed in zone 1, section 4.148.A.1 through 10, if any spillage is in excess or equal to the threshold limit (section 4.150.H.1) of a regulated substance.
3. *Revision.* The County Utility Department's Technical Division may revise any permit as set forth above or by first issuing a written notice of intent to revise (certified mail return receipt requested, or hand delivery).
4. *Spills.*
   a. A spill in excess or equal to the threshold limit (section 4.150.H.1) of a regulated substance that is not reported in accordance with section 4.148.A.7 could result in revocation or revision of the permit. Within 30 days of a spill in protection zone 1, 2, or 3, the County Utility Department's Technical Division shall review for possible revocation or revision of the permit.
   b. Upon such review, the County Utility Department's Technical Division may issue a notice of intent to revoke or revise that shall be subject to the provisions set forth above, or elect not to issue such notice. In consideration of whether to revoke or revise the permit, the County Utility Department's Technical Division

may consider the intentional nature or degree of negligence, if any, associated with this spill and the extent to which containment or cleanup is possible, the nature, number and frequency of previous spills by the permittee and the potential degree of harm to the groundwater and surrounding wells due to the spill.

5. *Notice.*

a. For any revocation or revision of an operating permit containing a special or administrative exemption permitting certain land uses or activities, the County Utility Department's Technical Division shall issue a notice of intent to revoke or revise the permit that shall state that the County Utility Department's Technical Division intends to revoke or revise the operating permit.

b. The written notice of intent to revoke or revise shall contain the following information:

(1) The name and address of the permittee, if any, and property owner, if different.

(2) A description of the facility that is the subject of the proposed revocation or revision.

(3) Location of the spill, if any.

(4) Give a concise explanation and specific reasons for the proposed revocation or revision.

(5) A statement stating "Failure to file a petition with the clerk of the board within 20 days after the date upon which permittee receives written notice of the intent to revoke to revise shall render the proposed revocation or revision final and in full force and effect."

c. Failure of a permittee to file a petition as set forth above shall render the proposed revocation or revision final and in full force and effect. Nothing in this section shall preclude or be deemed a condition precedent to the County Utility Department's Technical Division's seeking a temporary or permanent injunction.

4.151.F *Reconstruction after catastrophe.*

1. Reconstruction of any portion of a structure or building in which there is any land use or activity subject to the provisions of this division, which structure is damaged by fire, vandalism, riot, flood, explosion, collapse, wind, war or other catastrophe, shall be in strict conformity with this division.

2. Within 90 days of the receipt of written notice from the County Utility Department's Technical Division, all owners of existing land uses shall file or activities regulated by this division that use, handle, store, or produce regulated substances shall file an application for an operating permit. Any owner of such land use or activity that fails to apply for an operating permit shall file for a closure permit within 120 days of the receipt of written notice from the County Utility Department's Technical Division. Said permit application shall be prepared and signed by a professional engineer registered and licensed in the State of Florida. Within 30 days of receipt of said notice, the owner shall file with the County Utility Department's Technical Division proof of retention of said engineer. If application is made for an operating permit, such permit shall be issued or denied within 60 days of the filing of the completed application. If the application for an operating permit is denied, then the activity shall cease within 12 months of the denial and an application for a closure permit shall be filed with the County Utility Department's Technical Division within 120 days of the denial of the

operating permit.

(Code 1974, § 12-110; Ord. No. 428, pt. 2(J), 7-27-1993; Ord. No. 437, pts. IX—XII, 3-8-1994)

Cross reference— *Development review procedures, art. 10.*

Sec. 4.152. - Restrictions on new activity permits and licenses.

4.152.A Every application for a rezoning, special exception, occupational license, change of occupancy, development order, certificate of occupancy, or building permit shall indicate whether or not the property, or any portion thereof, lies within a protection zone. The applicant shall be informed of this division if located within a protection zone and instructed to apply for an appropriate wellfield protection permit(s) at the Technical Services Division of the Utilities Department.

4.152.B Every application which involves property located wholly or partially within a protection zone shall be reviewed by the County Utility Department's Technical Division. The County Utility Department's Technical Division shall then issue a notice as to whether or not the proposed use or activity meets the requirements of this division.

4.152.C No request for a rezoning, special exception, special permit, development order, certificate of occupancy, building permit, change of occupancy or occupational license for any activity regulated by this division shall be granted that is contrary to the restrictions and provisions provided in this division. Permits or occupational licenses issued in violation of this division confer no right or privilege on the grantee, and such invalid permit or licenses will not vest rights.

(Code 1974, § 12-111; Ord. No. 428, pt. 2(K), 7-27-1993)

Sec. 4.153. - Protection of future wells.

The prohibitions and restrictions set forth in this division and any regulations promulgated pursuant hereto shall apply to any future public potable water supply well sites adopted by the Board of County Commissioners by resolution. A protected future well is permitted by the SFWMD. If a permit has not been obtained then the following criteria must be met:

4.153.A. The proposed well site is included in a water use application with the SFWMD;

4.153.B. The SFWMD application is not over three years old;

4.153.C. A notification has been placed in the newspaper;

4.153.D. Adjacent landowners within the corresponding protection zone 1 have been contacted;

4.153.E. Preliminary approval has been received from the Wellfield Protection Division; and

4.153.F. A DEP water construction permit has been received for site approval.

(Code 1974, § 12-112; Ord. No. 428, pt. 2(L), 7-27-1993)

Sec. 4.154. - Enforcement.

4.154.A The County is hereby authorized and empowered to make inspections at reasonable hours of all land uses or activities regulated by this division within wellfield protection zones in order to determine if applicable provisions of this division are being followed.

4.154.B.

Any person subject to this division shall be liable for any damage caused by a regulated substance present on or emanating from the person's property, for all costs of removal or remedial action incurred by the County, and damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction or loss resulting from the release or threatened release of a regulated substance. Such removal or remedial action by the County shall include, but is not limited to, the prevention of further contamination of groundwater, monitoring, containment and cleanup or disposal of regulated substances resulting from the spilling, leaking, pumping, pouring, emitting or dumping of any regulated substance or material that creates an emergency hazardous situation or is expected to create an emergency hazardous situation.

(Code 1974, § 12-113; Ord. No. 428, pt. 2(M), 7-27-1993)

EXHIBIT A. PUBLIC WATER SUPPLY WELL GENERIC SUBSTANCE LIST

Acid and basic cleaning solutions.

Antifreeze and coolants.

Arsenic and arsenic compounds.

Bleaches, peroxides.

Brake and transmission fluids.

Brine solution.

Casting and foundry chemicals.

Caulking agents and sealants.

Cleaning solvents.

Corrosion and rust prevention solutions.

Cutting fluids.

Degreasing solvents.

Disinfectants.

Electroplating solutions.

Explosives.

Fire extinguishing chemicals.

Food processing wastes.

Formaldehyde.

Fuels and additives.

Glues, adhesives and resins.

Greases.

Hydraulic fluid.

Indicators.

Industrial and commercial janitorial supplies.

Industrial sludges and stillbottoms.

Inks, printing and photocopying chemicals.

Laboratory chemicals.

Liquid storage batteries.

Medical, pharmaceutical, dental, veterinary and hospital solutions.

Mercury and mercury compounds.

Metal finishing solutions.

Oils.

Paints, primers, thinners, dyes, stains, wood preservatives, varnishing and cleaning compounds.

Painting solvents.

PCBs.

Pesticides and herbicides.

Plastic resins, plasticizers and catalysts.

Photo development chemicals.

Poisons.

Polishes.

Pool chemicals.

Processed dust and particulates.

Radioactive sources.

Reagents and standards.

Refrigerants.

Roofing chemicals and sealers.

Sanitizers, disinfectants, bactericides and algaecides.

Solders and fluxes.

Stripping compounds.

Tanning industry chemicals.

Transformer and capacitor oils/fluids.

Water and wastewater treatment chemicals.

(Code 1974, ch. 12, art. VII, exhibit A; Ord. No. 437, pt. XIII, 3-8-1994)

Secs. 4.155—4.180. - Reserved.

FOOTNOTE(S):

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(24) ***Cross reference***— *Excavation, filling and mining, § 4.341 et seq.; stormwater management and flood control, § 4.381 et seq.* *(Back)*

DIVISION 5. WELLFIELD PROTECTION*

*Cross references: Excavation, filling and mining, § 4.341 et seq.; stormwater management and flood control, § 4.381 et seq.

Sec. 4.141. Short title; applicability; construction.

4.141.A. This division shall be known as the "Wellfield Protection Ordinance."

4.141.B. All provisions of this division shall be effective within the incorporated and unincorporated areas of Martin County, Florida, and shall set restrictions, constraints, and prohibitions to protect existing and future public potable water supply wells from degradation by contamination from deleterious substances.

4.141.C. This division shall be liberally construed to effectuate the purposes set forth herein.

(Code 1974, § 12-100; Ord. No. 428, pt. 2, 7-27-1993; Ord. No. 437, pt. I, 3-8-1994)

Sec. 4.142. Purpose and intent.

The purpose and intent of this division is to protect the health and welfare of the residents and visitors of the County by providing criteria for regulating deleterious substances and contaminants, and by regulating the design, location and operation of development and activities which may impair existing and future public potable water supply wells.

(Code 1974, § 12-101; Ord. No. 428, pt. 2(A), 7-27-1993)

Sec. 4.143. Definitions.

For the purposes of this division, the following terms are defined:

Aquifer means a groundwater-bearing geologic formation or formations that are saturated and permeable enough to yield significant quantities of water.

CERCLA means the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended.

DEP means the Florida Department of Environmental Protection.

EPA means the United States Environmental Protection Agency.

Groundwater means water that fills all the unblocked voids of underlying material below the natural ground surface, which is the upper limit of saturation, or water which is held in the unsaturated zone by capillarity.

Nonresidential activity means any activity which occurs in any building, structure, or open area which is not used primarily as a private residence or dwelling.

Person means any natural person, individual, public or private corporation, firm, association, joint venture, partnership, municipality, governmental agency, political subdivision, public officer or any other entity whatsoever or any combination of such, jointly or severally.

Petroleum product includes fuels (gasoline, diesel fuel, kerosene, and mixtures of these products), lubricating oils, motor oils (new and used), hydraulic fluids and other similar petroleum products.

Protection zone means that area surrounding a public potable water supply well that is protected by the provisions of this division.

Public potable water supply well means wells withdrawing potable water from the surficial aquifer

that serve and are operated by regional water systems. For purposes of this division, "regional water systems" shall mean any municipality, special district, County-owned or other water systems that have a DEP rated capacity of at least 500,000 gpd (0.5 MGD) and a South Florida Water Management District (SFWMD) individual water use permit.

Regional water system means a system [of] either government-owned or investor-owned potable water facilities that provide water, for a fee, to specific geographic areas within the County. These systems are designed and located so as to offer service to a relatively large area. This term is not intended to designate a single, County-wide potable water system.

Regulated area means that area within the zone of protection surrounding each public potable water supply well.

Regulated substances means:

1. Substances which are classified as one or more of the following:

   a. A priority toxic pollutant and hazardous substance by EPA (40 CFR 122.21).

   b. A hazardous substance by EPA under CERCLA (40 CFR 302).

   c. An extremely hazardous substance by EPA (40 CFR 355, appendices A and B).

   d. A hazardous waste (40 CFR part 261, subpart D) and hazardous constituents (40 CFR appendix VIII).

   e. A degradation product which is toxic and includes petroleum-based products.

   f. A restricted use pesticide pursuant to F.S. ch. 487, as set forth in F.A.C. chs. 5E-2 and 5E-9, and having the following physical characteristics:

      (1) Prone to be persistent in the environment; or

      (2) Water-soluble or prone to pass downward through surface soils, to enter into and mix with groundwater, and transported by the movement of groundwater.

2. Regulated substances shall include, but are not limited to, those set forth in the list entitled "Public Potable Well Water Supply Regulated Substances," which shall be maintained by the Growth Management and the Utilities Departments.

Retail sales activities means an establishment that is licensed for retail sales and that stores or handles consumer products that contain regulated substances, for resale in their original unopened containers.

Secondary containment shall mean a level of containment that is external to and substantially separate from the primary containment, which will prevent the contained material from being discharged and will allow for leak detection capability between the two levels of containment.

SFWMD means the South Florida Water Management District.

Well means a hole sunk into the earth for the distinct purpose of reaching a supply of potable water for drinking.

(Code 1974, § 12-102; Ord. No. 428, pt. 2(B), 7-27-1993)

Cross references: Rules of interpretation, § 1.5.

Sec. 4.144. Applicability.

This division shall apply within all incorporated and unincorporated areas of the County. The provisions shall set restrictions, constraints and prohibitions to protect existing and future public potable water supply wells from degradation by contamination from deleterious substances.

(Code 1974, § 12-103; Ord. No. 428, pt. 2(C), 7-27-1993)

Sec. 4.145. Regulated area maps.

4.145.A. The regulated area maps shall illustrate existing and future public potable water supply

wells and their zones of protection and shall be reviewed and, if necessary, updated annually to include any amendments, additions, or deletions which are adopted by the Board of County Commissioners. Any entity that operates a well protected by this division shall assist the County in preparing the regulated area maps by delivering to the County a surveyed location sketch of each well and corresponding protection zone. Every development approval package that contains a site for a public potable water supply well shall include a resolution adding the well site to the County's regulated area maps. These maps shall be maintained by the Utilities Department and shall be on file with the Growth Management Department.

4.145.B. The boundaries of the wellfield protection areas reflect the best hydrogeologic information available as of the date of the map. Where these bounds are in doubt or in dispute, the burden of proof shall be upon the owner(s) of the land in question to show where the boundaries should be properly located. At the request of the owner(s), the County may engage a professional geologist, hydrogeologist, engineer, or other qualified expert trained and experienced in hydrogeology to determine more accurately the location and extent of an aquifer or recharge area, and may charge the owner(s) for the entire cost of the investigation.

(Code 1974, § 12-104; Ord. No. 428, pt. 2(D), 7-27-1993)

Sec. 4.146. Regulated areas.

The regulated areas comprise three zones, protection zone 1, protection zone 2, and protection zone 3. The effective date for zone 3 requirements is January 1, 1997. The size of the regulated areas is provided by resolution of the Board of County Commissioners.

(Code 1974, § 12-105; Ord. No. 428, pt. 2(E), 7-27-1993)

Sec. 4.147. Prohibited activities within regulated areas.

4.147.A. *Regulated substances.* Nonresidential activities, other than retail sales and offices exempted by section 4.149.A, B, which store, handle, produce or use any regulated substance within protection zone 1 shall be prohibited if its quantities are greater than those listed in section 4.150.H.

4.147.B. *Septic tanks.* Nonresidential septic tank drainfields shall not be located within 200 feet of a public potable water supply well.

4.147.C. *Stormwater retention/detention areas.* Stormwater retention/detention areas (wet), as defined by the SFWMD (volume VI, section 3.2.2.4), shall not be located within 300 feet of a public potable water supply well.

4.147.D. *Wastewater effluent discharges.* Wastewater treatment plant effluent discharges, including but not limited to percolation ponds, spray irrigation, surface water discharge, land application, or drainfields, shall not be located within 500 feet of a public potable water supply well unless otherwise allowed in accordance with DEP 17-610.

4.147.E. *Nonresidential use of regulated substances.* If a nonresidential building proposes to contain, use, handle or store regulated substances and is located partially within a protection zone, then the entire building shall be governed by the restrictions applicable to that zone or to the more restrictive zone, if two zones are covered.

4.147.F. *New wells.* No new wells shall be constructed within 200 feet of an existing or proposed public potable water supply well, except for the following purposes:

1. Wells constructed by a public utility for water production or groundwater monitoring;
2. Wells constructed to replace existing wells to meet additional standards;
3. Wells or test borings required as part of an approved contamination assessment plan where contamination exists or is suspected; or
4. Wells or test borings required as part of an approved remedial action plan to prevent further groundwater contamination; and
5. Serves individual household residence.

4.147.G. *Negative water supply impacts.* No development shall be approved that negatively impacts a public potable water well (see SFWMD volume III regulations). Impacts shall include potential supply limitations by excessive drawdown, saltwater contamination, or other quality problems.

(Code 1974, § 12-106; Ord. No. 428, pt. 2(F), 7-27-1993; Ord. No. 437, pt. II, 3-8-1994)

Sec. 4.148. Requirements within the regulated areas.

4.148.A. *Protection zone 1.* Nonresidential activities containing regulated substances shall be subject to the following requirements except as exempted by this division.

1. *Inventory.* Prepare and record an inventory of regulated substances.

2. *Containment of regulated substances.* Leakproof trays under containers, floor curbing or other containment systems to provide secondary liquid containment shall be installed. The containment shall be of adequate size and construction to handle all spills, leaks, overflows, and rainfall until appropriate action can be taken. The specific design and selection of materials shall be sufficient to preclude any regulated substance loss to the external environment. Containment systems shall be sheltered so that the intrusion of rainfall is prevented. The owner/operator may choose to provide adequate and appropriate liquid collection methods rather than sheltering only after approval of the design by the County Utility Department's Technical Services Division. These requirements shall apply to all areas of use, production, and handling, to all storage areas, to loading and off-loading areas, and to aboveground and underground storage areas. A generic list of secondary containers shall be provided. The list is provided by resolution of the Board of County Commissioners. Containers that require construction or containers beyond the scope of the list shall warrant certification by a professional engineer.

3. *Emergency collection devices.*

a. Vacuum suction devices, absorbent scavenger materials or other devices shall be present on-site or available within two hours (one hour in zone 1) by contract with a cleanup company in sufficient magnitude or capacity to control and collect the existing total quantity of regulated substances. Employees shall be trained to use the equipment. The equipment shall be inspected and tested on a regular basis to assure that it is in working order. The presence of such emergency collection devices shall be indicated in the operating permit application for existing activities.

b. If emergency devices are to remain on-site, then a generic list of emergency collection devices shall be provided. The list is provided by resolution of the Board of County Commissioners. Devices that are beyond the scope of the list shall warrant certification by a professional engineer registered in the State of Florida. The professional engineer shall certify that the emergency collection devices are sufficient to control and collect the existing total quantity of regulated substances. Certification shall be provided to the County Utility Department's Technical Division upon applying for an operating permit. The owner shall provide an affidavit stating that the emergency collection devices shall remain on-site.

4. *Emergency plan.* An emergency plan shall be prepared and filed with the operating permit application indicating the procedures that will be followed if a regulated substance is spilled. The plan is to control and collect all such spilled material in such a manner as to prevent as much spillage as possible from reaching any storm or sanitary drains or the ground.

5. *Regular maintenance of containment and emergency equipment.* Regular maintenance procedures shall be established for the quarterly in-house inspection, testing and maintenance of containment and emergency equipment. Such procedure shall be in writing, a regular checklist and schedule of maintenance shall be established, and a log shall be kept of inspections and maintenance. Such logs and records shall be kept up-to-date and available for inspection by the County Utility Department's Technical Services Division.

6. *Inspection.*

a. A responsible person designated by the permittee who stores, handles, uses or

produces the regulated substances shall check, every day of operation, for breakage or leakage of any container holding the regulated substances. Electronic sensing devices may be employed as part of the inspection process, provided the sensing system is checked daily for malfunctions.

b. The manner of daily inspection shall not necessarily require physical inspection of each container provided the location of the containers can be inspected to a degree that reasonably assures the County Utility Department's Technical Services Division that breakage or leakage can be detected by the inspection. Monitoring records shall be kept and made available to the County Utility Department's Technical Division at all reasonable times for examination.

7. *Reporting spills.* For the purpose of this division, any spill in excess or equal to the threshold limits (see section 4.150.H.1) of a regulated substance shall be reported by telephone to the County Utility Department's Technical Division within 24 hours of discovery of the spill. Cleanup shall commence immediately upon discovery of the spill. A full written report including the steps taken to contain and clean up the spill shall be submitted to the County Utility Department's Technical Division within 15 days of discovery of the spill. A section of the report shall also include a prevention plan to reduce the recurrence of another spill. If the property is being leased, then a certified letter shall be sent to the landowner, informing the owner of the spill.

8. *Monitoring for regulated substances in groundwater monitoring wells.*

a. Groundwater monitoring well(s) shall be provided at the expense of the permittee. The criteria to determine which nonresidential activity shall install monitoring wells are provided by resolution of the Board of County Commissioners. Except for existing wells found by the division to be adequate for this provision, the required well or wells shall be installed by a State-licensed water well contractor. A leak detection system is acceptable for double-walled tanks that are consistent with the Department of Environmental Protection's regulations. Samples shall be taken by the State-certified laboratory doing the analyses, or its authorized representative following standard chain of custody procedures.

b. Analytical reports prepared by a State-certified laboratory of the quantity present in each monitoring well of the regulated substances listed in the activity's operating permit shall be filed at least annually, or more often, as determined by the County Utility Department's Technical Division, based upon site conditions and operations. If the division determines that a monitoring well(s) are required, then a proposed nonresidential activity shall have the well(s) in place at the time the certificate of occupancy is issued.

9. *Disposal manifest required.* The permittee shall maintain a disposal manifest(s) which, at a minimum, provides the name and quantity of any regulated substance disposed of by the permittee, the method and place of disposal, and the name of the person or firm who transported the regulated substance to its ultimate place of disposal. Upon request, the permittee shall make the disposal manifest available to the County utilities or solid waste department.

10. *Alterations and expansion.*

a. The County Utility Department's Technical Division shall be notified in writing prior to expansion, alteration or modification of an activity holding an operating permit. Such expansion, alteration, or modification may result from increased square footage of production or storage capacity, or increased quantities of regulated substances, or changes in types of regulated substances beyond those square footages, quantities, and types upon which the permit was issued.

b. Excluded from notification prior to alteration or modification are changes in types of regulated substances used in laboratory or laboratories designated as such in the valid permit that do not exceed the nonaggregate limits in section 4.150.H (Quantities less than threshold limits) and that are within the generic substances listed in said permit based upon the generic substance list attached hereto and incorporated herein as exhibit A [following section 4.154].

c. Should a facility add new regulated substances that individually are below the nonaggregate limits, it shall notify the County Utility Department's Technical Division

on an annual basis of the types and quantities of such substances added and the location of the use, handling, storage, and production of said substances. If the total quantity of such additions exceed the total limit, then notification is required. Any such expansion, alteration or modification shall be in strict conformity with this division.

d. Except as provided herein, any existing operating permit shall be amended to reflect the introduction of any new regulated substances resulting from the change. The reported introduction of any new regulated substance shall not prevent the revocation or revision of any existing operating permit.

e. If the County Utility Department's Technical Division thinks such introduction substantially or materially modifies, alters or affects the conditions upon which the existing operating permit was granted or the ability to remain qualified as a general exemption, then the County Utility Department's Technical Division shall notify the permittee in writing within 60 days of receipt of the permittee's notice. The notification shall state that the division proposes to revoke or revise the permit. Also, it shall state the grounds which the existing operating permit was granted or the ability to remain qualified as a general exemption, if applicable, or to continue to satisfy any conditions that have been imposed as part of a special exemption, if applicable. The County Utility Department's Technical Division shall notify the permittee in writing that the permit will be revised or revoked within 60 days of receipt of the permittee's notice.

11. *Reconstruction after catastrophe.*

a. Reconstruction of any portion of a structure or building in which there is any activity subject to the provisions of this regulation and which is damaged by fire, vandalism, riot, flood, explosion, collapse, wind, war or other catastrophe shall be in strict conformity with this division. This provision shall not apply to retail sales activities and offices governed by section 4.149.

b. Any expansions or modifications or alterations shall be in conformance with paragraph 10 above.

4.148.B. *Protection zone 2.* Those persons in zone 2 who store, handle, use or produce any regulated substance may continue or propose to do so in agreement with the provisions and exemptions set forth in this division. They shall be subject to the requirements as listed above under subsection A.

4.148.C. *Protection zone 3.*

1. The effective date for zone 3 requirements is January 1, 1997.

2. Those activities involving the storage, handling, production or use of regulated substances in zone 3 which are in existence on the effective date of this division [January 1, 1994], or any new activity established thereafter, unless specifically exempted, shall be subject to the following requirements:

a. *Inventory.* Prepare and record an inventory of regulated substances.

b. *Emergency collection devices.*

(1) Vacuum suction devices, absorbent scavenger materials or other devices shall be present on-site or available within two hours (one hour in zone 1) by contract with a cleanup company in sufficient magnitude or capacity to control and collect the existing total quantity of regulated substances. To the degree feasible, emergency containers shall be present and of such capacity to hold the total quantity of regulated substances and the absorbent material. Employees shall be trained to use the equipment. The equipment shall be inspected and tested on a regular basis to assure that it is in working order. The presence of such emergency collection devices shall be indicated in the operating permit application for existing activities.

(2) If emergency devices are to remain on-site, then a generic list of emergency collection devices shall be provided. The list is provided by resolution of the Board of County Commissioners. Devices that are beyond

the scope of the list shall warrant certification by a professional engineer registered in the State of Florida. The professional engineer shall certify that the emergency collection devices are sufficient to control and collect the existing total quantity of regulated substances. Certification shall be provided to the County Utility Department's Technical Division upon applying for an operating permit. The owner shall provide an affidavit stating that the emergency collection devices shall remain on-site.

c. *Reporting spills.*

(1) Any spill in excess or equal to the threshold limits (see section 4.150.H.1) of a regulated substance shall be reported by telephone to the County Utility Department's Technical Division within 24 hours of discovery of the spill. Cleanup shall commence immediately upon discovery of the spill.

(2) A full written report including the steps taken to contain and clean up the spill shall be submitted to the County Utility Department's Technical Division within 15 days of discovery of the spill. A section of the report shall also include a prevention plan that is approved by the County Utility Department's Technical Services Division to reduce the recurrence of another spill. If the property is being leased, then a certified letter shall be sent to the landowner, informing the owner of the spill.

(Code 1974, § 12-107; Ord. No. 428, pt. 2(G), 7-27-1993; Ord. No. 437, pts. III, IV, 3-8-1994)

Sec. 4.149. Other activities.

4.149.A. *Retail sales activities.* Retail sales establishments in any regulated areas that store and handle regulated substances for resale in their original unopened containers shall be subject to the requirements as listed for protection zone 1, section 4.148.A.1, 3 and 7. The criteria to determine which retail sales activities shall comply with the above requirements are provided by resolution of the Board of County Commissioners. Activities that do not meet the criteria are exempt.

4.149.B. *Offices.* Offices in any regulated areas that use regulated substances for the daily operation of the business shall be subject to the requirements as listed for protection zone 1, section 4.148.A.1, 3 and 7. The criteria to determine which offices shall comply with the above requirements are provided by resolution of the Board of County Commissioners. Offices that do not meet the criteria are exempt.

(Code 1974, § 12-108; Ord. No. 428, pt. 2(H), 7-27-1993)

Sec. 4.150. Exemptions.

The following shall be exempt from the requirements of this division to the extent indicated:

4.150.A. *Previous approvals.* Development projects that applied for master or final plan approval before October 25, 1988, and are in compliance with the timetable and all terms of the development approval order shall be exempt from the prohibition based on the quantities of regulated substances set forth in section 4.148.A. Such activity shall be subject to all other requirements of this division.

4.150.B. *Transfer of ownership.* A new owner of an existing nonresidential activity whose intent is to operate the same business activity shall be exempt from the prohibition based on the quantities of regulated substances set forth in section 4.148.A. Such activity shall be subject to all other requirements of this division.

4.150.C. *Continuous transit.* The transportation of any regulated substance, provided that the transporting vehicle is passing or moving through protection zones 1 and 2 and the vehicle is not used for storage of regulated substances within those zones. This exemption includes the use of regulated substances in vehicle and lawn maintenance equipment provided that the regulated substance is necessary for the proper functioning of the vehicle or equipment.

4.150.D. *Vehicular fuel and lubricant use.* The use of any regulated substance solely as operating or hydraulic fuel in a vehicle or lawn maintenance equipment, as a lubricant

provided that it is necessary for the proper functioning of the vehicle or equipment.

4.150.E.*Pesticides, herbicides, fungicides and rodenticides.* The application of substances used as pesticides, herbicides, fungicides and rodenticides in recreation, agriculture, pest control and aquatic weed control activities shall be exempt from the provisions of this division provided that:

1. The property owner of a nonresidential activity shall register all services to the Technical Services Division of the Utilities Department that apply pesticides, insecticides, fungicides and herbicides within protection zone 1. The licensed applicator spraying within zone 1 shall register residential and nonresidential areas that are sprayed within zone 1 on a monthly basis. A monthly report shall indicate the name of the substance sprayed, the location, and the approximate quantity of substance used in the application. This requirement does not apply to indoor applications. Licensed applicators shall obtain a wellfield protection permit.

2. Chemicals shall not be stored within protection zone 1.

3. In all regulated areas the application is in strict conformity with the use requirement as set forth in the EPA substances' registries, as indicated on the containers in which the substances are sold.

4. In all regulated areas the application is in strict conformity with the requirements as set forth in F.S. chs. 482 and 487 and F.A.C. chs. 5E-2 and 5E-9. This exemption only applies to the application of pesticides, herbicides, fungicides and rodenticides.

5. Excess application is not exempt. Manufacturer's instructions or recommendations are not to be exceeded.

6. The quantity of pesticide handled by the operator and present in zones of protection 1 and 2 does not exceed 1,000 gallons of formulation at any one time.

4.150.F.*Fertilizers.* The use of fertilizers containing any form of nitrogen, provided that the application of the fertilizer is in accordance with manufacturer's directions or in accordance with the recommendations of the County Agricultural Extension Agent.

4.150.G.*Water plants/potable water facilities.* Potable water utility activities (e.g., well construction and water treatment) that are directly related to and required for the provision of potable water service shall be exempt from this division. Maintenance and refueling of utility vehicles are not exempt.

4.150.H.*Quantities less than threshold limits.* Any nonresidential activity that uses, handles, produces or stores the following quantities of regulated substances shall be allowed if all three criteria are met:

1. The total sum of all quantities of any one regulated substance for any one nonresidential activity at a given facility, building or property at any one time does not exceed six gallons where said substance is a liquid, or 25 pounds where said substance is a solid. If the reportable quantity under EPA 40 CFR 302.4 regulations is lower (a smaller quantity is considered hazardous, toxic, etc.), then only the lower quantity will be allowed.

2. The total sum of all regulated substances for any one nonresidential activity at one facility, building or property at any one time does not exceed 100 gallons if said substances are liquids, or 500 pounds where said substances are solids, and the total sum of all quantities of any one regulated substance does not exceed the reference limits in subparagraph 1 above.

3. Where regulated substances are dissolved in or mixed with other nonregulated substances, the total volume of the mixture present shall be used to determine compliance with this division, unless it can be documented that the mixture itself does not have hazardous and toxic substance characteristics as defined herein.

(Code 1974, § 12-109; Ord. No. 428, pt. 2(I), 7-27-1993; Ord. No. 437, pts. V--VIII, 3-8-1994)

Sec. 4.151. Wellfield protection permits.

4.151.A. *Permits required*

1. *Wellfield protection permits.* This section provides the requirements and procedures for the issuance of permits by this division.

2. An application shall satisfy the requirements of the applicable protection zone to receive a permit. If the applicant fails to satisfy these requirements or has three citations of this division, then the County Utility Department's Technical Division may deny a permit. If the prior history of the applicant's operation demonstrates an inability to comply with the requirements of the applicable zone, then the applicant shall not receive a permit.

3. An operating permit shall remain valid for one year for zone 1, two years for zone 2, and three years for zone 3, provided the permittee is in compliance with the terms and conditions of the permit.

4. A wellfield protection operating permit shall be renewed annually for zone 1, and every two years for zone 2, and every three years for zone 3. Applications for renewal of permit shall be made at least 90 days prior to the permit expiration date.

4.151.B. *Types of permits required.* The applicant shall receive all applicable permits, including the following permits in relation to wellfield protection:

1. *Wellfield protection operating permit.* Any activity coming under this regulation in zone 1 shall apply for a wellfield protection operating permit within 90 days of the effective date of this division [January 1, 1994]. Any activity in zone 2 shall apply for a permit within one year of the effective date of this division. Any activity in zone 3 shall apply for a permit within three years after the effective date of this division. A permit shall be received within 180 days of the date that the application was received.

2. *Construction permit.* Any activity that requires constructing secondary containment or installation of any other structural requirements shall obtain a construction permit from the County Utility Department's Technical Division. The applicant shall provide assurances (i.e., engineering certification, manufacturer's recommendations, etc.) that the containment has been designed, installed and is working properly. A permit is required for secondary structures by January 1995. An operating permit shall not be issued until the applicant demonstrates that the construction is operating properly.

3. *Closure permit.* When any activity coming under this regulation is to be permanently terminated, the permittee shall obtain a closure permit from the County Utility Department's Technical Division confirming that all regulated substances are to be or have been removed.

4.151.C. *Permit applications.*

1. *Wellfield protection operating permit.* Copies of reports to any other agency containing substantially similar information to that required hereunder shall constitute satisfaction of reporting required hereunder. The applicant shall submit a copy of the report to the Technical Services Division of the Utilities Department. All applications shall provide the following information:

a. A list of the regulated substances stored, handled, used or produced in the activity being permitted, including their quantities.

b. A detailed description of the nonresidential activities that involve the storage, handling, use or production of the regulated substances. The description shall indicate the unit quantity in which the substances are contained or manipulated and the square footage of the facility in which the activity is situated. If applicable, a professional engineer, registered and licensed in the State of Florida, shall certify that construction has been completed in a technically acceptable manner.

c. A description of the inventory record that will be instituted to comply with the restrictions required for zones 1, 2 and 3 as set forth by this division.

d. A description of the emergency collection devices for zones 1, 2 and 3.

e. A description of the containment, the emergency collection containers, and the emergency plan that will be employed to comply with the restrictions required for zones 1 and 2 as set forth above. For zone 3, this particular documentation will be required only with an application for a new wellfield protection operating permit following any spillage.

f. A description of the daily monitoring records that will be instituted to comply with the restrictions for zones 1 and 2.

g. A description of the proper and adequate regular maintenance of containment will be required for zones 1 and 2. For zone 3, this particular documentation will be required only with an application for a new wellfield protection operating permit following any spillage.

h. A description of the proper and adequate regular maintenance of emergency equipment that will be required for zones 1, 2 and 3.

i. If applicable, a description of the groundwater monitoring wells that have been or will be installed, other pertinent well construction information, or leak detection systems for double-walled tanks, and the arrangements that have been made or that will be made for certified analyses for specified regulated substances.

j. Existing nonresidential activities shall have 12 months to install structural requirements as identified in the permit. Proposed nonresidential activities shall have structural requirements in place to qualify for the certificate of occupancy.

2. *Wellfield protection closure permit.* All applications shall provide the following information:

a. A schedule of events to complete the closure of an activity that does store or did store, handle, use, or produce regulated substances. As a minimum, the following actions shall be addressed:

(1) Disposition of all regulated substances and contaminated containers.

(2) Cleanup of the activity and environs to preclude leaching of unacceptable levels of residual regulated substances into the aquifer.

(3) Certification by a professional engineer, registered and licensed in the State of Florida, that disposal and cleanup have been completed in a technically acceptable manner. The requirement for certification by a professional engineer may be waived if the applicant provides evidence to the County Utility Department's Technical Division that all of the following items are applicable:

(a) The entire operation is maintained inside the building(s) of the facility.

(b) The approved method of removing operating waste is not by septic tank, sewer mains, or floor drains.

(c) There is no evidence of spills permeating floors or environs.

(d) There are no outstanding past notices of violation from any regulatory agency concerned with hazardous, industrial or special waste.

(e) There is no evidence of past contamination in the public drinking water well(s) associated with the facility in zone 1.

(f) The applicant shall provide a sworn statement that disposal and cleanup have been completed in a technically acceptable manner.

(4) Liability of closure runs with the land.

3. *Permit conditions.* The permit conditions shall be such to comply with all the prohibitions and restrictions as set forth in this regulation.

4.151.D. *Fee schedule.* The fees are provided by resolution of the Board of County Commissioners. All applicants within the protection zones shall pay the fees for the wellfield protection permits.

1. *Operating permit fee.* All applicants for a wellfield protection operating permit shall pay a nonrefundable operating fee. The operating fee shall be paid prior to acceptance of the permit application for review.

2. *Operating permit renewal fee.* All applicants that have an existing operating permit shall

pay a fee for the annual renewal.

3. *Construction permit fee.* All applicants that are required to construct secondary containment shall pay a fee for a construction permit.

4. *Closure permit fee.* All applicants that close an activity that stores or did store, handle, use, or produce regulated substances are required to pay a fee for a closure permit.

5. *Permit transfer fee.* A fee shall be required for transfer of an operating permit or closure permit to defray the cost of processing the transfer. Application for transfer of permit is to be made within 60 days of transfer of ownership of the activity.

4.151.E. *Revocation or revision of the permit.*

1. *Revocation.* Any permit or exemption issued under the provisions of this division shall not become vested in the permittee. The County Utility Department's Technical Division may revoke any issued permit by first issuing a written notice of intent to revoke if it finds that the permit holder:

a. Has failed or refused to comply with any of the provisions of this division, including but not limited to permit conditions; or

b. Has submitted false or inaccurate information in the operating permit application; or

c. Has failed to submit operational reports or other information required by this division; or

d. Has refused lawful inspection; or

e. Is subject to revocation under other sections (alterations and expansions, spills).

The notice shall be sent certified mail return receipt requested, or hand delivered.

2. *Excess spillage.* A permittee's permit for zone 3 shall be revised to be in accordance with the requirements listed in zone 1, section 4.148.A.1 through 10, if any spillage is in excess or equal to the threshold limit (section 4.150.H.1) of a regulated substance.

3. *Revision.* The County Utility Department's Technical Division may revise any permit as set forth above or by first issuing a written notice of intent to revise (certified mail return receipt requested, or hand delivery).

4. *Spills.*

a. A spill in excess or equal to the threshold limit (section 4.150.H.1) of a regulated substance that is not reported in accordance with section 4.148.A.7 could result in revocation or revision of the permit. Within 30 days of a spill in protection zone 1, 2, or 3, the County Utility Department's Technical Division shall review for possible revocation or revision of the permit.

b. Upon such review, the County Utility Department's Technical Division may issue a notice of intent to revoke or revise that shall be subject to the provisions set forth above, or elect not to issue such notice. In consideration of whether to revoke or revise the permit, the County Utility Department's Technical Division may consider the intentional nature or degree of negligence, if any, associated with this spill and the extent to which containment or cleanup is possible, the nature, number and frequency of previous spills by the permittee and the potential degree of harm to the groundwater and surrounding wells due to the spill.

5. *Notice.*

a. For any revocation or revision of an operating permit containing a special or administrative exemption permitting certain land uses or activities, the County Utility Department's Technical Division shall issue a notice of intent to revoke or revise the permit that shall state that the County Utility Department's Technical Division intends to revoke or revise the operating permit.

b. The written notice of intent to revoke or revise shall contain the following information:

(1) The name and address of the permittee, if any, and property owner, if

different.

(2) A description of the facility that is the subject of the proposed revocation or revision.

(3) Location of the spill, if any.

(4) Give a concise explanation and specific reasons for the proposed revocation or revision.

(5) A statement stating "Failure to file a petition with the clerk of the board within 20 days after the date upon which permittee receives written notice of the intent to revoke to revise shall render the proposed revocation or revision final and in full force and effect."

c. Failure of a permittee to file a petition as set forth above shall render the proposed revocation or revision final and in full force and effect. Nothing in this section shall preclude or be deemed a condition precedent to the County Utility Department's Technical Division's seeking a temporary or permanent injunction.

4.151.F. *Reconstruction after catastrophe.*

1. Reconstruction of any portion of a structure or building in which there is any land use or activity subject to the provisions of this division, which structure is damaged by fire, vandalism, riot, flood, explosion, collapse, wind, war or other catastrophe, shall be in strict conformity with this division.

2. Within 90 days of the receipt of written notice from the County Utility Department's Technical Division, all owners of existing land uses shall file or activities regulated by this division that use, handle, store, or produce regulated substances shall file an application for an operating permit. Any owner of such land use or activity that fails to apply for an operating permit shall file for a closure permit within 120 days of the receipt of written notice from the County Utility Department's Technical Division. Said permit application shall be prepared and signed by a professional engineer registered and licensed in the State of Florida. Within 30 days of receipt of said notice, the owner shall file with the County Utility Department's Technical Division proof of retention of said engineer. If application is made for an operating permit, such permit shall be issued or denied within 60 days of the filing of the completed application. If the application for an operating permit is denied, then the activity shall cease within 12 months of the denial and an application for a closure permit shall be filed with the County Utility Department's Technical Division within 120 days of the denial of the operating permit.

(Code 1974, § 12-110; Ord. No. 428, pt. 2(J), 7-27-1993; Ord. No. 437, pts. IX--XII, 3-8-1994)

Cross references: Development review procedures, art. 10.

Sec. 4.152. Restrictions on new activity permits and licenses.

4.152.A. Every application for a rezoning, special exception, occupational license, change of occupancy, development order, certificate of occupancy, or building permit shall indicate whether or not the property, or any portion thereof, lies within a protection zone. The applicant shall be informed of this division if located within a protection zone and instructed to apply for an appropriate wellfield protection permit(s) at the Technical Services Division of the Utilities Department.

4.152.B. Every application which involves property located wholly or partially within a protection zone shall be reviewed by the County Utility Department's Technical Division. The County Utility Department's Technical Division shall then issue a notice as to whether or not the proposed use or activity meets the requirements of this division.

4.152.C. No request for a rezoning, special exception, special permit, development order, certificate of occupancy, building permit, change of occupancy or occupational license for any activity regulated by this division shall be granted that is contrary to the restrictions and provisions provided in this division. Permits or occupational licenses issued in violation of this division confer no right or privilege on the grantee, and such invalid permit or licenses will not vest rights.

(Code 1974, § 12-111; Ord. No. 428, pt. 2(K), 7-27-1993)

Sec. 4.153. Protection of future wells.

The prohibitions and restrictions set forth in this division and any regulations promulgated pursuant hereto shall apply to any future public potable water supply well sites adopted by the Board of County Commissioners by resolution. A protected future well is permitted by the SFWMD. If a permit has not been obtained then the following criteria must be met:

4.153.A. The proposed well site is included in a water use application with the SFWMD;

4.153.B. The SFWMD application is not over three years old;

4.153.C. A notification has been placed in the newspaper;

4.153.D. Adjacent landowners within the corresponding protection zone 1 have been contacted;

4.153.E. Preliminary approval has been received from the Wellfield Protection Division; and

4.153.F. A DEP water construction permit has been received for site approval.

(Code 1974, § 12-112; Ord. No. 428, pt. 2(L), 7-27-1993)

Sec. 4.154. Enforcement.

4.154.A. The County is hereby authorized and empowered to make inspections at reasonable hours of all land uses or activities regulated by this division within wellfield protection zones in order to determine if applicable provisions of this division are being followed.

4.154.B. Any person subject to this division shall be liable for any damage caused by a regulated substance present on or emanating from the person's property, for all costs of removal or remedial action incurred by the County, and damages for injury to, destruction of, or loss of natural resources, including the reasonable costs of assessing such injury, destruction or loss resulting from the release or threatened release of a regulated substance. Such removal or remedial action by the County shall include, but is not limited to, the prevention of further contamination of groundwater, monitoring, containment and cleanup or disposal of regulated substances resulting from the spilling, leaking, pumping, pouring, emitting or dumping of any regulated substance or material that creates an emergency hazardous situation or is expected to create an emergency hazardous situation.

(Code 1974, § 12-113; Ord. No. 428, pt. 2(M), 7-27-1993)

EXHIBIT A. PUBLIC WATER SUPPLY WELL GENERIC SUBSTANCE LIST

Acid and basic cleaning solutions.

Antifreeze and coolants.

Arsenic and arsenic compounds.

Bleaches, peroxides.

Brake and transmission fluids.

Brine solution.

Casting and foundry chemicals.

Caulking agents and sealants.

Cleaning solvents.

Corrosion and rust prevention solutions.

Cutting fluids.

Degreasing solvents.

Disinfectants.

Electroplating solutions.

Explosives.

Fire extinguishing chemicals.

Food processing wastes.

Formaldehyde.

Fuels and additives.

Glues, adhesives and resins.

Greases.

Hydraulic fluid.

Indicators.

Industrial and commercial janitorial supplies.

Industrial sludges and stillbottoms.

Inks, printing and photocopying chemicals.

Laboratory chemicals.

Liquid storage batteries.

Medical, pharmaceutical, dental, veterinary and hospital solutions.

Mercury and mercury compounds.

Metal finishing solutions.

Oils.

Paints, primers, thinners, dyes, stains, wood preservatives, varnishing and cleaning compounds.

Painting solvents.

PCBs.

Pesticides and herbicides.

Plastic resins, plasticizers and catalysts.

Photo development chemicals.

Poisons.

Polishes.

Pool chemicals.

Processed dust and particulates.

Radioactive sources.

Reagents and standards.

Refrigerants.

Roofing chemicals and sealers.

Sanitizers, disinfectants, bactericides and algaecides.

Solders and fluxes.

Stripping compounds.

Tanning industry chemicals.

Transformer and capacitor oils/fluids.

Water and wastewater treatment chemicals.

(Code 1974, ch. 12, art. VII, exhibit A; Ord. No. 437, pt. XIII, 3-8-1994)

Secs. 4.155--4.180. Reserved.

Appendix C Public Hearing

Treasure Coast Newspapers | TCPALM

The Stuart News
1939 SE Federal Highway, Stuart, FL 34994

AFFIDAVIT OF PUBLICATION

STATE OF FLORIDA
COUNTY OF MARTIN

Before the undersigned authority personally appeared, Natalie Zollar, who on oath says that she is Classified Inside Sales Manager of the Stuart News, a daily newspaper published at Stuart in Martin County, Florida: that the attached copy of advertisement was published in the Stuart News in the following issues below. Affiant further says that the said Stuart News is a newspaper published in Stuart in said Martin County, Florida, with offices and paid circulation in Martin County, Florida, and that said newspapers have heretofore been continuously published in said Martin County, Florida, daily and distributed in Martin, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that she has neither paid or promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper. The Stuart News has been entered as Periodical Matter at the Post Offices in Stuart, Martin County, Florida and has been for a period of one year next preceding the first publication of the attached copy of advertisement.

Customer	Ad Number	Copyline	PO #
432313 - CITY OF STUART	2044734	NOTICE OF PUBLIC HEARING Notice is h	

Pub Dates
June 20, 2018

Sworn to and subscribed before me this day of, June 20, 2018, by

Natalie Zollar, who is
Natalie Zollar
(X) personally known to me or
( ) who has produced _____ as identification.

Karol E Kangas

Karol Kangas **Notary Public**

KAROL E KANGAS
Notary Public – State of Florida
Commission # GG 126041
My Comm. Expires Jul 29, 2021
Bonded through National Notary Assn.

NOTICE OF PUBLIC HEARING

Notice is hereby given that the City of Stuart Public Utilities Department will hold a special meeting on July 5, 2018. The meeting is at 5:30 pm at City Hall, at 121 SW Flagler Avenue, Stuart, FL in the City commission chambers for the purpose of considering approval of the proposed City of Stuart Water Facilities Plan for the City of Stuart Pretreatment and Alternative Water Supply Project. This hearing will include a discussion of the Water Facilities Plan and the financial impact on the system users. The hearing is intended to afford the opportunity to individuals to be heard on the economic and social effects of the location, design, and environmental impact of the water system improvements.

The project will be utilizing the State Revolving Fund (SRF) loan program. Financial impacts on utility users will be presented at the hearing.

The Water Facilities Plan relevant to the discussion is available for public review in the Utilities Division of the City of Stuart Public Works Department, at 121 SW Flagler Avenue, Stuart, FL. All interested persons are invited to attend and be heard.

In compliance with the Americans with Disabilities Act (ADA), anyone who needs a special accommodation for this meeting should contact the City's ADA coordinator at (772) 288-5306 at least 48 hours in advance of the meeting, excluding Saturday and Sunday.

City of Stuart, Florida
David Peters
Director of Public Works
Pub: June 20, 2018
TCN 2044734

Sign In Sheet
City of Stuart Water Facilities Plan Public Meeting
Pretreatment and Alternative Water Supply Project

July 5, 2018 – 5:30 pm – City of Stuart Commission Chamber

Name	Phone Number	Email
Christine Miranda	(772) 919-4905	Christine.Miranda@Holtz Consulting.com
TIM VOELKER	(772) 288-5332	TVOELKER@CI.STUART.FL.US
David Peters	(772) 288-1292	dpeters@ci.stuart.fl.us

City of Stuart

Pretreatment and Alternative Water Supply Project



Stuart

Water Facilities Plan Public Meeting

July 5, 2018

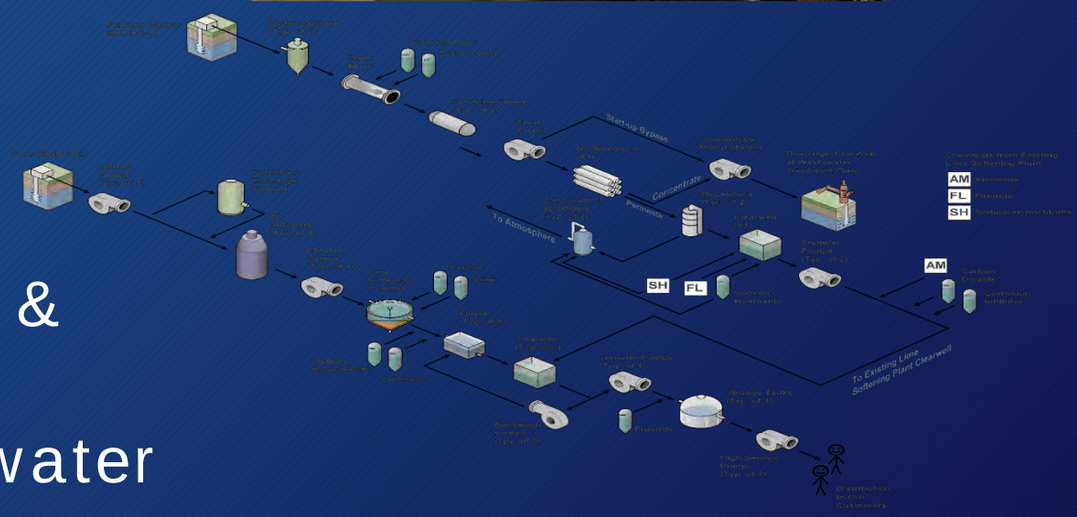
What is the Project?

- Construction of a pretreatment system at the City of Stuart Water Treatment Plant
  - Removes Perfluorinated (PFC) compounds
- Alternative Water Supply for the City of Stuart
  - Reverse Osmosis Treatment –Total 3 MGD
    - First Phase – 1 MGD – 2022
    - Second Phase – 1MGD – 2027
    - Third Phase – 1 MGD - 2032

Why is the City doing the Project?

- Pretreatment System
  - Removes PFC Contaminants to Below Health Advisory Levels Established by the EPA
- Alternative Water Supply
  - Threats & Reliability Issues with the Surficial Aquifer Supply
    - Groundwater Contamination
    - Salt Water Intrusion
    - Impacts on adjacent wetlands & other legal users
    - Future more stringent drinking water regulations





This Meeting

- Required by the Florida Department of Environmental Protection
- Public meeting intended to afford individuals the opportunity to comment on:
  - Water Facilities Plan
  - Economic & Social Effects
  - Location
  - Design
  - Environmental Impact

Project Description

- Pretreatment System
  - Modifications/replacement of the existing influent booster pumps
  - Four ion exchange vessels loaded with resin that has been selected to remove PFCs
  - Rated to treat 4 MGD
  - Remaining capacity will bypass the proposed system and blend upstream of the Volatile Organic Compound (VOC) towers
- Construction Cost - $1,904,733

Alternative Water Supply

- Scheduled to be implemented in three phases constructed over 10 years
- First phase – Reverse osmosis treatment capacity of 1.0-mgd and will be bid in three separate sub-phases (Phase 2A, 2B, and 2C) and bid packages.
  - Estimated construction cost: $16,284,000
  - $768,375 loan for design of first two sub-phases (2A & 2B – Well, Wellhead & Pipeline)

Alternative Water Supply

- Proposed improvements include the following:
  - The Upper Permeable Zone (UPZ) of the Upper Floridan Aquifer.
    - Three UPZ wells - 1.43 million gallons per day (mgd) each
    - Each well is sized to provide raw water to one reverse osmosis (RO) membrane train.
    - Membrane treatment plant on the WTP site with three RO membrane trains. Each membrane train would have a finished water capacity of 1.0 mgd.
    - Three wells and RO trains be constructed in phases as follows:
      - Well FA-1 and RO Train 1 in the year 2022
      - Well FA-2 and RO Train 2 in the year 2027
      - Well FA-3 and RO Train 3 in the year 2032
    - Disposal of RO concentrate (brine) be achieved by the following:
      - Convert existing Water Reclamation Facility injection well IW-2 into a tubing and packer well.



Phase	Incremental Finished Water Capacity (mgd)	Year On-Line
1	1.0	2022
2	1.0	2027
3	1.0	2032

Figure 5-1: Proposed Floridan Aquifer System Well Location Map

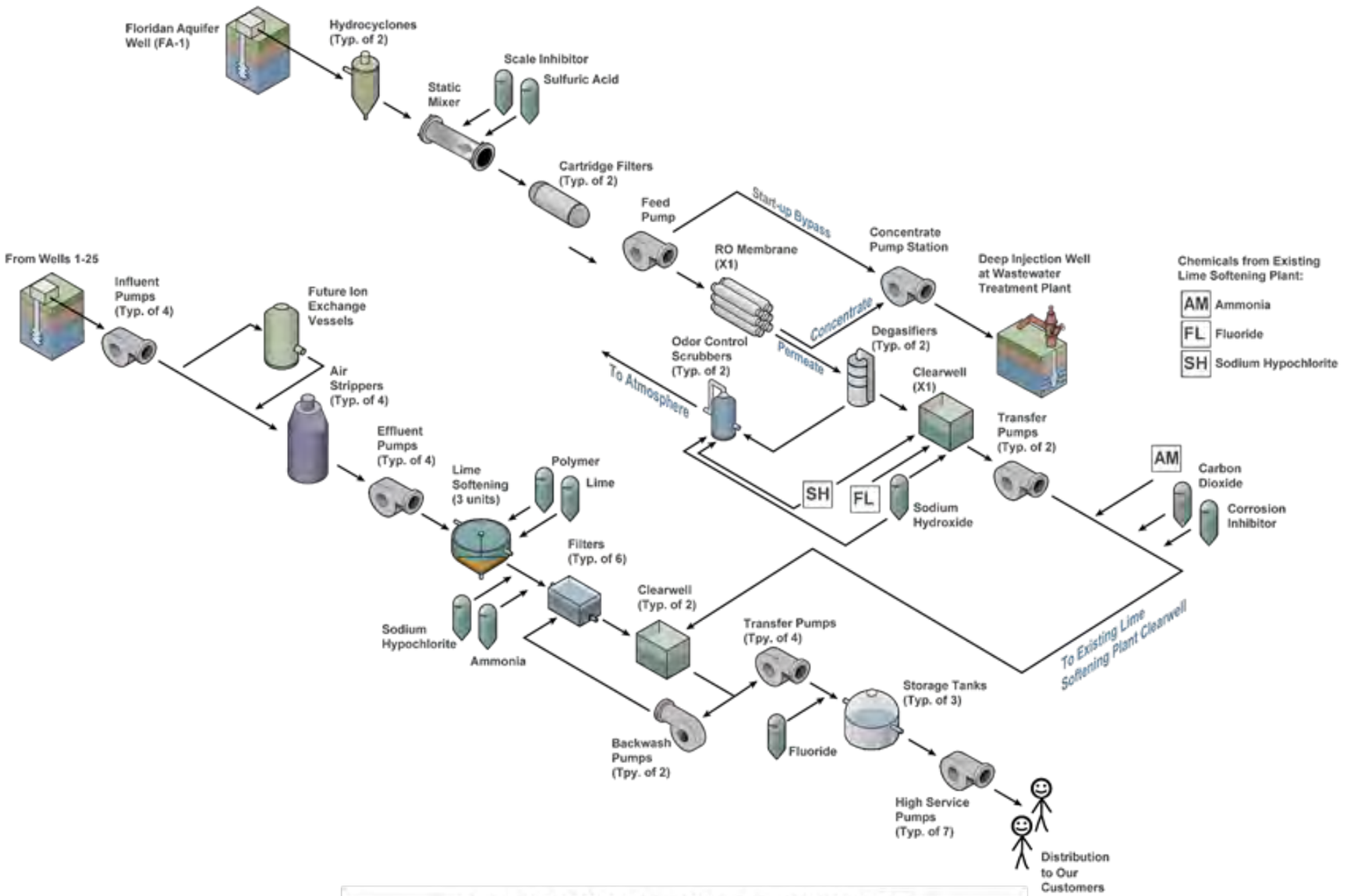


Figure 5-3: RO System Process Flow Diagram

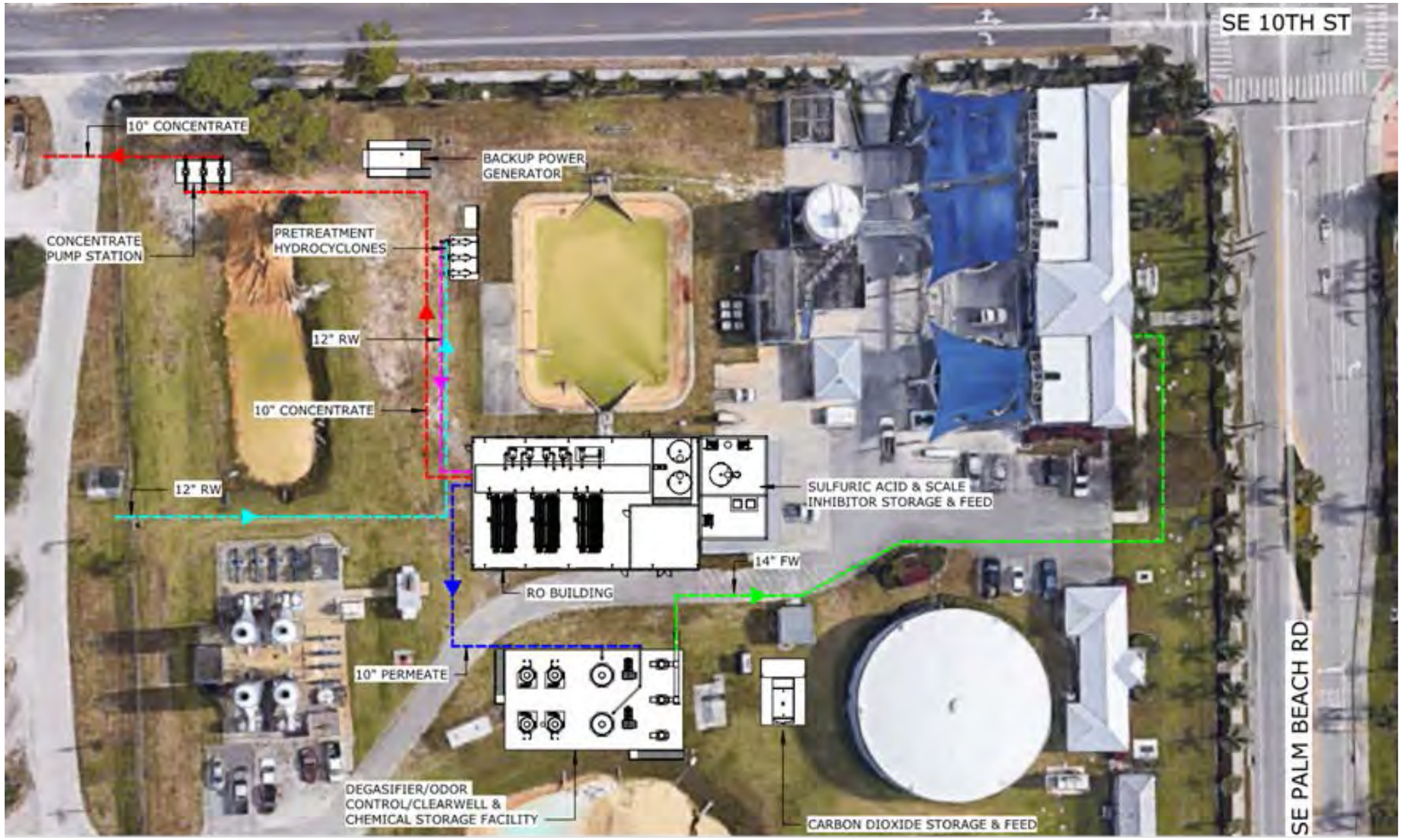


Figure 5-4: RO Conceptual Site Plan



Figure 5-4B: Membrane Building Conceptual Exterior View

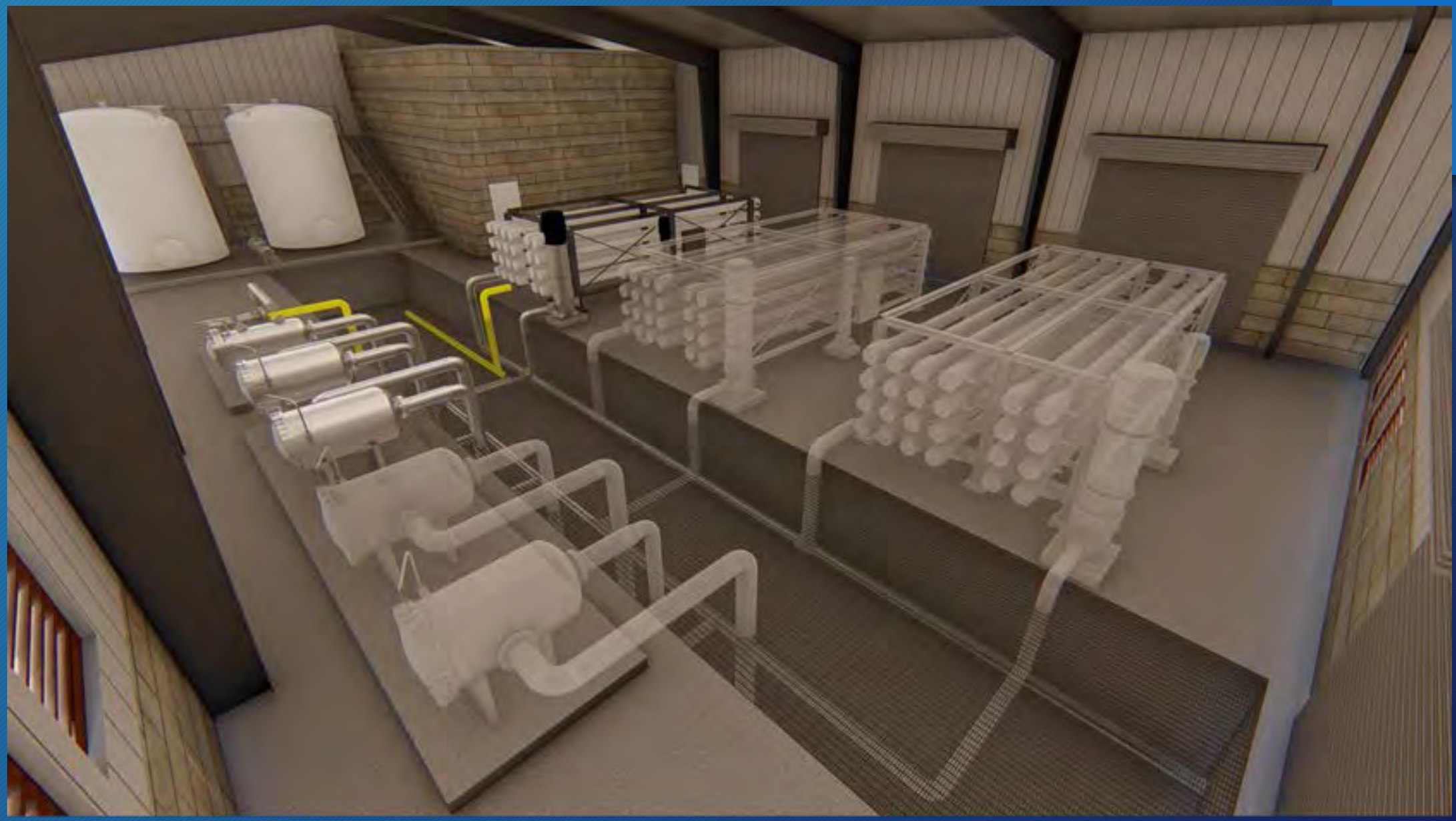


Figure 5-4C: Membrane Building Conceptual Interior View

Schedule for 2018-2019

May 2018 – Submit Water Facilities Plan	July 5, 2018 - Hold public hearing on facilities plan and business plan	July 2018 – Submit plans and specifications for pretreatment system (Phase 1) to FDEP	August 2018 – Be on the agenda for approval at the SRF hearing for a construction loan for the Phase 1 pretreatment system and a design loan for Phase 2A and 2B
September 2018 – Sign State Revolving Fund loan agreements	September 2018 – Start project construction of the Phase 1 pretreatment system	May 2019 – Submit plans and specifications for Phase 2A and 2B of the alternative water supply project	June 2019 – Complete construction of the Phase 1 pretreatment system
July 2019 – Certify operational performance of the Phase 1 pretreatment system project and complete close-out project documentation.	August 2019 - Be on the agenda for approval at the SRF hearing for a construction loan of Phase 2A and Phase 2B of the alternative water supply project and a design loan for Phase 2C of the alternative water supply project.	September 2019 – Sign State Revolving Fund loan agreements	September 2019 – Start project construction of Phase 2A and 2B of the alternative water supply project

Questions?

Appendix D Business Plan and 2017 Rate Study

DRINKING WATER STATE REVOLVING FUND BUSINESS PLAN

Sponsor Name: City of Stuart System Population: 16,623

DWSRF Project #: DW43041 PWS ID#: 4430259

Contact Person and Title: David Peters, Public Works Director Telephone: (772) 288-1292

Mailing Address: 121 SW Flagler Avenue City: Stuart State: FL Zip: 34994

Contact for Finance Plan (if different): Same Telephone: 772-288-1292

Mailing Address: City: State: Zip:

e-mail: dpeters@ci.stuart.fl.us Fax: (772) 288-5381

Source Type: ☒ Ground Water ☐ Purchase Water

☐ Surface Water ☐ Surface/Ground Combined

The Drinking Water State Revolving Fund Program (DWSRF), authorized by the 1996 amendments to the Safe Drinking Water Act, provides financial assistance to public water systems (PWS). To obtain this assistance, project sponsors must demonstrate Capacity Development or demonstrate how the assistance will ensure these requirements are met. The term Capacity Development takes into consideration three vital areas of a public water system: Technical, Managerial, and Financial capabilities.

FINANCIAL

A financial capability demonstration (and certification) is required well before the evaluation of the actual loan or grant application. This demonstration is necessary to ensure that the system has the financial capability to repay the loan, if applicable, and to adequately operate and maintain the system. Financial capability also includes funding future capital improvements that may be required. Please see Rule 62-552.700(4) in Chapter 62-552, F.A.C. for further details.

It is expected that the revenues to be dedicated to repaying a loan will be generated either from water and sewer utility operations or from water utility operations alone. If the source of revenues will not be from such enterprises, this set of worksheets alone will not satisfy the Department's needs. (Please contact the Department for further guidance if dedicated revenues will be generated externally to such utilities.)

The following worksheets have been developed to identify the minimum information needed. The completed worksheets should be used in disclosing DWSRF project financing to the public during the required dedicated revenue hearing. The worksheets can serve to identify the impacts of the SRF project on residential users and how the project fits into the project sponsor's overall capital improvement program for the water and sewer utility (or water utility, as appropriate). Supplemental capital financing documentation may be submitted with these worksheets and may be presented at the required dedicated revenue hearing.

The revenues being dedicated to repayment of the DWSRF loan are:	User Rates
What is the frequency of water system billing?	Monthly
How often are system rates reviewed for adequacy?	Every 3 to 5 years
When was the last time rates were reviewed?	August 2017
What resources and guidance does the water system use for setting water user rates, fees or charges?	Water, Wastewater, & Sanitation Rate Study dated August 28, 2017
What is your water system bond rating?	Standard & Poor's AA-
Is a rate increase necessary as a result of this project?	No
What is the Median Household Income (MHI) for the entire system?	$39,470

Which, if any, of the following activities must be undertaken to implement the DWSRF project?

Acquire privately held land?	Yes ☐	No ☒
Acquire land held by another public water system entity?	Yes ☐	No ☒
Enter into inter-local or inter-project sponsoring agency's agreements?	Yes ☐	No ☒
Does the system have an annual budget with a separate reserve account for equipment replacement and/or capital improvement?	Yes ☒	No ☐
Does the system have a capital improvement plan? How many years does it cover? 5	Yes ☒	No ☐

Does the system have a governing board of directors?	Yes ☒ No ☐
Does the water system employ the services of a professional engineer?	Yes ☒ No ☐
Are there procedures for billing and collection?	Yes ☒ No ☐
Does the system have audited financial statements?	Yes ☒ No ☐
Are there standard purchasing procedures that provide controls over expenditures?	Yes ☒ No ☐
What year will construction be completed and repayments begin (for the first project)?	2019
What is the estimated cost of your SRF project?	$2,673,108 ($1,904,733 for pretreatment system construction and $768,375 for the design of the first two bid packages of the alternative water supply project)

Please attach a copy of the user charge ordinance. **ATTACHED**

Table 1
WATER RATE REVENUE SUMMARY

		LAST YR.	YEAR 1 (Current Year)	YEAR 2	YEAR 3		SRF Project
1.	Number of Residential Customers						
2.	Number of New Residential Service Connections	**PLEASE REFER TO THE ATTACHED TABLES**					
3.	Annual Residential Water Sales (Gallons)						
4.	Avg Daily Residential Usage (Gal/day) (Line 3 divided by line 1 divided by 365)						
5.	Annual Residential Water Sales ($)						
6.	Average Annual Residential Bill (line 5 divided by line 1)						
7.	Annual Residential Bill Amount Uncollected						
8.	Total Residential Rates Collected (Line 5 minus line 7)						
9.	Impact and Connection Fees per Residential Service						
10.	Total Residential Impact and Connection Fees (Line 2 times line 9)						
11.	Number of Commercial Customers						
12.	Number of New Commercial Service Connections						
13.	Annual Commercial Water Sales (Gallons)						
14.	Annual Commercial Water Sales ($)						
15.	Annual Commercial Bill Amount Uncollected						
16.	Total Commercial/Industrial Bills Collected (Line 14 minus line 15)						
17.	Impact and Connection Fees for Commercial Service						
18.	Total Commercial Impact and Connection Fees (Line 12 times line 17)						
19.	Bulk Water Sales						
20.	Total Projected Water Revenue (Line 8+10+16+18+19)						

* Large meters should be checked annually for accuracy.

TABLE 1-A

CITY OF STUART, FLORIDA

HISTORICAL AND PROJECTED REVENUES AND INCOME [1] [2]

	Description	Code	Audited 2016	Audited 2017	Projected 2018	Projected 2019	Projected 2020
	OPERATING REVENUES						
1	Water and Wastewater Rate Revenues [3] [4]	1	$10,263,097	$10,364,119	$10,887,258	$11,524,903	$12,192,651
2	Fire Protection	2	0	0	0	0	0
3	Fees and Services [5]	3	425,942	507,537	415,485	553,580	584,556
4	Interest Income	4	0	0	0	0	0
5a	Other- Misc Revenue & Contributions	5	1,363	12,363	23,500	22,500	22,500
5b	Other-		0	0	0	0	0
6	**Total (Lines 1 - 5)**		$10,690,402	$10,884,019	$11,326,243	$12,100,982	$12,799,707
	NON-OPERATING REVENUES						
7	Interest Income	7	$79,916	$78,829	$15,000	$14,000	$15,000
8	Interfund Transfer	8	0	0	0	0	0
9	Proceeds from the Sale of Assets	9	25	7,050	14,600	0	0
10	Leases and Extraction Fees	10	0	0	0	0	0
11	Construction Grants	11	199,627	740,656	0	0	0
12	Proceeds from Borrowing	12	0	0	0	0	0
13	Equity Contribution/ Impact Fees	13	277,869	227,539	194,115	244,627	228,213
14	Other- Assessments	14	0	0	0	0	0
15	**Total (Lines 7 - 14)**		$557,436	$1,054,074	$223,715	$258,627	$243,213
16	**Total Revenues**		$11,247,838	$11,938,093	$11,549,958	$12,359,609	$13,042,920

Footnotes:

[1] Amounts shown for Fiscal Years 2016 and 2017 are based on detailed records provided by City staff, which were used to compile the City's Audited Financial Statements.

[2] Amounts projected for Fiscal Years 2018 through 2020 based on the City's most recent rate study which concluded on August 14, 2017. Since the detailed revenues from the updated rate study results were summarized herein, please refer to the updated rate study tables for specific results by revenue source.

Footnotes continued on following page.

TABLE 1-A

CITY OF STUART, FLORIDA

HISTORICAL AND PROJECTED REVENUES AND INCOME [1] [2]

[3] Based on the rate study results that concluded on August 14, 2017, the City adopted water and wasetwater rates for the five (5) Fiscal Years ending September 30, 2022 as follows:

	Water	Wastewater
Adopted Rate Increases on or after October 1, 2017	7%	3%
Adopted Rate Increases on or after October 1, 2018	7%	3%
Adopted Rate Increases on or after October 1, 2019	7%	3%
Adopted Rate Increases on or after October 1, 2020	2%	2%
Adopted Rate Increases on or after October 1, 2021	2%	2%

[4] Projected revenues based on the adopted rates plus an average customer growth rate of 1% per year on average. Additional sewer customer growth was assumed to account for recently completed and planned sewer expansion projects to eliminate septic tanks within selected sewer basins.

[5] Amounts include the operating portion of Sewer Plan Payments associated with the Sewer Expansion Program. A portion of the plan payments include the recoupment of Sewer Availability Fees or Impact Fees and were reflected on Line 13 below; Equity Contributions / Impact Fees.

TABLE 1-B

CITY OF STUART, FLORIDA

HISTORICAL AND PROJECTED OPERATING EXPENSES [1]

	Description	Code	Audited 2016	Audited 2017	Projected 2018	Escalation Factor [2]	Projected 2019	Projected 2020
	OPERATING EXPENSES							
	OPERATION AND MAINTENANCE							
16	Salaries (Operators)	16	$1,570,065	$1,655,279	$1,505,598	Labor	$1,535,710	$1,566,424
17	Benefits	17	544,611	599,846	643,930	Labor	671,892	701,305
18	Utilities	18	567,179	599,771	718,030	Utility	760,244	804,229
19	Chemicals & Treatment	19	410,663	398,453	571,138	Chemical	586,376	602,415
20	Monitoring	20	0	0	0	Inflation	0	0
21	Materials, Supplies & Parts [3]	21	393,648	1,028,383	932,775	Repair	960,718	989,504
22	Transportation	22	0	0	0	Inflation	0	0
23	Purchased Water Costs	23	0	0	0	Inflation	0	0
24	Outside Professional Services [4]	24	314,350	303,469	602,825	Inflation	616,690	631,491
25	Other- Misc. Expenses	25	106,081	106,092	167,955	Inflation	171,818	175,942
26	**Total (Lines 16-25)**		**$3,906,598**	**$4,691,294**	**$5,142,251**		**$5,303,448**	**$5,471,309**
	ADMINISTRATIVE							
27	Salaries and Benefits	27	$1,313,992	$1,448,917	$1,127,523	Labor	$1,156,440	$1,186,315
28	Building Overhead	28	40,034	39,913	46,350	Repair	47,674	49,072
29	Office Supplies & Postage	29	33,401	35,660	44,700	Inflation	46,372	48,084
30	Insurance	30	114,902	87,948	87,403	Insurance	90,025	92,726
31	Customer Billing & Collection	31	47,621	45,719	62,330	Inflation	64,183	66,123
32	Accounting and Legal	32	0	0	0	Inflation	0	0
33	A/E & Professional Services	33	45,181	38,335	93,295	Inflation	95,441	97,731
34	Other- Books & Training	34	105,968	114,272	138,346	Inflation	144,544	150,866
35	**TOTAL (Lines 27 - 34)**		**$1,701,098**	**$1,810,764**	**$1,599,947**		**$1,644,679**	**$1,690,916**
36	**Total Operating Expenses**		**$5,607,696**	**$6,502,058**	**$6,742,198**		**$6,948,127**	**$7,162,226**
	NON-OPERATING EXPENSES							
37	Existing Debt-Repayment - Principal and Interest [5]	37	$1,773,162	$2,041,634	$2,036,256	Link	$2,040,341	$2,040,723
38	Capital Improvements Acquisition of Plant Equipment [6] [7]	38	4,270,353	2,093,775	1,607,504	Input	1,782,658	1,801,416
39	Interfund Transfers [8]	39	254,083	230,676	247,699	Labor	252,653	257,706
40	To General Fund [9]	40	560,770	639,168	705,853	Revenue	743,992	784,117

TABLE 1-B

CITY OF STUART, FLORIDA

HISTORICAL AND PROJECTED OPERATING EXPENSES [1]

	Description	Code	Audited 2016	Audited 2017	Projected 2018	Escalation Factor [2]	Projected 2019	Projected 2020
41	To Replacement Fund	41	0	0	0	Constant	0	0
42	To Emergency Fund	42	0	0	0	Constant	0	0
43	Depreciation Expenses (If money is set aside)	43	0	0	0	Constant	0	0
44	Other-	44	0	0	0	Constant	0	0
45	**TOTAL (Lines 37 - 44)**		**$6,858,368**	**$5,005,253**	**$4,597,312**		**$4,819,644**	**$4,883,962**
46	**TOTAL EXPENSES**		**$12,466,064**	**$11,507,310**	**$11,339,510**		**$11,767,770**	**$12,046,188**

Footnotes:

[1] Amounts shown for Fiscal Years 2016 and 2017 are based on detailed records provided by City staff, which were used to compile the City's Audited Financial Statements. Amounts projected for Fiscal Years 2018 through 2020 based on the City's most recent rate study which concluded on August 14, 2017. The rate study results were briefly updated to account for known changes in the financial forecast.

[2] Descriptions reflect the principal cost drivers which were used to estimate future operating expenses. Since the detailed expenses from the updated rate study results were summarized herein, please refer to the rate study tables for specific results by cost center and department.

[3] Amounts derived from Table 3, Page 1 of 2, and reflect the existing annual principal and interest payments funded in each fiscal year. The amounts funded are based on when the City segregates the revenues to pay the periodic debt service payments over time (a sinking fund approach).

[4] Since Fiscal Year 2016, the City has increased funding for the ongoing maintenance and repairs of the water and wastewater system.

[5] Projected amounts based on the adopted Fiscal Year 2018 Budget, a portion of which may get capitalized when compared to the actual 2016 and 2017 results.

[6] The amounts funded for Fiscal Years 2016 and 2017 were derived from the cash flow statements provided in the City's Audited Financial Statements.

[7] The planned capital expenditures for Fiscal Years 2018 through 2020 reflect the estimated amount of capital to be paid from monthly user rates and/or reserves. Capital expenditures associated with future loan proceeds are not reflected in these totals. Please refer to the detailed capital plan included within the updated rate study results for additional project details.

[8] Amounts reflect an indirect cost allocation between the utility system and other City funds based on shared expenses and services.

[9] The City's transfer policy is based on six percent (6%) of annual gross revenues.

TABLE 2

INCOME, EXPENSES, AND CASH FLOW STATEMENT

	Income, Expense, and Cash Flow Statement	Last Yr.	Year 1	Year 2	Year 3		SRF Project
	OPERATING REVENUES						
1	Water Rates						
2	Fire Protection	**PLEASE REFER TO THE ATTACHED TABLE**					
3	Fees and Services						
4	Interest Income						
5a	Other –						
5b	Other –						
6	**Total (Lines 1 - 5)**						
	NON-OPERATING REVENUES						
7	Interest Income						
8	Interfund Transfer						
9	Proceeds from the Sale of Assets						
10	Leases and Extraction Fees						
11	Construction Grants						
12	Proceeds from Borrowing						
13	Equity Contribution						
14	Other -						
15	**Total (Lines 7 - 14)**						
	OPERATING EXPENSES						
	OPERATION AND MAINTENANCE						
16	Salaries (Operators)						
17	Benefits						
18	Utilities						
19	Chemicals & Treatment						
20	Monitoring						
21	Materials, Supplies & Parts						
22	Transportation						
23	Purchased Water Costs						
24	Outside Services –						
25	Other –						
26	**Total (Lines 16 – 25)**						

	ADMINISTRATIVE						
27	Salaries and Benefits						
28	Building Overhead						
29	Office Supplies & Postage						
30	Insurance						
31	Customer Billing & Collection						
32	Accounting and Legal						
33	A/E & Professional Services						
34	Other -						
35	**TOTAL (Lines27 – 34)**						
36	**Net Operating Income (Line 6 minus 26 minus 35)**						
	NON-OPERATING EXPENSES						
37	Debt-Repayment – Principal and Interest						
38	Capital Improvements Acquisition of Plant Equipment						
39	Interfund Transfers						
40	To General Fund						
41	To Replacement Fund						
42	To Emergency Fund						
43	Depreciation Expenses (If money is set aside)						
44	Other -						
45	**TOTAL (Lines 37 + 44)**						
46	**Net Non-Operating Income (Line 15 minus Line 45)**						
47	**Net Income Before Taxes (Lines 36 + 46)**						
	TAXES (N/A for publicly owned systems)						
48	Income Taxes						
49	Other Taxes						
50	**TOTAL (Lines 48 + 49)**						
51	**Net Income After Taxes (Line 47 minus 50)**						

TABLE 2

CITY OF STUART, FLORIDA

INCOME, EXPENSES, AND CASH FLOW STATEMENT [1]

	Income, Expense, and Cash Flow Statement	Code	Audited 2016	Audited 2017	Projected 2018	Projected 2019	Projected 2020	SRF Project 2020
	OPERATING REVENUES [2]							
1	Water and Wastewater Rates		$10,263,097	$10,364,119	$10,887,258	$11,524,903	$12,192,651	$12,192,651
2	Fire Protection		0	0	0	0	0	0
3	Fees and Services		425,942	507,537	415,485	553,580	584,556	584,556
4	Interest Income		0	0	0	0	0	0
5a	Other- Misc Revenue & Contributions		1,363	12,363	23,500	22,500	22,500	22,500
5b	Other-		0	0	0	0	0	0
6	**Total (Lines 1 - 5)**		**$10,690,402**	**$10,884,019**	**$11,326,243**	**$12,100,982**	**$12,799,707**	**$12,799,707**
	NON-OPERATING REVENUES [2]							
7	Interest Income		$79,916	$78,829	$15,000	$14,000	$15,000	$15,000
8	Interfund Transfer		0	0	0	0	0	0
9	Proceeds from the Sale of Assets		25	7,050	14,600	0	0	0
10	Leases and Extraction Fees		0	0	0	0	0	0
11	Construction Grants		199,627	740,656	0	0	0	0
12	Proceeds from Borrowing		0	0	0	0	0	0
13	Equity Contribution		277,869	227,539	194,115	244,627	228,213	228,213
14	Other-		0	0	0	0	0	0
15	**Total (Lines 7 - 14)**		**$557,436**	**$1,054,074**	**$223,715**	**$258,627**	**$243,213**	**$243,213**
	OPERATING EXPENSES [3]							
	OPERATION AND MAINTENANCE							
16	Salaries (Operators)	16	$1,570,065	$1,655,279	$1,505,598	$1,535,710	$1,566,424	$1,566,424
17	Benefits	17	544,611	599,846	643,930	671,892	701,305	701,305
18	Utilities	18	567,179	599,771	718,030	760,244	804,229	804,229
19	Chemicals & Treatment	19	410,663	398,453	571,138	586,376	602,415	602,415
20	Monitoring	20	0	0	0	0	0	0
21	Materials, Supplies & Parts	21	393,648	1,028,383	932,775	960,718	989,504	989,504
22	Transportation	22	0	0	0	0	0	0
23	Purchased Water Costs	23	0	0	0	0	0	0
24	Outside Professional Services	24	314,350	303,469	602,825	616,690	631,491	631,491
25	Other- Misc. Expenses	25	106,081	106,092	167,955	171,818	175,942	175,942
26	**Total (Lines 16-25)**		**$3,906,598**	**$4,691,294**	**$5,142,251**	**$5,303,448**	**$5,471,309**	**$5,471,309**

Footnotes begin on the last page.

	ADMINISTRATIVE [3]	Code	Audited 2016	Audited 2017	Projected 2018	Projected 2019	Projected 2020		SRF Project 2020
27	Salaries and Benefits	27	$1,313,992	$1,448,917	$1,127,523	$1,156,440	$1,186,315		$1,186,315
28	Building Overhead	28	40,034	39,913	46,350	47,674	49,072		49,072
29	Office Supplies & Postage	29	33,401	35,660	44,700	46,372	48,084		48,084
30	Insurance	30	114,902	87,948	87,403	90,025	92,726		92,726
31	Customer Billing & Collection	31	47,621	45,719	62,330	64,183	66,123		66,123
32	Accounting and Legal	32	0	0	0	0	0		0
33	A/E & Professional Services	33	45,181	38,335	93,295	95,441	97,731		97,731
34	Other- Books & Training	34	105,968	114,272	138,346	144,544	150,866		150,866
35	**Total (Lines 27 - 34)**		**$1,701,098**	**$1,810,764**	**$1,599,947**	**$1,644,679**	**$1,690,916**		**$1,690,916**
36	**NET OPERATING INCOME (Line 6 minus 26 minus 35)**		**$5,082,707**	**$4,381,961**	**$4,584,045**	**$5,152,856**	**$5,637,482**		**$5,637,482**
	NON-OPERATING EXPENSES [3]								
37	Debt-Repayment - Principal and Interest [4]	37	$1,773,162	$2,041,634	$2,036,256	$2,040,341	$2,040,723		$2,567,412
38	Capital Improvements Acquisition of Plant Equipment	38	4,270,353	2,093,775	1,607,504	1,782,658	1,801,416		1,801,416
39	Interfund Transfers	39	254,083	230,676	247,699	252,653	257,706		257,706
40	To General Fund	40	560,770	639,168	705,853	743,992	784,117		784,117
41	To Replacement Fund	41	0	0	0	0	0		0
42	To Emergency Fund	42	0	0	0	0	0		0
43	Depreciation Expenses (If money is set aside)	43	0	0	0	0	0		0
44	Other-	44	0	0	0	0	0		0
45	**Total (Lines 37 - 44)**		**$6,858,368**	**$5,005,253**	**$4,597,312**	**$4,819,644**	**$4,883,962**		**$5,410,651**
46	**Net Non-Operating Income (Line 15 minus Line 45)**		**($6,300,933)**	**($3,951,178)**	**($4,373,597)**	**($4,561,017)**	**($4,640,750)**		**($5,167,439)**
47	**Net Income Before Taxes (Lines 36+46)**		**($1,218,226)**	**$430,783**	**$210,448**	**$591,839**	**$996,732**		**$470,043**
	TAXES (N/A for publicly owned systems)								
48	Income Taxes		$0	$0	$0	$0	$0		$0
49	Other Taxes		0	0	0	0	0		0
50	**Total (Lines 48 + 49)**		**$0**	**$0**	**$0**	**$0**	**$0**		**$0**
51	**Net Income (Loss) After Taxes (Line 47 minus 50)**		**($1,218,226)**	**$430,783**	**$210,448**	**$591,839**	**$996,732**		**$470,043**

Footnotes continued on the following page.

Footnotes:

[1] A reconciliation of the Fiscal Year 2016 and 2017 Audited results to the Audited Financial Statements is shown in Attachment A.

[2] Amounts compiled by Public Resources Management Group, Inc. (PRMG) as derived from Table 1-A.

[3] Amounts compiled by Public Resources Management Group, Inc. (PRMG) as derived from Table 1-B.

[4] Details of annual debt service payments derived from Table 3. The existing loan payments are shown from Fiscal Years 2016 through 2020. For the SRF Project column, the Proposed SRF Loans 1 and 2 for the Proposed Projects and any future debt currently assumed was included as follows:

	SRF Project 2020 [a]
Existing Principal and Interest Payments	$2,040,723
Proposed SRF Loan 1 (ION Exchange) [b]	101,032
Proposed SRF Loan 2 (Eng. & Design Phases 1 & 2 R.O. Project) [c]	50,997
Future SRF Loan R.O. Phases 1-3 [d]	0
Future Junior Lien Loan Sewer Expansion [d]	141,032
Future Junior Lien Loan for Other Capital [d]	233,628
	$2,567,412

_____

[a] Amounts derived from Table 3, which includes two (2) pages of existing and projected debt service payments.

[b] The Proposed Project debt service costs are estimated based on the following:

ION Exchange Project Costs	$1,904,733
Less 20% Assumed Debt Forgiveness	(380,947)
Plus Financing Costs and Capitalized Interest	50,547
Total Principal Amount Borrowed (Rounded)	$1,575,000
Term (Years)	20
Rate (%)	2.5%
Total Annual Payment	$101,032

[c] The Proposed Project debt service costs are estimated based on the following:

Engineering & Design Phases 1 & 2 R.O. Project Costs	$768,375
Plus Financing Costs and Capitalized Interest	25,505
Total Principal Amount Borrowed (Rounded)	$795,000
Term (Years)	20
Rate (%)	2.5%
Total Annual Payment	$50,997

[d] Amounts included as a component of funding the total capital plan included in the updated rate study, but which are not directly associated with this application and may not be issued as planned.

ATTACHMENT A

CITY OF STUART, FLORIDA

RECONCILIATION OF NET INCOME TO AUDITED FINANCIAL STATEMENTS

Line No.	Description	FY 2016	FY 2017
1	Net Income (Line 51) [1]	($1,218,226)	$430,783
2	Plus Capital Improvements [1]	4,270,353	2,093,775
3	Plus Principal & Interest Payments [1]	1,773,162	2,041,634
4	Sub-total	4,825,289	4,566,191
5	Less Depreciation Expense [2]	(2,482,277)	(2,604,847)
6	Less Interest and Amortization Expenses [2]	(864,584)	(858,424)
7	Adjustment Due to Rounding	3	(3)
8	Net Income	$1,478,431	$1,102,917
9	Change in Net Position [2]	$1,478,431	$1,102,917

Notes:

[1] Amounts derived from Table 2, which were based on reports provided by the City.

[2] Amounts reconcile to the Audited Financial Statements on pages 22 and 21 of the Fiscal Year 2016 and 2017 Audits, respectively.

Prepared on: May 9, 2018
Prepared by: Public Resources Management Group, Inc.

Table 3
SCHEDULE OF PRIOR, PARITY, AND PROJECTED LIENS

List annual debt service beginning two years before the anticipated loan agreement date and continuing at least fifteen fiscal years. Include all existing and projected liens on the system. Use additional pages as necessary.

Identify Each Obligation		**Coverage**		**Insured?**
#1				
#2	**PLEASE REFER TO THE**			
#3	**ATTACHED TABLE**			
#4				
#5				

~~Annual Debt Service (Principal Plus Interest)~~

Fiscal Year	#1	#2	#3	#4	#5	Total Debt Service	Total Debt Service Incl. Coverage
2000							
2001							
2002	**PLEASE REFER TO THE ATTACHED TABLE**						
2003							
2004							
2005							
2006							
2007							
2008							
2009							
2010							
2011							
2012							
2013							
2014							
2015							
2016							
2017							
2018							
2019							
2020							
2021							
2022							

TABLE 3

CITY OF STUART, FLORIDA

SCHEDULE OF EXISTING PRIOR AND PARITY LIENS

List annual debt service beginning two years before the anticipated loan agreement date and continuing at least fifteen fiscal years. Include all existing and projected liens on the system. Use additional pages as necessary.

Identify Each Obligation [1]		Coverage		Insured?
#1	Revenue Refunding and Improvement Bonds, Series 2003	110%		Yes
#2	Subordinate Lien Public Utilities Revenue Refunding Note, Series 2006	100%		No
#3	Subordinate Lien Public Utilities Revenue Refunding Note, Series 2007	100%		No
#4	Subordinate Lien Public Utilities Revenue Refunding Note, Series 2011 (Refunded Series 2007B)	100%		No
#5	Existing SRF Loan - WW 430400 - Reclaimed Water Transmission Main	115%		No
#6	Existing SRF Loan - DW 430410 - Water Distribution Replacements and Meters	115%	1st Pmt. Dec. 2016	No

Fiscal Year	Annual Debt Service (Principal + Interest)						Total Debt Service	Total Debt Service Including Coverage
	#1	#2	#3	#4	#5	#6		
2016	$468,290.00	$343,154.02	$315,713.32	$379,333.62	$178,054.30	88,617.00	$1,773,162.26	$1,859,991.96
2017	469,800.00	343,393.25	315,700.82	380,217.36	178,054.30	354,468.00	2,041,633.73	2,168,492.08
2018	0.00	343,429.65	780,386.82	379,916.84	178,054.30	354,468.00	2,036,255.61	2,116,133.96
2019	0.00	342,425.90	785,937.69	379,455.12	178,054.30	354,468.00	2,040,341.01	2,120,219.36
2020	0.00	343,289.06	785,079.62	379,832.20	178,054.30	354,468.00	2,040,723.18	2,120,601.53
2021	0.00	343,378.25	783,082.94	379,025.02	178,054.30	354,468.00	2,038,008.51	2,117,886.86
2022	0.00	343,254.05	778,882.63	379,056.64	178,054.30	354,468.00	2,033,715.62	2,113,593.97
2023	0.00	948,089.70	178,902.13	379,904.02	178,054.30	354,468.00	2,039,418.15	2,119,296.50
2024	0.00	946,382.38	179,040.96	379,544.14	178,054.30	354,468.00	2,037,489.78	2,117,368.13
2025	0.00	278,175.75	1,144,245.13	0.00	178,054.30	354,468.00	1,954,943.18	2,034,821.53
2026	0.00	277,493.20	1,147,250.25	0.00	178,054.30	354,468.00	1,957,265.75	2,037,144.10
2027	0.00	277,810.65	1,142,489.69	0.00	178,054.30	354,468.00	1,952,822.64	2,032,700.99
2028	0.00	277,797.78	1,146,333.68	0.00	178,054.30	354,468.00	1,956,653.76	2,036,532.11
2029	0.00	1,447,365.25	0.00	0.00	178,054.30	354,468.00	1,979,887.55	2,059,765.90
2030	0.00	1,445,626.90	0.00	0.00	178,054.30	354,468.00	1,978,149.20	2,058,027.55
2031	0.00	1,446,041.65	0.00	0.00	89,026.98	354,468.00	1,889,536.63	1,956,060.88
2032	0.00	1,443,748.76	0.00	0.00	0.00	354,468.00	1,798,216.76	1,851,386.96
2033	0.00	1,447,888.80	0.00	0.00	0.00	354,468.00	1,802,356.80	1,855,527.00
2034	0.00	0.00	0.00	0.00	0.00	354,468.00	354,468.00	407,638.20
2035	0.00	0.00	0.00	0.00	0.00	354,468.00	354,468.00	407,638.20
2036	0.00	0.00	0.00	0.00	0.00	265,851.00	265,851.00	305,728.65
2037	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2038	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Footnotes:
[1] Amounts derived from the actual loan payment schedules provided by the City. Amounts reflect the estimated sinking fund payments required in each Fiscal Year.

Prepared on: May 9, 2018
Prepared by: Public Resources Management Group, Inc.

TABLE 3
CITY OF STUART, FLORIDA
SCHEDULE OF PROJECTED PARITY LIENS

List annual debt service beginning two years before the anticipated loan agreement date and continuing at least fifteen fiscal years. Include all existing and projected liens on the system. Use additional pages as necessary.

Identify Each Obligation		Coverage		Insured?
#7	Proposed SRF Loan 1 (ION Exchange) [1]	115%		No
#8	Proposed SRF Loan 2 (Eng. & Design Phases 1 & 2 R.O. Project) [1]	115%		No
#9	Future SRF Loan R.O. Phases 1-3 [2]	115%		No
#10	Future Junior Lien Loan Sewer Expansion [2]	115%		No
#11	Future Junior Lien Loan for Other Capital [2]	115%		No

Fiscal Year	Annual Debt Service (Principal + Interest)						Total Debt Service	Total Debt Service Including Coverage
	#7	#8	#9	#10	#11	#12		
2016	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
2017	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2018	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2019	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2020	101,031.73	50,996.97	0.00	141,031.82	233,628.48	0.00	526,689.00	605,692.35
2021	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2022	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2023	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2024	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2025	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2026	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2027	101,031.73	50,996.97	560,325.17	141,031.82	233,628.48	0.00	1,087,014.17	1,250,066.29
2028	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2029	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2030	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2031	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2032	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2033	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2034	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2035	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2036	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2037	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94
2038	101,031.73	50,996.97	560,325.17	0.00	0.00	0.00	712,353.86	819,206.94

Footnotes:

[1] Please refer to Footnote 4 of Table 2 for a description of the Proposed Project Costs and Debt Service Assumptions.

[2] Amounts included as a component of funding the total capital plan included in the updated rate study, but which are not directly associated with this application and may not be issued as planned.

SCHEDULE OF PRIOR, PARITY, OR PROJECTED REVENUES AND DEBT COVERAGE FOR RATE-BASED SYSTEM PLEDGED REVENUE

(Provide information beginning with the two fiscal years preceding the anticipated date of the first SRF loan repayment.)

	FY	FY	FY	FY	FY
(a) Net Operating Revenues. (Table 2 line 36)					
(b) Debt Service (including required coverage) pledged to all prior, parity, or projected projects (last column of Table 3).	**PLEASE REFER TO THE ATTACHED TABLE**				
(c) Net Revenue (= a – b)					

(d) Attach audited annual financial report(s), or pages thereof, and any other documentation necessary to support the above information. Include any notes or comments from the audit reports regarding compliance with covenants of debt obligations having a prior or parity lien on the revenues pledged for repayment of the SRF loan. (*Attachment #* _____)

(e) Attach worksheets reconciling this page with the appropriate financial statements (for example, backing out depreciation and interest payments from operating expenses). (*Attachment #* _____)

(f) If the net revenues were not sufficient to satisfy the debt service and coverage requirement, please explain what corrective action was taken. (Attachment #_____)

(k) Identify the source of the above information and explain methods used to develop the projections (Attachment # _____). Include an explanation of any revenue and expense growth or other adjustments; for example, any rate increases, service growth, inflation adjustments, expense adjustments reflecting the cost of operating additional facilities, or other considerations.

LIST OF ATTACHMENTS (use additional sheets if necessary)

Attachment	Number

TABLE 4

CITY OF STUART, FLORIDA

SCHEDULE OF PRIOR, PARITY, OR PROJECTED REVENUES AND DEBT COVERAGE FOR RATE-BASED SYSTEM PLEDGED REVENUE [1]

(Provide information beginning with the two fiscal years preceding the anticipated date of the first SRF loan repayment.)

		Audited 2016	Audited 2017	Projected 2018	Projected 2019	Projected 2020	SRF Project FY 2020	
(a)	Net Operating Revenues (Table 2 line 36)	$5,082,707	$4,381,961	$4,584,045	$5,152,856	$5,637,482	$5,637,482	
(b)	Debt Service (including required coverage) pledged to all prior, parity, or projected projects (last column of Table 3)							
	Existing Prior and Parity Debt (including Coverage)	$1,859,992	$2,168,492	$2,116,134	$2,120,219	$2,120,602	$2,120,602	[2]
	Proposed SRF Loan 1 (ION Exchange) (including coverage)	0	0	0	0	0	116,186	[3]
	Proposed SRF Loan 2 (Eng. & Design Phases 1 & 2 of R.O. Project) (including coverage)	0	0	0	0	0	58,647	[3]
	Future Junior Lien Loans (including coverage)	0	0	0	0	0	430,859	[4]
	Total Debt Service (including required coverage)	$1,859,992	$2,168,492	$2,116,134	$2,120,219	$2,120,602	$2,726,294	
(c)	Net Revenue (= a - b)	$3,222,715	$2,213,469	$2,467,911	$3,032,636	$3,516,880	$2,911,188	

(d) Attach audited annual financial report(s), or pages thereof, and any other documentation necessary to support the above information. Include any notes or comments from the audit reports regarding compliance with covenants of debt obligations having a prior or parity lien on the revenues pledged for repayment of the SRF loan.
(Please refer to Tables 1 through 3 included in this application and Attachment A that Reconciles the information to the Audited Financial Statements.)

(e) Attach worksheets reconciling this page with the appropriate financial statements (for example, backing out depreciation and interest payments from operating expenses).
(Please see Attachment A that reconciles Table 2 to the Audited Financial Statements)

(f) If the net revenues were not sufficient to satisfy the debt service and coverage requirement, please explain what corrective action was taken.
(Net Revenues have been and are projected to be fully adequate over the projection period, including the Proposed SRF Loans 1 and 2 and any future borrowings currently assumed, but which are not a component of this application and may not be issued as planned.)

(g) Identify the source of the above information and explain methods used to develop the projections. Include an explanation of any revenue and expense growth or other adjustments; for example, any rate increases, service growth, inflation adjustments, expense adjustments reflecting the cost of operating additional facilities, or other considerations.
(All study assumptions are discussed within Tables 1 through 3 included with this application.)

Footnotes:

[1] Amounts derived from Table 2 and Table 3 of this application. Table 2 was reconciled to the Audited Fiscal Year 2016 and 2017 Financial Statements as shown in Attachment A.

[2] Existing debt service amounts and coverage derived from Table 3, Page 1 of 2.

[3] The Proposed Project debt service amounts and coverage derived from Table 3, Page 2 of 2. For a detailed description of the Project Costs and debt service assumptions, please refer to Footnote 4 of Table 2.

[4] The Future debt service amounts and coverage derived from Table 3, Page 2 of 2. Amounts included as a component of funding the total capital plan included in the updated rate study, but which are not directly associated with this application and may not be issued as planned.

LIST OF ATTACHMENTS (use additional sheets if necessary)

Attachment	Number
Attachment A - Reconciliation of Actual to Audit Results	
Attachment B - Updated Rate Study Tables (Available upon request) [*]	Tables 1-19
[*] Updated Rate Study Tables were used to develop Tables 1-A and 1-B included in this application.	

Prepared on: May 9, 2018
Prepared by: Public Resources Management Group, Inc.

TECHNICAL: Accurate answers to the following questions will help identify the technical strengths as well as areas that may need improving within your system. If a question or section does not apply to your system, please write N/A for not applicable. For questions that ask you to rate your system from 1 to 5, answer 1 for worst case scenario and answer 5 for the best case scenario.

- System has current and accurate data showing average and peak gpd used — Yes ☒ No ☐
- System's capacity exceeds peak demand by more than 20% (Percentage -30%) — Yes ☒ No ☐
- System can meet peak demand without pumping at peak capacity for extended periods. — Yes ☒ No ☐
- System has an emergency plan in place to meet system demand during a shortage (natural disaster or largest pump/well out, etc.) — Yes ☒ No ☐
- System has accurate records indicating types and percentage of customers use: — Yes ☒ No ☐
  Residential 85% Commercial 10% Industrial 4% Dedicated Irrigation Meter 1%
- System has comprehensive water loss program that compares amount of water produced (plant meter) with total delivered through metered and unmetered service connections (system's unaccounted for water is 7.68 %) — Yes ☒ No ☐

Purchase Water Systems **NA** ☒

System has a written agreement with the supplier that:

- ensures adequate supply of water during shortage conditions, — Yes ☐ No ☐
- does not require the purchase of a minimum amount of water (water is supplied through a meter), — Yes ☐ No ☐
- assures supplying water system will remain in compliance with the appropriate State or federal regulations, and — Yes ☐ No ☐
- assures purchasing system will be notified of any water quality issues. — Yes ☐ No ☐

Surface Water Systems and Systems Using Ground Water Under the Influence of Surface Water **NA** ☒

- System has redundancy for all critical treatment components — 1 2 3 4 5
- System monitors raw, settled, and individual filtered water turbidity — 1 2 3 4 5
- System consistently (95% of the time) has a filtered water turbidity of _____%, which is within the current standard of .3 NTU — 1 2 3 4 5
- System has the capability to add coagulant before the filter and disinfect at various points in the treatment process — 1 2 3 4 5
- System is evaluating (or has evaluated) changes necessary to meet the Enhanced Surface Water Treatment Rule — 1 2 3 4 5
  Some needed changes are: _____
- System is evaluating (or has evaluated) changes needed to meet requirements in the Disinfection By Products Rule — 1 2 3 4 5
  Some planned modifications are: _____

Ground Water System **NA** ☐

- A minimum of two sources of groundwater are provided — Yes ☒ No ☐
- Source water protection area provides a minimum 500 foot radius around each drinking water well — Yes ☒ No ☐
- Groundwater source capacity equals or exceeds the design maximum day demand and equals or exceeds the design average day demand with the largest producing well out of service — Yes ☒ No ☐
- System monitors raw water quality to determine appropriate treatment — 1 2 3 4 (5)

- System's well(s) have; air/vacuum relief valve, check valve, blow-off, by-pass, meter, working sanitary seal, construction/maintenance records and are properly vented — 1 2 3 4 (5)
- System routinely monitors drawdown — 1 2 3 4 (5)

Disinfection

- System has adequate contact time of 278 minutes following disinfection and before the first user in the distribution system — Yes ☒ No ☐
- Disinfection equipment is regularly inspected and maintained — Yes ☒ No ☐
- A chlorine residual is maintained throughout the distribution system — 1 2 3 4 (5)

Distribution System

- System has accurate information, including age, for pipe materials that currently make up the distribution system — 1 2 (3) 4 5
- Water mains providing fire protection are a minimum of 6-inches in diameter — Yes ☒ No ☐
- System is free of severe "water hammer" problems — 1 2 3 4 (5)
- System tracks ranges of operating pressure, especially during peak demand — 1 2 3 4 (5)
- System maintains a minimum operating pressure of 20 psi — Yes ☒ No ☐
- Normal operating pressure is kept between 40 and 100 psi — 1 2 3 4 (5)
- System has a routine leak detection program that uses (type of equipment) N/A, repairs identified leaks quickly, and keeps water loss in the distribution system below 10%. Average number of leak repairs per year is 50 — 1 2 (3) 4 5
- System has a cross connection control program in place that addresses: evaluation of each service connection, installation of specified backflow preventer, training, record keeping, annual testing, and education — 1 2 3 4 (5)
- System is working to eliminate dead ends in the mains — 1 2 3 4 (5)
- System has a flushing program that operates 365 times a year — 1 2 3 4 (5)
- System has a map showing the bacteriological, lead and copper, and TTHM (if applicable) sampling points — 1 2 3 4 (5)
- System has accurate "as-built" maps of the distribution system posted that show: location of sources (or intakes), size of mains, dead end mains, valves, curb stops on service lines, and proximity of mains to other utilities (gas, electric, etc.) — 1 2 3 (4) 5
- System has a routine valve exercise program — 1 2 (3) 4 5
- All customers are metered and all meters are routinely calibrated — 1 2 3 4 (5)
- Customer complaints are relatively infrequent — 1 2 3 4 (5)
  List number of complaints in the past year: 2.

Pumping

- System has a pump maintenance program that includes annual inspection, scheduling of repair, and routine maintenance that is conducted by a qualified contractor — 1 2 3 4 (5)
- System has standby or emergency power equipment that is routinely tested under load and can provide 100% of the average daily demand for 6 days — 1 2 3 4 (5)

Storage

- System is able to meet peak demand without the high service pumps running at peak capacity for extended period — 1 2 3 4 (5)
- System has adequate reserve capacity for fire protection. — 1 2 3 4 (5)
  Total storage capacity of the system is 3 million gals
- System's 3 storage tanks receive routine inspection (every 3-5 years) to determine and schedule any needed maintenance — 1 2 3 4 (5)

- All storage tanks are equipped with an altitude valve to prevent overflowing and are sized appropriately to ensure adequate turnover and no loss of water quality 1 2 3 4 (5)
- Storage tanks are covered and the surrounding areas are fenced 1 2 3 4 (5)
- Storage tanks have a drain valve and an entry hatch to allow access for cleaning and painting of the interior of the tank 1 2 3 4 (5)

MANAGERIAL: Answering the next set of question will help the system clearly define responsible parties, staffing needs, operational needs, policies, and internal standard that guide system performance. For questions that ask you to rate your system from 1 to 5, answer 1 for worst case scenario and answer 5 for the best case scenario.

- System has a current organizational chart and accompanying position descriptions that clearly define responsibilities of staff members 1 2 3 4 (5)
- The plant is a category I plant operating 24 hours per day.

List names, class, and license numbers for all operators fulfilling staffing requirements:

Mike Woodside - A - 12938, James Allen – B- 17164, H. Bobby Kindel - A - 13408,
Marti Meehan - A - 16158, Scott Earl - C - 4749, Marvin Dyall- C -24464, Alexandre Canali- C- 20512

- System is satisfied with service provided by contract operator(s) (NA) 1 2 3 4 5
- The operator's authority and responsibilities are clearly defined 1 2 3 4 (5)

Policies and Plans: Please indicate with a check mark the items for which the water system has written policies or plans.

☒ standard specifications	☒ connection policies	☒ main extension policies
☒ bacteriological sampling plan	☒ emergency operation plan	☒ Lead & Copper sample plan
☒ cross connection control plan	☒ record management plan	☒ TTHM
☒ general rules	☒ disconnection policy	☒ public education & outreach
☒ disaster response plan	☒ personnel policy	☒ Safety/Risk Management Policy

- Based on the answers above the system has: clear organizational structure, defined staffing requirements, and appropriate rules/policies 1 2 3 4 (5)

Operations and Maintenance: The items that follow are elements that may be contained in a thorough Operations and Maintenance (O&M) manual. A complete O&M manual is useful as a quick reference for anything from trouble shooting to emergency procedures. Please indicate with a check mark those items contained in the system's O&M manual.

Introduction and Overview

☒ System name	☒ System ID#	☒ location
☒ design flow capacity	☒ type of treatment	☒ water source
☐ available training	☐ publications available	

☒ Statement of the purpose of the manual and relay to the operator how to best obtain pertinent information
☐ organizational chart (note which activities require qualified and licensed/certified personnel)

General System Description

☒ a flow schematic (source to distribution)
☒ pumping capabilities (source, chemicals, and high service)
☒ storage (raw, finished water, and chemicals)
☒ system map showing location of all wells, intake structures, pumping stations, storage tanks, and the defined service area

System Operation and Control

☒ identification of major system components including a description of the normal operation of each component
☐ possible alternative operation modes and circumstances under which they would be used
☒ schematic diagrams of each treatment process

- ☒ preventative maintenance program (include inspections performed when the facility is off-line)
- ☒ common operating problems with methods of bypassing while being repaired
- ☒ importance of and how to use laboratory tests for process control
- ☒ routine system operation for each major system component this should include startup and shutdown procedures, safety procedures, and meter reading
- ☐ evaluation of overall system performance

Laboratory Testing

- ☒ identification of samples and tests needed for compliance as well as for process control.
- ☒ sampling locations, time, and methods
- ☐ how to interpret laboratory results and the use of these results to improve the process
- ☒ what should be in laboratory supply and chemicals inventory
- ☐ list of laboratory references;
- ☒ instructions for filling out worksheets for a sample (include completed example)
- ☒ for tests to be performed by outside laboratories, the name of the laboratory, contact person, telephone number, and method of requesting sample pick-up or schedule for sample pick-up

Records and Reports Section

- ☒ a general explanation of the purpose and importance of accurate records and reports
- ☒ a log of complaints and responses
- ☒ daily logs, maintenance records, laboratory records, monthly reports, monitoring reports, sanitary surveys, annual reports, operating cost reports, and accident reports.
- ☒ historical records (permits, standards, pumping capacity, consumption, and drawdown)
- ☐ list of equipment warranties and provisions
- ☒ specific area for filing records
- ☒ procedures for reporting to appropriate agencies (specify how long records should be kept)

Maintenance

- ☒ general information including purpose and value of scheduled and preventative maintenance
- ☒ preventative maintenance schedule and sample worksheets with instructions
- ☒ specifications for fuels, lubricants, filters, etc. for equipment
- ☐ troubleshooting charts or guides which reference pages in manufacturers' O&M manual or system's O&M manual as appropriate
- ☒ a record of data plate information on each piece of equipment maintained, this should include manufacturers' maintenance schedule for routine adjustments
- ☒ a work order system for maintenance of equipment with sample forms to accurately track O&M costs for each piece of equipment
- ☒ brief operation instructions for each piece of equipment with reference to the manufacturers' technical specifications for major system components
- ☐ a mechanism for storage and check out of specialized equipment used infrequently
- ☒ list of outside contract maintenance tasks
- ☒ contact person and phone numbers for equipment manufacturers, major suppliers, and all utilities serving the system
- ☐ list of special tools used and how to replace
- ☒ stocks of spare parts, supplies, chemicals and other items vital to system operation
- ☒ a system of requisitions and/or work orders used to distribute parts, supplies, chemicals, etc. for reorder purposes

Emergency Response Program

- ☒ pre-response activity such as; personnel assignments, emergency equipment inventory, filling a storage tank before a storm hits, copies of all emergency numbers. Laminated copy of phone numbers to keep readily accessible should include water system personnel responsible for making decisions in specific situations; including name, job title, home and work phone number (pager/cell phone number if available), police, fire departments, and for chemical spills or exposure CHEMTECH 800-424-9300.

☒ safety procedures for all personnel involved in the response
☒ a contingency plan to ensure proper treatment of water even in adverse conditions which may include agreements with nearby water systems for equipment or personnel
☒ procedures for putting standby and emergency sources into active service
☒ procedures for notifying customers, the local health jurisdiction, and EPA of water quality problems
☒ systematic procedure for returning to normal operation

Appendix

The appendix can contain documents and other information that cannot be easily incorporated into the body of the manual. Large documents such as copies of plans and specifications may be stored separately from the main manual. The following list has examples of items that might be included in appendices. Please check all that apply to your O&M Manual.

☒ Detailed design criteria	☐ User Charge System	☐ Approved shop drawings
☒ Schematics	☒ Piping color codes	☐ Valve indices or schedule
☒ As-built drawings	☒ Drinking water rules/Ordinance	☒ Manufacturers' manuals

- Based on the answers above please rate the system's current O&M Manual. 1 2 3 (4) 5

The last set of questions is designed to help you evaluate the systems' source(s). Please read the item then circle the number from 1 (needs improving) to 5 (top notch) that you feel best describes your systems' current status relative to that item or check boxes as appropriate.

- System has an active Source Water Assessment Program 1 2 3 4 (5)

For Ground Water Systems:

- System has accurate historical information (like well driller's log and construction records) for each well 1 2 3 4 (5)
- Well(s) have the "zone of contribution" identified on a map 1 2 3 4 (5)
- No storage of potential contaminants in close proximity of well(s) 1 2 3 4 (5)
- Well(s) are housed and fenced and have an appropriate concrete pad 1 2 3 4 (5)
- Well casing(s) extend at least 12" above floor or ground 1 2 3 4 (5)

Name of aquifer is known: ☒ Yes ☐ No
Aquifer is: Surficial ☐ Confined ☒ Unconfined

For Surface Water Systems:

- Commercial, industrial, or agricultural operations up stream are identified 1 2 3 4 5
- System has provided a contact to these facilities in case of an accidental release 1 2 3 4 5
- System performs up stream monitoring 1 2 3 4 5
- System has a raw water reservoir of _____ gallons that acts as a buffer 1 2 3 4 5

Overall:

- System has adequate knowledge and program activity to protect and ensure an adequate supply of drinking water 10 years into the future 1 2 3 4 (5)

CERTIFICATION: I, the undersigned authorized representative of the applicant, hereby certify that all information contained in this form and attachments is true, correct, and complete to the best of my knowledge and belief. I also certify that I have been duly authorized to file the business plan and to provide these assurances.

Signature Of Authorized Representative 

Name (Please Print) Holly Vath

Title Acting Financial Services Director

Address 121 SW Flagler Ave.

City Stuart State FL 34994

Phone (772) 288-5319 Fax (772) 600-1280

BEFORE THE CITY COMMISSION
CITY OF STUART, FLORIDA
RESOLUTION NUMBER 115-2017

A RESOLUTION OF THE CITY COMMISSION OF THE CITY OF STUART, FLORIDA ADOPTING THE WATER, WASTEWATER, AND SANITATION RATE STUDY, PREPARED AND SUBMITTED BY PUBLIC RESOURCES MANAGEMENT GROUP, INC. DATED AUGUST 14, 2017. PROVIDING FOR AN EFFECTIVE DATE AND FOR OTHER PURPOSES.

* * * * *

WHEREAS, pursuant to various planned capital improvement projects, the City Commission has determined that water, wastewater, and sanitation rates must be adjusted to offset proposed debt service.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COMMISSION OF THE CITY OF STUART, FLORIDA that:

SECTION 1: The rate schedules in the Water, Wastewater, and Sanitation Rate Study dated August 14, 2017 attached hereto as Exhibit "A," are hereby adopted for use by the city in conjunction with the provision of water, wastewater, and sanitation services. The City Commission retains jurisdiction over the rates contained within the rate study and any administrative costs, which may be later amended from time to time, by Resolution.

SECTION 2: This resolution will become effective upon adoption.

RESOLUTION No. 115-2017
Water, Wastewater, and Sanitation Rate Study

Commissioner GLASS LEIGHTON offered the foregoing resolution and moved its adoption. The motion was seconded by Commissioner CLARKE and upon being put to a roll call vote, the vote was as follows:

	YES	NO	ABSENT	ABSTAIN
TROY A. MCDONALD, MAYOR	X			
KELLI GLASS LEIGHTON, VICE MAYOR	X			
JEFFREY A. KRAUSKOPF, COMMISSIONER	X			
EULA R. CLARKE, COMMISSIONER	X			
TOM CAMPENNI, COMMISSIONER	X			

ADOPTED this 28th day of August , 2017.

ATTEST:

CHERYL WHITE
CITY CLERK

KELLI GLASS LEIGHTON
VICE MAYOR

APPROVED AS TO FORM
AND CORRECTNESS:

MICHAEL MORTELL
CITY ATTORNEY

CITY OF STUART · FLORIDA · INCORPORATED 1914 · SAILFISH CAPITAL OF THE WORLD ·

City of Stuart, Florida
Water, Wastewater and Sanitation Rate Study

Prepared on: August 14, 2017

Prepared by: Public Resources Management Group, Inc.

Study Objectives

- Develop a funding strategy to pay for system operations and capital repairs & upgrades, including replacement of sanitation vehicles
- Estimate revenue requirements to be recovered from user rates
- Identify the need for future rate increases, if any

Study Considerations

- Increasing revenues from customer and sales growth
- Increasing operating expenses due to additional service demands from customer growth and estimated inflation
- Increased capital expenditures to maintain, rehabilitate and replace water and wastewater lines, lift stations, and other facilities, and the replacement of the sanitation fleet over time (10-year replacement cycle)
- Assumes the City will issue additional debt to help finance certain capital costs over a period of time
  - Strategy allows for the phasing-in of projected rate increases over the study period

Major Study Assumptions / Criteria

- Revenues at existing rates are projected to increase approximately 1% per year on average
  - Includes infill in the existing sewer basins and proposed expansion into six (6) additional sewer basins with 531 possible connections
- Operating expenses anticipated to increase between 2.7% and 3.5% annually for sanitation and water & wastewater systems, respectively
  - Includes $600,000 per year in incremental operating expenses associated with the proposed new water treatment improvements that are phased in from FY20 to FY22
- Study addresses funding of City priority projects including:
  - Public Works' Complex - $4.5 million
  - Water Treatment Plant Improvements - $10.1 million
  - Sewer System Expansion - $767,250 after considering matching grants
  - Large Meter Conversion and Force Main Replacements - $1,275,000

Major Study Assumptions / Criteria (cont.)

- Proposed future water and wastewater debt
  - Series 2018 SRF Loan – Water Treatment Plant Improvements
    - $8.6 million in project costs after using $1.5 million in availability fees
    - 20 years at 2.5% annual interest; 2-years capitalized interest
    - $575,400 annual payment beginning in FY20
  - Series 2018 Bank Loan – Sewer Expansion
    - $767,250 in project costs after considering 50% matching grants
    - 10 years at 3.0% annual interest; 2-years capitalized interest
    - $141,032 annual payment beginning in FY20
  - Series 2018 Bank Loan – Large Meter Conversion & Force Main Replacements
    - $1,275,000 in project costs
    - 10 years at 3.0% annual interest; 2-years capitalized interest
    - $234,341 annual payment beginning in FY20

Major Study Assumptions / Criteria (cont.)

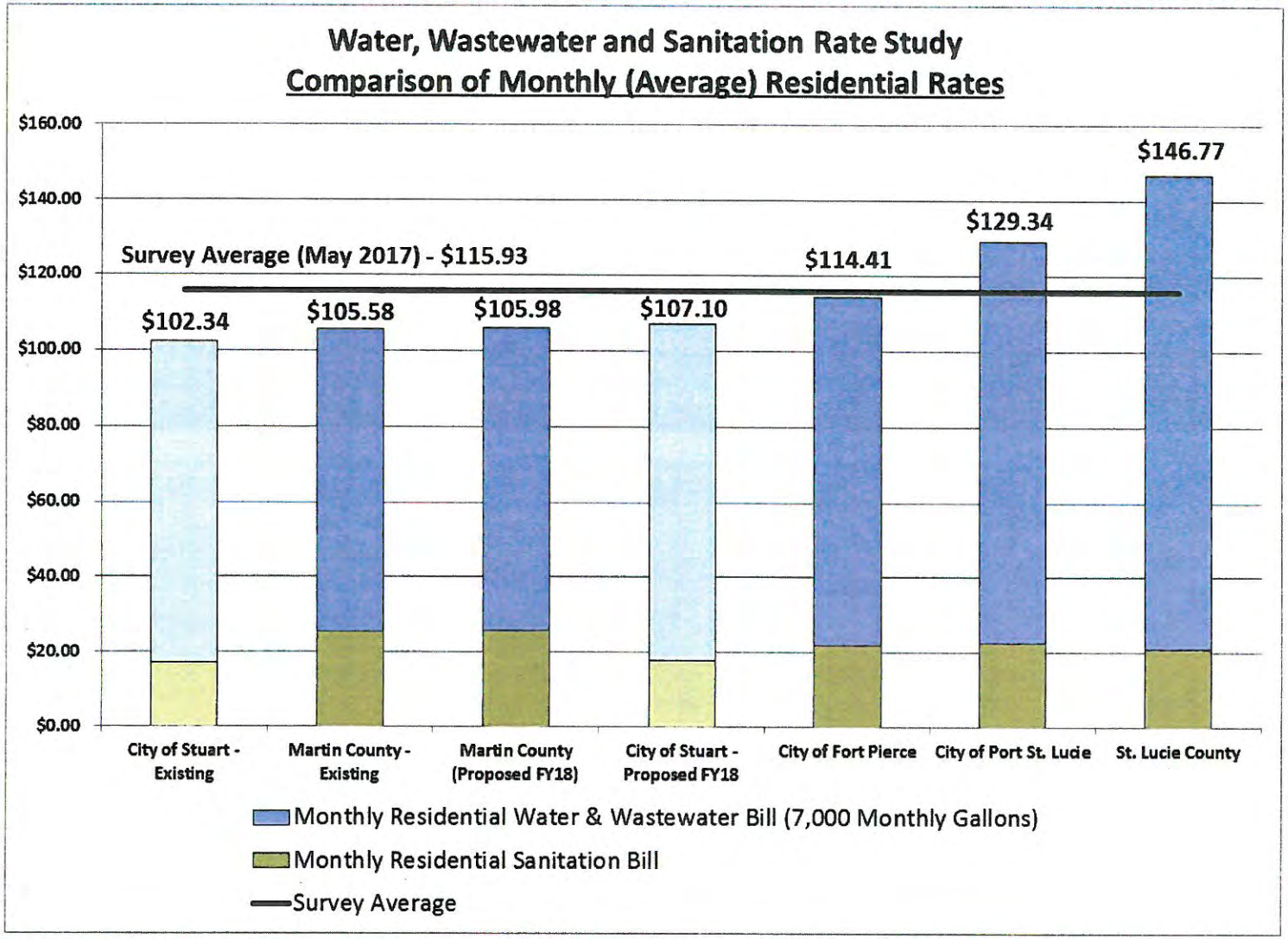
- Proposed future sanitation debt
  - Series 2019 Bank Loan – Public Works' Complex
    - $4.0 million in project costs after using $500,000 in reserves
    - 15 years at 3.5% annual interest; 2-years capitalized interest
    - $423,771 annual payment beginning in FY21
- Maintain minimum operating reserve balances of not less than 25% of the operating expenses or 90 days
- Phase-in projected rate adjustments using reserve balances above the minimum requirement in the short-term while ensuring that revenues are adequate to meet the annual expenditure needs without the use of reserves by FY22

Summary of Proposed Rate Adjustments

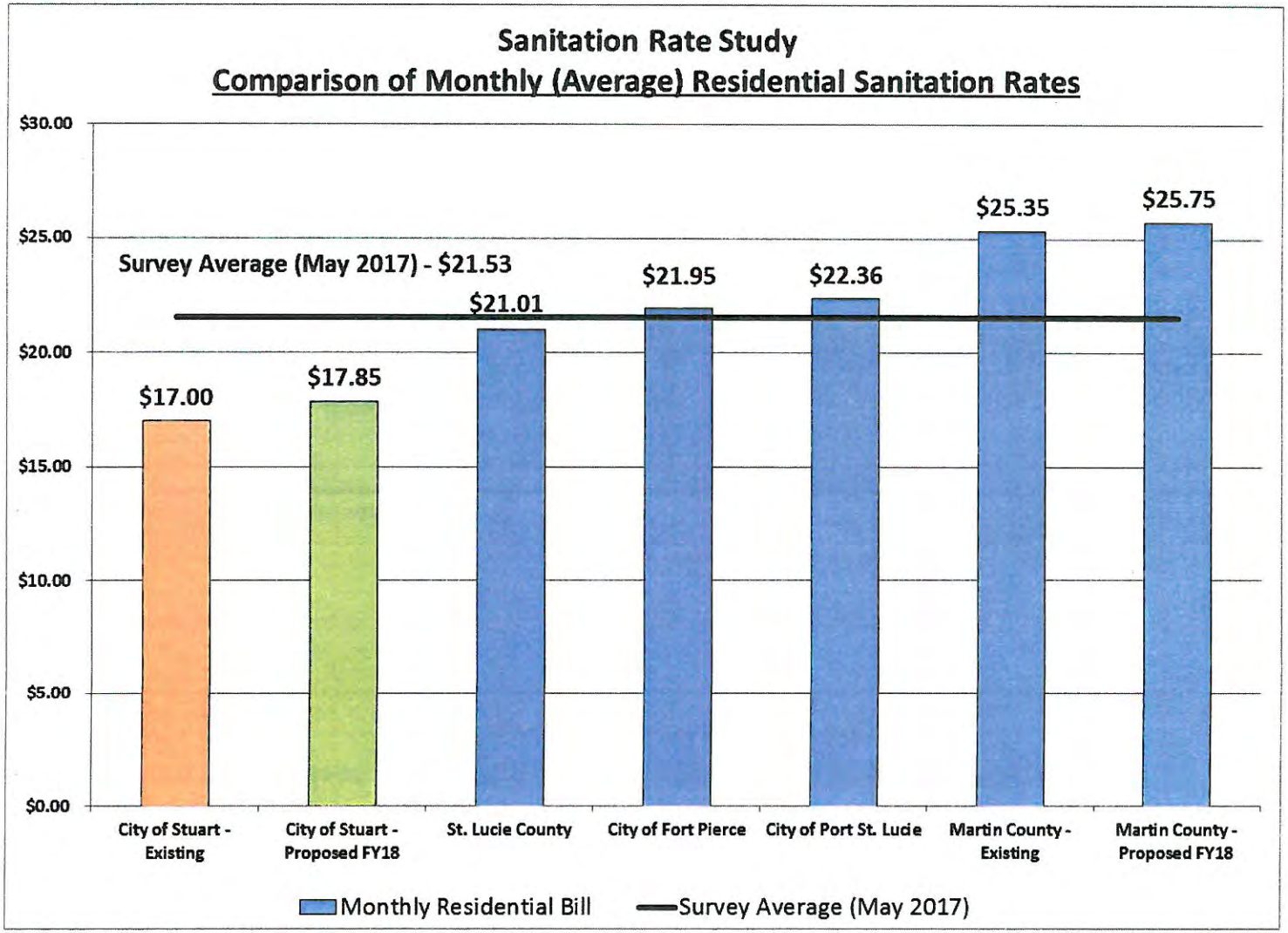
Summary of Proposed Rate Adjustments					
Description	2018	2019	2020	2021	2022
Water System	7%	7%	7%	2%	2%
Wastewater System	3%	3%	3%	2%	2%
Sanitation System	5%	5%	5%	5%	5%

Estimated Residential Bill for Water, Wastewater & Sanitation Services – 7,000 Monthly Gallons						
Description	Existing	2018	2019	2020	2021	2022
Water Bill	$33.13	$35.47	$37.95	$40.60	$41.43	$42.27
Wastewater Bill	$52.21	$53.78	$55.42	$57.07	$58.22	$59.38
Sanitation Bill	$17.00	$17.85	$18.74	$19.68	$20.66	$21.69
Total Bill	$102.34	$107.10	$112.11	$117.35	$120.31	$123.34
Percent Increase		4.7%	4.7%	4.7%	2.5%	2.5%

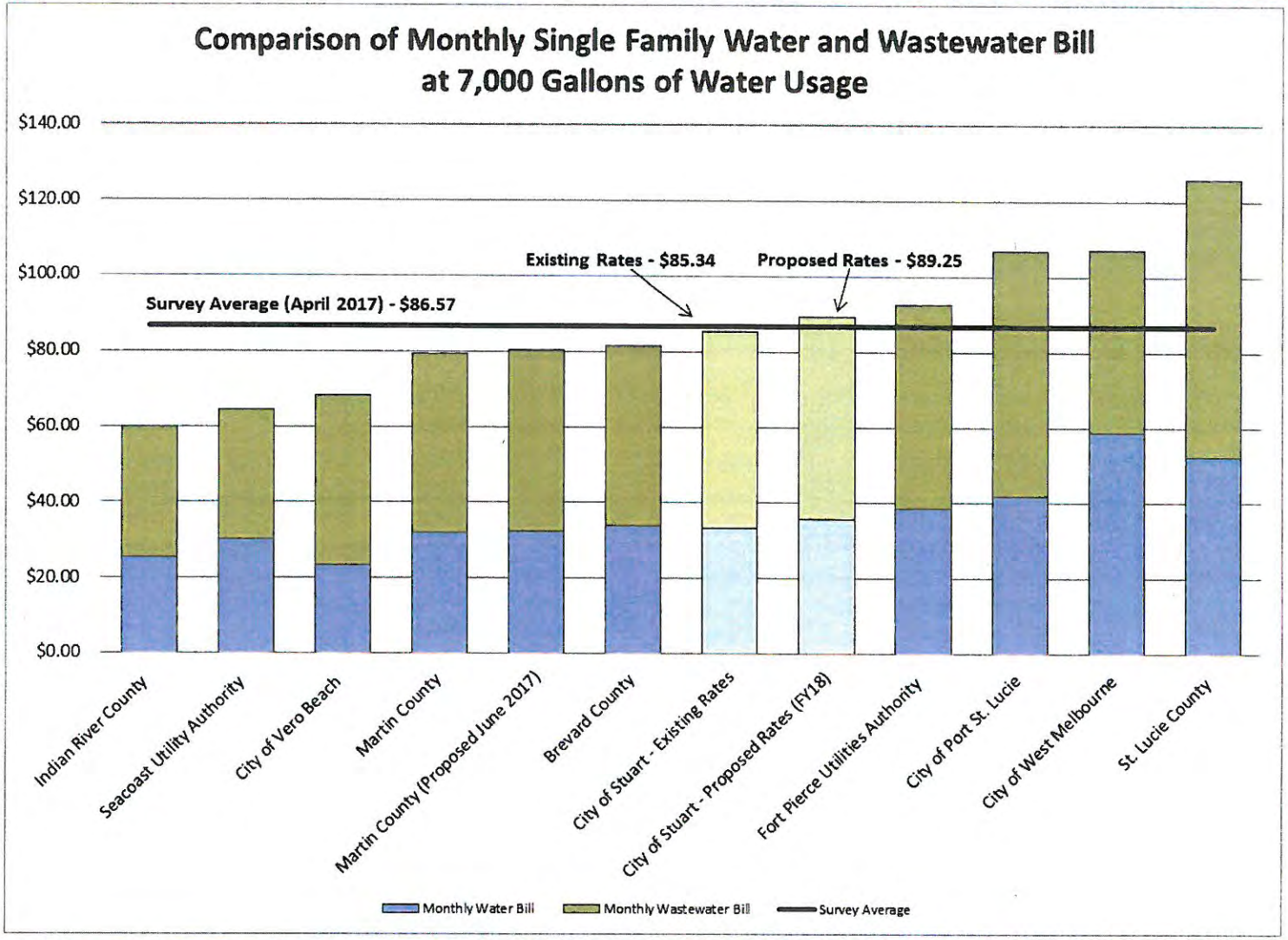
Comparison of Proposed Monthly Residential Bills – Combined FY18



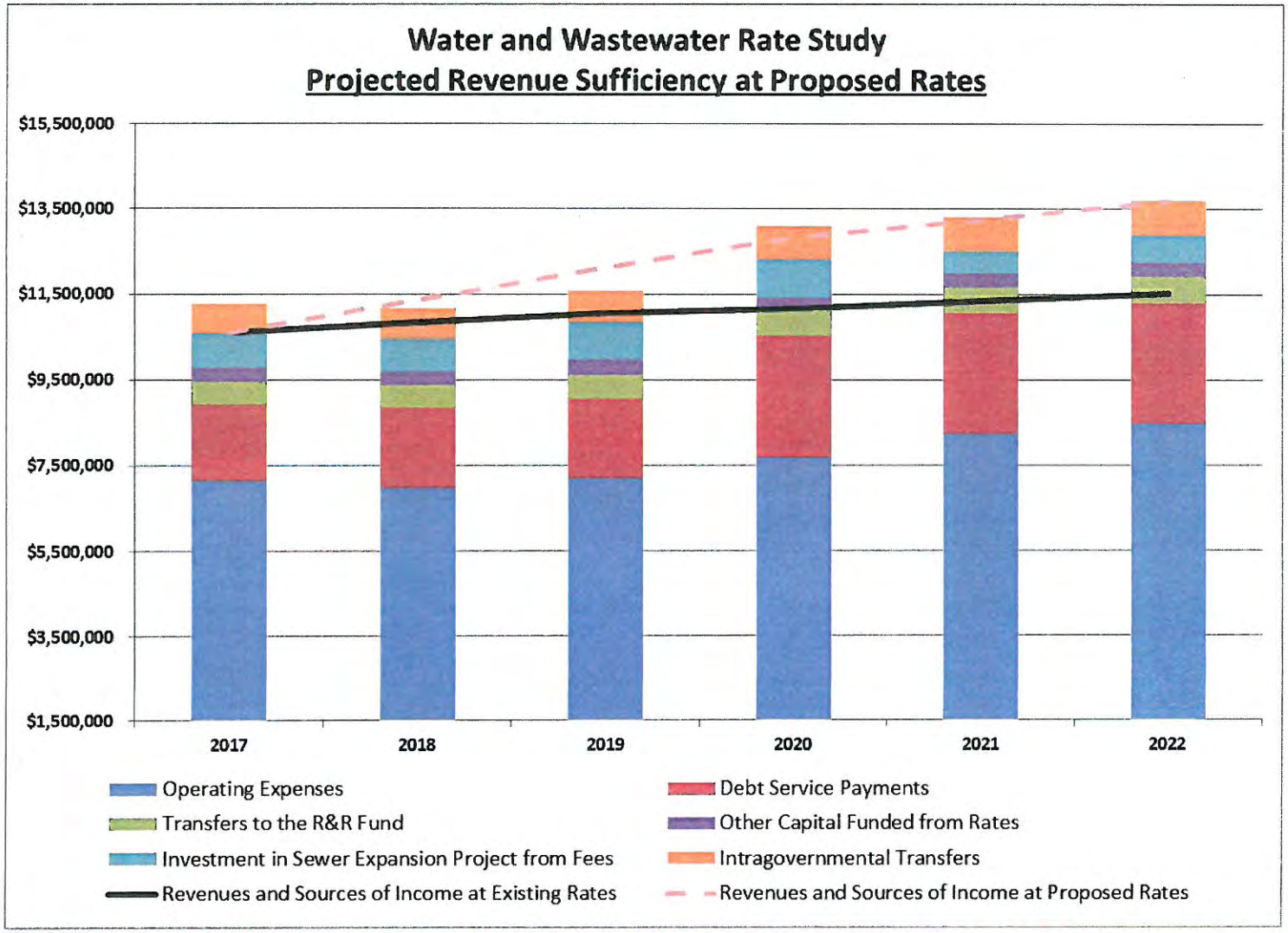
Comparison of Proposed Monthly Sanitation Bills for Residential Service



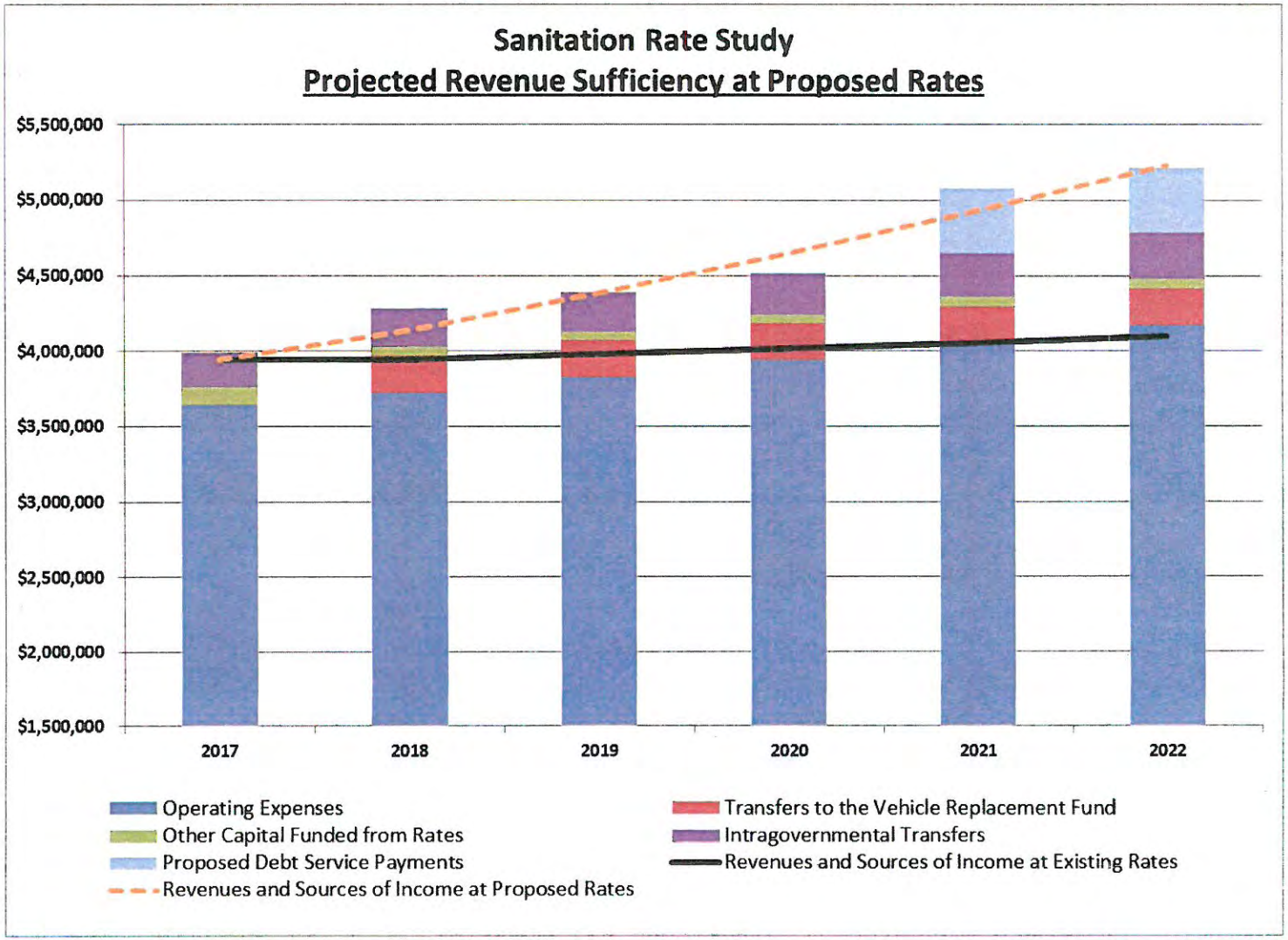
Comparison of Proposed Monthly Water and Wastewater Bills for Residential Service



Projected Adequacy of Proposed Water and Wastewater Rates



Projected Adequacy of Proposed Sanitation Rates



Recommendations & Conclusions

- The City's existing water, wastewater and sanitation rates are not adequate to meet the projected expenditure requirements of each system through FY22
- The City should consider adopting the proposed sanitation, water and wastewater rates as outlined in this study beginning with bills rendered on or after October 1, 2017 and every October 1st thereafter
- The proposed rates are competitive when compared to neighboring utility systems for similar services
- The City should consider updating this study within five years

Discussion & Questions



Supplemental Water, Wastewater and Sanitation Rate Study Information

Major Study Assumptions and Development of Projected Revenue Requirements

Prepared on: August 14, 2017
Prepared by: Public Resources Management Group., Inc.

Projection of Revenues

- Projected revenue growth of approximately 1% per year on average
- Includes infill growth in existing sewer basins of approximately 125 connections per year
- Includes expansion into six (6) additional basins with 531 possible connections (400 new connections phased in over 10-years)
  - Based on 50% matching grants and financing the difference through a bank loan over 10-years
- Existing and future sewer expansion fee revenues used to perpetually fund the purchase of new grinder systems as connections are assumed to be made
  - Requires additional funding from user rates over the study period
- Miscellaneous income generally held constant

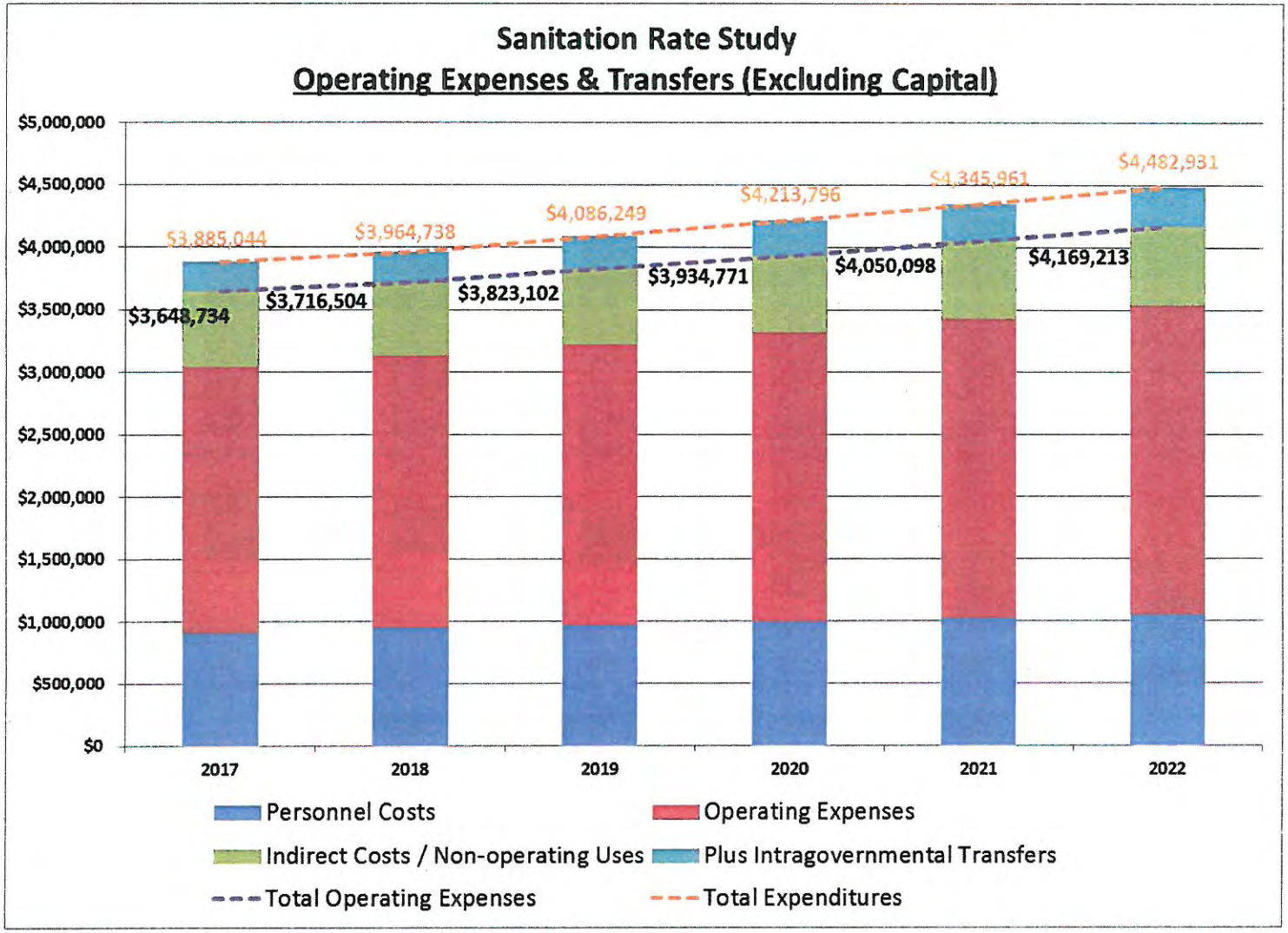
Projection of Operating Expenses

- Based on the Adopted FY17 & Proposed FY18 Budgets
- Expenses increased beyond FY18 as follows:
  - Labor: 2% per year
  - Health Insurance: 6% per year
  - Workers' Compensation & Liability Insurance: 3% per year
  - Utility & Fuel Costs: 5% per year
  - Repairs & Maintenance Expenses: 3% per year
  - All other costs based on CPI or 2.4% per year on average
- Incremental operating expenses assumed based on the water treatment plant improvements beginning in FY20 at $290,000 per year and increasing to $605,000 by FY22

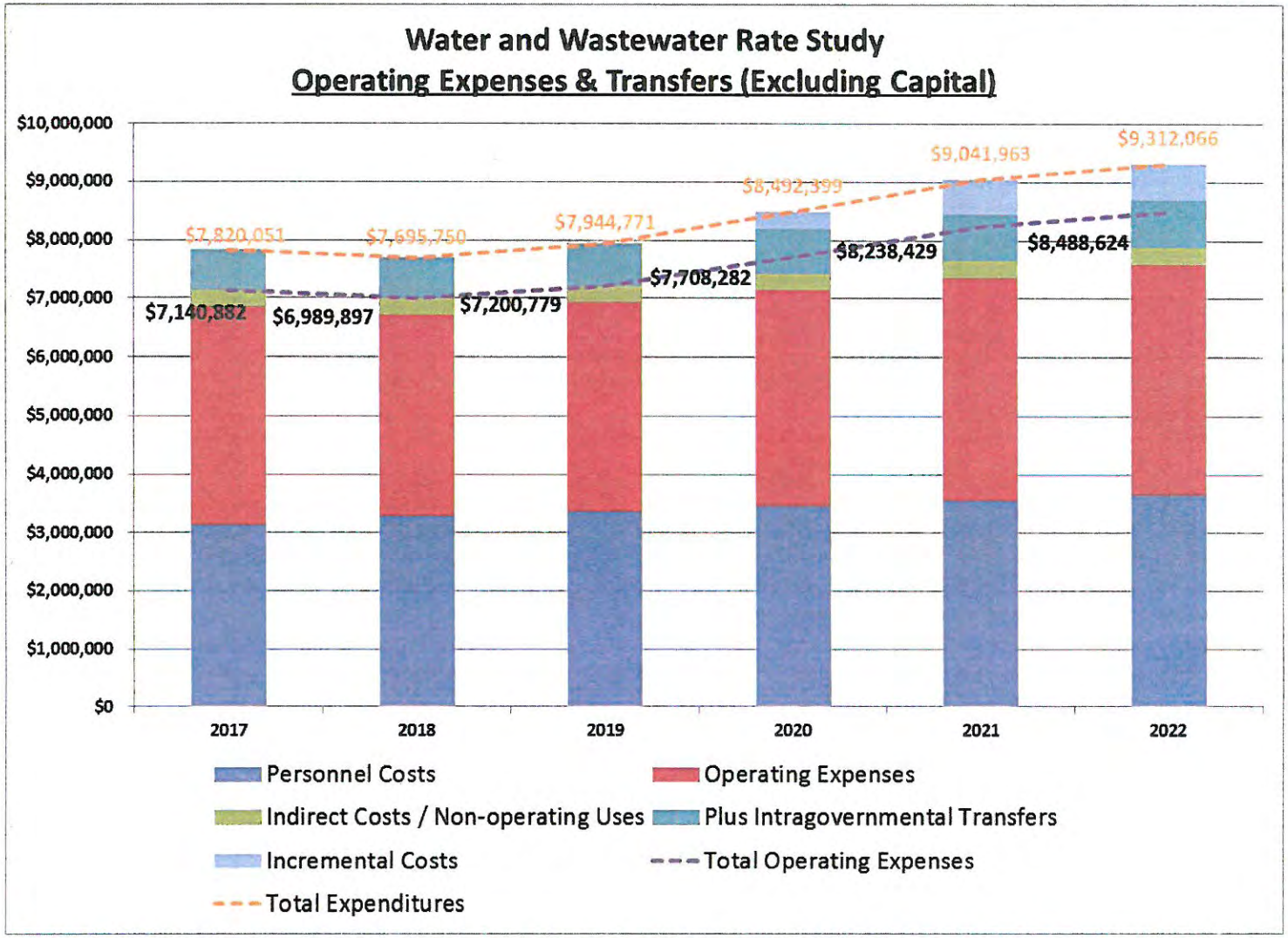
Projection of General Fund Transfers

- Based on the Adopted FY17 and Proposed FY18 Budgets or approximately 6.0% of Gross Revenues
  - Sanitation: $248,000 per year
  - Water and Wastewater: $706,000 per year

Projection of Sanitation Expenses



Projection of Water & Wastewater Expenses



Capital Improvement Program

- Sanitation: $6.1 million through Fiscal Year 2022
  - Includes $4.5 million for Public Works' Complex
  - Primarily includes vehicle replacements
  - Established a Vehicle Replacement Fund with a current balance of $500,000 and funded $250,000 per year from rates based the planned expenditures, which reflect a 10-year replacement horizon
- Water & Wastewater: $27.1 million through Fiscal Year 2022
  - $10.1 million in Water Treatment Plant Improvements
  - $1.5 million in Sewer Expansion Projects (Assumed 50% Matching Grants)
    - $4.8 million in Grinder Systems funded through existing and future sewer expansion fees and user rates when the connections occur
  - $1.2 million in Large Meter Conversions and Force Main Replacements for Monterey Road and Stuart Middle
  - Additional amounts to fund recurring renewals and replacements of other system assets and infrastructure

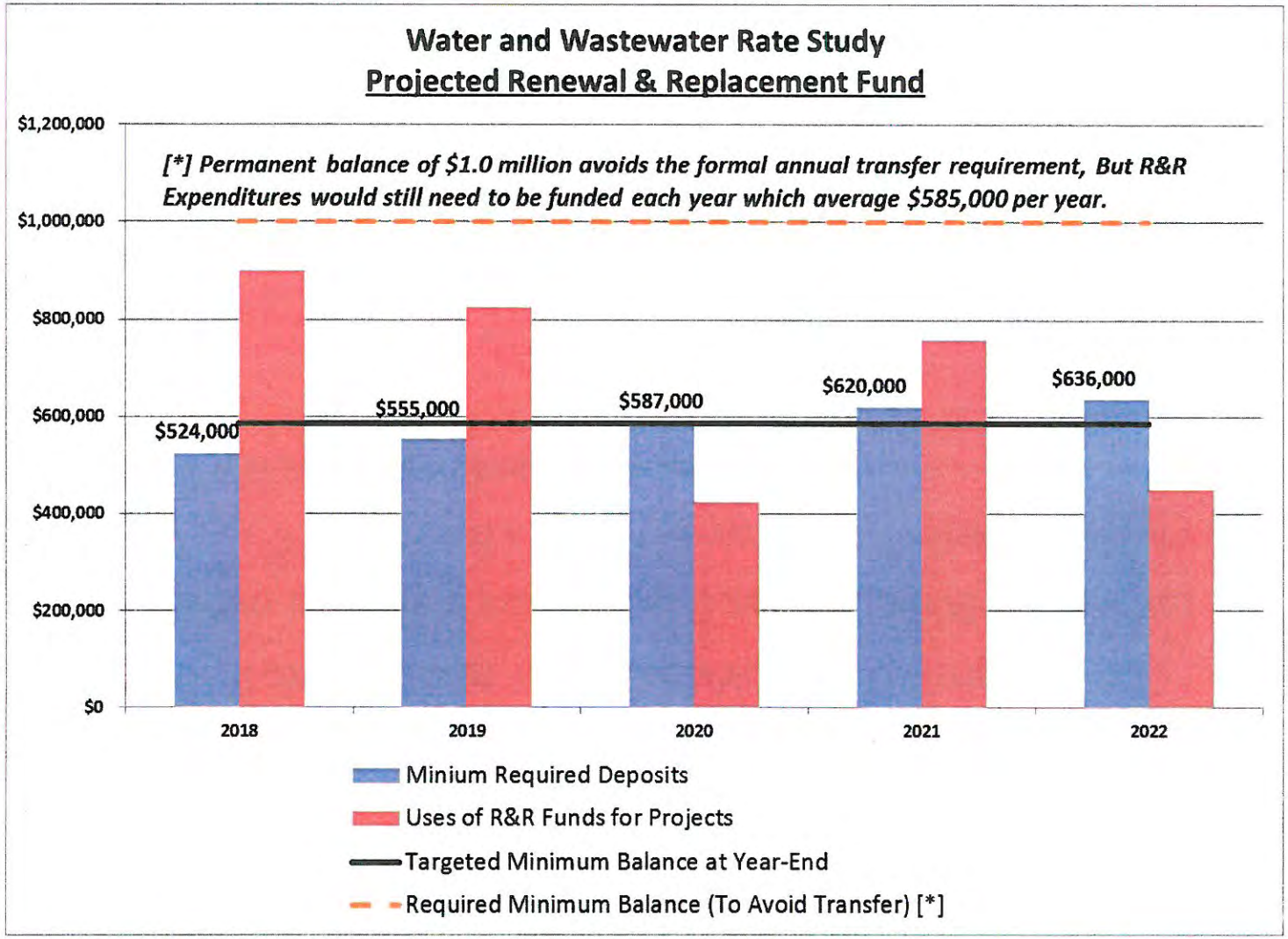
Proposed Debt

- Proposed future water and wastewater debt
  - Series 2018 SRF Loan – Water Treatment Plant Improvements
    - $8.6 million in project costs after using $1.5 million in availability fees
    - 20 years at 2.5% annual interest; 2-years capitalized interest
    - $575,400 annual payment beginning in FY20
  - Series 2018 Bank Loan – Sewer Expansion
    - $767,250 in project costs after considering 50% matching grants
    - 10 years at 3.0% annual interest; 2-years capitalized interest
    - $141,032 annual payment beginning in FY20
  - Series 2018 Bank Loan – Large Meter Conversion & Force Main Replacements
    - $1,275,000 in project costs
    - 10 years at 3.0% annual interest; 2-years capitalized interest
    - $234,341 annual payment beginning in FY20

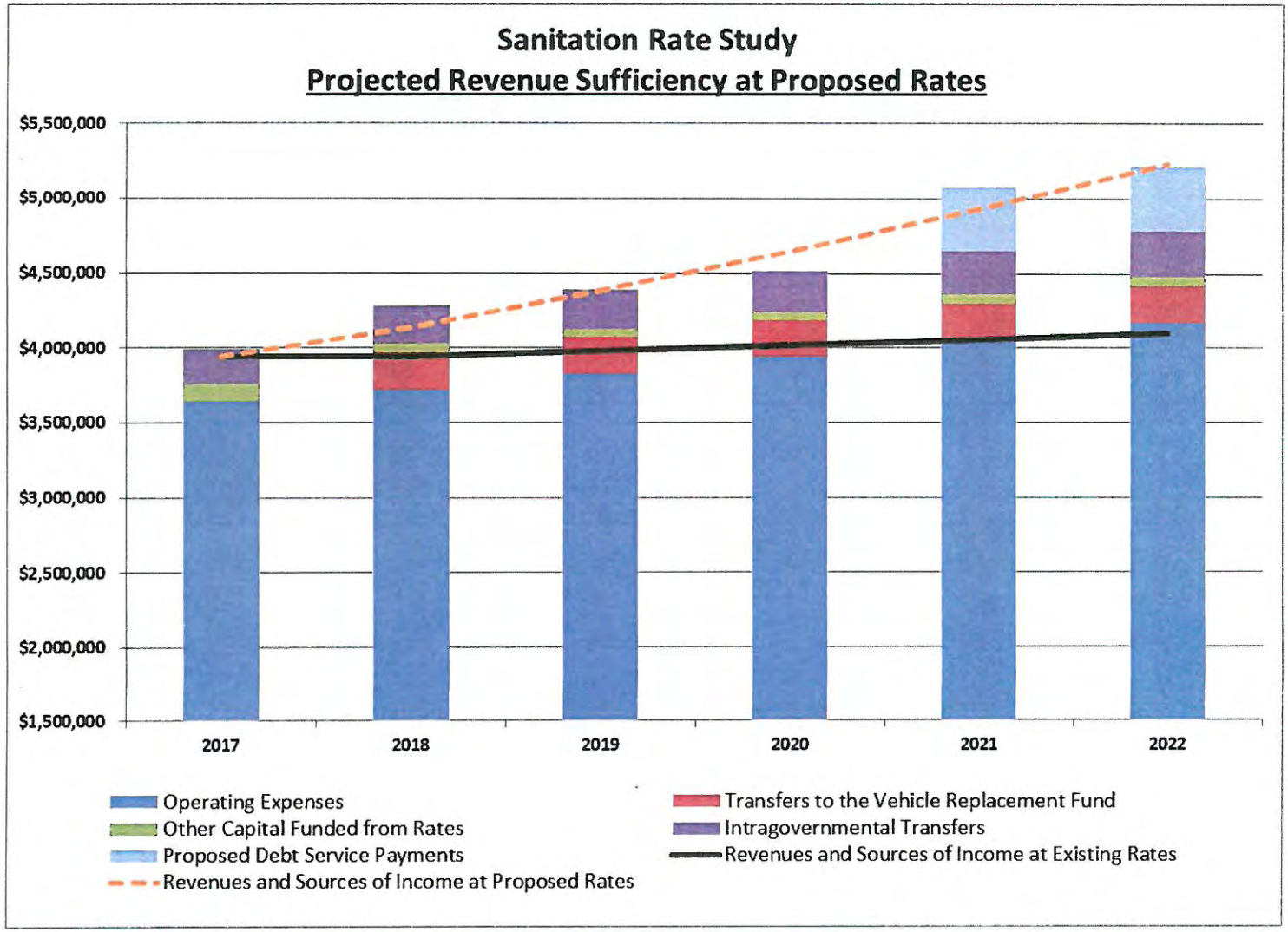
Proposed Debt (cont.)

- Proposed future sanitation debt
  - Series 2019 Bank Loan – Public Works' Complex
    - $4.0 million in project costs after using $500,000 in reserves
    - 15 years at 3.5% annual interest; 2-years capitalized interest
    - $423,771 annual payment beginning in FY21

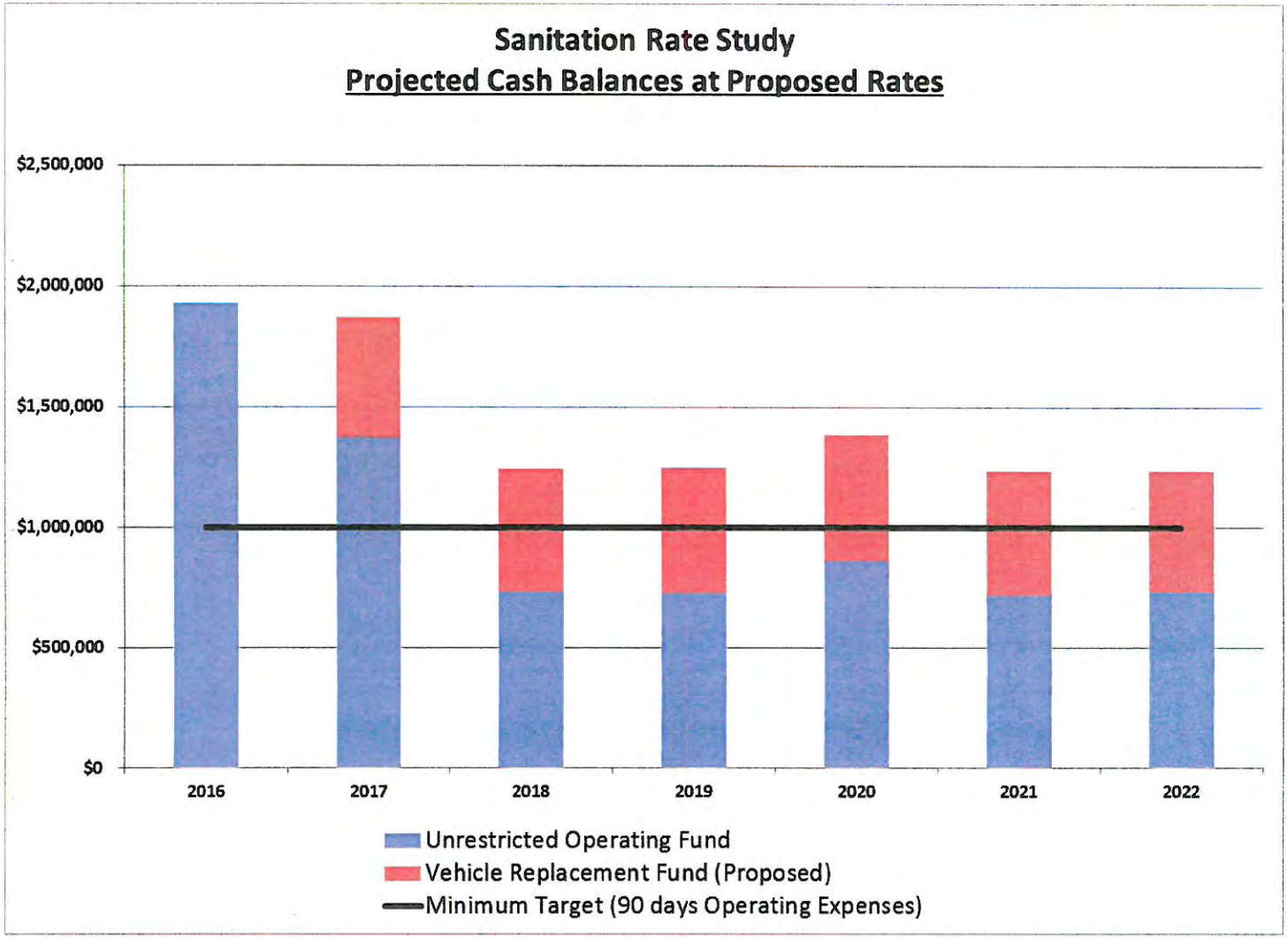
Projection of Water and Wastewater R&R Fund Transfers



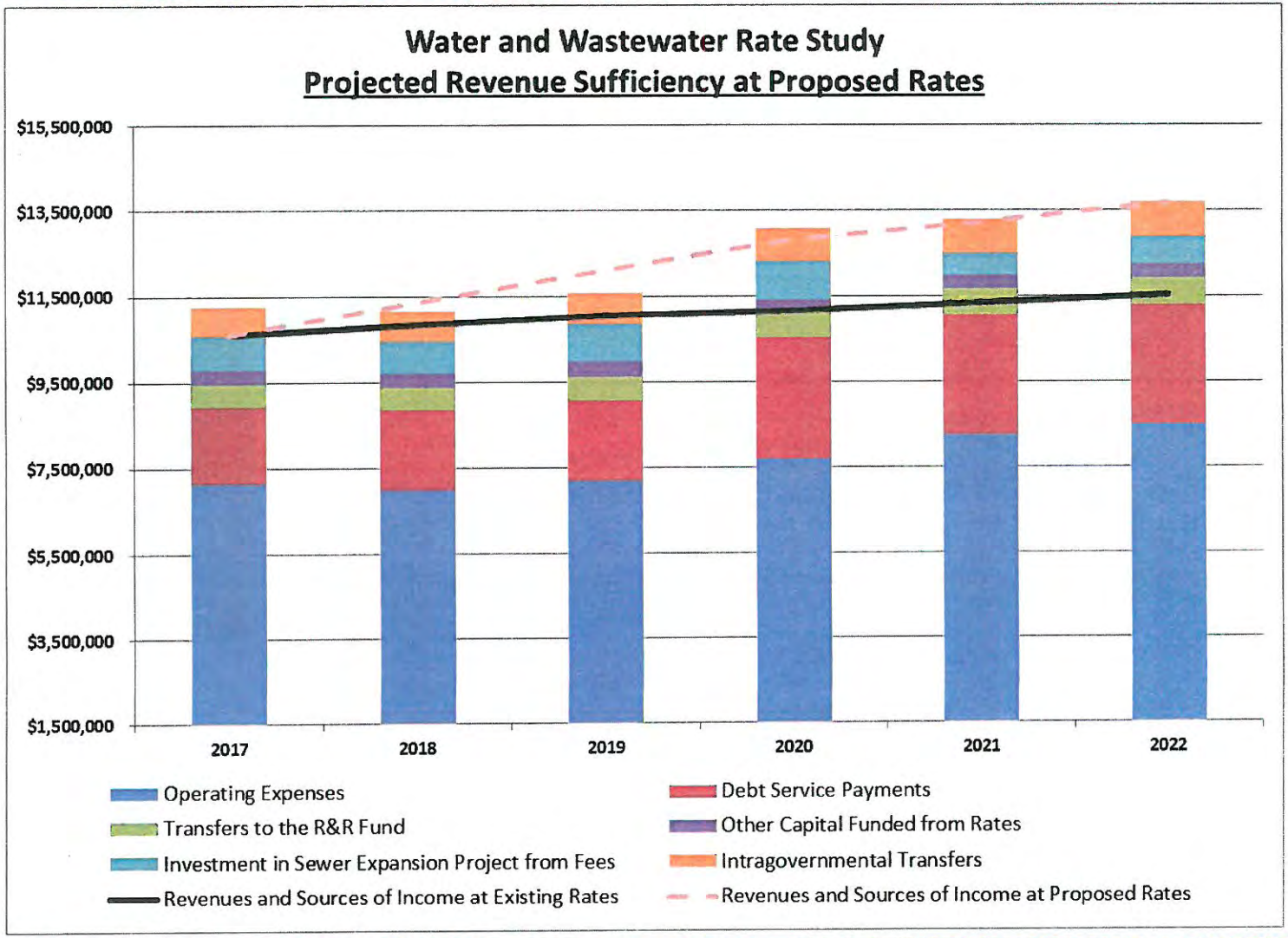
Projected Adequacy of Proposed Sanitation Rates



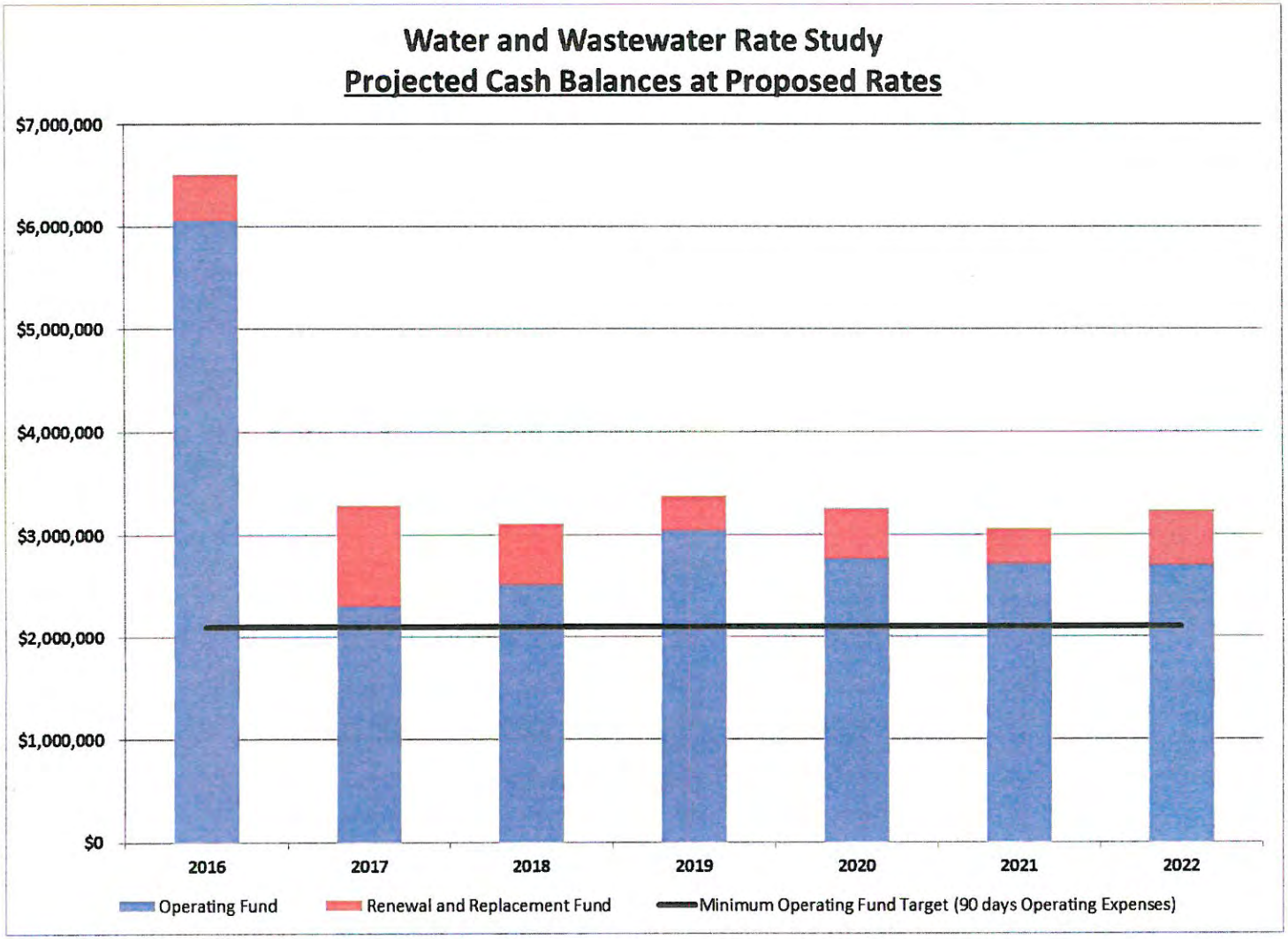
Projected Adequacy of Proposed Sanitation Rates



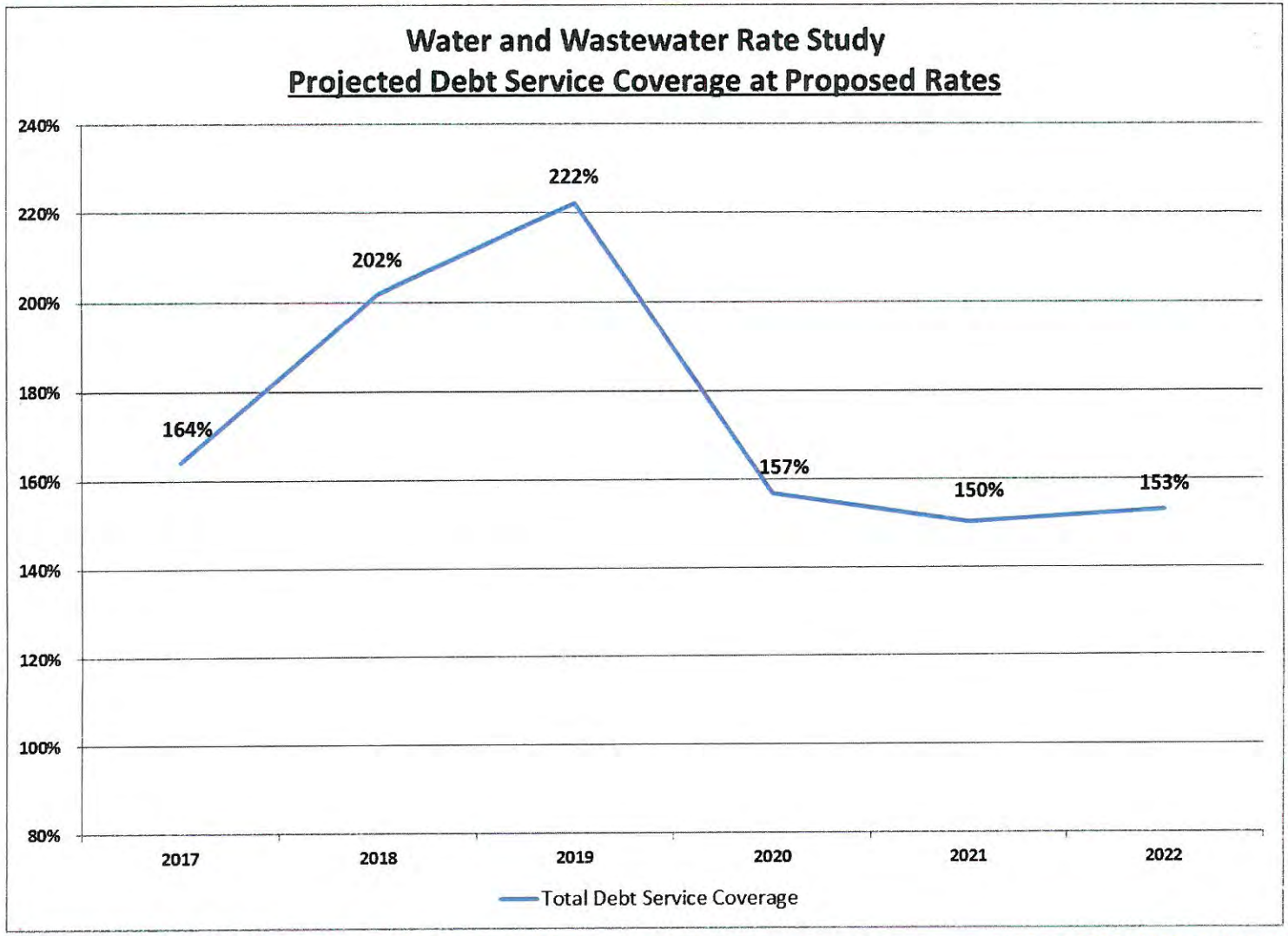
Projected Adequacy of Proposed Water and Wastewater Rates



Projected Adequacy of Proposed Water and Wastewater Rates



Projected Adequacy of Proposed Water and Wastewater Rates



Appendices

Appendix A – Sanitation Rate Study Tables
Appendix B – Water and Wastewater Rate Study Tables

Appendix A
City of Stuart
Sanitation Rate Study

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3	Summary of Projected Escalation Factors
4	Capital Funding Program
5	Projected Intragovernmental Transfers
6	Projected Sanitation Revenue Requirements
7	Projected Fund Balances
8	Proposed Sanitation Rates
9	Comparison of Residential Sanitation Rates

Table 1
City of Stuart
Sanitation Rate Study

Projected Operating and Miscellaneous Revenue at Existing Rates

Line No	Description		Budgeted 2017 [1]	Proposed Adjustments	Adjusted 2017	Budgeted 2018 [1]	Proposed Adjustments	Adjusted 2018	Escalation Reference [2]	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	SYSTEM REVENUES												
	Charges for Service												
1	Residential Garbage	343401	$568,486	$1,514	$570,000	$574,086	$914	$575,000	Marginal	$580,750	$586,558	$592,423	$598,347
2	Commercial Garbage	343403	3,188,288	136,712	3,325,000	3,187,499	137,501	3,325,000	Marginal	3,358,250	3,391,833	3,425,751	3,460,008
3	Delinquent Garbage Fees	343410	5,500	0	5,500	5,500	0	5,500	Constant	5,500	5,500	5,500	5,500
4	Trash Collections	343420	28,000	0	28,000	25,000	0	25,000	Constant	25,000	25,000	25,000	25,000
5	Utility Service charges	343910	4,000	0	4,000	4,000	0	4,000	Constant	4,000	4,000	4,000	4,000
6	Other Utility Charges		0	0	0	0	0	0	Constant	0	0	0	0
7	**Total Charges for Service**		$3,794,274	$138,226	$3,932,500	$3,796,085	$138,415	$3,934,500		$3,973,500	$4,012,890	$4,052,674	$4,092,856
	Miscellaneous Revenue												
	Disposition of Fixed Assets	364000	$26,500	$0	$26,500	$2,500	$0	$2,500	Eliminate	$0	$0	$0	$0
8	Sale of Surplus and Scrap	365000	0	0	26,500	0	0	2,500	Eliminate	0	0	0	0
	Total Miscellaneous Revinue		$26,500	$0	$53,000	$2,500	$0	$5,000		$0	$0	$0	$0
	Other Sources												
9	Trans FR Other Reserves	381248	$21,000	(21,000)	0	$0	0	0	Constant	0	0	0	0
10	Proprietary-Interest [3]	389100	0	0	0	0	0	0	Constant	0	0	0	0
11	Funds FR Retained Earning and Debt Proceeds [4]	389972	396,964	(396,964)	0	565,000	(565,000)	0	Constant	0	0	0	0
12	**Total Other Sources**		$417,964	($417,964)	$0	$565,000	($565,000)	$0		$0	$0	$0	$0
13	**TOTAL SYSTEM REVENUES**		$4,238,738	($279,738)	$3,985,500	$4,363,585	($426,585)	$3,939,500		$3,973,500	$4,012,890	$4,052,674	$4,092,856

Footnotes:

[1] Based on budgeted figures for the Fiscal Year 2017 Adopted Budget and 2018 Preliminary Budget. FY18 amounts exclude any rate increase or index that was assumed in the budget.

[2] Escalation factors and attributes derived from Table 3.

[3] Interest Income, if any, was removed from this schedule which is then calculated in Table 8 based on the annual average balance of each fund.

[4] Transfers from Retained Earnings reflect the amount of annual expenditures in excess of revenues for each Fiscal Year. Such amounts, if any, are calculated in Table 6.

Table 2
City of Stuart
Sanitation Rate Study

Projected Operating Expenses

Line No	Description		Budgeted 2017 [1]	Proposed Adjustments	Adjusted 2017	Budgeted 2018 [1]	Proposed Adjustments	Adjusted 2018	Escalation Reference [2]	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	OPERATING EXPENSES												
	Residential Collection (1710)												
	Personnel Services												
1	Regular Salaries and Wages	512	$96,387	$0	$96,387	$99,140	$0	$99,140	Labor	$101,123	$103,145	$105,208	$107,312
2	Overtime	514	11,000	0	11,000	15,000	0	15,000	Labor	15,300	15,606	15,918	16,236
3	Special Pay	515	3,236	0	3,236	7,736	0	7,736	Labor	7,891	8,049	8,210	8,374
4	FICA Taxes	521	8,463	0	8,463	9,257	0	9,257	Labor	9,442	9,631	9,824	10,020
5	Retirement Contributions	522	10,353	0	10,353	12,272	0	12,272	Labor	12,517	12,768	13,023	13,284
6	Life and Health Insurance	523	19,340	0	19,340	13,983	0	13,983	Ins-Health	14,822	15,711	16,654	17,653
7	Workers' Compensation	524	5,346	0	5,346	5,427	0	5,427	Worker Comp	5,590	5,758	5,930	6,108
8	Total Personnel Services		$154,125	$0	$154,125	$162,815	$0	$162,815		$166,685	$170,667	$174,767	$178,988
	Operating Expenses												
9	Professional Services	531	$18,500	$0	$18,500	$0	$0	$0	Inflation	$0	$0	$0	$0
10	Other Contractual Services	534	21,350	0	21,350	23,125	0	23,125	Contract	23,588	24,059	24,540	25,031
11	Travel and Per Diem	540	3,080	0	3,080	4,675	0	4,675	Inflation	4,783	4,897	5,015	5,135
12	Freight / Postage Services	542	3,095	0	3,095	3,095	0	3,095	Inflation	3,166	3,242	3,320	3,400
13	Utility Services	543	10,950	0	10,950	0	0	0	Inflation	0	0	0	0
14	Tipping Fees	543	180,000	0	180,000	180,000	0	180,000	Disposal	185,981	192,349	198,935	205,747
15	Rentals and Leases	544	1,080	0	1,080	1,080	0	1,080	Inflation	1,105	1,131	1,159	1,186
16	Insurance	545	5,080	0	5,080	5,156	0	5,156	Insurance	5,311	5,470	5,634	5,803
17	Repairs and Maintenance	546	46,000	0	46,000	46,000	0	46,000	Repair	47,380	48,801	50,265	51,773
18	Printing and Binding	547	2,300	0	2,300	3,600	0	3,600	Inflation	3,683	3,771	3,862	3,954
19	Promotional Activities	548	11,000	0	11,000	14,800	0	14,800	Inflation	15,140	15,504	15,876	16,257
20	Other Current Charges	549	0	0	0	15,000	0	15,000	Inflation	15,345	15,713	16,090	16,477
21	Office Supplies	551	1,030	0	1,030	500	0	500	Inflation	512	524	536	549
22	Operating Supplies	552	37,570	0	37,570	37,985	0	37,985	Inflation	38,859	39,791	40,746	41,724
23	Fuel for Trucks	552	27,409	0	27,409	35,000	0	35,000	Fuel	36,750	38,588	40,517	42,543
24	Books and Memberships	554	558	0	558	750	0	750	Inflation	767	786	805	824
25	Training	555	2,718	0	2,718	6,000	0	6,000	Inflation	6,138	6,285	6,436	6,591
26	Total Operating Expenses		$371,720	$0	$371,720	$376,766	$0	$376,766		$388,507	$400,913	$413,737	$426,994
	Capital Outlay [3]												
27	Buildings	562	$0	$0	$0	$200,000	($200,000)	$0	Eliminate	$0	$0	$0	$0
28	Infrastructure	563	0	0	0	0	0	0	Eliminate	0	0	0	0
29	Machinery & Equipment	564	0	0	0	0	0	0	Eliminate	0	0	0	0
30	Total Capital Outlay		$0	$0	$0	$200,000	($200,000)	$0		$0	$0	$0	$0
31	**Total Residential Collection (1710)**		$525,845	$0	$525,845	$739,581	($200,000)	$539,581		$555,192	$571,580	$588,504	$605,982
	Commercial Collection (1720)												
	Personnel Services												
32	Regular Salaries and Wages	512	$409,740	$0	$409,740	$416,168	$0	$416,168	Labor	$424,491	$432,981	$441,641	$450,474
33	Overtime	514	24,500	0	24,500	24,500	0	24,500	Labor	24,990	25,490	26,000	26,520
34	Special Pay	515	3,716	0	3,716	9,716	0	9,716	Labor	9,910	10,109	10,311	10,517
35	FICA Taxes	521	33,504	0	33,504	34,388	0	34,388	Labor	35,076	35,777	36,493	37,223
36	Retirement Contributions	522	33,918	0	33,918	38,133	0	38,133	Labor	38,896	39,674	40,467	41,276
37	Life and Health Insurance	523	95,799	0	95,799	112,373	0	112,373	Ins-Health	119,115	126,262	133,838	141,868
38	Workers' Compensation	524	18,525	0	18,525	18,803	0	18,803	Worker Comp	19,367	19,948	20,547	21,163

Table 2
City of Stuart
Sanitation Rate Study

Projected Operating Expenses

Line No.	Description		Budgeted 2017 [1]	Proposed Adjustments	Adjusted 2017	Budgeted 2018 [1]	Proposed Adjustments	Adjusted 2018	Escalation Reference [2]	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
39	Total Personnel Services		$619,702	$0	$619,702	$654,081	$0	$654,081		$671,846	$690,241	$709,296	$729,040
	Operating Expenses												
40	Professional Services	531	$28,500	$0	$28,500	$25,000	$0	$25,000	Inflation	$25,575	$26,189	$26,817	$27,461
41	Other Contractual Services	534	82,920	0	82,920	62,800	0	62,800	Contract	64,056	65,337	66,644	67,977
42	Other Contractual Services - Hauling Services	534	45,000	0	45,000	25,000	0	25,000	Hauling	26,513	28,117	29,818	31,622
43	Travel and Per Diem	540	2,000	0	2,000	3,000	0	3,000	Inflation	3,069	3,143	3,218	3,295
44	Communication Services	541	1,169	0	1,169	1,180	0	1,180	Inflation	1,207	1,236	1,266	1,296
45	Freight / Postage Services	542	1,030	0	1,030	1,030	0	1,030	Inflation	1,054	1,079	1,105	1,131
46	Utility Services	543	1,175	0	1,175	0	0	0	Inflation	0	0	0	0
47	Tipping Fees	543	1,068,180	0	1,068,180	1,080,600	0	1,080,600	Disposal	1,116,508	1,154,738	1,194,276	1,235,168
48	Rentals and Leases	544	2,160	0	2,160	2,200	0	2,200	Inflation	2,251	2,305	2,360	2,417
49	Insurance	545	18,781	0	18,781	19,064	0	19,064	Insurance	19,636	20,225	20,832	21,457
50	Repairs and Maintenance	546	86,000	0	86,000	106,000	0	106,000	Repair	109,180	112,455	115,829	119,304
51	Printing and Binding	547	2,000	0	2,000	4,000	0	4,000	Inflation	4,092	4,190	4,291	4,394
52	Promotional Activities	548	4,800	0	4,800	6,800	0	6,800	Inflation	6,956	7,123	7,294	7,469
53	Other Current Charges	549	0	0	0	15,000	0	15,000	Inflation	15,345	15,713	16,090	16,477
54	Office Supplies	551	1,000	0	1,000	500	0	500	Inflation	512	524	536	549
55	Operating Supplies	552	72,165	0	72,165	61,815	0	61,815	Inflation	63,237	64,754	66,309	67,900
56	Fuel for Trucks	552	60,167	0	60,167	87,500	0	87,500	Fuel	91,875	96,469	101,292	106,357
57	Books and Memberships	554	500	0	500	500	0	500	Inflation	512	524	536	549
58	Training	555	2,000	0	2,000	3,000	0	3,000	Inflation	3,069	3,143	3,218	3,295
59	Total Operating Expenses		$1,479,547	$0	$1,479,547	$1,504,989	$0	$1,504,989		$1,554,645	$1,607,263	$1,661,731	$1,718,117
	Capital Outlay [3]												
60	Buildings	562	$0	$0	$0	$200,000	($200,000)	$0	Eliminate	$0	$0	$0	$0
61	Infrastructure	563	20,000	(20,000)	0	0	0	0	Eliminate	0	0	0	0
62	Machinery & Equipment	564	21,000	(21,000)	0	65,000	(65,000)	0	Eliminate	0	0	0	0
63	Total Capital Outlay		$41,000	($41,000)	$0	$265,000	($265,000)	$0		$0	$0	$0	$0
64	**Total Commercial Collection (1720)**		$2,140,249	($41,000)	$2,099,249	$2,424,070	($265,000)	$2,159,070		$2,226,491	$2,297,504	$2,371,027	$2,447,158
	Yard Waste Collection (1730)												
	Personnel Services												
65	Regular Salaries and Wages	512	$82,790	$0	$82,790	$83,902	$0	$83,902	Labor	$85,580	$87,292	$89,037	$90,818
66	Overtime	514	15,000	0	15,000	15,000	0	15,000	Labor	15,300	15,606	15,918	16,236
67	Special Pay	515	0	0	0	2,000	0	2,000	Labor	2,040	2,081	2,122	2,165
68	FICA Taxes	521	7,481	0	7,481	7,719	0	7,719	Labor	7,873	8,031	8,191	8,355
69	Retirement Contributions	522	6,226	0	6,226	7,833	0	7,833	Labor	7,990	8,149	8,312	8,479
70	Life and Health Insurance	523	17,450	0	17,450	11,985	0	11,985	Ins-Health	12,704	13,466	14,274	15,131
71	Workers' Compensation	524	5,502	0	5,502	5,584	0	5,584	Worker Comp	5,752	5,924	6,102	6,285
72	Total Personnel Services		$134,449	$0	$134,449	$134,023	$0	$134,023		$137,239	$140,549	$143,958	$147,469
	Operating Expenses												
73	Professional Services	531	$16,000	$0	$16,000	$0	$0	$0	Inflation	$0	$0	$0	$0
74	Other Contractual Services	534	46,050	0	46,050	47,250	0	47,250	Contract	48,195	49,159	50,142	51,145
75	Other Contractual Services - Grinding Services	534	112,800	0	112,800	109,080	0	109,080	Grinding	112,352	115,723	119,195	122,771
76	Travel and Per Diem	540	1,000	0	1,000	1,000	0	1,000	Inflation	1,023	1,048	1,073	1,098
77	Communication Services	541	0	0	0	0	0	0	Inflation	0	0	0	0
78	Freight / Postage Services	542	0	0	0	0	0	0	Inflation	0	0	0	0

Table 2
City of Stuart
Sanitation Rate Study

Projected Operating Expenses

Line No.	Description		Budgeted 2017 [1]	Proposed Adjustments	Adjusted 2017	Budgeted 2018 [1]	Proposed Adjustments	Adjusted 2018	Escalation Reference [2]	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
79	Utility Services	543	6,510	0	6,510	0	0	0	Inflation	0	0	0	0
80	Tipping Fees	543	61,740	0	61,740	63,840	0	63,840	Disposal	65,961	68,220	70,556	72,972
81	Rentals and Leases	544	1,000	0	1,000	1,000	0	1,000	Inflation	1,023	1,048	1,073	1,098
82	Insurance	545	3,690	0	3,690	3,746	0	3,746	Insurance	3,858	3,974	4,093	4,216
83	Repairs and Maintenance	546	21,000	0	21,000	22,000	0	22,000	Repair	22,660	23,340	24,040	24,761
84	Printing and Binding	547	0	0	0	0	0	0	Inflation	0	0	0	0
85	Promotional Activities	548	800	0	800	1,800	0	1,800	Inflation	1,841	1,886	1,931	1,977
86	Office Supplies	551	520	0	520	500	0	500	Inflation	512	524	536	549
87	Operating Supplies	552	1,390	0	1,390	37,590	0	37,590	Inflation	38,455	39,377	40,323	41,290
88	Fuel for Trucks	552	7,222	0	7,222	10,000	0	10,000	Fuel	10,500	11,025	11,576	12,155
89	Books and Memberships	554	500	0	500	0	0	0	Inflation	0	0	0	0
90	Training	555	500	0	500	1,500	0	1,500	Inflation	1,535	1,571	1,609	1,648
91	Total Operating Expenses		$280,722	$0	$280,722	$299,306	$0	$299,306		$307,915	$316,894	$326,146	$335,681
	Capital Outlay [3]												
92	Buildings	562	$0	$0	$0	$100,000	($100,000)	$0	Eliminate	$0	$0	$0	$0
93	Infrastructure	563	0	0	0	0	0	0	Eliminate	0	0	0	0
94	Machinery & Equipment	564	306,000	(306,000)	0	0	0	0	Eliminate	0	0	0	0
95	Total Capital Outlay		$306,000	($306,000)	$0	$100,000	($100,000)	$0		$0	$0	$0	$0
96	**Total Yard Waste Collection (1730)**		$721,171	($306,000)	$415,171	$533,329	($100,000)	$433,329		$445,154	$457,443	$470,104	$483,150
	Non - Operating (1790)												
97	Transfer (Indirect Cost Allocation) [4]	557	$399,462	$0	$399,462	$392,450	$0	$392,450	Calculated	$400,299	$408,305	$416,468	$424,788
98	Transfers - Water & Sewer		196,207	0	196,207	190,803	0	190,803	Labor	194,619	198,511	202,482	206,531
99	Other Non-operating Uses - Life / Health Insurance	523	12,800	0	12,800	1,271	0	1,271	Ins-Health	1,347	1,428	1,514	1,605
100	Intragovernmental Transfers [5]	591	227,656	(227,656)	0	227,656	(227,656)	0	Eliminate	0	0	0	0
101	Transfer to Retained Earnings [6]		12,150	(12,150)	0	0	0	0	Eliminate	0	0	0	0
	Machinery & Equipment	564	3,199	(3,199)	0	0	0		Eliminate				
102	**Total Non - Departmental**		$851,474	($243,005)	$608,469	$812,180	($227,656)	$584,524		$596,265	$608,245	$620,463	$632,924
	Additional Charges												
103	Additional Personnel Costs		$0	$0	$0	$0	$0	$0	Input	$0	$0	$0	$0
104	Additional Operating Costs		0	0	0	0	0	0	Calculated	0	0	0	0
105	Additional Maintenance Costs		0	0	0	0	0	0	Calculated	0	0	0	0
106	Bad Debt Expense		0	0	0	0	0	0	None	0	0	0	0
107	Operating Contingency		0	0	0	0	0	0	None	0	0	0	0
108	**Total Additional Charges**		$0	$0	$0	$0	$0	$0		$0	$0	$0	$0
109	**TOTAL OPERATING EXPENSES**		$4,238,739	($590,005)	$3,648,734	$4,509,160	($792,656)	$3,716,504		$3,823,102	$3,934,771	$4,050,098	$4,169,213
								1.86%		2.87%	2.92%	2.93%	2.94%

Table 2
City of Stuart
Sanitation Rate Study

Projected Operating Expenses

Line No.	Description	Budgeted 2017 [1]	Proposed Adjustments	Adjusted 2017	Budgeted 2018 [1]	Proposed Adjustments	Adjusted 2018	Escalation Reference [2]	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022

Footnotes:

[1] Based on budgeted figures for the Fiscal Year 2017 Adopted Budget and Fiscal Year 2018 Preliminary Budget

[2] Inflationary attributes derived from Table 3.

[3] Amounts removed from operating expenses and shown separately within the Capital Plan in Table 4.

[4] Amounts adjusted based on discussions with City staff as follows:

	Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
Transfer (Indirect Cost Allocation) - Base Amount (As Adopted)	$399,462	$392,450	$392,450	$392,450	$392,450	$392,450
Adjustments to Street Allocation	0	0	0	0	0	0
Revised Transfer - Base Amount	$399,462	$392,450	$392,450	$392,450	$392,450	$392,450
Cumulative Labor Index	0.00%	0.00%	2.00%	4.04%	6.12%	8.24%
Projected Transfer Amount	$399,462	$392,450	$400,299	$408,305	$416,468	$424,788

[5] Amounts removed from operating expenses and calculated separately within Table 5. Intragovernmental Transfer is based on 6% of annual operating revenues.

[6] Transfers to Retained Earnings reflect the amount of revenue sources in excess of annual expenditures for each Fiscal Year. Such amounts, if any, are calculated in Table 6.

Table 3
City of Stuart
Sanitation Rate Study

Summary of Projected Escalation Factors

Line No.	Description	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
1	Constant	Constant	1.0000	1.0000	1.0000	1.0000
2	Eliminate	Eliminate	0.0000	0.0000	0.0000	0.0000
3	General Inflation (CPI)	Inflation	1.0230	1.0240	1.0240	1.0240
4	Labor Escalator	Labor	1.0200	1.0200	1.0200	1.0200
5	Contract Labor	Contract	1.0200	1.0200	1.0200	1.0200
6	Grinder Services	Grinding	1.0300	1.0300	1.0300	1.0300
7	Life/Health/Disability Insurance Escalator	Ins-Health	1.0600	1.0600	1.0600	1.0600
8	Workers Compensation	Worker Comp	1.0300	1.0300	1.0300	1.0300
9	Insurance Factor	Insurance	1.0300	1.0300	1.0300	1.0300
10	Repair and Maintenance	Repair	1.0300	1.0300	1.0300	1.0300
11	Fuel	Fuel	1.0500	1.0500	1.0500	1.0500
12	Growth in Disposal + CPI	Disposal	1.0332	1.0342	1.0342	1.0342
13	Growth in Disposal + Fuel	Hauling	1.0605	1.0605	1.0605	1.0605
14	Marginal Adjustment Factor	Marginal	1.0100	1.0100	1.0100	1.0100

Table 4
City of Stuart
Sanitation Rate Study

Capital Funding Program

Line No	Description	Reference	Projected Fiscal Year Ending September 30, - Future Dollars [1] 2017	Adjustments	2017	2018	2019	2020	2021	2022	Totals
	CUMULATIVE INFLATIONARY ADJUSTMENT FACTOR		1.000	1.000	1.000	1.000	1.030	1.061	1.093	1.126	
	CAPITAL PLAN										
	Replacement of Vehicles										
1	Yard Trash Collection - Rear Loader	VRF	$241,000	($241,000)	$0	$0	$0	$0	$0	$0	$0
2	Annual Allowance for Replacement of Vehicles	VRF	0	0	0	235,000	242,000	249,000	257,000	264,000	1,247,000
3	Additional Vehicles	VRF	0	0	0	0	0	0	0	0	0
4	Additional Vehicles	VRF	0	0	0	0	0	0	0	0	0
5	Total Vehicle Replacements		$241,000	($241,000)	$0	$235,000	$242,000	$249,000	$257,000	$264,000	$1,247,000
	Other Capital Requirements										
6	Capital Outlay	REV	$106,000	$0	$106,000	$65,000	$52,000	$53,000	$55,000	$56,000	$387,000
7	Public Works Complex at Old City Landfill - 1 of 2	OR	0	0	0	500,000	0	0	0	0	500,000
8	Public Works Complex at Old City Landfill - 2 of 2	DEBT1	0	0	0	0	2,000,000	2,000,000	0	0	4,000,000
9	Total Capital Projects		$106,000	$0	$106,000	$565,000	$2,052,000	$2,053,000	$55,000	$56,000	$4,887,000
10	**TOTAL CAPITAL PLAN**		$347,000	($241,000)	$106,000	$800,000	$2,294,000	$2,302,000	$312,000	$320,000	$6,134,000
	FUNDING SOURCES										
11	Operating Reserves	OR	$0	$0	$0	$500,000	$0	$0	$0	$0	$500,000
12	Operating Revenues	REV	106,000	0	106,000	65,000	52,000	53,000	55,000	56,000	387,000
13	Vehicle Replacement Fund	VRF	241,000	(241,000)	0	235,000	242,000	249,000	257,000	264,000	1,247,000
14	Other	OTHER	0	0	0	0	0	0	0	0	0
15	Debt Proceeds 1	DEBT1	0	0	0	0	2,000,000	2,000,000	0	0	4,000,000
16	Debt Proceeds 2	DEBT2	0	0	0	0	0	0	0	0	0
17	**TOTAL FUNDING SOURCES**		$347,000	($241,000)	$106,000	$800,000	$2,294,000	$2,302,000	$312,000	$320,000	$6,134,000

Footnotes:

[1] Amounts as provided by the City.

[2] Proposed Bank Loan as follows:

Project Amount	$4,000,000
Financing Costs (2%)	$80,000
Sub-Total	$4,080,000
Interest Rate	3.50%
Term	15
Capitalized Interest (2 years)	$286,000
Total Principal	$4,366,000
Payment Over Remaining 13 Years	$423,771
First Payment	FY21

Table 5
City of Stuart
Sanitation Rate Study

Projected Intragovernmental Transfers

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	INTRAGOVERNMENTAL TRANSFERS						
	Gross Revenues [1]						
1	Residential Garbage	$570,000	$575,000	$580,750	$586,558	$592,423	$598,347
2	Commercial Garbage	3,325,000	3,325,000	3,358,250	3,391,833	3,425,751	3,460,008
3	Delinquent Garbage Fees	5,500	5,500	5,500	5,500	5,500	5,500
4	Trash Collections	28,000	25,000	25,000	25,000	25,000	25,000
5	Utility Service charges	4,000	4,000	4,000	4,000	4,000	4,000
6	Other Utility Charges	0	0	0	0	0	0
7	Interest Income	6,000	6,000	5,000	5,000	5,000	5,000
8	Revenues from Proposed Rate Increases [2]	0	196,725	407,284	632,532	873,377	1,130,781
9	**Total Gross Revenues**	$3,938,500	$4,137,225	$4,385,784	$4,650,422	$4,931,050	$5,228,636
10	Percent of Revenues [3]	6%	6%	6%	6%	6%	6%
11	Sub-total Intragovernmental Transfers	$236,310	$248,234	$263,147	$279,025	$295,863	$313,718
12	Additional Transfers (CRA)	0	0	0	0	0	0
13	**TOTAL INTRAGOVERNMENTAL TRANSFERS**	$236,310	$248,234	$263,147	$279,025	$295,863	$313,718

Footnotes:

[1] Amounts derived from Table 1.

[2] Amounts derived from Table 6.

[3] Transfer amount as adopted by the City.

Table 6
City of Stuart
Sanitation Rate Study

Projected Sanitation Revenue Requirements

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
1	Total Operating Expenses [1]	$3,648,734	$3,716,504	$3,823,102	$3,934,771	$4,050,098	$4,169,213
	Other Revenue Requirements						
2	Annual Debt Service Payments [2]	$0	$0	$0	$0	$423,771	$423,771
3	Transfer to Vehicle Replacement Fund [3]	0	250,000	250,000	250,000	250,000	250,000
4	Other Capital Funded from Rates [4]	106,000	65,000	52,000	53,000	55,000	56,000
5	Intragovernmental Transfers [5]	236,310	248,234	263,147	279,025	295,863	313,718
6	Operating Reserves - Deposits to/(Uses of)	0	0	0	0	0	0
7	Total Other Revenue Requirements	$342,310	$563,234	$565,147	$582,025	$1,024,634	$1,043,489
8	Gross Revenue Requirements	$3,991,044	$4,279,738	$4,388,249	$4,516,796	$5,074,732	$5,212,702
	Less Income and Funds from Other Sources						
9	Other Operating Revenue [6]	$0	$0	$0	$0	$0	$0
10	Interest Income	6,000	6,000	5,000	5,000	5,000	5,000
11	Net Revenue Requirements	$3,985,044	$4,273,738	$4,383,249	$4,511,796	$5,069,732	$5,207,702
	Revenue from Operations						
12	Existing Operating Revenue [6]	$3,932,500	$3,934,500	$3,973,500	$4,012,890	$4,052,674	$4,092,856
13	Prior Year Rate Adjustments	0	0	198,675	411,321	638,803	882,036
14	Total Rate Revenue Before Current Year Adjustment	3,932,500	3,934,500	4,172,175	4,424,211	4,691,477	4,974,892
	Current Year Rate Adjustments						
15	Current Year Rate Adjustment	0.00%	5.00%	5.00%	5.00%	5.00%	5.00%
	Effective Month	Oct.	Oct.	Oct.	Oct.	Oct.	Oct.
16	% of Current Year Effective	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
17	Total Revenue from Current Year Adjustments	$0	$196,725	$208,609	$221,211	$234,574	$248,745
18	Total Revenue	$3,932,500	$4,131,225	$4,380,784	$4,645,422	$4,926,050	$5,223,636
19	Revenue Surplus/(Deficiency)	($52,544)	($142,513)	($2,465)	$133,625	($143,681)	$15,934
20	Percent of Rate Revenues	-1.34%	-3.45%	-0.06%	2.88%	-2.92%	0.31%

Table 6
City of Stuart
Sanitation Rate Study

Projected Sanitation Revenue Requirements

		As of Fiscal Year Ending September 30,					
21	**Summary of Cash Balances (Year-End)**	2017	2018	2019	2020	2021	2022
22	Unrestricted Operating Fund	$1,372,648	$730,135	$727,670	$861,295	$717,614	$733,548
23	Vehicle Replacement Fund [*]	500,000	515,000	523,000	524,000	517,000	503,000
24	**Total Cash Balances (Year-End)**	$1,872,648	$1,245,135	$1,250,670	$1,385,295	$1,234,614	$1,236,548
25	Operating Days of Operating Expenses - Min.	90	90	90	90	90	90
26	Operating Days of Operating Expenses - Calculated	187	122	119	129	111	108

[*] Amount designed to accumulate not less than $400,000 per year.

	Projected Net Assets	Fiscal Year Ending September 30,					
27		2017	2018	2019	2020	2021	2022
28	Beginning Unrestricted Balance	$2,553,342	$2,360,519	$2,286,727	$2,339,983	$2,530,329	$2,716,330
29	Revenues	$3,932,500	$4,131,225	$4,380,784	$4,645,422	$4,926,050	$5,223,636
30	Less Expenditures	(3,985,044)	(4,273,738)	(4,383,249)	(4,511,796)	(5,069,732)	(5,207,702)
31	Add Back Capital Expenditures	106,000	315,000	302,000	303,000	305,000	306,000
32	Add Back Debt Service Payments	0	0	0	0	423,771	423,771
33	Less Interest Expenses	0	0	0	0	(152,810)	(143,326)
34	Less Allowance for Depreciation & Accrued Adjustments	(246,279)	(246,279)	(246,279)	(246,279)	(246,279)	(246,279)
35	Total Year-end Cash	$2,360,519	$2,286,727	$2,339,983	$2,530,329	$2,716,330	$3,072,429
36	Operating Days of Operating Expenses - Min.	90	90	90	90	90	90
37	Operating Days of Operating Expenses - Calculated	236	225	223	235	245	269

Footnotes continued on the following page.

Footnotes:

[1] Amounts derived from Table 2.

[2] The Department does not have any outstanding obligations, not does it plan to borrow monies for capital projects during the forecast period.

[3] Amounts needed to fund the vehicle replacement needs of the sysetm over 10 years.

[4] Amounts derived from Table 4, if any.

[5] Amounts derived from Table 5.

[6] Amounts derived from Table 1.

Table 7
City of Stuart
Sanitation Rate Study

Projected Fund Balances

Line No.	Description	Reference	Projected Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	UNRESTRICTED OPERATING FUND							
1	Beginning Balance [2]		$1,425,192	$1,372,648	$730,135	$727,670	$861,295	$717,614
2	Transfers In - Revenues		3,932,500	4,131,225	4,380,784	4,645,422	4,926,050	5,223,636
3	Transfers Out - Net Revenue Requirements		3,985,044	4,273,738	4,383,249	4,511,796	5,069,732	5,207,702
4	Transfers Out - CIP		0	500,000	0	0	0	0
5	Transfers Out (In) - Water and Wastewater Fund		0	0	0	0	0	0
6	End of Year Transfer In / (Out)		0	0	0	0	0	0
7	Interest Rate	Short Term	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
8	Interest Income		3,000	3,000	2,000	2,000	2,000	2,000
9	Transfer of Interest Income to Revenue Fund		3,000	3,000	2,000	2,000	2,000	2,000
10	Ending Balance		$1,372,648	$730,135	$727,670	$861,295	$717,614	$733,548
	VEHICLE REPLACEMENT FUND (PROPOSED)							
11	Beginning Balance [2]		$500,000	$500,000	$515,000	$523,000	$524,000	$517,000
12	Transfers In		0	250,000	250,000	250,000	250,000	250,000
13	Transfers Out		0	235,000	242,000	249,000	257,000	264,000
14	Interest Rate	Medium Term	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
15	Interest Income		3,000	3,000	3,000	3,000	3,000	3,000
16	Transfer of Interest Income to Revenue Fund		3,000	3,000	3,000	3,000	3,000	3,000
17	Ending Balance		$500,000	$515,000	$523,000	$524,000	$517,000	$503,000
	CUSTOMER DEPOSITS							
18	Beginning Balance [2]		$391,376	$391,376	$391,376	$391,376	$391,376	$391,376
19	Transfers In		0	0	0	0	0	0
20	Transfers Out		0	0	0	0	0	0
21	Interest Rate	None	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
22	Interest Income		0	0	0	0	0	0
23	Transfer of Interest Income to Revenue Fund		0	0	0	0	0	0
24	Ending Balance		$391,376	$391,376	$391,376	$391,376	$391,376	$391,376
25	TOTAL INTEREST INCOME		$6,000	$6,000	$5,000	$5,000	$5,000	$5,000

Footnotes:

[1] Cash balances dependent upon the adoption of proposed rate increases shown in Table 7, if any.

[2] The beginning balance was derived from the City's audited CAFR as of September 30, 2016.

Table 8
City of Stuart
Sanitation Rate Study

Proposed Sanitation Rates

Line No.	Description	Existing	Adjusted Existing [1]	Proposed Sanitation Rates by Service and Frequency: Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	SANITATION SYSTEM							
1	Proposed Sanitation Rate Increase [2]	N/A	N/A	5.00%	5.00%	5.00%	5.00%	5.00%
	RESIDENTIAL - LESS THAN THREE (3) UNITS							
2	Monthly Charges (per Unit)	$17.00	$17.00	$17.85	$18.74	$19.68	$20.66	$21.69
	MULTI-FAMILY - FOUR (4) OR MORE UNITS							
	Monthly Charge (per Unit)							
	1/2 Cubic Yard Container							
3	One (1) Pickup per Week	$20.25	$20.25	$21.26	$22.32	$23.44	$24.61	$25.84
4	Two (2) Pickups per Week	$40.50	$40.50	$42.52	$44.64	$46.88	$49.22	$51.68
5	Three (3) Pickups per Week	$60.74	$60.75	$63.78	$66.96	$70.32	$73.83	$77.52
6	Four (4) Pickups per Week	$80.99	$81.00	$85.04	$89.28	$93.76	$98.44	$103.36
7	Five (5) Pickups per Week	$101.23	$101.25	$106.30	$111.60	$117.20	$123.05	$129.20
8	Six (6) Pickups per Week	$121.48	$121.50	$127.56	$133.92	$140.64	$147.66	$155.04
	1 Cubic Yard Container							
9	One (1) Pickup per Week	$40.50	$40.50	$42.53	$44.66	$46.89	$49.23	$51.69
10	Two (2) Pickups per Week	$80.97	$81.00	$85.06	$89.32	$93.78	$98.46	$103.38
11	Three (3) Pickups per Week	$121.45	$121.50	$127.59	$133.98	$140.67	$147.69	$155.07
12	Four (4) Pickups per Week	$161.93	$162.00	$170.12	$178.64	$187.56	$196.92	$206.76
13	Five (5) Pickups per Week	$202.42	$202.50	$212.65	$223.30	$234.45	$246.15	$258.45
14	Six (6) Pickups per Week	$242.90	$243.00	$255.18	$267.96	$281.34	$295.38	$310.14
	2 Cubic Yard Container							
15	One (1) Pickup per Week	$80.97	$81.00	$85.05	$89.30	$93.77	$98.46	$103.38
16	Two (2) Pickups per Week	$161.93	$162.00	$170.10	$178.60	$187.54	$196.92	$206.76
17	Three (3) Pickups per Week	$242.90	$243.00	$255.15	$267.90	$281.31	$295.38	$310.14
18	Four (4) Pickups per Week	$323.86	$324.00	$340.20	$357.20	$375.08	$393.84	$413.52
19	Five (5) Pickups per Week	$404.84	$405.00	$425.25	$446.50	$468.85	$492.30	$516.90
20	Six (6) Pickups per Week	$485.80	$486.00	$510.30	$535.80	$562.62	$590.76	$620.28
	3 Cubic Yard Container							
21	One (1) Pickup per Week	$121.45	$121.50	$127.58	$133.96	$140.66	$147.69	$155.07
22	Two (2) Pickups per Week	$242.90	$243.00	$255.16	$267.92	$281.32	$295.38	$310.14
23	Three (3) Pickups per Week	$364.35	$364.50	$382.74	$401.88	$421.98	$443.07	$465.21
24	Four (4) Pickups per Week	$485.80	$486.00	$510.32	$535.84	$562.64	$590.76	$620.28
25	Five (5) Pickups per Week	$607.25	$607.50	$637.90	$669.80	$703.30	$738.45	$775.35
26	Six (6) Pickups per Week	$728.70	$729.00	$765.48	$803.76	$843.96	$886.14	$930.42
	4 Cubic Yard Container							
27	One (1) Pickup per Week	$161.93	$162.00	$170.10	$178.61	$187.54	$196.92	$206.77
28	Two (2) Pickups per Week	$323.86	$324.00	$340.20	$357.22	$375.08	$393.84	$413.54
29	Three (3) Pickups per Week	$485.80	$486.00	$510.30	$535.83	$562.62	$590.76	$620.31
30	Four (4) Pickups per Week	$647.73	$648.00	$680.40	$714.44	$750.16	$787.68	$827.08
31	Five (5) Pickups per Week	$809.67	$810.00	$850.50	$893.05	$937.70	$984.60	$1,033.85
32	Six (6) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.66	$1,125.24	$1,181.52	$1,240.62
	6 Cubic Yard Container							
33	One (1) Pickup per Week	$242.90	$243.00	$255.15	$267.91	$281.31	$295.38	$310.15
34	Two (2) Pickups per Week	$485.80	$486.00	$510.30	$535.82	$562.62	$590.76	$620.30
35	Three (3) Pickups per Week	$728.70	$729.00	$765.45	$803.73	$843.93	$886.14	$930.45
36	Four (4) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.64	$1,125.24	$1,181.52	$1,240.60
37	Five (5) Pickups per Week	$1,214.50	$1,215.00	$1,275.75	$1,339.55	$1,406.55	$1,476.90	$1,550.75
38	Six (6) Pickups per Week	$1,457.40	$1,458.00	$1,530.90	$1,607.46	$1,687.86	$1,772.28	$1,860.90
	8 Cubic Yard Container							
39	One (1) Pickup per Week	$323.86	$324.00	$340.20	$357.21	$375.07	$393.82	$413.51
40	Two (2) Pickups per Week	$647.73	$648.00	$680.40	$714.42	$750.14	$787.64	$827.02
41	Three (3) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.63	$1,125.21	$1,181.46	$1,240.53
42	Four (4) Pickups per Week	$1,295.47	$1,296.00	$1,360.80	$1,428.84	$1,500.28	$1,575.28	$1,654.04
43	Five (5) Pickups per Week	$1,619.33	$1,620.00	$1,701.00	$1,786.05	$1,875.35	$1,969.10	$2,067.55
44	Six (6) Pickups per Week	$1,943.20	$1,944.00	$2,041.20	$2,143.26	$2,250.42	$2,362.92	$2,481.06

Table 8
City of Stuart
Sanitation Rate Study

Proposed Sanitation Rates

Line No.	Description	Existing	Adjusted Existing [1]	Proposed Sanitation Rates by Service and Frequency Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	COMMERCIAL (ALL NONRESIDENTIAL USES)							
	Monthly Charge (per Unit)							
	1/2 Cubic Yard Container							
45	One (1) Pickup per Week	$20.25	$20.25	$21.26	$22.32	$23.44	$24.61	$25.84
46	Two (2) Pickups per Week	$40.50	$40.50	$42.52	$44.64	$46.88	$49.22	$51.68
47	Three (3) Pickups per Week	$60.74	$60.75	$63.78	$66.96	$70.32	$73.83	$77.52
48	Four (4) Pickups per Week	$80.99	$81.00	$85.04	$89.28	$93.76	$98.44	$103.36
49	Five (5) Pickups per Week	$101.23	$101.25	$106.30	$111.60	$117.20	$123.05	$129.20
50	Six (6) Pickups per Week	$121.48	$121.50	$127.56	$133.92	$140.64	$147.66	$155.04
	1 Cubic Yard Container							
51	One (1) Pickup per Week	$40.50	$40.50	$42.53	$44.66	$46.89	$49.23	$51.69
52	Two (2) Pickups per Week	$80.97	$81.00	$85.06	$89.32	$93.78	$98.46	$103.38
53	Three (3) Pickups per Week	$121.45	$121.50	$127.59	$133.98	$140.67	$147.69	$155.07
54	Four (4) Pickups per Week	$161.93	$162.00	$170.12	$178.64	$187.56	$196.92	$206.76
55	Five (5) Pickups per Week	$202.42	$202.50	$212.65	$223.30	$234.45	$246.15	$258.45
56	Six (6) Pickups per Week	$242.90	$243.00	$255.18	$267.96	$281.34	$295.38	$310.14
	2 Cubic Yard Container							
57	One (1) Pickup per Week	$80.97	$81.00	$85.05	$89.30	$93.77	$98.46	$103.38
58	Two (2) Pickups per Week	$161.93	$162.00	$170.10	$178.60	$187.54	$196.92	$206.76
59	Three (3) Pickups per Week	$242.90	$243.00	$255.15	$267.90	$281.31	$295.38	$310.14
60	Four (4) Pickups per Week	$323.86	$324.00	$340.20	$357.20	$375.08	$393.84	$413.52
61	Five (5) Pickups per Week	$404.84	$405.00	$425.25	$446.50	$468.85	$492.30	$516.90
62	Six (6) Pickups per Week	$485.80	$486.00	$510.30	$535.80	$562.62	$590.76	$620.28
	3 Cubic Yard Container							
63	One (1) Pickup per Week	$121.45	$121.50	$127.58	$133.96	$140.66	$147.69	$155.07
64	Two (2) Pickups per Week	$242.90	$243.00	$255.16	$267.92	$281.32	$295.38	$310.14
65	Three (3) Pickups per Week	$364.35	$364.50	$382.74	$401.88	$421.98	$443.07	$465.21
66	Four (4) Pickups per Week	$485.80	$486.00	$510.32	$535.84	$562.64	$590.76	$620.28
67	Five (5) Pickups per Week	$607.25	$607.50	$637.90	$669.80	$703.30	$738.45	$775.35
68	Six (6) Pickups per Week	$728.70	$729.00	$765.48	$803.76	$843.96	$886.14	$930.42
	4 Cubic Yard Container							
69	One (1) Pickup per Week	$161.93	$162.00	$170.10	$178.61	$187.54	$196.92	$206.77
70	Two (2) Pickups per Week	$323.86	$324.00	$340.20	$357.22	$375.08	$393.84	$413.54
71	Three (3) Pickups per Week	$485.80	$486.00	$510.30	$535.83	$562.62	$590.76	$620.31
72	Four (4) Pickups per Week	$647.73	$648.00	$680.40	$714.44	$750.16	$787.68	$827.08
73	Five (5) Pickups per Week	$809.67	$810.00	$850.50	$893.05	$937.70	$984.60	$1,033.85
74	Six (6) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.66	$1,125.24	$1,181.52	$1,240.62
	6 Cubic Yard Container							
75	One (1) Pickup per Week	$242.90	$243.00	$255.15	$267.91	$281.31	$295.38	$310.15
76	Two (2) Pickups per Week	$485.80	$486.00	$510.30	$535.82	$562.62	$590.76	$620.30
77	Three (3) Pickups per Week	$728.70	$729.00	$765.45	$803.73	$843.93	$886.14	$930.45
78	Four (4) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.64	$1,125.24	$1,181.52	$1,240.60
79	Five (5) Pickups per Week	$1,214.50	$1,215.00	$1,275.75	$1,339.55	$1,406.55	$1,476.90	$1,550.75
80	Six (6) Pickups per Week	$1,457.40	$1,458.00	$1,530.90	$1,607.46	$1,687.86	$1,772.28	$1,860.90
	8 Cubic Yard Container							
81	One (1) Pickup per Week	$323.86	$324.00	$340.20	$357.21	$375.07	$393.82	$413.51
82	Two (2) Pickups per Week	$647.73	$648.00	$680.40	$714.42	$750.14	$787.64	$827.02
83	Three (3) Pickups per Week	$971.60	$972.00	$1,020.60	$1,071.63	$1,125.21	$1,181.46	$1,240.53
84	Four (4) Pickups per Week	$1,295.47	$1,296.00	$1,360.80	$1,428.84	$1,500.28	$1,575.28	$1,654.04
85	Five (5) Pickups per Week	$1,619.33	$1,620.00	$1,701.00	$1,786.05	$1,875.35	$1,969.10	$2,067.55
86	Six (6) Pickups per Week	$1,943.20	$1,944.00	$2,041.20	$2,143.26	$2,250.42	$2,362.92	$2,481.06
	COMMERCIAL ROFF-OFF / COMPACTOR							
	Charge per Pickup							
87	10 Cubic Yards	$149.18	$149.18	$156.64	$164.47	$172.69	$181.32	$190.39
88	20 Cubic Yards	$159.46	$159.46	$167.43	$175.80	$184.59	$193.82	$203.51
89	30 Cubic Yards	$169.75	$169.75	$178.24	$187.15	$196.51	$206.34	$216.66
90	40 Cubic Yards	$180.04	$180.04	$189.04	$198.49	$208.41	$218.83	$229.77
91	Compactor	$236.62	$236.62	$248.45	$260.87	$273.91	$287.61	$301.99

Table 8
City of Stuart
Sanitation Rate Study

Proposed Sanitation Rates

Line No.	Description	Existing	Adjusted Existing [1]	Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
				Proposed Sanitation Rates by Service and Frequency				
	COMMERCIAL RECYCLING							
	Monthly Charge (per Unit)							
	1/2 Cubic Yard Container							
92	One (1) Pickup per Week	$10.12	$10.12	$10.63	$11.16	$11.72	$12.31	$12.93
93	Two (2) Pickups per Week	$20.25	$20.24	$21.26	$22.32	$23.44	$24.62	$25.86
94	Three (3) Pickups per Week	$30.37	$30.36	$31.89	$33.48	$35.16	$36.93	$38.79
95	Four (4) Pickups per Week	$40.50	$40.48	$42.52	$44.64	$46.88	$49.24	$51.72
96	Five (5) Pickups per Week	$50.61	$50.60	$53.15	$55.80	$58.60	$61.55	$64.65
97	Six (6) Pickups per Week	$60.74	$60.72	$63.78	$66.96	$70.32	$73.86	$77.58
	1 Cubic Yard Container							
98	One (1) Pickup per Week	$20.24	$20.24	$21.25	$22.31	$23.43	$24.60	$25.83
99	Two (2) Pickups per Week	$40.48	$40.48	$42.50	$44.62	$46.86	$49.20	$51.66
100	Three (3) Pickups per Week	$60.71	$60.72	$63.75	$66.93	$70.29	$73.80	$77.49
101	Four (4) Pickups per Week	$80.95	$80.96	$85.00	$89.24	$93.72	$98.40	$103.32
102	Five (5) Pickups per Week	$101.18	$101.20	$106.25	$111.55	$117.15	$123.00	$129.15
103	Six (6) Pickups per Week	$121.42	$121.44	$127.50	$133.86	$140.58	$147.60	$154.98
	2 Cubic Yard Container							
104	One (1) Pickup per Week	$40.48	$40.48	$42.50	$44.63	$46.86	$49.20	$51.66
105	Two (2) Pickups per Week	$79.91	$80.96	$85.00	$89.26	$93.72	$98.40	$103.32
106	Three (3) Pickups per Week	$121.42	$121.44	$127.50	$133.89	$140.58	$147.60	$154.98
107	Four (4) Pickups per Week	$161.89	$161.92	$170.00	$178.52	$187.44	$196.80	$206.64
108	Five (5) Pickups per Week	$202.37	$202.40	$212.50	$223.15	$234.30	$246.00	$258.30
109	Six (6) Pickups per Week	$242.84	$242.88	$255.00	$267.78	$281.16	$295.20	$309.96
	3 Cubic Yard Container							
110	One (1) Pickup per Week	$60.71	$60.72	$63.76	$66.95	$70.30	$73.82	$77.51
111	Two (2) Pickups per Week	$121.41	$121.44	$127.52	$133.90	$140.60	$147.64	$155.02
112	Three (3) Pickups per Week	$182.13	$182.16	$191.28	$200.85	$210.90	$221.46	$232.53
113	Four (4) Pickups per Week	$242.84	$242.88	$255.04	$267.80	$281.20	$295.28	$310.04
114	Five (5) Pickups per Week	$303.55	$303.60	$318.80	$334.75	$351.50	$369.10	$387.55
115	Six (6) Pickups per Week	$364.26	$364.32	$382.56	$401.70	$421.80	$442.92	$465.06
	4 Cubic Yard Container							
116	One (1) Pickup per Week	$71.83	$80.96	$85.01	$89.26	$93.72	$98.41	$103.33
117	Two (2) Pickups per Week	$161.89	$161.92	$170.02	$178.52	$187.44	$196.82	$206.66
118	Three (3) Pickups per Week	$242.84	$242.88	$255.03	$267.78	$281.16	$295.23	$309.99
119	Four (4) Pickups per Week	$323.78	$323.84	$340.04	$357.04	$374.88	$393.64	$413.32
120	Five (5) Pickups per Week	$404.73	$404.80	$425.05	$446.30	$468.60	$492.05	$516.65
121	Six (6) Pickups per Week	$485.68	$485.76	$510.06	$535.56	$562.32	$590.46	$619.98
	6 Cubic Yard Container							
122	One (1) Pickup per Week	$121.42	$121.44	$127.51	$133.89	$140.58	$147.61	$154.99
123	Two (2) Pickups per Week	$242.84	$242.88	$255.02	$267.78	$281.16	$295.22	$309.98
124	Three (3) Pickups per Week	$364.26	$364.32	$382.53	$401.67	$421.74	$442.83	$464.97
125	Four (4) Pickups per Week	$485.68	$485.76	$510.04	$535.56	$562.32	$590.44	$619.96
126	Five (5) Pickups per Week	$607.09	$607.20	$637.55	$669.45	$702.90	$738.05	$774.95
127	Six (6) Pickups per Week	$728.52	$728.64	$765.06	$803.34	$843.48	$885.66	$929.94
	8 Cubic Yard Container							
128	One (1) Pickup per Week	$163.95	$161.92	$170.02	$178.52	$187.45	$196.82	$206.66
129	Two (2) Pickups per Week	$323.78	$323.84	$340.04	$357.04	$374.90	$393.64	$413.32
130	Three (3) Pickups per Week	$485.68	$485.76	$510.06	$535.56	$562.35	$590.46	$619.98
131	Four (4) Pickups per Week	$647.57	$647.68	$680.08	$714.08	$749.80	$787.28	$826.64
132	Five (5) Pickups per Week	$809.46	$809.60	$850.10	$892.60	$937.25	$984.10	$1,033.30
133	Six (6) Pickups per Week	$971.35	$971.52	$1,020.12	$1,071.12	$1,124.70	$1,180.92	$1,239.96

Table 8
City of Stuart
Sanitation Rate Study

Proposed Sanitation Rates

Line No.	Description	Existing	Adjusted Existing [1]	Proposed Sanitation Rates by Service and Frequency: Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	COMMERCIAL RECYCLING CREDIT							
	Monthly Charge (per Unit)							
	1/2 Cubic Yard Container							
134	One (1) Pickup per Week	$17.74	$17.74	$18.63	$19.56	$20.54	$21.57	$22.65
135	Two (2) Pickups per Week	$35.47	$35.48	$37.26	$39.12	$41.08	$43.14	$45.30
136	Three (3) Pickups per Week	$53.21	$53.22	$55.89	$58.68	$61.62	$64.71	$67.95
137	Four (4) Pickups per Week	$70.94	$70.96	$74.52	$78.24	$82.16	$86.28	$90.60
138	Five (5) Pickups per Week	$88.68	$88.70	$93.15	$97.80	$102.70	$107.85	$113.25
139	Six (6) Pickups per Week	$106.42	$106.44	$111.78	$117.36	$123.24	$129.42	$135.90
	1 Cubic Yard Container							
140	One (1) Pickup per Week	$35.47	$35.48	$37.25	$39.11	$41.07	$43.12	$45.28
141	Two (2) Pickups per Week	$70.94	$70.96	$74.50	$78.22	$82.14	$86.24	$90.56
142	Three (3) Pickups per Week	$106.42	$106.44	$111.75	$117.33	$123.21	$129.36	$135.84
143	Four (4) Pickups per Week	$141.85	$141.92	$149.00	$156.44	$164.28	$172.48	$181.12
144	Five (5) Pickups per Week	$177.31	$177.40	$186.25	$195.55	$205.35	$215.60	$226.40
145	Six (6) Pickups per Week	$212.77	$212.88	$223.50	$234.66	$246.42	$258.72	$271.68
	2 Cubic Yard Container							
146	One (1) Pickup per Week	$70.94	$70.96	$74.51	$78.24	$82.15	$86.26	$90.57
147	Two (2) Pickups per Week	$141.85	$141.92	$149.02	$156.48	$164.30	$172.52	$181.14
148	Three (3) Pickups per Week	$212.77	$212.88	$223.53	$234.72	$246.45	$258.78	$271.71
149	Four (4) Pickups per Week	$283.69	$283.84	$298.04	$312.96	$328.60	$345.04	$362.28
150	Five (5) Pickups per Week	$354.62	$354.80	$372.55	$391.20	$410.75	$431.30	$452.85
151	Six (6) Pickups per Week	$425.54	$425.76	$447.06	$469.44	$492.90	$517.56	$543.42
	3 Cubic Yard Container							
152	One (1) Pickup per Week	$106.42	$106.44	$111.76	$117.35	$123.22	$129.38	$135.85
153	Two (2) Pickups per Week	$212.77	$212.88	$223.52	$234.70	$246.44	$258.76	$271.70
154	Three (3) Pickups per Week	$319.15	$319.32	$335.28	$352.05	$369.66	$388.14	$407.55
155	Four (4) Pickups per Week	$425.54	$425.76	$447.04	$469.40	$492.88	$517.52	$543.40
156	Five (5) Pickups per Week	$531.92	$532.20	$558.80	$586.75	$616.10	$646.90	$679.25
157	Six (6) Pickups per Week	$638.31	$638.64	$670.56	$704.10	$739.32	$776.28	$815.10
	4 Cubic Yard Container							
158	One (1) Pickup per Week	$141.85	$141.92	$149.02	$156.47	$164.29	$172.50	$181.13
159	Two (2) Pickups per Week	$283.69	$283.84	$298.04	$312.94	$328.58	$345.00	$362.26
160	Three (3) Pickups per Week	$425.54	$425.76	$447.06	$469.41	$492.87	$517.50	$543.39
161	Four (4) Pickups per Week	$567.39	$567.68	$596.08	$625.88	$657.16	$690.00	$724.52
162	Five (5) Pickups per Week	$709.23	$709.60	$745.10	$782.35	$821.45	$862.50	$905.65
163	Six (6) Pickups per Week	$851.08	$851.52	$894.12	$938.82	$985.74	$1,035.00	$1,086.78
	6 Cubic Yard Container							
164	One (1) Pickup per Week	$212.77	$212.88	$223.52	$234.70	$246.44	$258.76	$271.70
165	Two (2) Pickups per Week	$425.54	$425.76	$447.04	$469.40	$492.88	$517.52	$543.40
166	Three (3) Pickups per Week	$638.31	$638.64	$670.56	$704.10	$739.32	$776.28	$815.10
167	Four (4) Pickups per Week	$851.08	$851.52	$894.08	$938.80	$985.76	$1,035.04	$1,086.80
168	Five (5) Pickups per Week	$1,063.85	$1,064.40	$1,117.60	$1,173.50	$1,232.20	$1,293.80	$1,358.50
169	Six (6) Pickups per Week	$1,276.62	$1,277.28	$1,341.12	$1,408.20	$1,478.64	$1,552.56	$1,630.20
	8 Cubic Yard Container							
170	One (1) Pickup per Week	$283.69	$283.84	$298.03	$312.93	$328.58	$345.01	$362.26
171	Two (2) Pickups per Week	$567.39	$567.68	$596.06	$625.86	$657.16	$690.02	$724.52
172	Three (3) Pickups per Week	$851.08	$851.52	$894.09	$938.79	$985.74	$1,035.03	$1,086.78
173	Four (4) Pickups per Week	$1,134.77	$1,135.36	$1,192.12	$1,251.72	$1,314.32	$1,380.04	$1,449.04
174	Five (5) Pickups per Week	$1,418.47	$1,419.20	$1,490.15	$1,564.65	$1,642.90	$1,725.05	$1,811.30
175	Six (6) Pickups per Week	$1,702.16	$1,703.04	$1,788.18	$1,877.58	$1,971.48	$2,070.06	$2,173.56
	COMMERCIAL EXTRA PICKUP [3]							
	Charge per Extra Pickup							
176	1/2 Cubic Yard Container	N/A	$4.67	$4.91	$5.15	$5.41	$5.68	$5.96
177	1 Cubic Yard Container	N/A	$9.35	$9.81	$10.31	$10.82	$11.36	$11.93
178	2 Cubic Yard Container	$18.69	$18.69	$19.63	$20.61	$21.64	$22.72	$23.86
179	3 Cubic Yard Container	$28.03	$28.04	$29.44	$30.91	$32.46	$34.08	$35.79
180	4 Cubic Yard Container	$37.37	$37.38	$39.25	$41.22	$43.28	$45.44	$47.72
181	6 Cubic Yard Container	$56.06	$56.08	$58.88	$61.83	$64.92	$68.16	$71.57
182	8 Cubic Yard Container	$74.73	$74.77	$78.51	$82.43	$86.55	$90.88	$95.43
	COMMERCIAL RECYCLE EXTRA PICKUP [3]							
	Charge per Extra Pickup							
183	1/2 Cubic Yard Container	N/A	$2.34	$2.45	$2.58	$2.70	$2.84	$2.98
184	1 Cubic Yard Container	N/A	$4.67	$4.90	$5.15	$5.41	$5.68	$5.96
185	2 Cubic Yard Container	$9.34	$9.34	$9.81	$10.30	$10.81	$11.35	$11.92
186	3 Cubic Yard Container	$14.01	$14.01	$14.71	$15.45	$16.22	$17.04	$17.89
187	4 Cubic Yard Container	$18.69	$18.68	$19.62	$20.60	$21.63	$22.71	$23.85
188	6 Cubic Yard Container	$28.03	$28.02	$29.43	$30.90	$32.44	$34.06	$35.77
189	8 Cubic Yard Container	$37.37	$37.37	$39.24	$41.20	$43.26	$45.42	$47.69

Table 8
City of Stuart
Sanitation Rate Study

Proposed Sanitation Rates

Line No.	Description	Existing	Adjusted Existing [1]	Proposed Sanitation Rates by Service and Frequency Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	COMMERCIAL EXTRA PICKUP WITH RECYCLE SERVICE							
	Charge per Extra Pickup							
190	1/2 Cubic Yard Container	N/A	$4.16	$4.37	$4.59	$4.82	$5.06	$5.31
191	1 Cubic Yard Container	N/A	$8.32	$8.74	$9.18	$9.64	$10.12	$10.62
192	2 Cubic Yard Container	$16.62	$16.64	$17.48	$18.36	$19.28	$20.24	$21.24
193	3 Cubic Yard Container	$24.94	$24.96	$26.22	$27.54	$28.92	$30.36	$31.86
194	4 Cubic Yard Container	$33.25	$33.28	$34.96	$36.72	$38.56	$40.48	$42.48
195	6 Cubic Yard Container	$49.88	$49.92	$52.44	$55.08	$57.84	$60.72	$63.72
196	8 Cubic Yard Container	$66.50	$66.56	$69.92	$73.44	$77.12	$80.96	$84.96
	COMMERCIAL CLEANUP							
	Charge per Cleanup							
197	1/2 Cubic Yard Container	N/A	$4.67	$4.91	$5.15	$5.41	$5.68	$5.96
198	1 Cubic Yard Container	N/A	$9.35	$9.81	$10.31	$10.82	$11.36	$11.93
199	2 Cubic Yard Container	$18.69	$18.69	$19.63	$20.61	$21.64	$22.72	$23.86
200	3 Cubic Yard Container	$28.03	$28.04	$29.44	$30.91	$32.46	$34.08	$35.79
201	4 Cubic Yard Container	$37.37	$37.38	$39.25	$41.22	$43.28	$45.44	$47.72
202	6 Cubic Yard Container	$56.05	$56.08	$58.88	$61.83	$64.92	$68.16	$71.57
203	8 Cubic Yard Container	$74.73	$74.77	$78.51	$82.43	$86.55	$90.88	$95.43
	COMMERCIAL RECYCLE CLEANUP							
	Charge per Cleanup							
204	1/2 Cubic Yard Container	N/A	$2.34	$2.45	$2.58	$2.70	$2.84	$2.98
205	1 Cubic Yard Container	N/A	$4.67	$4.90	$5.15	$5.41	$5.68	$5.96
206	2 Cubic Yard Container	$9.34	$9.34	$9.81	$10.30	$10.81	$11.35	$11.92
207	3 Cubic Yard Container	$14.01	$14.01	$14.71	$15.45	$16.22	$17.04	$17.89
208	4 Cubic Yard Container	$18.69	$18.68	$19.62	$20.60	$21.63	$22.71	$23.85
209	6 Cubic Yard Container	$28.03	$28.02	$29.43	$30.90	$32.44	$34.06	$35.77
210	8 Cubic Yard Container	$37.37	$37.37	$39.24	$41.20	$43.26	$45.42	$47.69
	COMMERCIAL CLEANUP WITH RECYCLE SERVICE							
	Charge per Cleanup							
211	1/2 Cubic Yard Container	N/A	$4.16	$4.37	$4.59	$4.82	$5.06	$5.31
212	1 Cubic Yard Container	N/A	$8.32	$8.74	$9.18	$9.64	$10.12	$10.62
213	2 Cubic Yard Container	$16.62	$16.64	$17.48	$18.36	$19.28	$20.24	$21.24
214	3 Cubic Yard Container	$24.94	$24.96	$26.22	$27.54	$28.92	$30.36	$31.86
215	4 Cubic Yard Container	$33.25	$33.28	$34.96	$36.72	$38.56	$40.48	$42.48
216	6 Cubic Yard Container	$49.88	$49.92	$52.44	$55.08	$57.84	$60.72	$63.72
217	8 Cubic Yard Container	$66.50	$66.56	$69.92	$73.44	$77.12	$80.96	$84.96
	TRASH PICKUP							
	Charge per Pickup							
218	1/4 Load = 6 Cubic Yards	$31.04	$31.04	$32.59	$34.22	$35.93	$37.73	$39.62
219	1/2 Load = 12 Cubic Yards	$62.08	$62.08	$65.18	$68.44	$71.86	$75.46	$79.24
220	3/4 Load = 18 Cubic Yards	$93.01	$93.12	$97.77	$102.66	$107.79	$113.19	$118.86
221	Full Load = 24 Cubic Yards	$124.02	$124.16	$130.36	$136.88	$143.72	$150.92	$158.48
	VARIOUS MISCELLANEOUS [4]							
	Charge per Occurrence							
222	Dumpster Delivery Fee	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00
223	Roll-Off / Compactor Delivery	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00
224	Change in Service	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00	$34.00
225	Wheels - Straight or Swivel	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00
226	Cleaning of Dumpsters	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00
227	Cleaning of Roll-off / Compactor	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00	$100.00
228	Install Locking Device	$56.00	$56.00	$56.00	$56.00	$56.00	$56.00	$56.00
229	Relocation of Roll-off / Compactor	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00	$75.00
230	Return Trip for Inaccessible Dumpster	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00
231	Return Trip for Inaccessible Roll-off / Compactor	$135.00	$135.00	$135.00	$135.00	$135.00	$135.00	$135.00
232	Yard Trash Left by Landscaping Business	$65.00	$65.00	$65.00	$65.00	$65.00	$65.00	$65.00

Footnotes:

[1] The sanitation rate structure was initially based on a uniform rate per size and frequency of pickups. Over time, as adjustments have been made to the rates, the rates have migrated from the original form. Amounts reflect adjustments to the current rates to recalibrate the rates to match the uniform approach.

[2] Proposed annual rate increases derived from Table 6.

[3] Amounts based on the stated monthly rates for each service allocated over a single pick-up or 12 months service for 52 weeks during the year on average.

[4] Based on discussions with City staff, charges reflect miscellaneous fees which are not proposed to increase over the study period.

Table 9
City of Stuart
Sanitation Rate Study

Comparison of Residential Sanitation Rates [1]

Line No.	Description	Residential Collection & Disposal: Annual Charges	Garbage Collection	Recycling Collection	Yard-Waste Collection	Non-Ad Valorem Assessment
	City of Stuart:					
1	Existing [2]	$17.00	1 x week	1 x week	1 x week	No
2	Proposed FY 2018 [2]	17.85	1 x week	1 x week	1 x week	No
	Other Sanitation Systems:					
3	City of Fort Pierce [3]	21.95	2 x week	1 x week	1 x week	No
4	Martin County - Existing	25.35	2 x week	1 x week	1 x week	Yes
5	Martin County - Proposed FY 2018	25.75	2 x week	1 x week	1 x week	Yes
6	City of Port St. Lucie	22.36	2 x week	1 x week	1 x week	Yes
7	St. Lucie County	21.01	2 x week	1 x week	1 x week	Yes
8	Existing Survey Average	$21.53				

Footnotes:

[1] Unless otherwise noted, amounts shown reflect rates in effect April 2017 and are exclusive of taxes or franchise fees, if any. All rates are as reported by the respective utility. This comparison is intended to show comparable charges for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utility.

[2] The City of Stuart offers two recycling collections per week for certain addresses.

[3] The City of Fort Pierce charges $19.25 per month for garbage and yard waste collection. Recycling service is an additional $2.70 per month.

Appendix B
City of Stuart
Water and Wastewater Rate Study

List of Tables

No.	Description
1	Summary of Sewer Expansion Program Assumptions
2	Projected New Customer Growth and Availability Fees
3	Projected Rate Revenues at Existing Rates
4	Projected Other Operating Revenues
5	Projected Other Revenues and Transfers
6	Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems
7	Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems
8	Projected Water Operating Expenses
9	Projected Wastewater Operating Expenses
10	Summary of Projected Expense Escalation Factors
11	Five Year Estimated Capital Funding Program
12	Existing and Projected Debt Service Allocation
13	Projected Transfer to Renewal and Replacement Fund
14	Projected Intragovernmental Transfer
15	Combined Revenue Requirements
16	Projected Water Revenue Requirements
17	Projected Wastewater Revenue Requirements
18	Projected Available Fund Balances and Interest Earnings
19	Projected Debt Service Coverage
20	Proposed Water Rates
21	Proposed Wastewater Rates
22	Comparison of Typical Monthly Residential Bills For Water Service
23	Comparison of Typical Monthly Residential Bills For Wastewater Service
24	Comparison of Typical Monthly Residential Bills For Water and Wastewater Service

Table 1
City of Stuart
Water and Wastewater Rate Study

Summary of Sewer Expansion Program Assumptions

Line No.	Description	Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	DEVELOPMENT OF CHARGES						
	Proposed Charges						
1	Collection System Cost per ERC	$6,908	$6,908	$6,908	$6,908	$6,908	$6,908
2	Sewer Availability Fee per ERC	$2,092	$2,092	$2,092	$2,092	$2,092	$2,092
3	Total Charges per ERC	$9,000	$9,000	$9,000	$9,000	$9,000	$9,000
	Sewer Expansion Fees Terms						
4	Period (Years)	10	10	10	10	10	10
5	Interest Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Projected Annual Sewer Expansion Fees						
6	Collection System Cost per ERC	$691	$691	$691	$691	$691	$691
7	Sewer Availability Fee per ERC	$209	$209	$209	$209	$209	$209
8	Total Charges per ERC	$900	$900	$900	$900	$900	$900
9	Discount for Connection within 12 Months	22.22%	22.22%	22.22%	22.22%	22.22%	22.22%
	Projected Annual Sewer Expansion Fees (Discounted)						
10	Collection System Cost per ERC	$491	$491	$491	$491	$491	$491
11	Sewer Availability Fee per ERC	$209	$209	$209	$209	$209	$209
12	Total Charges per ERC	$700	$700	$700	$700	$700	$700
	Projected Upfront Payment						
13	Collection System Cost per ERC	$3,908	$3,908	$3,908	$3,908	$3,908	$3,908
14	Sewer Availability Fee per ERC	$2,092	$2,092	$2,092	$2,092	$2,092	$2,092
15	Total Charges per ERC	$6,000	$6,000	$6,000	$6,000	$6,000	$6,000

Table 1
City of Stuart
Water and Wastewater Rate Study

Summary of Sewer Expansion Program Assumptions

Line No.	Description	Short-term Life Cycle Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Unconnected
	CUSTOMER PROFILE						
	Customer Connection Profile						
16	Connections	12.50%	6.94%	6.94%	6.94%	6.94%	25.00%
	Payment Profile	Percent	Percent	Percent	Percent	Percent	Weighted
17	Upfront Payment	6.25%	0.00%	0.00%	0.00%	0.00%	15.52%
18	Annual Sewer Expansion Fees (Discounted)	6.25%	0.00%	0.00%	0.00%	0.00%	15.52%
19	Annual Sewer Expansion Fees (At Cost)	0.00%	6.94%	6.94%	6.94%	6.94%	68.97%

Line No.	Description	Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	CUSTOMER CONNECTIONS						
20	Customer Connections - Available						
21	St. Lucie Basin		200				
22	Dolphin Basin			156			
23	Poppleton Basin			94			
24	Palm Beach Basin			53			
25	East Stuart Basin			10			
26	Channel Ave. Basin			18			
27	Existing Basin Expansion	125	125	125	125	125	125
28	Future Basin Expansion						
29	Future Basin Expansion						
30	Total Connections - Available	125	325	456	125	125	125
20	Customer Connections - Each Year						
21	St. Lucie Basin		25	14	14	14	14
22	Dolphin Basin			20	11	11	11
23	Poppleton Basin			12	7	7	7
24	Palm Beach Basin			7	4	4	4
25	East Stuart Basin			1	1	1	1
26	Channel Ave. Basin			2	1	1	1
27	Existing Basin Expansion	125	125	125	125	125	125
28	Future Basin Expansion						
29	Future Basin Expansion						
31	Total Connections - Each Year	125	150	180	162	162	162
20	Customer Connections - Cumulative						
21	St. Lucie Basin	0	25	39	53	67	81
22	Dolphin Basin	0	0	20	30	41	52
23	Poppleton Basin	0	0	12	18	25	31
24	Palm Beach Basin	0	0	7	10	14	18
25	East Stuart Basin	0	0	1	2	3	3
26	Channel Ave. Basin	0	0	2	4	5	6
27	Existing Basin Expansion	125	250	375	500	625	750
28	Future Basin Expansion	0	0	0	0	0	0
29	Future Basin Expansion	0	0	0	0	0	0
32	Total Connections - Cumulative	125	275	455	617	779	941

Table 1
City of Stuart
Water and Wastewater Rate Study

Summary of Sewer Expansion Program Assumptions

Line No.	Description	Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	DEVELOPMENT OF SEF REVENUES						
	Projected Upfront Payments						
33	Collection System Cost	$0	$48,850	$80,847	$0	$0	$0
34	Sewer Availability Fee	$0	$26,150	$43,278	$0	$0	$0
35	Total Charges	$0	$75,000	$124,125	$0	$0	$0
	Projected Annual Sewer Expansion Fees (Discounted)						
36	Collection System Cost	$0	$6,135	$16,288	$16,288	$16,288	$16,288
37	Sewer Availability Fee	$0	$2,615	$6,943	$6,943	$6,943	$6,943
38	Total Charges	$0	$8,750	$23,231	$23,231	$23,231	$23,231
	Projected Annual Sewer Expansion Fees (At Cost)						
39	Collection System Cost	$86,350	$172,700	$268,644	$380,468	$492,291	$604,114
40	Sewer Availability Fee	$26,150	$52,300	$81,356	$115,219.81	$149,084	$182,948
41	Total Charges	$112,500	$225,000	$350,000	$495,688	$641,375	$787,063
	TOTAL SEF REVENUES						
42	Total Operating Sewer Expansion Fees Revenues	$86,350	$227,685	$365,780	$396,756	$508,579	$620,403
43	Total Sewer Availability Charges	$26,150	$81,065	$131,577	$122,163	$156,027	$189,891
44	Total Charges	$112,500	$308,750	$497,356	$518,919	$664,606	$810,294

Line No.	Description	Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	Capital Projects - City Costs (Net of Grant Revenues) - See CIP						
45	St. Lucie Basin	$373,660	$0	$0	$0	$0	$0
46	Dolphin Basin	0	227,000	0	0	0	0
47	Poppleton Basin	0	193,500	0	0	0	0
48	Palm Beach Basin	0	153,500	0	0	0	0
49	East Stuart Basin	0	112,000	0	0	0	0
50	Channel Ave. Basin	0	81,250	0	0	0	0
51	Sewer Expansion - Incremental Grinder Systems	500,000	750,000	901,319	809,375	809,375	809,375
52	Total Projects	$873,660	$1,517,250	$901,319	$809,375	$809,375	$809,375
						Total	$5,720,354

Table 2
City of Stuart
Water and Wastewater Rate Study

Projected New Customer Growth and Availability Fees

Line No.	Description		Projected Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	WATER SYSTEM							
	Impact Fee Schedule							
1	Impact Fee Per ERC		$1,933	$1,933	$1,933	$1,933	$1,933	$1,933
2	Projected New ERC's	Yes	10.0	10.0	10.0	10.0	10.0	10.0
3	Total Water Impact Fee Revenue		$19,330	$19,330	$19,330	$19,330	$19,330	$19,330
4	Percent Prepaid		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5	Water Impact Fee Revenue Recognized for Forecast		$19,330	$19,330	$19,330	$19,330	$19,330	$19,330
	WASTEWATER SYSTEM							
	Impact Fee Schedule							
6	Impact Fee Per ERC		$2,092	$2,092	$2,092	$2,092	$2,092	$2,092
7	Projected New ERC's	Yes	10.0	10.0	10.0	10.0	10.0	10.0
8	Total Wastewater Impact Fee Revenue		$20,920	$20,920	$20,920	$20,920	$20,920	$20,920
9	Percent Prepaid		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10	Wastewater Impact Fee Revenue Recognized for Forecast		$20,920	$20,920	$20,920	$20,920	$20,920	$20,920

Table 2
City of Stuart
Water and Wastewater Rate Study

Projected New Customer Growth and Availability Fees

Footnotes:
[1] Projected new development based upon information provided by staff as follows:

Planned Construction Projects:	Projected Fiscal Year Ending September 30,					
	2017	2018	2019	2020	2021	2022
Incremental Customer Growth						
Number of Homes	10.0	10.0	10.0	10.0	10.0	10.0
Water Gallons per Day per Unit	250	250	250	250	250	250
Wastewater Gallons per Day per Unit	200	200	200	200	200	200
Projected Water ERCs	10.0	10.0	10.0	10.0	10.0	10.0
Projected Wastewater ERCs	10.0	10.0	10.0	10.0	10.0	10.0
Wastewater Expansion Project						
Number of Homes	125.0	150.0	180.3	161.9	161.9	161.9
Water Gallons per Day per Unit	0	0	0	0	0	0
Wastewater Gallons per Day per Unit	200	200	200	200	200	200
Projected Water ERCs	0.0	0.0	0.0	0.0	0.0	0.0
Projected Wastewater ERCs	125.0	150.0	180.3	161.9	161.9	161.9
Total Projected Customer Growth						
Projected Water and Wastewater Accounts	10.0	10.0	10.0	10.0	10.0	10.0
Projected Water ERCs	10.0	10.0	10.0	10.0	10.0	10.0
Projected Wastewater ERCs	135.0	160.0	190.3	171.9	171.9	171.9

Table 2
City of Stuart
Water and Wastewater Rate Study

Projected New Customer Growth and Availability Fees

Footnote 1 Continued.

Projected Billing Determinants:		Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
Average Account Growth:							
Water System		4,428	4,438	4,448	4,458	4,468	4,478
	Yes	10.0	10.0	10.0	10.0	10.0	10.0
		4,438	4,448	4,458	4,468	4,478	4,488
		0.23%	0.23%	0.22%	0.22%	0.22%	0.22%
Wastewater System		2,397	2,532	2,692	2,882	3,054	3,226
	Yes	135.0	160.0	190.3	171.9	171.9	171.9
		2,532	2,692	2,882	3,054	3,226	3,398
		5.63%	6.32%	7.07%	5.96%	5.63%	5.33%
Average Sales Growth:							
Water System		990,000	990,480	990,960	991,440	991,920	992,400
	Yes	480	480	480	480	480	480
		990,480	990,960	991,440	991,920	992,400	992,880
		0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Wastewater System		620,000	626,480	634,160	643,292	651,543	659,793
	Yes	6,480	7,680	9,132	8,250	8,250	8,250
		626,480	634,160	643,292	651,543	659,793	668,043
		1.05%	1.23%	1.44%	1.28%	1.27%	1.25%

Table 3
City of Stuart
Water and Wastewater Rate Study

Projected Rate Revenues at Existing Rates

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	WATER SYSTEM						
1	Existing Revenues (Budgeted) [1]	$5,308,806	$5,308,806	$5,308,806	$5,308,806	$5,308,806	$5,308,806
2	Additional Revenues from Growth (Cumulative) [2]	2,964	5,928	8,892	11,856	14,820	17,784
3	Total Water Revenues	$5,311,770	$5,314,734	$5,317,698	$5,320,662	$5,323,626	$5,326,590
4	**WASTEWATER SYSTEM**						
5	Existing Revenues (Budgeted) [1]	$4,931,741	$4,931,741	$4,931,741	$4,931,741	$4,931,741	$4,931,741
6	Additional Revenues from Growth (Cumulative) [2]	53,671	117,281	192,920	261,253	329,585	397,918
7	Total Wastewater Revenues	$4,985,412	$5,049,022	$5,124,661	$5,192,994	$5,261,326	$5,329,659
8	**TOTAL RATE REVENUES**	$10,297,182	$10,363,756	$10,442,359	$10,513,656	$10,584,952	$10,656,249

Table 3
City of Stuart
Water and Wastewater Rate Study

Projected Rate Revenues at Existing Rates

Footnotes:

[1] Amounts based on budget, but exclude the proposed index for Fiscal Year 2018.

[2] Projected new development derived from Table 2 based upon information provided by staff as follows:

Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
Water System						
Cumulative Growth in Customer Accounts	10	20	30	40	50	60
Existing Monthly Base Fee & Customer Charge	$13.98	$13.98	$13.98	$13.98	$13.98	$13.98
Projected Revenues from Base Facility Charges	$1,678	$3,355	$5,033	$6,710	$8,388	$10,066
Cumulative Growth in Sales (kgals)	480	960	1,440	1,920	2,400	2,880
Existing Volume Charge (per kgal)	$2.68	$2.68	$2.68	$2.68	$2.68	$2.68
Projected Revenues from Base Facility Charges	$1,286	$2,573	$3,859	$5,146	$6,432	$7,718
Total Incremental Revenues from Customer Growth	$2,964	$5,928	$8,892	$11,856	$14,820	$17,784
Wastewater System						
Cumulative Growth in Customer Accounts	135	295	485	657	829	1,001
Existing Monthly Base Fee & Customer Charge	$7.69	$7.69	$7.69	$7.69	$7.69	$7.69
Projected Revenues from Base Facility Charges	$12,458	$27,223	$44,780	$60,641	$76,502	$92,363
Cumulative Growth in Sales (kgals)	6,480	14,160	23,292	31,543	39,793	48,043
Existing Volume Charge (per kgal)	$6.36	$6.36	$6.36	$6.36	$6.36	$6.36
Projected Revenues from Base Facility Charges	$41,213	$90,058	$148,140	$200,612	$253,083	$305,555
Total Incremental Revenues from Customer Growth	$53,671	$117,281	$192,920	$261,253	$329,585	$397,918

Table 4
City of Stuart
Water and Wastewater Rate Study

Allocation of Other Operating Revenues to Individual Systems

Line No.	Description	Budget [1] 2017	Adjustments	Adjusted 2017	Budget [1] 2018	Adjustments	Adjusted 2018	Basis	Allocation Percentages Water System	Allocation Percentages Wastewater System
	Other Operating Revenues									
1	Miscellaneous Fees / Inspections	$15,000	$0	$15,000	$15,000	$0	$15,000	Input	100.00%	0.00%
2	Delinquent Water Fees	7,500	0	7,500	7,625	0	7,625	Input	100.00%	0.00%
3	Delinquent Sewer Fees	5,500	0	5,500	5,800	0	5,800	Input	0.00%	100.00%
4	Utility Service Charges	47,700	0	47,700	49,000	0	49,000	Equal	50.00%	50.00%
5	Sewer Payment Plans [2]	268,568	(268,568)	0	298,568	(298,568)	0	Direct-S	0.00%	100.00%
6	Reclaimed Water Revenue	83,000	0	83,000	102,942	7,433	110,375	Direct-S	0.00%	100.00%
7	Recovered Bad Debt	300	0	300	1,000	0	1,000	Equal	50.00%	50.00%
8	Other Miscellaneous Revenues	1,200	0	1,200	6,500	0	6,500	Equal	50.00%	50.00%
9	Totals	$428,768	($268,568)	$160,200	$486,435	($291,135)	$195,300			

Footnotes:
[1] Based on budgeted figures as provided by the City.
[2] Amount excluded from operating revenues but included as a cash source for sewer expansion in Table 18.

Table 4
City of Stuart
Water and Wastewater Rate Study

Projected Other Operating Revenues

Line No.	Description	Budgeted 2017	Budgeted 2018	Escalation Reference	Fiscal Year Ending September 30, 2019	2020	2021	2022
	Water System							
	Other Operating Revenues							
1	Miscellaneous Fees / Inspections	$15,000	$15,000	Constant	$15,000	$15,000	$15,000	$15,000
2	Delinquent Water Fees	7,500	7,625	Constant	7,625	7,625	7,625	7,625
3	Delinquent Sewer Fees	0	0	Constant	0	0	0	0
4	Utility Service Charges	23,850	24,500	Constant	24,500	24,500	24,500	24,500
5	Sewer Payment Plans [2]	0	0	Constant	0	0	0	0
6	Reclaimed Water Revenue	0	0	Constant	0	0	0	0
7	Recovered Bad Debt	150	500	Eliminate	0	0	0	0
7	Other Miscellaneous Revenues	600	3,250	Constant	3,250	3,250	3,250	3,250
8	Totals	$47,100	$50,875		$50,375	$50,375	$50,375	$50,375
	Wastewater System							
	Other Operating Revenues							
9	Miscellaneous Fees / Inspections	$0	$0	Constant	$0	$0	$0	$0
10	Delinquent Water Fees	0	0	Constant	0	0	0	0
11	Delinquent Sewer Fees	5,500	5,800	Constant	5,800	5,800	5,800	5,800
12	Utility Service Charges	23,850	24,500	Constant	24,500	24,500	24,500	24,500
13	Sewer Payment Plans [2]	0	0	Constant	0	0	0	0
14	Reclaimed Water Revenue	83,000	110,375	Calculated	110,375	110,375	110,375	110,375
15	Recovered Bad Debt	150	500	Eliminate	0	0	0	0
16	Other Miscellaneous Revenues	600	3,250	Constant	3,250	3,250	3,250	3,250
17	Totals	$113,100	$144,425		$143,925	$143,925	$143,925	$143,925

Table 5
City of Stuart
Water and Wastewater Rate Study

Allocation of Other Revenues and Transfers to Individual Systems

Line No.	Description	Budget [1] 2017	Adjustments	Adjusted 2017	Budget [1] 2018	Adjustments	Adjusted 2018	Basis	Allocation Percentages Water System	Allocation Percentages Wastewater System
	Other Operating Revenues									
1	Special Assessments	$0	$0	$0	$8,000	$0	$8,000	Direct-W	100.00%	0.00%
2	Donations from Public	35,000	0	35,000	16,000	0	16,000	Equal	50.00%	50.00%
3	Disposition of Assets / Sale of Scrap	4,500	0	4,500	14,600	0	14,600	Equal	50.00%	50.00%
4	Transfer from Other City Funds	0	0	0	0	0	0	Equal	50.00%	50.00%
5	Totals	$39,500	$0	$39,500	$38,600	$0	$38,600			

Footnotes:
[1] Based on budgeted figures as provided by the City.

Table 5
City of Stuart
Water and Wastewater Rate Study

Projected Other Revenues and Transfers

Line No.	Description	Budgeted 2017	Budgeted 2018	Escalation Reference	Fiscal Year Ending September 30, 2019	2020	2021	2022
	Water System							
	Other Operating Revenues							
1	Special Assessments	$0	$8,000	Constant	$8,000	$8,000	$8,000	$8,000
2	Donations from Public	17,500	8,000	Constant	8,000	8,000	8,000	8,000
3	Disposition of Assets / Sale of Scrap	2,250	7,300	Eliminate	0	0	0	0
4	Transfer from Other City Funds	0	0	Constant	0	0	0	0
5	Totals	$19,750	$23,300		$16,000	$16,000	$16,000	$16,000
	Wastewater System							
	Other Operating Revenues							
6	Special Assessments	$0	$0	Constant	$0	$0	$0	$0
7	Donations from Public	17,500	8,000	Constant	8,000	8,000	8,000	8,000
8	Disposition of Assets / Sale of Scrap	2,250	7,300	Eliminate	0	0	0	0
9	Transfer from Other City Funds	0	0	Constant	0	0	0	0
10	Totals	$19,750	$15,300		$8,000	$8,000	$8,000	$8,000

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Wastewater	Adjusted 2017 Water	Wastewater
	Water Plant (1610)									
	Personnel Costs									
1	Salaries - Regular	512	$471,413	$0	$471,413	Direct-W	100.0%	0.0%	$471,413	$0
2	Salaries - Overtime	514	31,000	0	31,000	Direct-W	100.0%	0.0%	31,000	0
3	Salaries - Part-time		0	0	0	Direct-W	100.0%	0.0%	0	0
4	Salaries - Longevity		0	0	0	Direct-W	100.0%	0.0%	0	0
5	Salaries - Special Pay	515	4,200	0	4,200	Direct-W	100.0%	0.0%	4,200	0
6	FICA Taxes	521	38,756	0	38,756	Direct-W	100.0%	0.0%	38,756	0
7	Retirement Contribution	522	35,766	0	35,766	Direct-W	100.0%	0.0%	35,766	0
8	Insurance - Life & Health	523	99,989	0	99,989	Direct-W	100.0%	0.0%	99,989	0
9	Workers Compensation	524	15,277	0	15,277	Direct-W	100.0%	0.0%	15,277	0
10	Unemployment Compensation		0	0	0	Direct-W	100.0%	0.0%	0	0
11	Total Personnel Costs		$696,401	$0	$696,401				$696,401	$0
	Operating Services									
12	Professional Services	531	$305,296	$0	$305,296	Direct-W	100.0%	0.0%	$305,296	$0
13	Other Contractual Services	534	218,250	0	218,250	Direct-W	100.0%	0.0%	218,250	0
14	Travel and Per Diem	540	2,500	0	2,500	Direct-W	100.0%	0.0%	2,500	0
15	Communications / Freight	541&542	6,468	0	6,468	Direct-W	100.0%	0.0%	6,468	0
16	Utility Services	543	238,000	0	238,000	Direct-W	100.0%	0.0%	238,000	0
17	Rentals and Leases	544	28,500	0	28,500	Direct-W	100.0%	0.0%	28,500	0
18	Insurance	545	17,559	0	17,559	Direct-W	100.0%	0.0%	17,559	0
19	Repair and Maintenance	546	585,000	0	585,000	Direct-W	100.0%	0.0%	585,000	0
20	Printing and Binding	547	7,220	0	7,220	Direct-W	100.0%	0.0%	7,220	0
21	Other Current Charges	549	27,471	0	27,471	Direct-W	100.0%	0.0%	27,471	0
22	Office Supplies	551	2,095	0	2,095	Direct-W	100.0%	0.0%	2,095	0
23	Operating Supplies	552	312,901	0	312,901	Direct-W	100.0%	0.0%	312,901	0
24	Publications / Memberships / Training	554&555	3,865	0	3,865	Direct-W	100.0%	0.0%	3,865	0
25	Promotional Activities	548	6,900	0	6,900	Direct-W	100.0%	0.0%	6,900	0
26	Total Operating Services		$1,762,025	$0	$1,762,025				$1,762,025	$0
	Capital Outlay									
27	Buildings	562	$0	$0 [3]	$0	Direct-W	100.0%	0.0%	$0	$0
28	Infrastructure	563	276,189	(276,189) [3]	0	Direct-W	100.0%	0.0%	0	0
29	Machinery & Equipment	564	55,500	(55,500) [3]	0	Direct-W	100.0%	0.0%	0	0
30	Total Capital Outlay		$331,689	($331,689)	$0				$0	$0
31	**Total Water Plant**		$2,790,115	($331,689)	$2,458,426				$2,458,426	$0

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2017 Water	Adjusted 2017 Wastewater
	Wastewater Plant (1620)									
	Personnel Costs									
32	Salaries - Regular	512	$488,918	$0	$488,918	Direct-S	0.0%	100.0%	$0	$488,918
33	Salaries - Overtime	514	23,500	0	23,500	Direct-S	0.0%	100.0%	0	23,500
34	Salaries - Part-time		0	0	0	Direct-S	0.0%	100.0%	0	0
35	Salaries - Longevity		0	0	0	Direct-S	0.0%	100.0%	0	0
36	Salaries - Special Pay	515	5,160	0	5,160	Direct-S	0.0%	100.0%	0	5,160
37	FICA Taxes	521	39,595	0	39,595	Direct-S	0.0%	100.0%	0	39,595
38	Retirement Contribution	522	36,925	0	36,925	Direct-S	0.0%	100.0%	0	36,925
39	Insurance - Life & Health	523	115,705	0	115,705	Direct-S	0.0%	100.0%	0	115,705
40	Workers Compensation	524	13,151	0	13,151	Direct-S	0.0%	100.0%	0	13,151
41	Unemployment Compensation		0	0	0	Direct-S	0.0%	100.0%	0	0
42	Total Personnel Costs		$722,954	$0	$722,954				$0	$722,954
	Operating Services									
43	Professional Services	531	$36,959	$0	$36,959	Direct-S	0.0%	100.0%	$0	$36,959
44	Other Contractual Services	534	152,475	0	152,475	Direct-S	0.0%	100.0%	0	152,475
45	Travel and Per Diem	540	600	0	600	Direct-S	0.0%	100.0%	0	600
46	Communications / Freight	541&542	8,649	0	8,649	Direct-S	0.0%	100.0%	0	8,649
47	Utility Services	543	430,000	0	430,000	Direct-S	0.0%	100.0%	0	430,000
48	Rentals and Leases	544	52,000	0	52,000	Direct-S	0.0%	100.0%	0	52,000
49	Insurance	545	21,572	0	21,572	Direct-S	0.0%	100.0%	0	21,572
50	Repair and Maintenance	546	221,000	0	221,000	Direct-S	0.0%	100.0%	0	221,000
51	Printing and Binding	547	1,000	0	1,000	Direct-S	0.0%	100.0%	0	1,000
52	Other Current Charges	549	13,828	0	13,828	Direct-S	0.0%	100.0%	0	13,828
53	Office Supplies	551	1,500	0	1,500	Direct-S	0.0%	100.0%	0	1,500
54	Operating Supplies	552	101,382	0	101,382	Direct-S	0.0%	100.0%	0	101,382
55	Publications / Memberships / Training	554&555	1,200	0	1,200	Direct-S	0.0%	100.0%	0	1,200
56	Promotional Activities	548	2,000	0	2,000	Direct-S	0.0%	100.0%	0	2,000
57	Total Operating Services		$1,044,165	$0	$1,044,165				$0	$1,044,165
	Capital Outlay									
58	Buildings	562	$38,343	($38,343) [3]	$0	Direct-S	0.0%	100.0%	$0	$0
59	Infrastructure	563	39,000	(39,000) [3]	0	Direct-S	0.0%	100.0%	0	0
60	Machinery & Equipment	564	17,848	(17,848) [3]	0	Direct-S	0.0%	100.0%	0	0
61	Total Capital Outlay		$95,191	($95,191)	$0				$0	$0
62	**Total Wastewater Plant**		$1,862,309	($95,191)	$1,767,119				$0	$1,767,119

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Wastewater	Adjusted 2017 Water	Wastewater
	Distribution and Collection (1630)									
	Personnel Costs									
63	Salaries - Regular	512	$419,485	$0	$419,485	Lines	63.8%	36.2%	$267,631	$151,854
64	Salaries - Overtime	514	24,000	0	24,000	Lines	63.8%	36.2%	15,312	8,688
65	Salaries - Part-time		0	0	0	Lines	63.8%	36.2%	0	0
66	Salaries - Longevity		0	0	0	Lines	63.8%	36.2%	0	0
67	Salaries - Special Pay	515	3,300	0	3,300	Lines	63.8%	36.2%	2,105	1,195
68	FICA Taxes	521	34,179	0	34,179	Lines	63.8%	36.2%	21,806	12,373
69	Retirement Contribution	522	31,681	0	31,681	Lines	63.8%	36.2%	20,212	11,469
70	Insurance - Life & Health	523	101,376	0	101,376	Lines	63.8%	36.2%	64,678	36,698
71	Workers Compensation	524	14,700	0	14,700	Lines	63.8%	36.2%	9,379	5,321
72	Unemployment Compensation		0	0	0	Lines	63.8%	36.2%	0	0
73	Total Personnel Costs		$628,721	$0	$628,721				$401,124	$227,597
	Operating Services									
74	Professional Services	531	$39,950	$0	$39,950	Lines	63.8%	36.2%	$25,488	$14,462
75	Other Contractual Services	534	155,765	0	155,765	Lines	63.8%	36.2%	99,378	56,387
76	Travel and Per Diem	540	250	0	250	Lines	63.8%	36.2%	160	91
77	Communications / Freight	541&542	6,393	0	6,393	Lines	63.8%	36.2%	4,079	2,314
78	Utility Services	543	8,781	0	8,781	Lines	63.8%	36.2%	5,602	3,179
79	Rentals and Leases	544	500	0	500	Lines	63.8%	36.2%	319	181
80	Insurance	545	31,774	0	31,774	Lines	63.8%	36.2%	20,272	11,502
81	Repair and Maintenance	546	185,962	0	185,962	Lines	63.8%	36.2%	118,644	67,318
82	Printing and Binding	547	500	0	500	Lines	63.8%	36.2%	319	181
83	Other Current Charges	549	700	0	700	Lines	63.8%	36.2%	447	253
84	Office Supplies	551	250	0	250	Lines	63.8%	36.2%	160	91
85	Operating Supplies	552	46,816	0	46,816	Lines	63.8%	36.2%	29,869	16,947
86	Road Materials / Supplies	553	2,575	0	2,575	Lines	63.8%	36.2%	1,643	932
87	Publications / Memberships / Training	554&555	2,010	0	2,010	Lines	63.8%	36.2%	1,282	728
88	Promotional Activities	548	1,600	0	1,600	Lines	63.8%	36.2%	1,021	579
89	Total Operating Services		$483,826	$0	$483,826				$308,681	$175,145
	Capital Outlay									
90	Buildings	562	$0	$0 [3]	$0	Lines	63.8%	36.2%	$0	$0
91	Infrastructure	563	4,241,121	(4,241,121) [3]	0	Input	0.0%	100.0%	0	0
92	Machinery & Equipment	564	30,000	(30,000) [3]	0	Lines	63.8%	36.2%	0	0
93	Total Capital Outlay		$4,271,121	($4,271,121)	$0				$0	$0
94	**Total Distribution and Collection**		$5,383,668	($4,271,121)	$1,112,547				$709,805	$402,742

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2017 Water	Adjusted 2017 Wastewater
	Utility Customer Service (1640)									
	Personnel Costs									
95	Salaries - Regular	512	$203,376	$0	$203,376	Accounts	64.9%	35.1%	$131,949	$71,427
96	Salaries - Overtime	514	4,500	0	4,500	Accounts	64.9%	35.1%	2,920	1,580
97	Salaries - Part-time		0	0	0	Accounts	64.9%	35.1%	0	0
98	Salaries - Longevity		0	0	0	Accounts	64.9%	35.1%	0	0
99	Salaries - Special Pay	515	2,400	0	2,400	Accounts	64.9%	35.1%	1,557	843
100	FICA Taxes	521	16,086	0	16,086	Accounts	64.9%	35.1%	10,436	5,650
101	Retirement Contribution	522	15,294	0	15,294	Accounts	64.9%	35.1%	9,923	5,371
102	Insurance - Life & Health	523	41,299	0	41,299	Accounts	64.9%	35.1%	26,794	14,505
103	Workers Compensation	524	295	0	295	Accounts	64.9%	35.1%	191	104
104	Unemployment Compensation		0	0	0	Accounts	64.9%	35.1%	0	0
105	Total Personnel Costs		$283,250	$0	$283,250				$183,770	$99,480
	Operating Services									
106	Professional Services	531	$36,442	$0	$36,442	Accounts	64.9%	35.1%	$23,643	$12,799
107	Accounting and Auditing		0	0	0	Accounts	64.9%	35.1%	0	0
108	Other Contractual Services	534	37,200	0	37,200	Accounts	64.9%	35.1%	24,135	13,065
109	Travel and Per Diem	540	1,000	0	1,000	Accounts	64.9%	35.1%	649	351
110	Communications / Freight	541&542	38,987	0	38,987	Accounts	64.9%	35.1%	25,294	13,693
111	Utility Services	543	2,400	0	2,400	Accounts	64.9%	35.1%	1,557	843
112	Rentals and Leases	544	1,000	0	1,000	Accounts	64.9%	35.1%	649	351
113	Insurance	545	2,374	0	2,374	Accounts	64.9%	35.1%	1,540	834
114	Repair and Maintenance	546	530	0	530	Accounts	64.9%	35.1%	344	186
115	Printing and Binding	547	9,500	0	9,500	Accounts	64.9%	35.1%	6,164	3,336
116	Other Current Charges	549	95,300	0	95,300	Accounts	64.9%	35.1%	61,830	33,470
117	Office Supplies	551	2,000	0	2,000	Accounts	64.9%	35.1%	1,298	702
118	Operating Supplies	552	10,250	0	10,250	Accounts	64.9%	35.1%	6,650	3,600
119	Publications / Memberships / Training	554&555	2,000	0	2,000	Accounts	64.9%	35.1%	1,298	702
120	Promotional Activities	548	600	0	600	Accounts	64.9%	35.1%	389	211
121	Total Operating Services		$239,583	$0	$239,583				$155,439	$84,144
	Capital Outlay									
122	Buildings	562	$0	$0 [3]	$0	Accounts	64.9%	35.1%	$0	$0
123	Infrastructure	563	0	0 [3]	0	Accounts	64.9%	35.1%	0	0
124	Machinery & Equipment	564	3,152	(3,152) [3]	0	Accounts	64.9%	35.1%	0	0
125	Total Capital Outlay		$3,152	($3,152)	$0				$0	$0
126	**Total Utility Customer Service**		$525,985	($3,152)	$522,833				$339,209	$183,624

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2017 Water	Adjusted 2017 Wastewater
	Water and Wastewater General Government (1670)									
	Personnel Costs									
127	Salaries - Regular	512	$592,651	$0	$592,651	Salaries	55.2%	44.8%	$327,156	$265,495
128	Salaries - Overtime	514	1,000	0	1,000	Salaries	55.2%	44.8%	552	448
129	Salaries - Part-time		0	0	0	Salaries	55.2%	44.8%	0	0
130	Salaries - Longevity		0	0	0	Salaries	55.2%	44.8%	0	0
131	Salaries - Special Pay	515	5,164	0	5,164	Salaries	55.2%	44.8%	2,851	2,313
132	FICA Taxes	521	45,809	0	45,809	Salaries	55.2%	44.8%	25,288	20,521
133	Retirement Contribution	522	50,595	0	50,595	Salaries	55.2%	44.8%	27,930	22,665
134	Insurance - Life & Health	523	102,398	0	102,398	Salaries	55.2%	44.8%	56,526	45,872
135	Workers Compensation	524	4,998	0	4,998	Salaries	55.2%	44.8%	2,759	2,239
136	Unemployment Compensation		0	0	0	Salaries	55.2%	44.8%	0	0
137	Total Personnel Costs		$802,615	$0	$802,615				$443,061	$359,554
	Operating Services									
138	Professional Services	531	$113,500	$0	$113,500	Salaries	55.2%	44.8%	$62,654	$50,846
139	Other Contractual Services	534	1,000	0	1,000	Salaries	55.2%	44.8%	552	448
140	Travel and Per Diem	540	5,500	0	5,500	Salaries	55.2%	44.8%	3,036	2,464
141	Communications / Freight	541&542	4,494	0	4,494	Salaries	55.2%	44.8%	2,481	2,013
142	Utility Services	543	5,400	0	5,400	Salaries	55.2%	44.8%	2,981	2,419
143	Rentals and Leases	544	27,300	0	27,300	Salaries	55.2%	44.8%	15,070	12,230
144	Insurance	545	13,874	0	13,874	Salaries	55.2%	44.8%	7,659	6,215
145	Repair and Maintenance	546	6,365	0	6,365	Salaries	55.2%	44.8%	3,514	2,851
146	Printing and Binding	547	1,030	0	1,030	Salaries	55.2%	44.8%	569	461
147	Other Current Charges	549	0	0	0	Salaries	55.2%	44.8%	0	0
148	Office Supplies	551	4,330	0	4,330	Salaries	55.2%	44.8%	2,390	1,940
149	Operating Supplies	552	15,863	0	15,863	Salaries	55.2%	44.8%	8,757	7,106
150	Road Materials / Supplies	553	0	0	0	Salaries	55.2%	44.8%	0	0
151	Publications / Memberships / Training	554&555	7,050	0	7,050	Salaries	55.2%	44.8%	3,892	3,158
	Professional Services	548	950							
152	Total Operating Services		$206,656	$0	$205,706				$113,554	$92,152
	Capital Outlay									
153	Buildings	562	$0	$0 [3]	$0	Salaries	55.2%	44.8%	$0	$0
154	Infrastructure	563	0	0 [3]	0	Salaries	55.2%	44.8%	0	0
155	Machinery & Equipment	564	82,760	(82,760) [3]	0	Salaries	55.2%	44.8%	0	0
156	Total Capital Outlay		$82,760	($82,760)	$0				$0	$0
157	**Total Water and Wastewater General Government**		$1,092,031	($82,760)	$1,008,321				$556,615	$451,706

Table 6
City of Stuart
Water and Wastewater Rate Study

Adopted Fiscal Year 2017 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2017 [1]	Adjustments	Adjusted 2017	Basis	Allocation Percentages [2] Water	Wastewater	Adjusted 2017 Water	Wastewater
	Debt Service (1660)									
158	Principal		$1,171,486	($1,171,486) [4]	$0	Salaries	55.2%	44.8%	$0	$0
159	Interest		866,562	(866,562) [4]	0	Salaries	55.2%	44.8%	0	0
160	Other Debt Service Costs		123,735	(123,735) [4]	0	Salaries	55.2%	44.8%	0	0
161	**Total Debt Service**		$2,161,783	($2,161,783)	$0				$0	$0
	Non - Departmental (1690)									
162	Transfers (Indirect Cost Allocation) - Net	557	$230,676	$0	$230,676	Salaries	55.2%	44.8%	$127,338	$103,338
163	Other Non-operating Uses - Life / Health Insurar	523	40,960	0	40,960	Salaries	55.2%	44.8%	22,611	18,349
163	Intragovernmental Transfers	591	679,169	(679,169)	0	Salaries	55.2%	44.8%	0	0
164	Transfer to Retained Earnings	595	728,925	(728,925)	0	Salaries	55.2%	44.8%	0	0
165	**Total Non - Departmental**		$1,679,730	($1,408,094)	$271,636				$149,949	$121,687
166	**Total System**		$15,495,622	($8,353,789)	$7,140,882				$4,214,004	$2,926,878

Footnotes:

[1] Based on budgeted figures for the Fiscal Year Ending September 30, 2017 as amended by the City.

[2] Allocations based on operating information obtained from the budget, historical operating records and other information provided by the City.

[3] Amounts, if any, reflect reductions in the operating budget for capital expenditures shown in Table 11.

[4] Amounts reflect reductions in the operating budget for debt service payments associated with long-term debt. Such amounts are reflected in Table 12 of this report.

Table 7
City of Stuart
Water and Wastewater Rate Study

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Wastewater	Adjusted 2013 Water	Wastewater
	Water Plant (1610)									
	Personnel Costs									
1	Salaries - Regular	512	$480,090	$0	$480,090	Direct-W	100.0%	0.0%	$480,090	$0
2	Salaries - Overtime	514	31,000	0	31,000	Direct-W	100.0%	0.0%	31,000	0
3	Salaries - Part-time		0	0	0	Direct-W	100.0%	0.0%	0	0
4	Salaries - Longevity		0	0	0	Direct-W	100.0%	0.0%	0	0
5	Salaries - Special Pay	515	4,500	0	4,500	Direct-W	100.0%	0.0%	4,500	0
6	FICA Taxes	521	39,443	0	39,443	Direct-W	100.0%	0.0%	39,443	0
7	Retirement Contribution	522	40,835	0	40,835	Direct-W	100.0%	0.0%	40,835	0
8	Insurance - Life & Health	523	119,748	0	119,748	Direct-W	100.0%	0.0%	119,748	0
9	Workers Compensation	524	15,506	0	15,506	Direct-W	100.0%	0.0%	15,506	0
10	Unemployment Compensation		0	0	0	Direct-W	100.0%	0.0%	0	0
11	Total Personnel Costs		$731,122	$0	$731,122				$731,122	$0
	Operating Services									
12	Professional Services	531	$57,500	$0	$57,500	Direct-W	100.0%	0.0%	$57,500	$0
13	Other Contractual Services	534	207,450	0	207,450	Direct-W	100.0%	0.0%	207,450	0
14	Travel and Per Diem	540	4,500	0	4,500	Direct-W	100.0%	0.0%	4,500	0
15	Communications / Freight	541&542	6,900	0	6,900	Direct-W	100.0%	0.0%	6,900	0
16	Utility Services	543	226,000	0	226,000	Direct-W	100.0%	0.0%	226,000	0
17	Rentals and Leases	544	28,750	0	28,750	Direct-W	100.0%	0.0%	28,750	0
18	Insurance	545	17,211	0	17,211	Direct-W	100.0%	0.0%	17,211	0
19	Repair and Maintenance	546	372,000	0	372,000	Direct-W	100.0%	0.0%	372,000	0
20	Printing and Binding	547	7,900	0	7,900	Direct-W	100.0%	0.0%	7,900	0
21	Other Current Charges	549	24,750	0	24,750	Direct-W	100.0%	0.0%	24,750	0
22	Office Supplies	551	1,500	0	1,500	Direct-W	100.0%	0.0%	1,500	0
23	Operating Supplies	552	413,833	0	413,833	Direct-W	100.0%	0.0%	413,833	0
24	Publications / Memberships / Training	554&555	8,765	0	8,765	Direct-W	100.0%	0.0%	8,765	0
25	Promotional Activities	548	11,900	0	11,900	Direct-W	100.0%	0.0%	11,900	0
26	Total Operating Services		$1,388,959	$0	$1,388,959				$1,388,959	$0
	Capital Outlay									
27	Buildings	562	$0	$0 [3]	$0	Direct-W	100.0%	0.0%	$0	$0
28	Infrastructure	563	3,100,000	(3,100,000) [3]	0	Direct-W	100.0%	0.0%	0	0
29	Machinery & Equipment	564	51,000	(51,000) [3]	0	Direct-W	100.0%	0.0%	0	0
30	Total Capital Outlay		$3,151,000	($3,151,000)	$0				$0	$0
31	**Total Water Plant**		$5,271,081	($3,151,000)	$2,120,081				$2,120,081	$0

Table 7
City of Stuart
Water and Wastewater Rate Study

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2013 Water	Adjusted 2013 Wastewater
	Wastewater Plant (1620)									
	Personnel Costs									
32	Salaries - Regular	512	$497,476	$0	$497,476	Direct-S	0.0%	100.0%	$0	$497,476
33	Salaries - Overtime	514	24,000	0	24,000	Direct-S	0.0%	100.0%	0	24,000
34	Salaries - Part-time		0	0	0	Direct-S	0.0%	100.0%	0	0
35	Salaries - Longevity		0	0	0	Direct-S	0.0%	100.0%	0	0
36	Salaries - Special Pay	515	5,760	0	5,760	Direct-S	0.0%	100.0%	0	5,760
37	FICA Taxes	521	40,334	0	40,334	Direct-S	0.0%	100.0%	0	40,334
38	Retirement Contribution	522	41,515	0	41,515	Direct-S	0.0%	100.0%	0	41,515
39	Insurance - Life & Health	523	128,868	0	128,868	Direct-S	0.0%	100.0%	0	128,868
40	Workers Compensation	524	13,349	0	13,349	Direct-S	0.0%	100.0%	0	13,349
41	Unemployment Compensation		0	0	0	Direct-S	0.0%	100.0%	0	0
42	Total Personnel Costs		$751,302	$0	$751,302				$0	$751,302
	Operating Services									
43	Professional Services	531	$35,000	$0	$35,000	Direct-S	0.0%	100.0%	$0	$35,000
44	Other Contractual Services	534	171,975	0	171,975	Direct-S	0.0%	100.0%	0	171,975
45	Travel and Per Diem	540	2,800	0	2,800	Direct-S	0.0%	100.0%	0	2,800
46	Communications / Freight	541&542	13,870	0	13,870	Direct-S	0.0%	100.0%	0	13,870
47	Utility Services	543	454,400	0	454,400	Direct-S	0.0%	100.0%	0	454,400
48	Rentals and Leases	544	56,000	0	56,000	Direct-S	0.0%	100.0%	0	56,000
49	Insurance	545	21,433	0	21,433	Direct-S	0.0%	100.0%	0	21,433
50	Repair and Maintenance	546	369,000	0	369,000	Direct-S	0.0%	100.0%	0	369,000
51	Printing and Binding	547	1,000	0	1,000	Direct-S	0.0%	100.0%	0	1,000
52	Other Current Charges	549	7,500	0	7,500	Direct-S	0.0%	100.0%	0	7,500
53	Office Supplies	551	1,000	0	1,000	Direct-S	0.0%	100.0%	0	1,000
54	Operating Supplies	552	111,005	0	111,005	Direct-S	0.0%	100.0%	0	111,005
55	Publications / Memberships / Training	554	4,500	0	4,500	Direct-S	0.0%	100.0%	0	4,500
56	Promotional Activities	548	2,000	0	2,000	Direct-S	0.0%	100.0%	0	2,000
57	Total Operating Services		$1,251,483	$0	$1,251,483				$0	$1,251,483
	Capital Outlay									
58	Buildings	562	$500,000	($500,000) [3]	$0	Direct-S	0.0%	100.0%	$0	$0
59	Infrastructure	563	0	0 [3]	0	Direct-S	0.0%	100.0%	0	0
60	Machinery & Equipment	564	95,500	(95,500) [3]	0	Direct-S	0.0%	100.0%	0	0
61	Total Capital Outlay		$595,500	($595,500)	$0				$0	$0
62	**Total Wastewater Plant**		$2,598,285	($595,500)	$2,002,785				$0	$2,002,785

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Wastewater	Adjusted 2013 Water	Wastewater
	Distribution and Collection (1630)									
	Personnel Costs									
63	Salaries - Regular	512	$429,172	$0	$429,172	Lines	63.8%	36.2%	$273,812	$155,360
64	Salaries - Overtime	514	26,700	0	26,700	Lines	63.8%	36.2%	17,035	9,665
65	Salaries - Part-time		0	0	0	Lines	63.8%	36.2%	0	0
66	Salaries - Longevity		0	0	0	Lines	63.8%	36.2%	0	0
67	Salaries - Special Pay	515	6,900	0	6,900	Lines	63.8%	36.2%	4,402	2,498
68	FICA Taxes	521	35,402	0	35,402	Lines	63.8%	36.2%	22,586	12,816
69	Retirement Contribution	522	36,485	0	36,485	Lines	63.8%	36.2%	23,277	13,208
70	Insurance - Life & Health	523	117,524	0	117,524	Lines	63.8%	36.2%	74,980	42,544
71	Workers Compensation	524	14,921	0	14,921	Lines	63.8%	36.2%	9,520	5,401
72	Unemployment Compensation		0	0	0	Lines	63.8%	36.2%	0	0
73	Total Personnel Costs		$667,104	$0	$667,104				$425,612	$241,492
	Operating Services									
74	Professional Services	531	$20,000	$0	$20,000	Lines	63.8%	36.2%	$12,760	$7,240
75	Other Contractual Services	534	110,900	0	110,900	Lines	63.8%	36.2%	70,754	40,146
76	Travel and Per Diem	540	300	0	300	Lines	63.8%	36.2%	191	109
77	Communications / Freight	541&542	6,420	0	6,420	Lines	63.8%	36.2%	4,096	2,324
78	Utility Services	543	10,440	0	10,440	Lines	63.8%	36.2%	6,661	3,779
79	Rentals and Leases	544	500	0	500	Lines	63.8%	36.2%	319	181
80	Insurance	545	32,251	0	32,251	Lines	63.8%	36.2%	20,576	11,675
81	Repair and Maintenance	546	186,000	0	186,000	Lines	63.8%	36.2%	118,668	67,332
82	Printing and Binding	547	500	0	500	Lines	63.8%	36.2%	319	181
83	Other Current Charges	549	1,000	0	1,000	Lines	63.8%	36.2%	638	362
84	Office Supplies	551	700	0	700	Lines	63.8%	36.2%	447	253
85	Operating Supplies	552	46,300	0	46,300	Lines	63.8%	36.2%	29,539	16,761
86	Road Materials / Supplies	553	2,575	0	2,575	Lines	63.8%	36.2%	1,643	932
87	Publications / Memberships / Training	554	3,690	0	3,690	Lines	63.8%	36.2%	2,354	1,336
88	Promotional Activities	548	1,600	0	1,600	Lines	63.8%	36.2%	1,021	579
89	Total Operating Services		$423,176	$0	$423,176				$269,986	$153,190
	Capital Outlay									
90	Buildings	562	$0	$0 [3]	$0	Lines	63.8%	36.2%	$0	$0
91	Infrastructure	563	2,884,500	(2,884,500) [3]	0	Input	4.3%	95.7%	0	0
92	Machinery & Equipment	564	179,000	(179,000) [3]	0	Lines	63.8%	36.2%	0	0
93	Total Capital Outlay		$3,063,500	($3,063,500)	$0				$0	$0
94	**Total Distribution and Collection**		$4,153,780	($3,063,500)	$1,090,280				$695,599	$394,681

Table 7
City of Stuart
Water and Wastewater Rate Study

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2013 Water	Adjusted 2013 Wastewater
	Utility Customer Service (1640)									
	Personnel Costs									
95	Salaries - Regular	512	$207,748	$0	$207,748	Accounts	64.9%	35.1%	$134,785	$72,963
96	Salaries - Overtime	514	7,500	0	7,500	Accounts	64.9%	35.1%	4,866	2,634
97	Salaries - Part-time		0	0	0	Accounts	64.9%	35.1%	0	0
98	Salaries - Longevity		0	0	0	Accounts	64.9%	35.1%	0	0
99	Salaries - Special Pay	515	3,720	0	3,720	Accounts	64.9%	35.1%	2,414	1,306
100	FICA Taxes	521	16,751	0	16,751	Accounts	64.9%	35.1%	10,868	5,883
101	Retirement Contribution	522	17,048	0	17,048	Accounts	64.9%	35.1%	11,061	5,987
102	Insurance - Life & Health	523	52,789	0	52,789	Accounts	64.9%	35.1%	34,249	18,540
103	Workers Compensation	524	299	0	299	Accounts	64.9%	35.1%	194	105
104	Unemployment Compensation		0	0	0	Accounts	64.9%	35.1%	0	0
105	Total Personnel Costs		$305,855	$0	$305,855				$198,436	$107,419
	Operating Services									
106	Professional Services	531	$4,500	$0	$4,500	Accounts	64.9%	35.1%	$2,920	$1,580
107	Accounting and Auditing		0	0	0	Accounts	64.9%	35.1%	0	0
108	Other Contractual Services	534	23,275	0	23,275	Accounts	64.9%	35.1%	15,101	8,174
109	Travel and Per Diem	540	3,600	0	3,600	Accounts	64.9%	35.1%	2,336	1,264
110	Communications / Freight	541&542	42,040	0	42,040	Accounts	64.9%	35.1%	27,275	14,765
111	Utility Services	543	1,500	0	1,500	Accounts	64.9%	35.1%	973	527
112	Rentals and Leases	544	1,000	0	1,000	Accounts	64.9%	35.1%	649	351
113	Insurance	545	2,410	0	2,410	Accounts	64.9%	35.1%	1,564	846
114	Repair and Maintenance	546	1,250	0	1,250	Accounts	64.9%	35.1%	811	439
115	Printing and Binding	547	12,000	0	12,000	Accounts	64.9%	35.1%	7,785	4,215
116	Other Current Charges	549	95,300	0	95,300	Accounts	64.9%	35.1%	61,830	33,470
117	Office Supplies	551	12,700	0	12,700	Accounts	64.9%	35.1%	8,240	4,460
118	Operating Supplies	552	11,250	0	11,250	Accounts	64.9%	35.1%	7,299	3,951
119	Publications / Memberships / Training	554/555	4,724	0	4,724	Accounts	64.9%	35.1%	3,065	1,659
120	Promotional Activities	548	2,200	0	2,200	Accounts	64.9%	35.1%	1,427	773
121	Total Operating Services		$217,749	$0	$217,749				$141,274	$76,475
	Capital Outlay									
122	Buildings	562	$0	$0 [3]	$0	Accounts	64.9%	35.1%	$0	$0
123	Infrastructure	563	0	0 [3]	0	Accounts	64.9%	35.1%	0	0
124	Machinery & Equipment	564	21,000	(21,000) [3]	0	Accounts	64.9%	35.1%	0	0
125	Total Capital Outlay		$21,000	($21,000)	$0				$0	$0
126	**Total Utility Customer Service**		$544,604	($21,000)	$523,604				$339,710	$183,894

Table 7
City of Stuart
Water and Wastewater Rate Study

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2013 Water	Adjusted 2013 Wastewater
	Water and Wastewater General Government (1670)									
	Personnel Costs									
127	Salaries - Regular	512	$600,631	$0	$600,631	Salaries	55.2%	44.8%	$331,561	$269,070
128	Salaries - Overtime	514	4,000	0	4,000	Salaries	55.2%	44.8%	2,208	1,792
129	Salaries - Part-time		0	0	0	Salaries	55.2%	44.8%	0	0
130	Salaries - Longevity		0	0	0	Salaries	55.2%	44.8%	0	0
131	Salaries - Special Pay	515	6,184	0	6,184	Salaries	55.2%	44.8%	3,414	2,770
132	FICA Taxes	521	46,599	0	46,599	Salaries	55.2%	44.8%	25,724	20,875
133	Retirement Contribution	522	54,161	0	54,161	Salaries	55.2%	44.8%	29,898	24,263
134	Insurance - Life & Health	523	105,020	0	105,020	Salaries	55.2%	44.8%	57,973	47,047
135	Workers Compensation	524	5,073	0	5,073	Salaries	55.2%	44.8%	2,800	2,273
136	Unemployment Compensation		0	0	0	Salaries	55.2%	44.8%	0	0
137	Total Personnel Costs		$821,668	$0	$821,668				$453,578	$368,090
	Operating Services									
138	Professional Services	531	$50,000	$0	$50,000	Salaries	55.2%	44.8%	$27,601	$22,399
139	Other Contractual Services	534	15,520	0	15,520	Salaries	55.2%	44.8%	8,567	6,953
140	Travel and Per Diem	540	10,500	0	10,500	Salaries	55.2%	44.8%	5,796	4,704
141	Communications / Freight	541&542	4,140	0	4,140	Salaries	55.2%	44.8%	2,285	1,855
142	Utility Services	543	5,800	0	5,800	Salaries	55.2%	44.8%	3,202	2,598
143	Rentals and Leases	544	29,300	0	29,300	Salaries	55.2%	44.8%	16,174	13,126
144	Insurance	545	14,098	0	14,098	Salaries	55.2%	44.8%	7,782	6,316
145	Repair and Maintenance	546	7,500	0	7,500	Salaries	55.2%	44.8%	4,140	3,360
146	Printing and Binding	547	1,000	0	1,000	Salaries	55.2%	44.8%	552	448
147	Other Current Charges	549	4,000	0	4,000	Salaries	55.2%	44.8%	2,208	1,792
148	Office Supplies	551	4,100	0	4,100	Salaries	55.2%	44.8%	2,263	1,837
149	Operating Supplies	552	16,650	0	16,650	Salaries	55.2%	44.8%	9,191	7,459
150	Promotional Materials	548	950	0	950	Salaries	55.2%	44.8%	524	426
151	Publications / Memberships / Training	554	7,950	0	7,950	Salaries	55.2%	44.8%	4,389	3,561
152	Total Operating Services		$171,508	$0	$171,508				$94,676	$76,832
	Capital Outlay									
153	Buildings	562	$0	$0 [3]	$0	Salaries	55.2%	44.8%	$0	$0
154	Infrastructure	563	0	0 [3]	0	Salaries	55.2%	44.8%	0	0
155	Machinery & Equipment	564	10,000	(10,000) [3]	0	Salaries	55.2%	44.8%	0	0
156	Total Capital Outlay		$10,000	($10,000)	$0				$0	$0
157	**Total Water and Wastewater General Government**		$1,003,176	($10,000)	$993,176				$548,254	$444,922

Table 7
City of Stuart
Water and Wastewater Rate Study

Proposed Fiscal Year 2018 Budget and Allocation of Operating Expenses to Individual Systems

Line No.	Description	Codes	Budget 2018 [1]	Adjustments	Adjusted 2018	Basis	Allocation Percentages [2] Water	Allocation Percentages [2] Wastewater	Adjusted 2013 Water	Adjusted 2013 Wastewater
	Debt Service (1660)									
158	Principal		$1,206,563	($1,206,563) [4]	$0	Salaries	55.2%	44.8%	$0	$0
159	Interest		813,329	(813,329) [4]	0	Salaries	55.2%	44.8%	0	0
160	Other Debt Service Costs		122,916	(122,916) [4]	0	Salaries	55.2%	44.8%	0	0
161	**Total Debt Service**		$2,142,808	($2,142,808)	$0				$0	$0
	Non - Departmental (1690)									
162	Transfers (Indirect Cost Allocation) - Net		$247,699	$0	$247,699	Salaries	55.2%	44.8%	$136,735	$110,964
163	Other Non-operating Uses - Life / Health Insurance & Other		12,272	0	12,272	Salaries	55.2%	44.8%	6,774	5,498
164	Intragovernmental Transfers		679,169	(679,169)	0	Salaries	55.2%	44.8%	0	0
165	Transfer to Retained Earnings		0	0	0	Salaries	55.2%	44.8%	0	0
166	**Total Non - Departmental**		$939,140	($679,169)	$259,971				$143,510	$116,461
167	**Total System**		$16,652,874	($9,662,977)	$6,989,897				$3,847,153	$3,142,744

Footnotes:

[1] Based on budgeted figures for the Fiscal Year Ending September 30, 2018 provided on July 10, 2017.

[2] Allocations based on operating information obtained from the budget, historical operating records and other information provided by the City.

[3] Amounts, if any, reflect reductions in the operating budget for capital expenditures shown in Table 11.

[4] Amounts reflect reductions in the operating budget for debt service payments associated with long-term debt. Such amounts are reflected in Table 12 of this report.

Table 8
City of Stuart
Water and Wastewater Rate Study

Projected Water Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	Water Plant							
	Personnel Costs							
1	Salaries - Regular	$471,413	$480,090	Labor	$489,692	$499,486	$509,475	$519,665
2	Salaries - Overtime	31,000	31,000	Labor	31,620	32,252	32,897	33,555
3	Salaries - Part-time	0	0	Labor	0	0	0	0
4	Salaries - Longevity	0	0	Labor	0	0	0	0
5	Salaries - Special Pay	4,200	4,500	Labor	4,590	4,682	4,775	4,871
6	FICA Taxes	38,756	39,443	Labor	40,232	41,036	41,857	42,694
7	Retirement Contribution	35,766	40,835	Labor	41,652	42,485	43,334	44,201
8	Insurance - Life & Health	99,989	119,748	Ins-Health	126,933	134,549	142,622	151,179
9	Workers Compensation	15,277	15,506	Worker Comp	15,971	16,450	16,944	17,452
10	Unemployment Compensation	0	0	Labor	0	0	0	0
11	Total Personnel Costs	$696,401	$731,122		$750,689	$770,940	$791,905	$813,618
	Operating Services							
12	Professional Services	$305,296	$57,500	Inflation	$58,823	$60,234	$61,680	$63,160
13	Other Contractual Services	218,250	207,450	Inflation	212,221	217,315	222,530	227,871
14	Travel and Per Diem	2,500	4,500	Inflation	4,604	4,714	4,827	4,943
15	Communications / Freight	6,468	6,900	Inflation	7,059	7,228	7,402	7,579
16	Utility Services	238,000	226,000	Utility-W	237,415	249,406	262,003	275,237
17	Rentals and Leases	28,500	28,750	Inflation	29,411	30,117	30,840	31,580
18	Insurance	17,559	17,211	Ins-Property	17,727	18,259	18,807	19,371
19	Repair and Maintenance	585,000	372,000	Repair	383,160	394,655	406,494	418,689
20	Printing and Binding	7,220	7,900	Inflation	8,082	8,276	8,474	8,678
21	Other Current Charges	27,471	24,750	Inflation	25,319	25,927	26,549	27,186
22	Office Supplies	2,095	1,500	Inflation	1,535	1,571	1,609	1,648
23	Operating Supplies	312,901	413,833	Water Flow	423,556	433,932	444,561	455,451
24	Publications / Memberships / Training	3,865	8,765	Inflation	8,967	9,182	9,402	9,628
25	Promotional Activities	6,900	11,900	Inflation	12,174	12,466	12,765	13,071
26	Total Operating Services	$1,762,025	$1,388,959		$1,430,052	$1,473,282	$1,517,944	$1,564,092
27	**Total Water Plant**	$2,458,426	$2,120,081		$2,180,741	$2,244,222	$2,309,850	$2,377,710
	Distribution and Collection							
	Personnel Costs							
28	Salaries - Regular	$267,631	$273,812	Labor	$279,288	$284,874	$290,571	$296,383
29	Salaries - Overtime	15,312	17,035	Labor	17,375	17,723	18,077	18,439
30	Salaries - Part-time	0	0	Labor	0	0	0	0
31	Salaries - Longevity	0	0	Labor	0	0	0	0
32	Salaries - Special Pay	2,105	4,402	Labor	4,490	4,580	4,672	4,765
33	FICA Taxes	21,806	22,586	Labor	23,038	23,499	23,969	24,448
34	Retirement Contribution	20,212	23,277	Labor	23,743	24,218	24,702	25,196
35	Insurance - Life & Health	64,678	74,980	Ins-Health	79,479	84,248	89,303	94,661
36	Workers Compensation	9,379	9,520	Worker Comp	9,805	10,099	10,402	10,714
37	Unemployment Compensation	0	0	Labor	0	0	0	0
38	Total Personnel Costs	$401,124	$425,612		$437,219	$449,241	$461,696	$474,606
	Operating Services							
39	Professional Services	$25,488	$12,760	Inflation	$13,053	$13,367	$13,688	$14,016
40	Other Contractual Services	99,378	70,754	Inflation	72,382	74,119	75,898	77,719
41	Travel and Per Diem	160	191	Inflation	196	201	205	210
42	Communications / Freight	4,079	4,096	Inflation	4,190	4,291	4,394	4,499
43	Utility Services	5,602	6,661	Utility-W	6,997	7,351	7,722	8,112
44	Rentals and Leases	319	319	Inflation	326	334	342	350
45	Insurance	20,272	20,576	Ins-Property	21,193	21,829	22,484	23,159
46	Repair and Maintenance	118,644	118,668	Repair	122,228	125,895	129,672	133,562
47	Printing and Binding	319	319	Inflation	326	334	342	350
48	Other Current Charges	447	638	Inflation	653	668	684	701
49	Office Supplies	160	447	Inflation	457	468	479	491
50	Operating Supplies	29,869	29,539	Water Flow	30,233	30,974	31,733	32,510
51	Road Materials / Supplies	1,643	1,643	Inflation	1,681	1,721	1,762	1,805
52	Publications / Memberships / Training	1,282	2,354	Inflation	2,408	2,466	2,525	2,586
53	Promotional Activities	1,021	1,021	Inflation	1,044	1,069	1,095	1,121
54	Total Operating Services	$308,681	$269,986		$277,369	$285,086	$293,025	$301,191
55	**Total Distribution and Collection**	$709,805	$695,599		$714,588	$734,327	$754,721	$775,797

Table 8
City of Stuart
Water and Wastewater Rate Study

Projected Water Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	Utility Customer Service							
	Personnel Costs							
56	Salaries - Regular	$131,949	$134,785	Labor	$137,481	$140,230	$143,035	$145,896
57	Salaries - Overtime	2,920	4,866	Labor	4,963	5,063	5,164	5,267
58	Salaries - Part-time	0	0	Labor	0	0	0	0
59	Salaries - Longevity	0	0	Labor	0	0	0	0
60	Salaries - Special Pay	1,557	2,414	Labor	2,462	2,511	2,561	2,612
61	FICA Taxes	10,436	10,868	Labor	11,085	11,307	11,533	11,764
62	Retirement Contribution	9,923	11,061	Labor	11,282	11,507	11,738	11,972
63	Insurance - Life & Health	26,794	34,249	Ins-Health	36,304	38,482	40,791	43,239
64	Workers Compensation	191	194	Worker Comp	200	206	212	218
65	Unemployment Compensation	0	0	Labor	0	0	0	0
66	Total Personnel Costs	$183,770	$198,436		$203,777	$209,306	$215,034	$220,968
	Operating Services							
67	Professional Services	$23,643	$2,920	Inflation	$2,987	$3,058	$3,132	$3,207
68	Accounting and Auditing	0	0	Inflation	0	0	0	0
69	Other Contractual Services	24,135	15,101	Inflation	15,448	15,819	16,198	16,587
70	Travel and Per Diem	649	2,336	Inflation	2,389	2,447	2,505	2,566
71	Communications / Freight	25,294	27,275	Cust-Water	27,965	28,701	29,455	30,230
72	Utility Services	1,557	973	Utility	1,022	1,073	1,127	1,183
73	Rentals and Leases	649	649	Inflation	664	680	696	713
74	Insurance	1,540	1,564	Ins-Property	1,610	1,659	1,709	1,760
75	Repair and Maintenance	344	811	Repair	835	860	886	913
76	Printing and Binding	6,164	7,785	Cust-Water	7,982	8,192	8,408	8,629
77	Other Current Charges	61,830	61,830	Cust-Water	63,394	65,061	66,772	68,527
78	Office Supplies	1,298	8,240	Cust-Water	8,448	8,670	8,898	9,132
79	Operating Supplies	6,650	7,299	Cust-Water	7,484	7,680	7,882	8,089
80	Publications / Memberships / Training	1,298	3,065	Inflation	3,135	3,211	3,288	3,367
81	Promotional Activities	389	1,427	Inflation	1,460	1,495	1,531	1,568
82	Total Operating Services	$155,439	$141,274		$144,824	$148,606	$152,487	$156,469
83	**Total Utility Customer Service**	$339,209	$339,710		$348,601	$357,913	$367,521	$377,437
	Water and Wastewater General Government							
	Personnel Costs							
84	Salaries - Regular	$327,156	$331,561	Labor	$338,192	$344,956	$351,855	$358,892
85	Salaries - Overtime	552	2,208	Labor	2,252	2,297	2,343	2,390
86	Salaries - Part-time	0	0	Labor	0	0	0	0
87	Salaries - Longevity	0	0	Labor	0	0	0	0
88	Salaries - Special Pay	2,851	3,414	Labor	3,482	3,552	3,623	3,695
89	FICA Taxes	25,288	25,724	Labor	26,238	26,763	27,298	27,844
90	Retirement Contribution	27,930	29,898	Labor	30,496	31,106	31,728	32,363
91	Insurance - Life & Health	56,526	57,973	Ins-Health	61,452	65,139	69,047	73,190
92	Workers Compensation	2,759	2,800	Worker Comp	2,884	2,971	3,060	3,152
93	Unemployment Compensation	0	0	Labor	0	0	0	0
94	Total Personnel Costs	$443,061	$453,578		$464,997	$476,784	$488,955	$501,526
	Operating Services							
95	Professional Services	$62,654	$27,601	Inflation	$28,236	$28,914	$29,607	$30,318
96	Other Contractual Services	552	8,567	Inflation	8,764	8,975	9,190	9,411
97	Travel and Per Diem	3,036	5,796	Inflation	5,930	6,072	6,218	6,367
98	Communications / Freight	2,481	2,285	Inflation	2,338	2,394	2,451	2,510
99	Utility Services	2,981	3,202	Utility	3,362	3,530	3,706	3,892
100	Rentals and Leases	15,070	16,174	Inflation	16,546	16,943	17,350	17,766
101	Insurance	7,659	7,782	Ins-Property	8,016	8,256	8,504	8,759
102	Repair and Maintenance	3,514	4,140	Repair	4,264	4,392	4,524	4,660
103	Printing and Binding	569	552	Inflation	565	578	592	606
104	Other Current Charges	0	2,208	Inflation	2,259	2,313	2,369	2,425
105	Office Supplies	2,390	2,263	Inflation	2,315	2,371	2,428	2,486
106	Operating Supplies	8,757	9,191	Inflation	9,403	9,628	9,859	10,096
107	Promotional Materials	0	524	Inflation	536	549	563	576
108	Publications / Memberships / Training	3,892	4,389	Inflation	4,490	4,597	4,708	4,821
109	Total Operating Services	$113,554	$94,676		$97,024	$99,513	$102,069	$104,693
110	**Total Water and Wastewater General Government**	$556,615	$548,254		$562,020	$576,297	$591,024	$606,220

Table 8
City of Stuart
Water and Wastewater Rate Study

Projected Water Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	Non - Departmental							
111	Transfers (Indirect Cost Allocation) - Net	$127,338	$136,735	Labor	$139,470	$142,259	$145,104	$148,007
112	Other Non-operating Uses	22,611	6,774	Ins-Health	7,181	7,612	8,068	8,553
113	Other Costs	0	0	Constant	0	0	0	0
114	**Total Non - Departmental**	$149,949	$143,510		$146,651	$149,871	$153,173	$156,559
	Additional Charges							
115	Additional Personnel Costs [3]	$0	$0	Input	$0	$0	$0	$0
116	Additional Operating Costs [3]	0	0	Calculated	0	288,350	591,300	605,900
117	Additional Maintenance Costs	0	0	Calculated	0	0	0	0
118	Bad Debt Expense	0	0	Calculated	0	0	0	0
119	**Total Additional Charges**	$0	$0		$0	$288,350	$591,300	$605,900
120	**Total System**	$4,214,004	$3,847,153		$3,952,601	$4,350,979	$4,767,588	$4,899,623

Footnotes:

[1] Amounts derived from Table 6 as allocated to the water system.

[2] Amounts derived from Table 7 as allocated to the water system.

[3] Based on discussions with the City, no new personnel costs are assumed based on the water plant improvements; however, incremental operating expenses are estimated to be incurred to produce 1 MGD beginning in FY20 and increasing waster production to 2 MGD by FY21 as provided by the City's Consulting Engineer.

Table 9
City of Stuart
Water and Wastewater Rate Study

Projected Wastewater Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
	Wastewater Plant							
	Personnel Costs							
1	Salaries - Regular	$488,918	$497,476	Labor	$507,426	$517,574	$527,926	$538,484
2	Salaries - Overtime	23,500	24,000	Labor	24,480	24,970	25,469	25,978
3	Salaries - Part-time	0	0	Labor	0	0	0	0
4	Salaries - Longevity	0	0	Labor	0	0	0	0
5	Salaries - Special Pay	5,160	5,760	Labor	5,875	5,993	6,113	6,235
6	FICA Taxes	39,595	40,334	Labor	41,141	41,963	42,803	43,659
7	Retirement Contribution	36,925	41,515	Labor	42,345	43,192	44,056	44,937
8	Insurance - Life & Health	115,705	128,868	Ins-Health	136,600	144,796	153,484	162,693
9	Workers Compensation	13,151	13,349	Worker Comp	13,749	14,162	14,587	15,024
10	Unemployment Compensation	0	0	Labor	0	0	0	0
11	Total Personnel Costs	$722,954	$751,302		$771,616	$792,650	$814,437	$837,010
	Operating Services							
12	Professional Services	$36,959	$35,000	Inflation	$35,805	$36,664	$37,544	$38,445
13	Other Contractual Services	152,475	171,975	Inflation	175,930	180,153	184,476	188,904
14	Travel and Per Diem	600	2,800	Inflation	2,864	2,933	3,004	3,076
15	Communications / Freight	8,649	13,870	Inflation	14,189	14,530	14,878	15,235
16	Utility Services	430,000	454,400	Utility-S	483,991	514,708	547,287	581,837
17	Rentals and Leases	52,000	56,000	Inflation	57,288	58,663	60,071	61,513
18	Insurance	21,572	21,433	Ins-Property	22,076	22,738	23,420	24,123
19	Repair and Maintenance	221,000	369,000	Repair	380,070	391,472	403,216	415,313
20	Printing and Binding	1,000	1,000	Inflation	1,023	1,048	1,073	1,098
21	Other Current Charges	13,828	7,500	Inflation	7,673	7,857	8,045	8,238
22	Office Supplies	1,500	1,000	Inflation	1,023	1,048	1,073	1,098
23	Operating Supplies	101,382	111,005	Sewer Flow	115,193	119,471	123,887	128,447
24	Publications / Memberships / Training	1,200	4,500	Inflation	4,604	4,714	4,827	4,943
25	Promotional Activities	2,000	2,000	Inflation	2,046	2,095	2,145	2,197
26	Total Operating Services	$1,044,165	$1,251,483		$1,303,775	$1,358,093	$1,414,947	$1,474,467
27	**Total Wastewater Plant**	$1,767,119	$2,002,785		$2,075,391	$2,150,743	$2,229,384	$2,311,478
	Distribution and Collection							
	Personnel Costs							
28	Salaries - Regular	$151,854	$155,360	Labor	$158,467	$161,637	$164,870	$168,167
29	Salaries - Overtime	8,688	9,665	Labor	9,859	10,056	10,257	10,462
30	Salaries - Part-time	0	0	Labor	0	0	0	0
31	Salaries - Longevity	0	0	Labor	0	0	0	0
32	Salaries - Special Pay	1,195	2,498	Labor	2,548	2,599	2,651	2,704
33	FICA Taxes	12,373	12,816	Labor	13,072	13,333	13,600	13,872
34	Retirement Contribution	11,469	13,208	Labor	13,472	13,741	14,016	14,296
35	Insurance - Life & Health	36,698	42,544	Ins-Health	45,096	47,802	50,670	53,710
36	Workers Compensation	5,321	5,401	Worker Comp	5,563	5,730	5,902	6,079
37	Unemployment Compensation	0	0	Labor	0	0	0	0
38	Total Personnel Costs	$227,597	$241,492		$248,077	$254,898	$261,966	$269,291
	Operating Services							
39	Professional Services	$14,462	$7,240	Inflation	$7,407	$7,584	$7,766	$7,953
40	Other Contractual Services	56,387	40,146	Inflation	41,069	42,055	43,064	44,098
41	Travel and Per Diem	91	109	Inflation	111	114	116	119
42	Communications / Freight	2,314	2,324	Inflation	2,377	2,435	2,493	2,553
43	Utility Services	3,179	3,779	Utility-S	4,025	4,281	4,552	4,839
44	Rentals and Leases	181	181	Inflation	185	190	194	199
45	Insurance	11,502	11,675	Ins-Property	12,025	12,386	12,757	13,140
46	Repair and Maintenance	67,318	67,332	Repair	69,352	71,433	73,575	75,783
47	Printing and Binding	181	181	Inflation	185	190	194	199
48	Other Current Charges	253	362	Inflation	370	379	388	398
49	Office Supplies	91	253	Inflation	259	265	272	278
50	Operating Supplies	16,947	16,761	Sewer Flow	17,393	18,039	18,706	19,394
51	Road Materials / Supplies	932	932	Inflation	954	976	1,000	1,024
52	Publications / Memberships / Training	728	1,336	Inflation	1,367	1,399	1,433	1,467
53	Promotional Activities	579	579	Inflation	593	607	621	636
54	Total Operating Services	$175,145	$153,190		$157,672	$162,332	$167,133	$172,080
55	**Total Distribution and Collection**	$402,742	$394,681		$405,749	$417,230	$429,099	$441,370
	Utility Customer Service							
	Personnel Costs							

Table 9
City of Stuart
Water and Wastewater Rate Study

Projected Wastewater Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
56	Salaries - Regular	$71,427	$72,963	Labor	$74,422	$75,911	$77,429	$78,977
57	Salaries - Overtime	1,580	2,634	Labor	2,687	2,740	2,795	2,851
58	Salaries - Part-time	0	0	Labor	0	0	0	0
59	Salaries - Longevity	0	0	Labor	0	0	0	0
60	Salaries - Special Pay	843	1,306	Labor	1,333	1,359	1,386	1,414
61	FICA Taxes	5,650	5,883	Labor	6,001	6,121	6,243	6,368
62	Retirement Contribution	5,371	5,987	Labor	6,107	6,229	6,354	6,481
63	Insurance - Life & Health	14,505	18,540	Ins-Health	19,652	20,832	22,081	23,406
64	Workers Compensation	104	105	Worker Comp	108	111	115	118
65	Unemployment Compensation	0	0	Labor	0	0	0	0
66	Total Personnel Costs	$99,480	$107,419		$110,310	$113,303	$116,404	$119,616
	Operating Services							
67	Professional Services	$12,799	$1,580	Inflation	$1,617	$1,656	$1,695	$1,736
68	Accounting and Auditing	0	0	Inflation	0	0	0	0
69	Other Contractual Services	13,065	8,174	Inflation	8,362	8,563	8,769	8,979
70	Travel and Per Diem	351	1,264	Inflation	1,293	1,324	1,356	1,389
71	Communications / Freight	13,693	14,765	Cust-Water	15,138	15,536	15,945	16,364
72	Utility Services	843	527	Utility	553	581	610	640
73	Rentals and Leases	351	351	Inflation	359	368	377	386
74	Insurance	834	846	Ins-Property	872	898	925	953
75	Repair and Maintenance	186	439	Repair	452	466	480	494
76	Printing and Binding	3,336	4,215	Cust-Sewer	4,616	5,009	5,418	5,843
77	Other Current Charges	33,470	33,470	Cust-Sewer	36,660	39,778	43,025	46,405
78	Office Supplies	702	4,460	Cust-Sewer	4,885	5,301	5,734	6,184
79	Operating Supplies	3,600	3,951	Cust-Sewer	4,328	4,696	5,079	5,478
80	Publications / Memberships / Training	702	1,659	Inflation	1,697	1,738	1,780	1,822
81	Promotional Activities	211	773	Inflation	790	809	829	849
82	Total Operating Services	$84,144	$76,475		$81,624	$86,724	$92,021	$97,523
83	**Total Utility Customer Service**	$183,624	$183,894		$191,934	$200,027	$208,425	$217,139
	Water and Wastewater General Government							
	Personnel Costs							
84	Salaries - Regular	$265,495	$269,070	Labor	$274,451	$279,940	$285,539	$291,250
85	Salaries - Overtime	448	1,792	Labor	1,828	1,864	1,902	1,940
86	Salaries - Part-time	0	0	Labor	0	0	0	0
87	Salaries - Longevity	0	0	Labor	0	0	0	0
88	Salaries - Special Pay	2,313	2,770	Labor	2,826	2,882	2,940	2,999
89	FICA Taxes	20,521	20,875	Labor	21,293	21,719	22,153	22,596
90	Retirement Contribution	22,665	24,263	Labor	24,748	25,243	25,748	26,263
91	Insurance - Life & Health	45,872	47,047	Ins-Health	49,870	52,862	56,033	59,395
92	Workers Compensation	2,239	2,273	Worker Comp	2,341	2,411	2,483	2,558
93	Unemployment Compensation	0	0	Labor	0	0	0	0
94	Total Personnel Costs	$359,554	$368,090		$377,356	$386,921	$396,798	$407,001
	Operating Services							
95	Professional Services	$50,846	$22,399	Inflation	$22,914	$23,464	$24,027	$24,604
96	Other Contractual Services	448	6,953	Inflation	7,113	7,283	7,458	7,637
97	Travel and Per Diem	2,464	4,704	Inflation	4,812	4,927	5,046	5,167
98	Communications / Freight	2,013	1,855	Inflation	1,897	1,943	1,989	2,037
99	Utility Services	2,419	2,598	Utility	2,728	2,865	3,008	3,158
100	Rentals and Leases	12,230	13,126	Inflation	13,428	13,750	14,080	14,418
101	Insurance	6,215	6,316	Ins-Property	6,505	6,700	6,901	7,108
102	Repair and Maintenance	2,851	3,360	Repair	3,461	3,564	3,671	3,782
103	Printing and Binding	461	448	Inflation	458	469	481	492
104	Other Current Charges	0	1,792	Inflation	1,833	1,877	1,922	1,968
105	Office Supplies	1,940	1,837	Inflation	1,879	1,924	1,970	2,018
106	Operating Supplies	7,106	7,459	Inflation	7,630	7,814	8,001	8,193
107	Promotional Materials	0	426	Inflation	435	446	457	467
108	Publications / Memberships / Training	3,158	3,561	Inflation	3,643	3,731	3,820	3,912
109	Total Operating Services	$92,152	$76,832		$78,737	$80,757	$82,832	$84,961
110	**Total Water and Wastewater General Government**	$451,706	$444,922		$456,093	$467,679	$479,630	$491,962
	Non - Departmental							
111	Transfers (Indirect Cost Allocation) - Net	$103,338	$110,964	Labor	$113,183	$115,447	$117,756	$120,111
112	Other Non-operating Uses	18,349	5,498	Ins-Health	5,827	6,177	6,548	6,941
113	Other Costs	0	0	Constant	0	0	0	0

Table 9
City of Stuart
Water and Wastewater Rate Study

Projected Wastewater Operating Expenses

Line No.	Description	Budget [1] 2017	Budget [2] 2018	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
114	**Total Non - Departmental**	$121,687	$116,461		$119,011	$121,624	$124,303	$127,051
	Additional Charges							
115	Additional Personnel Costs	$0	$0	Input	$0	$0	$0	$0
116	Additional Operating Costs	0	0	Calculated	0	0	0	0
117	Additional Maintenance Costs	0	0	Calculated	0	0	0	0
118	Bad Debt Expense	0	0	Calculated	0	0	0	0
119	**Total Additional Charges**	$0	$0		$0	$0	$0	$0
120	**Total System**	$2,926,878	$3,142,744		$3,248,179	$3,357,303	$3,470,841	$3,589,001

Footnotes:

[1] Amounts derived from Table 6 as allocated to the wastewater system.

[2] Amounts derived from Table 7 as allocated to the wastewater system.

Table 10
City of Stuart
Water and Wastewater Rate Study

Summary of Projected Expense Escalation Factors

Line No.	Description	Escalation Reference	Projected Fiscal Year Ending September 30, 2019	2020	2021	2022
1	Constant	Constant	1.0000	1.0000	1.0000	1.0000
2	General Inflation (CPI Index)	Inflation	1.0230	1.0240	1.0240	1.0240
3	Labor Escalator	Labor	1.0200	1.0200	1.0200	1.0200
4	Customer Acct. Growth + Inflation (Water)	Cust-Water	1.0253	1.0263	1.0263	1.0263
5	Customer Acct. Growth + Inflation (Sewer)	Cust-Sewer	1.0953	1.0851	1.0816	1.0786
6	Rate Revenue - Water	Water Rev	1.0006	1.0006	1.0006	1.0006
7	Rate Revenue - Sewer	Sewer Rev	1.0150	1.0133	1.0132	1.0130
8	Flow Growth + Inflation (Water)	Water Flow	1.0235	1.0245	1.0245	1.0245
9	Flow Growth + Inflation (Sewer)	Sewer Flow	1.0377	1.0371	1.0370	1.0368
10	Utility Costs	Utility	1.0500	1.0500	1.0500	1.0500
11	Flow Growth + Inflation (Water)	Utility-W	1.0505	1.0505	1.0505	1.0505
12	Flow Growth + Inflation (Sewer)	Utility-S	1.0651	1.0635	1.0633	1.0631
13	Life/Health/Disability Insurance Escalator	Ins-Health	1.0600	1.0600	1.0600	1.0600
14	Workers Compensation	Worker Comp	1.0300	1.0300	1.0300	1.0300
15	Property Insurance Escalator	Ins-Property	1.0300	1.0300	1.0300	1.0300
16	Repair and Maintenance	Repair	1.0300	1.0300	1.0300	1.0300
17	Marginal Escalator	Margin	1.0010	1.0010	1.0010	1.0010
18	Auto/Equipment User Charge Allocation	Auto Exp	1.0000	1.0000	1.0000	1.0000

	2018	2019	2020	2021	2022
No. of Customers - Water	4,448	4,458	4,468	4,478	4,488
Rate of Growth		0.22%	0.22%	0.22%	0.22%
No. of Customers - Wastewater	2,692	2,882	3,054	3,226	3,398
Rate of Growth		7.07%	5.96%	5.63%	5.33%
Water Revenue	$5,314,734	$5,317,698	$5,320,662	$5,323,626	$5,326,590
Rate of Growth		0.06%	0.06%	0.06%	0.06%
Wastewater Revenue	$5,049,022	$5,124,661	$5,192,994	$5,261,326	$5,329,659
Rate of Growth		1.50%	1.33%	1.32%	1.30%
Water Sales	990,960	991,440	991,920	992,400	992,880
Rate of Growth		0.05%	0.05%	0.05%	0.05%
Wastewater Sales	634,160	643,292	651,543	659,793	668,043
Rate of Growth		1.44%	1.28%	1.27%	1.25%

Table 11
City of Stuart
Water and Wastewater Rate Study

Five Year Estimated Capital Funding Program

Line No.	Description	Ref	Funding Source	For the Fiscal Years Ending September 30, Future Dollars [1] 2017	2018	2019	2020	2021	2022	Total
	Cumulative Inflation Factor ==>			1.000	1.000	1.030	1.061	1.093	1.126	
	SYSTEM CAPITAL COSTS									
	Water System									
	Water Treatment and Supply									
1	1 MGD Floridan Aquifer Supply Well #1	WTF-1	Debt1	$0	$1,250,000	$0	$0	$0	$0	$1,250,000
2	2 MGD Floridan Aquifer Supply Well #2	WTF-2	Debt1	0	0	1,250,000	0	0	0	1,250,000
3	3 MGD Floridan Aquifer Supply Well #3	WTF-3	Debt1	0	0	1,250,000	0	0	0	1,250,000
4	2 MGD RO Membrane Skids within Metal Building for Expandable to 4MGD	WTF-4	Debt1	0	0	3,000,000	0	0	0	3,000,000
5	Lime Softening Plant Blending Upgrades	WTF-5	Debt1	0	0	1,500,000	0	0	0	1,500,000
6	RO Reject Main from WTF to WRF Injection Well 2	WTF-6	Debt1	0	1,250,000	0	0	0	0	1,250,000
7	GAC - Wells 1, 3, and 5	WTF-7	Debt1	0	600,000	0	0	0	0	600,000
8	Renewal and Replacement Fund (Above Budget)	0	RR	0	150,000	155,000	159,000	164,000	169,000	797,000
9	Paint Water Treatment Facility	0	RR	0	0	0	0	158,000	0	158,000
10	Adjustment - Debt 1	0	Debt1	0	0	(1,500,000)	0	0	0	(1,500,000)
11	Adjustment - WAF	0	WAF	0	0	1,500,000	0	0	0	1,500,000
12	Other Projects	0	WREV2	0	0	0	0	0	0	0
13	**Total Water Treatment and Supply**			$0	$3,250,000	$7,155,000	$159,000	$322,000	$169,000	$11,055,000
	Water Transmission and Distribution									
14	Phase II Water Main Rehabilitation	WD-1	RR	$0	$0	$0	$0	$0	$0	$0
15	Large Meter Conversion	WD-2	Debt3	0	125,000	129,000	0	0	0	254,000
16	US 1 12" Water Main Extension (south of Johnson Ave)	WD-3	WAF	0	0	0	0	0	0	0
17	Renewal & Replacement (Above Budget)	0	RR	0	100,000	103,000	106,000	109,000	113,000	531,000
18	Other Projects	0	WREV2	0	0	0	0	0	0	0
19	Other Projects	0	WREV2	0	0	0	0	0	0	0
20	Other Projects	0	WREV2	0	0	0	0	0	0	0
21	**Total Water Transmission and Distribution**			$0	$225,000	$232,000	$106,000	$109,000	$113,000	$785,000
	Other Capital Projects									
22	Other Projects	0	WREV2	$0	$0	$0	$0	$0	$0	$0
23	FY16 Carry Forward into FY17	0	OR	166,000	0	0	0	0	0	166,000
24	Capital Outlay - Net Amount from Budget (Excludes FY16 Carry Forward in FY17)	N/A	WREV1	232,000	184,000	155,000	159,000	164,000	169,000	1,063,000
25	**Total Other Capital Projects**			$398,000	$184,000	$155,000	$159,000	$164,000	$169,000	$1,229,000
26	**Total Water System**			$398,000	$3,659,000	$7,542,000	$424,000	$595,000	$451,000	$13,069,000

Table 11
City of Stuart
Water and Wastewater Rate Study

Five Year Estimated Capital Funding Program

Line No.	Description	Ref	Funding Source	For the Fiscal Years Ending September 30, Future Dollars [1] 2017	2018	2019	2020	2021	2022	Total
	Wastewater System									
	Water Reclamation Facility									
27	Mercaptan Odor Control - Influent Wet Well	WRF-1	SREV2	$0	$0	$0	$0	$0	$0	$0
28	Electrical Control Building Modification	WRF-2	RR	0	500,000	0	0	0	0	500,000
29	Grit Removal System Replacement	WRF-3	RR	0	0	0	0	0	0	0
30	Clarifier Drive Unit Renewal (3)	WRF-4	RR	0	0	0	0	0	0	0
31	DMW-1 Monitoring Well Replacement	WRF-5	RR	0	0	412,000	0	0	0	412,000
32	DMR-1R Monitoring Well Replacement	WRF-6	RR	0	0	0	0	0	0	0
33	1,000 KW Plant Generator Replacement	WRF-7	RR	0	0	0	0	0	0	0
34	Replace Blowers (5) with Turbo Blowers and VFD's	WRF-8	RR	0	0	0	0	0	0	0
35	New 2.3 MGD Krueger Filter	WRF-9	RR	0	0	0	0	0	0	0
36	Renewal & Replacement Fund (Above Budget)	0	RR	0	150,000	155,000	159,000	164,000	169,000	797,000
37	WWTP Plant Painting	WRF-11	RR	0	0	0	0	164,000	0	164,000
38	Upgrade Security Surveillance System	WRF-21	SREV2	0	0	52,000	0	0	0	52,000
39	Other Projects	0	SREV2	0	0	0	0	0	0	0
40	Other Projects	0	SREV2	0	0	0	0	0	0	0
41	Other Projects	0	SREV2	0	0	0	0	0	0	0
42	**Total Wastewater Treatment and Disposal**			$0	$650,000	$619,000	$159,000	$328,000	$169,000	$1,925,000
	Wastewater Transmission and Collection									
43	Monterey Road Force Main Replacement Willoughby to Dixie	WC-1	Debt3	$0	$300,000	$309,000	$0	$0	$0	$609,000
44	Dolphin Sewer Basin 1 of 2	WC-2	Debt2	0	227,000	0	0	0	0	227,000
45	Dolphin Sewer Basin 2 of 2	WC-2	Grant	0	227,000	0	0	0	0	227,000
46	Poppleton Basin 1 of 2	WC-3	Debt2	0	193,500	0	0	0	0	193,500
47	Poppleton Basin 2 of 2	WC-3	Grant	0	193,500	0	0	0	0	193,500
48	Palm Beach Sewer Basin 1 of 2	WC-4	Debt2	0	153,500	0	0	0	0	153,500
49	Palm Beach Sewer Basin 2 of 2	WC-4	Grant	0	153,500	0	0	0	0	153,500
50	East Stuart Sewer Basin 1 of 2	WC-5	Debt2	0	112,000	0	0	0	0	112,000
51	East Stuart Sewer Basin 2 of 2	WC-5	Grant	0	112,000	0	0	0	0	112,000
52	Channel Ave. Sewer Basin 1 of 2	0	Debt2	0	81,250	0	0	0	0	81,250
53	Channel Ave. Sewer Basin 2 of 2	0	Grant	0	81,250	0	0	0	0	81,250
54	Grinder Systems (Link to Sewer Expansion Growth Assumptions)	0	Construction	500,000	500,000	515,000	530,000	546,000	563,000	3,154,000
55	Grinder Systems (Link to Sewer Expansion Growth Assumptions)	0	Construction	(500,000)	(500,000)	(515,000)	(530,000)	(546,000)	(563,000)	(3,154,000)
56	Grinder Systems (Link to Sewer Expansion Growth Assumptions)	0	Construction	500,000	750,000	928,000	859,000	884,000	911,000	4,832,000
57	St, Lucie Basin - 1 of 2	0	Construction	374,000	0	0	0	0	0	374,000
58	St, Lucie Basin - 2 of 2	0	Grant	485,000	0	0	0	0	0	485,000
59	Stuart Middle Force Main Replacement	0	Debt3	0	0	412,000	0	0	0	412,000
60	**Total Wastewater Transmission and Collection**			$1,359,000	$2,584,500	$1,649,000	$859,000	$884,000	$911,000	$8,246,500
	Other Capital Projects									
61	Other Projects	0	SREV2	$0	$0	$0	$0	$0	$0	$0
62	FY16 Carry Forward into FY17	0	OR	2,921,000	0	0	0	0	0	2,921,000
63	Capital Outlay - Net Amount from Budget (Excludes FY16 Carry Forward in FY17)	N/A	SREV1	106,000	172,000	155,000	159,000	164,000	169,000	925,000
64	**Total Other Capital Projects**			$3,027,000	$172,000	$155,000	$159,000	$164,000	$169,000	$3,846,000
65	**Total Wastewater System**			$4,386,000	$3,406,500	$2,423,000	$1,177,000	$1,376,000	$1,249,000	$14,017,500
66	**TOTAL SYSTEM CAPITAL COSTS**			$4,784,000	$7,065,500	$9,965,000	$1,601,000	$1,971,000	$1,700,000	$27,086,500

Table 11
City of Stuart
Water and Wastewater Rate Study

Five Year Estimated Capital Funding Program

Line No.	Description	Ref	Funding Source	For the Fiscal Years Ending September 30, Future Dollars [1] 2017	2018	2019	2020	2021	2022	Total
	FUNDING SOURCES									
67	**Operating Reserves**	0	OR	$3,087,000	$0	$0	$0	$0	$0	$3,087,000
68	Renewal and Replacement Fund	0	RR	0	900,000	825,000	424,000	759,000	451,000	3,359,000
69	Rate Revenue - Water System (For Ordinary Vehicles, Equipment and Other Capital Outlay)	0	WREV1	232,000	184,000	155,000	159,000	164,000	169,000	1,063,000
70	Rate Revenue - Water System (For all other lawful capital expenditures)	0	WREV2	0	0	0	0	0	0	0
71	Rate Revenue - Wastewater System (For Ordinary Vehicles, Equipment and Other Capital Outlay)	0	SREV1	106,000	172,000	155,000	159,000	164,000	169,000	925,000
72	Rate Revenue - Wastewater System (For all other lawful capital expenditures)	0	SREV2	0	0	52,000	0	0	0	52,000
73	Water Availability Fees	0	WAF	0	0	1,500,000	0	0	0	1,500,000
74	Wastewater Availability Fees	0	SAF	0	0	0	0	0	0	0
75	Grant	0	Grant	485,000	767,250	0	0	0	0	1,252,250
76	Special Sewer Expansion Fees	0	Sewer Expansion Fees	0	0	0	0	0	0	0
77	Sewer Expansion Construction Fund	0	Construction	874,000	750,000	928,000	859,000	884,000	911,000	5,206,000
78	Debt Proceeds (Anticipated) - Proposed SRF Loan	0	Debt1	0	3,100,000	5,500,000	0	0	0	8,600,000
79	Debt Proceeds (Anticipated) - Bank Loan Sewer Expansion	0	Debt2	0	767,250	0	0	0	0	767,250
80	Debt Proceeds (Anticipated) - Bank Note Other Capital	0	Debt3	0	425,000	850,000	0	0	0	1,275,000
81	Debt Proceeds (Anticipated) - Bank Note Other Capital	0	Debt4	0	0	0	0	0	0	0
82	**TOTAL FUNDING SOURCES**			$4,784,000	$7,065,500	$9,965,000	$1,601,000	$1,971,000	$1,700,000	$27,086,500

Table 12
City of Stuart
Water and Wastewater Rate Study

Existing and Projected Debt Service Allocation

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	EXISTING DEBT SERVICE [1]						
	Series 2003 Bonds (Unrefunded)						
1	Total Annual Debt Service	$469,800	$0	$0	$0	$0	$0
2	Percent Allocated to Water System	51.00%	51.00%	51.00%	51.00%	51.00%	51.00%
3	Percent Allocated to Wastewater System	49.00%	49.00%	49.00%	49.00%	49.00%	49.00%
4	Amount Allocated to Water System	$239,598	$0	$0	$0	$0	$0
5	Amount Allocated to Wastewater System	$230,202	$0	$0	$0	$0	$0
	Series 2006 Refunding Notes						
6	Total Annual Debt Service	$343,393	$343,430	$342,426	$343,289	$343,378	$343,254
7	Percent Allocated to Water System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
8	Percent Allocated to Wastewater System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
9	Amount Allocated to Water System	$171,697	$171,715	$171,213	$171,645	$171,689	$171,627
10	Amount Allocated to Wastewater System	$171,697	$171,715	$171,213	$171,645	$171,689	$171,627
	Series 2007A Refunding Notes						
11	Total Annual Debt Service	$315,701	$780,387	$785,938	$785,080	$783,083	$778,883
12	Percent Allocated to Water System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
13	Percent Allocated to Wastewater System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
14	Amount Allocated to Water System	$157,850	$390,193	$392,969	$392,540	$391,541	$389,441
15	Amount Allocated to Wastewater System	$157,850	$390,193	$392,969	$392,540	$391,541	$389,441

Table 12
City of Stuart
Water and Wastewater Rate Study

Existing and Projected Debt Service Allocation

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	Series 2011 Refunding Notes						
16	Total Annual Debt Service	$380,217	$379,917	$379,455	$379,832	$379,025	$379,057
17	Percent Allocated to Water System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
18	Percent Allocated to Wastewater System	50.00%	50.00%	50.00%	50.00%	50.00%	50.00%
19	Amount Allocated to Water System	$190,109	$189,958	$189,728	$189,916	$189,513	$189,528
20	Amount Allocated to Wastewater System	$190,109	$189,958	$189,728	$189,916	$189,513	$189,528
	SRF WW 430400						
21	Total Annual Debt Service	$178,054	$178,054	$178,054	$178,054	$178,054	$178,054
22	Percent Allocated to Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
23	Percent Allocated to Wastewater System	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
24	Amount Allocated to Water System	$0	$0	$0	$0	$0	$0
25	Amount Allocated to Wastewater System	$178,054	$178,054	$178,054	$178,054	$178,054	$178,054
	SRF DW 430410						
26	Total Annual Debt Service	$354,468	$354,468	$354,468	$354,468	$354,468	$354,468
27	Percent Allocated to Water System	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
28	Percent Allocated to Wastewater System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
29	Amount Allocated to Water System	$354,468	$354,468	$354,468	$354,468	$354,468	$354,468
30	Amount Allocated to Wastewater System	$0	$0	$0	$0	$0	$0

Table 12
City of Stuart
Water and Wastewater Rate Study

Existing and Projected Debt Service Allocation

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	Other - Non-departmental						
31	Total Annual Debt Service	$0	$0	$0	$0	$0	$0
32	Percent Allocated to Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
33	Percent Allocated to Wastewater System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
34	Amount Allocated to Water System	$0	$0	$0	$0	$0	$0
35	Amount Allocated to Wastewater System	$0	$0	$0	$0	$0	$0
	TOTAL DEBT SERVICE - EXISTING DEBT						
36	Amount Allocated to Water System	$1,113,722	$1,106,335	$1,108,377	$1,108,568	$1,107,211	$1,105,065
37	Amount Allocated to Wastewater System	927,912	929,921	931,964	932,155	930,797	928,651
38	Total Annual Debt Service	$2,041,634	$2,036,256	$2,040,341	$2,040,723	$2,038,009	$2,033,716
39	Percent Allocated to Water System	54.55%	54.33%	54.32%	54.32%	54.33%	54.34%
40	Percent Allocated to Wastewater System	45.45%	45.67%	45.68%	45.68%	45.67%	45.66%
	PROPOSED DEBT SERVICE - ADDITIONAL DEBT [2]						
	Debt Proceeds (Anticipated) - Proposed SRF Loan						
41	Annual Principal Payment	$0	$0	$0	$351,150	$359,928	$368,927
42	Annual Interest Payment	0	0	0	224,250	215,471	206,473
43	Total Annual Debt Service	$0	$0	$0	$575,400	$575,400	$575,400
44	Percent Allocated to Water System	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
45	Percent Allocated to Wastewater System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	Percent Allocated to Reclaimed Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
46	Amount Allocated to Water System	$0	$0	$0	$575,400	$575,400	$575,400
47	Amount Allocated to Wastewater System	0	0	0	0	0	0
	Amount Allocated to Reclaimed Water System	0	0	0	0	0	0

Table 12
City of Stuart
Water and Wastewater Rate Study

Existing and Projected Debt Service Allocation

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	Debt Proceeds (Anticipated) - Bank Loan Sewer Expansion						
48	Annual Principal Payment	$0	$0	$0	$111,332	$114,672	$118,112
49	Annual Interest Payment	0	0	0	29,700	26,360	22,920
50	Total Annual Debt Service	$0	$0	$0	$141,032	$141,032	$141,032
51	Percent Allocated to Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
52	Percent Allocated to Wastewater System	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Percent Allocated to Reclaimed Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
53	Amount Allocated to Water System	$0	$0	$0	$0	$0	$0
54	Amount Allocated to Wastewater System	0	0	0	141,032	141,032	141,032
	Amount Allocated to Reclaimed Water System	0	0	0	0	0	0
	Debt Proceeds (Anticipated) - Bank Note Other Capital						
55	Annual Principal Payment	$0	$0	$0	$184,991	$190,540	$196,257
56	Annual Interest Payment	0	0	0	49,350	43,800	38,084
57	Total Annual Debt Service	$0	$0	$0	$234,341	$234,341	$234,341
58	Percent Allocated to Water System	19.92%	19.92%	19.92%	19.92%	19.92%	19.92%
59	Percent Allocated to Wastewater System	80.08%	80.08%	80.08%	80.08%	80.08%	80.08%
	Percent Allocated to Reclaimed Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
60	Amount Allocated to Water System	$0	$0	$0	$46,684	$46,684	$46,684
61	Amount Allocated to Wastewater System	0	0	0	187,656	187,656	187,656
	Amount Allocated to Reclaimed Water System	0	0	0	0	0	0
	0						
62	Annual Principal Payment	$0	$0	$0	$0	$0	$0
63	Annual Interest Payment	0	0	0	0	0	0
64	Total Annual Debt Service	$0	$0	$0	$0	$0	$0
65	Percent Allocated to Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
66	Percent Allocated to Wastewater System	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
	Percent Allocated to Reclaimed Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
67	Amount Allocated to Water System	$0	$0	$0	$0	$0	$0
68	Amount Allocated to Wastewater System	0	0	0	0	0	0
	Amount Allocated to Reclaimed Water System	0	0	0	0	0	0

Table 12
City of Stuart
Water and Wastewater Rate Study

Existing and Projected Debt Service Allocation

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	TOTAL DEBT SERVICE - PROPOSED DEBT						
69	Amount Allocated to Water System	$0	$0	$0	$622,084	$622,084	$622,084
70	Amount Allocated to Wastewater System	0	0	0	328,688	328,688	328,688
	Percent Allocated to Reclaimed Water System	0	0	0	0	0	0
71	Total Annual Debt Service	$0	$0	$0	$950,772	$950,772	$950,772
72	Percent Allocated to Water System	0.00%	0.00%	0.00%	65.43%	65.43%	65.43%
73	Percent Allocated to Wastewater System	0.00%	0.00%	0.00%	34.57%	34.57%	34.57%
	Percent Allocated to Reclaimed Water System	100.00%	100.00%	100.00%	0.00%	0.00%	0.00%
	TOTAL DEBT SERVICE - EXISTING AND PROPOSED						
74	Amount Allocated to Water System	$1,113,722	$1,106,335	$1,108,377	$1,730,653	$1,729,295	$1,727,149
75	Amount Allocated to Wastewater System	927,912	929,921	931,964	1,260,843	1,259,486	1,257,339
	Amount Allocated to Reclaimed Water System	0	0	0	0	0	0
76	Total Annual Debt Service	$2,041,634	$2,036,256	$2,040,341	$2,991,496	$2,988,781	$2,984,488
77	Percent Allocated to Water System	54.55%	54.33%	54.32%	57.85%	57.86%	57.87%
78	Percent Allocated to Wastewater System	45.45%	45.67%	45.68%	42.15%	42.14%	42.13%
	Percent Allocated to Reclaimed Water System	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Footnotes:

[1] Payment schedules as provided by the City.

[2] Amounts as derived from Table 12a.

Table 12a
City of Stuart
Water and Wastewater Rate Study

Summary of Debt Service Sizing and Payments

No.	Description	Percent	Amount
	Debt Proceeds (Anticipated) - Proposed SRF Loan		
	Projects		
1	Water	100.0%	$8,600,000
2	Wastewater	0.0%	0
3	Other	0.0%	0
4	Other	0.0%	0
5	Other	0.0%	0
6	Other	0.0%	0
7	Total Project Cost		$8,600,000
8	Issuance and Surety Costs		
9	Issuance Costs (%)	2.00%	$179,400
10	Bond Insurance	0.00%	0
11	Surety Costs (%)	0.00%	0
12	Underwriters Discount	0.00%	0
13	Total Issuance Costs	2.00%	$179,400
14	Capitalized Interest - CP Used	Yes	
15	Capitalized Interest 0.0	0.0 yr	185,969
16	Debt Service Reserve Requirement	0%	-
17	Principal Amount of Bonds (Rounded)		$8,970,000
18	Assumed Issue Date		October 1, 2019
19	Level Debt Service Payment		
20	Term-Years		20
21	Interest Rate		2.50%
22	First Year of Bond Term (Fiscal Year)		2020
23	First Year of Amortization (Fiscal Year)		2020
24	Interest Only Periods		-
25	Issue Month (Jan=1)		10
26	Principal Payment Month (Jan=1)		10
27	Annual Payment		$575,400

Amortization

Year	Start Bal	Principal	Interest	Cap Int	Payment	End Bal
2020	8,970,000	351,150	224,250	0	575,400	8,618,850
2021	8,618,850	359,928	215,471	0	575,400	8,258,922
2022	8,258,922	368,927	206,473	0	575,400	7,889,995
2023	7,889,995	378,150	197,250	0	575,400	7,511,845
2024	7,511,845	387,604	187,796	0	575,400	7,124,242
2025	7,124,242	397,294	178,106	0	575,400	6,726,948
2026	6,726,948	407,226	168,174	0	575,400	6,319,722
2027	6,319,722	417,407	157,993	0	575,400	5,902,315
2028	5,902,315	427,842	147,558	0	575,400	5,474,473
2029	5,474,473	438,538	136,862	0	575,400	5,035,935
2030	5,035,935	449,501	125,898	0	575,400	4,586,434
2031	4,586,434	460,739	114,661	0	575,400	4,125,695
2032	4,125,695	472,257	103,142	0	575,400	3,653,438
2033	3,653,438	484,064	91,336	0	575,400	3,169,374
2034	3,169,374	496,165	79,234	0	575,400	2,673,209
2035	2,673,209	508,570	66,830	0	575,400	2,164,639
2036	2,164,639	521,284	54,116	0	575,400	1,643,355
2037	1,643,355	534,316	41,084	0	575,400	1,109,039
2038	1,109,039	547,674	27,726	0	575,400	561,366
2039	561,366	561,366	14,034	0	575,400	0

Do Not Delete Lines - For Amortization Purposes

28	Commercial Paper Capitalized Interest Calculation			2018	2019	2020	2021	2022
29	Beginning Balance			$ -	$3,138,750	$ -	$ -	$ -
30	Construction Fund Draw-down (Cannot Exceed 5 Fiscal Years)			3,100,000	5,500,000	-	-	-
31	Interest Cost		2.50%	38,750	147,219	-	-	-
32	Unadjusted Ending Balance			$3,138,750	$8,785,969	$ -	$ -	$ -
33	Conversion to Conventional Financing		2019	-	8,785,969	-	-	-
34	Ending Balance for Interest Calculation			$3,138,750	$ -	$ -	$ -	$ -

Table 12a
City of Stuart
Water and Wastewater Rate Study

Summary of Debt Service Sizing and Payments

No.	Description	Percent	Amount
	Debt Proceeds (Anticipated) - Bank Loan Sewer Expansion		
	Projects		
35	Water	0.0%	$0
36	Wastewater	100.0%	767,250
37	Other	0.0%	0
38	Other	0.0%	0
39	Other	0.0%	0
40	Other	0.0%	0
41	Total Projects		$767,250
42	Issuance and Surety Costs		
43	Issuance Costs (%)	2.00%	$19,800
44	Bond Insurance	0.00%	0
45	Surety Costs (%)	0.00%	0
46	Underwriters Discount	0.00%	0
47	Total Issuance Costs	2.00%	$19,800
	Capitalized Interest - CP Used	No	
48	Capitalized Interest 2.0	2.0 yr	59,400
49	Debt Service Reserve Requirement		141,032
50	Principal Amount of Bonds (Rounded)		$990,000
51	Assumed Issue Date		October 1, 2017
	Level Debt Service Payment		
52	Term-Years		10
53	Interest Rate		3.00%
54	First Year of Bond Term (Fiscal Year)		2018
55	First Year of Amortization (Fiscal Year)		2020
56	Interest Only Periods		-
57	Issue Month		10
58	Principal Payment Month		10
59	Annual Payment		$141,032

Amortization

Year	Start Bal	Principal	Interest	Cap Int	Payment	End Bal
2018	990,000	0	29,700	29,700	0	990,000
2019	990,000	0	29,700	29,700	0	990,000
2020	990,000	111,332	29,700	0	141,032	878,668
2021	878,668	114,672	26,360	0	141,032	763,996
2022	763,996	118,112	22,920	0	141,032	645,884
2023	645,884	121,655	19,377	0	141,032	524,229
2024	524,229	125,305	15,727	0	141,032	398,924
2025	398,924	129,064	11,968	0	141,032	269,860
2026	269,860	132,936	8,096	0	141,032	136,924
2027	136,924	136,924	4,108	0	141,032	0

Do Not Delete Lines - For Amortization Purposes

No.				2018	2019	2020	2021	2022
60	Commercial Paper Capitalized Interest Calculation							
61	Beginning Balance			$ -	$ -	$ -	$ -	$ -
62	Construction Fund Draw-down (Cannot Exceed 5 Fiscal Years)			-	-	-	-	-
63	Interest Cost		3.00%	-	-	-	-	-
64	Unadjusted Ending Balance			$ -	$ -	$ -	$ -	$ -
65	Conversion to Conventional Financing	2017		-	-	-	-	-
66	Ending Balance for Interest Calculation			$ -	$ -	$ -	$ -	$ -

Table 12a
City of Stuart
Water and Wastewater Rate Study

Summary of Debt Service Sizing and Payments

No.	Description	Percent	Amount
	Debt Proceeds (Anticipated) - Bank Note Other Capital		
	Projects		
67	Water	19.9%	$254,000
68	Wastewater	80.1%	1,021,000
69	Other	0.0%	0
70	Other	0.0%	0
71	Other	0.0%	0
72	Other	0.0%	0
73	Total Projects		$1,275,000
74	Issuance and Surety Costs		
75	Issuance Costs (%)	2.00%	$32,900
76	Bond Insurance	0.00%	0
77	Surety Costs (%)	0.00%	0
78	Underwriters Discount	0.00%	0
79	Total Issuance Costs	2.00%	$32,900
	Capitalized Interest - CP Used	No	
80	Capitalized Interest	2 2 yr	98,700
81	Debt Service Reserve Requirement		234,341
82	Principal Amount of Bonds (Rounded)		$1,645,000
83	Assumed Issue Date		October 1, 2017
	Level Debt Service Payment		
84	Term-Years		10
85	Interest Rate		3.00%
86	First Year of Bond Term (Fiscal Year)		2018
87	First Year of Amortization (Fiscal Year)		2020
88	Interest Only Periods		-
89	Issue Month		10
90	Principal Payment Month		10
91	Annual Payment		$234,341

Amortization

Year	Start Bal	Principal	Interest	Cap Int	Payment	End Bal
2018	1,645,000	0	49,350	49,350	0	1,645,000
2019	1,645,000	0	49,350	49,350	0	1,645,000
2020	1,645,000	184,991	49,350	0	234,341	1,460,009
2021	1,460,009	190,540	43,800	0	234,341	1,269,469
2022	1,269,469	196,257	38,084	0	234,341	1,073,212
2023	1,073,212	202,144	32,196	0	234,341	871,068
2024	871,068	208,209	26,132	0	234,341	662,859
2025	662,859	214,455	19,886	0	234,341	448,404
2026	448,404	220,889	13,452	0	234,341	227,515
2027	227,515	227,515	6,825	0	234,341	0

Do Not Delete Lines - For Amortization Purposes

No.				2018	2019	2020	2021	2022
92	Commercial Paper Capitalized Interest Calculation							
93	Beginning Balance			$ -	$ -	$ -	$ -	$ -
94	Construction Fund Draw-down (Cannot Exceed 5 Fiscal Years)			-	-	-	-	-
95	Interest Cost		3.00%	-	-	-	-	-
96	Unadjusted Ending Balance			$ -	$ -	$ -	$ -	$ -
97	Conversion to Conventional Financing	2017		-	-	-	-	-
98	Ending Balance for Interest Calculation			$ -	$ -	$ -	$ -	$ -

Table 13
City of Stuart
Water and Wastewater Rate Study

Projected Transfer to Renewal and Replacement Fund

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	TRANSFER TO RENEWAL & REPLACEMENT FUND						
	Gross Revenues (Previous Year)						
	Existing Rate Revenue						
1	Water Rate Revenues	$4,931,325	$5,311,770	$5,314,734	$5,317,698	$5,320,662	$5,323,626
2	Wastewater Rate Revenues	4,511,950	4,985,412	5,049,022	5,124,661	5,192,994	5,261,326
3	Total Rate Revenues	9,443,275	10,297,182	10,363,756	10,442,359	10,513,656	10,584,952
4	Other Water Operating Revenue and Interest Income	86,525	56,328	58,059	57,108	57,165	57,156
5	Other Wastewater Operating Revenue and Interest Income	168,405	122,872	152,241	151,192	152,135	152,144
6	Total Other Income	254,930	179,200	210,300	208,300	209,300	209,300
7	Total Revenue at Existing Rates	$9,698,205	$10,476,382	$10,574,056	$10,650,659	$10,722,956	$10,794,252
8	Additional Water Rate Revenue from Rate Increases	0	0	372,031	770,493	1,197,416	1,328,433
9	Additional Wastewater Rate Revenue from Rate Increases	0	0	151,471	312,051	481,579	602,885
10	Total Gross Revenue	$9,698,205	$10,476,382	$11,097,558	$11,733,203	$12,401,951	$12,725,569
	Renewal and Replacement Fund						
11	Average Funding Requirement [1]	5.47%	5.00%	5.00%	5.00%	5.00%	5.00%
12	Minimum Funding Requirement	530,339	523,819	554,878	586,660	620,098	636,278
13	Total Deposit	$530,339	$523,819	$554,878	$586,660	$620,098	$636,278
	Allocation of Transfer to Renewal & Replacement Fund						
14	Water System Allocation	51.74%	51.24%	51.77%	52.38%	53.02%	52.72%
15	Wastewater System Allocation	48.26%	48.76%	48.23%	47.62%	46.98%	47.28%
16	Water Deposit	$274,397	$268,405	$287,241	$307,265	$328,762	$335,461
17	Average Funding Requirement [1]	5.47%	5.00%	5.00%	5.00%	5.00%	5.00%
18	Wastewater Deposit	$255,942	$255,414	$267,637	$279,395	$291,335	$300,818
19	Average Funding Requirement [1]	5.47%	5.00%	5.00%	5.00%	5.00%	5.00%
20	Estimated Ending Balance [2]	$980,516	$604,335	$334,213	$496,873	$357,971	$543,249

Footnotes:

[1] Transfer a minimum of five (5) percent of previous years gross revenues into the renewal and replacements fund until the minimum requirement of $1,000,000 as set forth in the bond indenture.

[2] Estimated based on a Flow of Funds Analysis.

Table 14
City of Stuart
Water and Wastewater Rate Study

Projected Intragovernmental Transfer

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
	INTRAGOVERNMENTAL TRANSFER						
	Gross Revenues (Current Year)						
	Existing Rate Revenue						
1	Water Rate Revenues	$5,311,770	$5,314,734	$5,317,698	$5,320,662	$5,323,626	$5,326,590
2	Wastewater Rate Revenues	4,985,412	5,049,022	5,124,661	5,192,994	5,261,326	5,329,659
3	Total Rate Revenues	10,297,182	10,363,756	10,442,359	10,513,656	10,584,952	10,656,249
4	Other Water Operating Revenue and Interest Income	56,328	58,059	57,108	57,165	57,156	57,128
5	Other Wastewater Operating Revenue and Interest Income	122,872	152,241	151,192	152,135	152,144	152,172
6	Total Other Income	179,200	210,300	208,300	209,300	209,300	209,300
7	Total Revenue at Existing Rates	$10,476,382	$10,574,056	$10,650,659	$10,722,956	$10,794,252	$10,865,549
8	Additional Water Rate Revenue from Rate Increases	0	372,031	770,493	1,197,416	1,328,433	1,462,316
9	Additional Wastewater Rate Revenue from Rate Increases	0	151,471	312,051	481,579	602,885	729,507
10	Total Gross Revenue	$10,476,382	$11,097,558	$11,733,203	$12,401,951	$12,725,569	$13,057,372
	Intragovernmental Transfer						
11	Average Funding Requirement	6%	6%	6%	6%	6%	6%
12	Minimum Funding Requirement	$639,169	$665,853	$703,992	$744,117	$763,534	$783,442
	Additional Deposits						
13	Transfer to CRA	40,000	40,000	40,000	40,000	40,000	40,000
14	Other Deposits	0	0	0	0	0	0
15	Total Additional Deposit Requests	40,000	40,000	40,000	40,000	40,000	40,000
16	Total Intragovernmental Transfer	$679,169	$705,853	$743,992	$784,117	$803,534	$823,442
	Allocation of Intragovernmental Transfer						
17	Water System Allocation	51.24%	51.77%	52.38%	53.02%	52.72%	52.43%
18	Wastewater System Allocation	48.76%	48.23%	47.62%	46.98%	47.28%	47.57%
19	Water Transfer	$348,006	$365,396	$389,668	$415,722	$423,642	$431,734
20	Wastewater Transfer	$331,163	$340,457	$354,324	$368,395	$379,892	$391,708

Table 15
City of Stuart
Water and Wastewater Rate Study

Combined Revenue Requirements

Line No.	Description	Projected Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
1	Operating Expenses	$7,140,882	$6,989,897	$7,200,779	$7,708,282	$8,238,429	$8,488,624
2	Plus Allowance for Rebate	0	0	0	0	0	0
3	Total Operating Expenses	$7,140,882	$6,989,897	$7,200,779	$7,708,282	$8,238,429	$8,488,624
	Other Revenue Requirements						
	Debt Service						
4	Existing Debt Service	$2,041,634	$2,036,256	$2,040,341	$2,040,723	$2,038,009	$2,033,716
5	Proposed Debt Service	0	0	0	950,772	950,772	950,772
	Less:						
6	Amount Paid by Impact Fees	(250,000)	(178,000)	(178,000)	(178,000)	(178,000)	(178,000)
7	Total Debt Service	$1,791,634	$1,858,256	$1,862,341	$2,813,496	$2,810,781	$2,806,488
8	Transfer to Renewals & Replacement Fund	$530,339	$523,819	$554,878	$586,660	$620,098	$636,278
9	Capital Funded from Rates	338,000	356,000	362,000	318,000	328,000	338,000
10	Investment in Sewer Expansion Project from Fees	786,350	727,685	865,780	896,756	508,579	620,403
11	Intragovernmental Transfers	679,169	705,853	743,992	784,117	803,534	823,442
12	Operating Reserves - Deposits to/(Uses of)	0	0	0	0	0	0
13	Total Other Revenue Requirements	$4,125,492	$4,171,613	$4,388,991	$5,399,029	$5,070,992	$5,224,611
14	Gross Revenue Requirements	$11,266,374	$11,161,510	$11,589,770	$13,107,311	$13,309,421	$13,713,235
	Less Income and Funds from Other Sources						
15	Other Operating Revenue (Including Reclaimed Water Sales)	$160,200	$195,300	$194,300	$194,300	$194,300	$194,300
16	Other Revenues and Transfers	39,500	38,600	24,000	24,000	24,000	24,000
17	Revenues from Operating Sewer Expansion Fees	86,350	227,685	365,780	396,756	508,579	620,403
18	Unrestricted Interest Income	19,000	15,000	14,000	15,000	15,000	15,000
19	Sub-total Income and Funds from Other Sources	$305,050	$476,585	$598,080	$630,056	$741,879	$853,703
20	Net Revenue Requirements	$10,961,324	$10,684,925	$10,991,690	$12,477,254	$12,567,541	$12,859,532
	Revenue from Water and Wastewater Rates						
21	Existing Retail Rate Revenue	$10,297,182	$10,363,756	$10,442,359	$10,513,656	$10,584,952	$10,656,249
22	Prior Year Rate Adjustments	0	0	525,900	1,087,300	1,685,900	1,939,900
23	Total Rate Revenue Before Current Year Adjustment	$10,297,182	$10,363,756	$10,968,259	$11,600,956	$12,270,852	$12,596,149
24	Total Revenue from Current Year Adjustments	$0	$523,502	$556,644	$591,695	$245,417	$251,923
25	Total Revenue from Rates	$10,297,182	$10,887,258	$11,524,903	$12,192,651	$12,516,269	$12,848,072
25	**Projected Surplus/(Deficiency)**	($664,142)	$202,333	$533,212	($284,603)	($51,272)	($11,460)
26	Surplus/(Deficiency) - Percent of Rate Revenues	(6.45%)	1.86%	4.63%	(2.33%)	(0.41%)	(0.09%)

Table 15
City of Stuart
Water and Wastewater Rate Study

Combined Revenue Requirements

	Proposed Annual Increases (system-wide)	Fiscal Year Ending September 30,					
		2017	2018	2019	2020	2021	2022
27	Water System (Includes Indexing Provision)	N/A	7.0%	7.0%	7.0%	2.0%	2.0%
28	Wastewater System (Includes Indexing Provision)	N/A	3.0%	3.0%	3.0%	2.0%	2.0%
29	Effective	N/A	Oct. 1	Oct. 1	Oct. 1	Oct. 1	Oct. 1

	Proposed Year-end Cash Balances	Fiscal Year Ending September 30,					
		2017	2018	2019	2020	2021	2022
30	Operating Fund	$2,311,835	$2,514,168	$3,047,381	$2,762,777	$2,711,505	$2,700,045
31	Renewal and Replacement Fund	980,516	604,335	334,213	496,873	357,971	543,249
32	Availability Fee Fund	1,736,900	1,745,015	295,642	329,854	397,931	501,872
33	Total Year-end Cash	$5,029,251	$4,863,518	$3,677,235	$3,589,505	$3,467,407	$3,745,166
34	Operating Days of Operating Expenses - Min.	90	90	90	90	90	90
35	Operating Days of Operating Expenses - Calculated	118	131	154	131	120	116

	Projected Net Assets	Fiscal Year Ending September 30,					
36		2017	2018	2019	2020	2021	2022
37	Beginning Unrestricted Balance	$4,808,651	$4,194,556	$4,502,958	$5,357,736	$6,097,419	$6,780,998
38	Revenues	$10,297,182	$10,887,258	$11,524,903	$12,192,651	$12,516,269	$12,848,072
39	Less Expenditures	(10,961,324)	(10,684,925)	(10,991,690)	(12,477,254)	(12,567,541)	(12,859,532)
40	Add Back Capital Expenditures	1,654,689	1,607,504	1,782,658	1,801,416	1,456,677	1,594,681
41	Add Back Debt Service Payments	1,791,634	1,858,256	1,862,341	2,813,496	2,810,781	2,806,488
42	Less Interest Expenses	(833,121)	(796,538)	(760,278)	(1,027,472)	(969,453)	(911,220)
43	Less Allowance for Depreciation & Accrued Adjustments	(2,563,154)	(2,563,154)	(2,563,154)	(2,563,154)	(2,563,154)	(2,563,154)
44	Total Year-end Cash	$4,194,556	$4,502,958	$5,357,736	$6,097,419	$6,780,998	$7,696,333
45	Operating Days of Operating Expenses - Min.	90	90	90	90	90	90
46	Operating Days of Operating Expenses - Calculated	214	235	272	289	300	331

Footnotes:
[1] Amounts derived from Tables 16 and 17.

Table 16
City of Stuart
Water and Wastewater Rate Study

Projected Water Revenue Requirements

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
1	Operating Expenses [1]	$4,214,004	$3,847,153	$3,952,601	$4,350,979	$4,767,588	$4,899,623
2	Plus Allowance for Rebate	0	0	0	0	0	0
3	Total Operating Expenses	$4,214,004	$3,847,153	$3,952,601	$4,350,979	$4,767,588	$4,899,623
	Other Revenue Requirements						
	Debt Service [2]						
4	Existing Debt Service	$1,113,722	$1,106,335	$1,108,377	$1,108,568	$1,107,211	$1,105,065
5	Proposed Debt Service	0	0	0	622,084	622,084	622,084
	Less:						
6	Amount Paid by Impact Fees	(250,000)	0	0	0	0	0
7	Total Debt Service	$863,722	$1,106,335	$1,108,377	$1,730,653	$1,729,295	$1,727,149
8	Transfer to Renewals & Replacement Fund [3]	$274,397	$268,405	$287,241	$307,265	$328,762	$335,461
9	Capital Funded from Rates [4]	232,000	184,000	155,000	159,000	164,000	169,000
10	Investment in Sewer Expansion Project	0	0	0	0	0	0
11	Intragovernmental Transfers	348,006	365,396	389,668	415,722	423,642	431,734
12	Operating Reserves - Deposits to/(Uses of)	0	0	0	0	0	0
13	Total Other Revenue Requirements	$1,718,125	$1,924,135	$1,940,287	$2,612,639	$2,645,699	$2,663,344
14	Gross Revenue Requirements	$5,932,130	$5,771,289	$5,892,887	$6,963,618	$7,413,287	$7,562,967
	Less Income and Funds from Other Sources						
15	Other Operating Revenue [5]	$47,100	$50,875	$50,375	$50,375	$50,375	$50,375
16	Other Revenues and Transfers [5]	19,750	23,300	16,000	16,000	16,000	16,000
17	Revenues from Operating Sewer Expansion Fees	0	0	0	0	0	0
18	Unrestricted Interest Income [6]	9,228	7,184	6,733	6,790	6,781	6,753
19	Sub-total Income and Funds from Other Sources	$76,078	$81,359	$73,108	$73,165	$73,156	$73,128
20	Net Revenue Requirements	$5,856,052	$5,689,930	$5,819,779	$6,890,454	$7,340,132	$7,489,838
	Revenue from Water Rates						
21	Existing Retail Rate Revenue [7]	$5,311,770	$5,314,734	$5,317,698	$5,320,662	$5,323,626	$5,326,590
22	Prior Year Rate Adjustments	0	0	372,200	771,000	1,198,000	1,329,200
23	Total Rate Revenue Before Current Year Adjustment	$5,311,770	$5,314,734	$5,689,898	$6,091,662	$6,521,626	$6,655,790
	System-wide Rate Adjustments						
24	Current Year Rate Adjustment	0.00%	7.00%	7.00%	7.00%	2.00%	2.00%
	Effective Month	Oct.	Oct.	Oct.	Oct.	Oct.	Oct.
25	% of Current Year Effective	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
26	Total Revenue from Current Year Adjustments	$0	$372,031	$398,293	$426,416	$130,433	$133,116
27	Cumulative Rate Adjustments (Excluding Surcharges)	0.00%	7.00%	14.49%	22.50%	24.95%	27.45%
28	Total Revenue from Rates	$5,311,770	$5,686,765	$6,088,191	$6,518,078	$6,652,059	$6,788,906
29	**Projected Surplus/(Deficiency)**	($544,282)	($3,165)	$268,412	($372,375)	($688,073)	($700,933)
30	Surplus/(Deficiency) - Percent of Rate Revenues	(10.25%)	(0.06%)	4.41%	(5.71%)	(10.34%)	(10.32%)

Footnotes continued on the following page.

Table 16
City of Stuart
Water and Wastewater Rate Study

Projected Water Revenue Requirements

Footnotes:

[1] Amounts derived from Table 8.

[2] Amounts derived from Table 12.

[3] Amounts derived from Table 13.

[4] Amounts derived from Table 11 to pay for capital equipment, improvements and extensions as follows:

	Fiscal Year Ending September 30,					
	2017	2018	2019	2020	2021	2022
Revenues to Fund Vehicles, Equipment & Other Capital Outlay	$232,000	$184,000	$155,000	$159,000	$164,000	$169,000
Revenues to other Lawful Capital Expenditures	0	0	0	0	0	0
Total Capital Funded from Rates	$232,000	$184,000	$155,000	$159,000	$164,000	$169,000

[5] Amounts based on Budget.

[6] Amounts estimated based on the cash flows anticipated for the forecast period.

[7] Amounts derived from Table 3.

Table 17
City of Stuart
Water and Wastewater Rate Study

Projected Wastewater Revenue Requirements

Line No.	Description	Projected Fiscal Year Ending September 30, 2017	2018	2019	2020	2021	2022
1	Operating Expenses [1]	$2,926,878	$3,142,744	$3,248,179	$3,357,303	$3,470,841	$3,589,001
2	Plus Allowance for Rebate	0	0	0	0	0	0
3	Total Operating Expenses	$2,926,878	$3,142,744	$3,248,179	$3,357,303	$3,470,841	$3,589,001
	Other Revenue Requirements						
	Debt Service [2]						
4	Existing Debt Service	$927,912	$929,921	$931,964	$932,155	$930,797	$928,651
5	Proposed Debt Service	0	0	0	328,688	328,688	328,688
	Less:						
6	Amount Paid by Impact Fees	0	(178,000)	(178,000)	(178,000)	(178,000)	(178,000)
7	Total Debt Service	$927,912	$751,921	$753,964	$1,082,843	$1,081,486	$1,079,339
8	Transfer to Renewals & Replacement Fund [3]	$255,942	$255,414	$267,637	$279,395	$291,335	$300,818
9	Capital Funded from Rates [4]	106,000	172,000	207,000	159,000	164,000	169,000
10	Investment in Sewer Expansion Project from Fees	786,350	727,685	865,780	896,756	508,579	620,403
11	Intragovernmental Transfers	331,163	340,457	354,324	368,395	379,892	391,708
12	Operating Reserves - Deposits to/(Uses of)	0	0	0	0	0	0
13	Total Other Revenue Requirements	$2,407,366	$2,247,477	$2,448,704	$2,786,390	$2,425,293	$2,561,268
14	Gross Revenue Requirements	$5,334,244	$5,390,221	$5,696,883	$6,143,692	$5,896,133	$6,150,268
	Less Income and Funds from Other Sources						
15	Other Operating Revenue (Including Reclaimed Water Sales) [5]	$113,100	$144,425	$143,925	$143,925	$143,925	$143,925
16	Other Revenues and Transfers [5]	19,750	15,300	8,000	8,000	8,000	8,000
17	Revenues from Operating Sewer Expansion Fees [6]	86,350	227,685	365,780	396,756	508,579	620,403
18	Unrestricted Interest Income [7]	9,772	7,816	7,267	8,210	8,219	8,247
19	Sub-total Income and Funds from Other Sources	$228,972	$395,226	$524,971	$556,891	$668,724	$780,574
20	Net Revenue Requirements	$5,105,273	$4,994,995	$5,171,911	$5,586,801	$5,227,410	$5,369,694
	Revenue from Wastewater Rates						
21	Existing Retail Rate Revenue [8]	$4,985,412	$5,049,022	$5,124,661	$5,192,994	$5,261,326	$5,329,659
22	Prior Year Rate Adjustments	0	0	153,700	316,300	487,900	610,700
23	Total Rate Revenue Before Current Year Adjustment	$4,985,412	$5,049,022	$5,278,361	$5,509,294	$5,749,226	$5,940,359
	Current Year Rate Adjustments						
24	Current Year Rate Adjustment	0.00%	3.00%	3.00%	3.00%	2.00%	2.00%
	Effective Month	Oct.	Oct.	Oct.	Oct.	Oct.	Oct.
25	% of Current Year Effective	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
26	Total Revenue from Current Year Adjustments	$0	$151,471	$158,351	$165,279	$114,985	$118,807
27	Cumulative Rate Adjustments (Excluding Surcharges)	0.00%	3.00%	6.09%	9.27%	11.46%	13.69%
28	Total Revenue from Rates	$4,985,412	$5,200,493	$5,436,712	$5,674,573	$5,864,211	$6,059,166
29	**Projected Surplus/(Deficiency)**	($119,861)	$205,498	$264,800	$87,772	$636,801	$689,472
30	Surplus/(Deficiency) - Percent of Rate Revenues	(2.40%)	3.95%	4.87%	1.55%	10.86%	11.38%

Footnotes continued on the following page.

Table 17
City of Stuart
Water and Wastewater Rate Study

Projected Wastewater Revenue Requirements

Footnotes:

[1] Amounts derived from Table 9.

[2] Amounts derived from Table 12.

[3] Amounts derived from Table 13.

[4] Amounts derived from Table 11 to pay for capital equipment, improvements and extensions as follows:.

	Fiscal Year Ending September 30,					
	2017	2018	2019	2020	2021	2022
Revenues to Fund Vehicles, Equipment & Other Capital Outlay	$106,000	$172,000	$155,000	$159,000	$164,000	$169,000
Revenues to other Lawful Capital Expenditures	0	0	52,000	0	0	0
Total Capital Funded from Rates	$106,000	$172,000	$207,000	$159,000	$164,000	$169,000

[5] Amounts based on Budget.

[6] Amounts derived from Table 1.

[7] Amounts estimated based on the cash flows anticipated for the forecast period.

[8] Amounts derived from Table 3.

Table 18
City of Stuart
Water & Wastewater Rate Study

Projected Available Fund Balances and Interest Earnings

Line No.	Description	For the Fiscal Years Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	OPERATING FUND (U)						
1	Beginning Balance	$6,062,977	$2,311,835	$2,514,168	$3,047,381	$2,762,777	$2,711,505
2	Transfers In - Rate Revenues	10,297,182	10,887,258	11,524,903	12,192,651	12,516,269	12,848,072
3	Transfers In - Recapture Water Availability Fees for Debt	0	0	0	0	0	0
4	Transfers Out - Net Revenue Requirements	10,961,324	10,684,925	10,991,690	12,477,254	12,567,541	12,859,532
5	Transfers Out - Capital Improvements	3,087,000	0	0	0	0	0
6	Transfers Out - Other	0	0	0	0	0	0
7	End of Year Transfers In (Out)	0	0	0	0	0	0
8	Interest Rate	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
9	Interest Income	10,000	6,000	7,000	7,000	7,000	7,000
10	Recognition of Interest Earnings in Revenue Requirements	10,000	6,000	7,000	7,000	7,000	7,000
11	Ending Balance	$2,311,835	$2,514,168	$3,047,381	$2,762,777	$2,711,505	$2,700,045
12	Percent Allocable to Water System	51.58%	52.23%	52.83%	53.46%	53.15%	52.84%
13	Amount Allocable to Water System	$5,158	$3,134	$3,698	$3,742	$3,720	$3,699
14	Amount Allocable to Wastewater System	$4,842	$2,866	$3,302	$3,258	$3,280	$3,301
	CUSTOMER DEPOSITS (R)						
15	Beginning Balance	$604,184	$604,184	$604,184	$604,184	$604,184	$604,184
16	Transfers In	0	0	0	0	0	0
17	Transfers Out	0	0	0	0	0	0
18	Interest Rate	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
19	Interest Income	0	0	0	0	0	0
20	Recognition of Interest Earnings in Revenue Requirements	0	0	0	0	0	0
21	Ending Balance	$604,184	$604,184	$604,184	$604,184	$604,184	$604,184
22	Percent Allocable to Water System	64.88%	64.88%	64.88%	64.88%	64.88%	64.88%
23	Amount Allocable to Water System	$0	$0	$0	$0	$0	$0
24	Amount Allocable to Wastewater System	$0	$0	$0	$0	$0	$0
	SINKING FUND (U)						
	Sinking Fund Deposit:						
25	Existing Debt	$2,041,634	$2,036,256	$2,040,341	$2,040,723	$2,038,009	$2,033,716
26	Proposed Debt	0	0	0	950,772	950,772	950,772
27	Average Balance	$1,020,817	$1,018,128	$1,020,171	$1,495,748	$1,494,390	$1,492,244
28	Interest Rate	0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
29	Interest Income	$3,000	$3,000	$3,000	$4,000	$4,000	$4,000
30	Recognition of Interest Earnings in Revenue Requirements	3,000	3,000	3,000	4,000	4,000	4,000
31	Percent Allocable to Water System	54.55%	54.33%	54.32%	57.85%	57.86%	57.87%
32	Amount Allocable to Water System	$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
33	Amount Allocable to Wastewater System	$1,000	$1,000	$1,000	$2,000	$2,000	$2,000
	RENEWAL & REPLACEMENT INVESTMENT (U)						
34	Beginning Balance	$450,177	$980,516	$604,335	$334,213	$496,873	$357,971
35	Transfers In	530,339	523,819	554,878	586,660	620,098	636,278
36	Transfers In - Other	0	0	0	0	0	0
37	Transfers Out	0	900,000	825,000	424,000	759,000	451,000
38	Interest Rate	0.50%	0.50%	0.50%	0.50%	0.50%	0.50%
39	Interest Income	4,000	4,000	2,000	2,000	2,000	2,000
40	Recognition of Interest Earnings in Revenue Requirements	4,000	4,000	2,000	2,000	2,000	2,000
41	Ending Balance	$980,516	$604,335	$334,213	$496,873	$357,971	$543,249
42	Percent Allocable to Water System	51.74%	51.24%	51.77%	52.38%	53.02%	52.72%
43	Amount Allocable to Water System	$2,070	$2,050	$1,035	$1,048	$1,060	$1,054
44	Amount Allocable to Wastewater System	$1,930	$1,950	$965	$952	$940	$946

Table 18
City of Stuart
Water & Wastewater Rate Study

Projected Available Fund Balances and Interest Earnings

Line No.	Description		For the Fiscal Years Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	SEWER EXPANSION CONSTRUCTION FUND	(R)						
45	Beginning Balance		$0	$45,550	$156,435	$227,415	$399,371	$158,150
46	Transfers In - Sewer Availability Fees		0	0	0	0	0	0
47	Transfers In - Existing Sewer Expansion Assessments		133,200	133,200	133,200	133,200	133,200	133,200
48	Transfers In - Operations		786,350	727,685	865,780	896,756	508,579	620,403
49	Transfers Out		874,000	750,000	928,000	859,000	884,000	911,000
50	Arbitrage Interest Rate		0.25%	0.25%	0.25%	0.25%	0.25%	0.25%
51	Interest Income (3)		0	0	0	1,000	1,000	0
52	Recognition of Interest Earnings in Revenue Requirements		0	0	0	0	0	0
53	Ending Balance		$45,550	$156,435	$227,415	$399,371	$158,150	$753
54	Percent Allocable to Water System		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
55	Amount Allocable to Water System		$0	$0	$0	$0	$0	$0
56	Amount Allocable to Wastewater System		$0	$0	$0	$1,000	$1,000	$0
	SRF RESERVE	(R)						
57	Beginning Balance		$181,838	$181,838	$181,838	$181,838	$181,838	$181,838
58	Transfers In		0	0	0	0	0	0
59	Transfers Out		0	0	0	0	0	0
60	Interest Rate		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
61	Interest Income		2,000	2,000	2,000	2,000	2,000	2,000
62	Recognition of Interest Earnings in Revenue Requirements		2,000	2,000	2,000	2,000	2,000	2,000
63	Ending Balance		$181,838	$181,838	$181,838	$181,838	$181,838	$181,838
64	Percent Allocable to Water System		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
65	Amount Allocable to Water System		$0	$0	$0	$0	$0	$0
66	Amount Allocable to Wastewater System		$2,000	$2,000	$2,000	$2,000	$2,000	$2,000
	WATER AVAILABILTY FEES	(R)						
67	Beginning Balance		$1,755,059	$1,540,389	$1,575,719	$103,049	$123,379	$143,709
68	Transfers In		19,330	19,330	19,330	19,330	19,330	19,330
69	Transfers Out		250,000	0	1,500,000	0	0	0
70	Transfer Out - Reimburse Operating Fund for Debt		0	0	0	0	0	0
71	Interest Rate		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
72	Interest Income		16,000	16,000	8,000	1,000	1,000	2,000
73	Recognition of Interest Earnings in Revenue Requirements		0	0	0	0	0	0
74	Ending Balance		$1,540,389	$1,575,719	$103,049	$123,379	$143,709	$165,039
75	Percent Allocable to Water System		100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
76	Amount Allocable to Water System		$16,000	$16,000	$8,000	$1,000	$1,000	$2,000
77	Amount Allocable to Wastewater System		$0	$0	$0	$0	$0	$0
	SEWER AVAILABILTY FEES	(R)						
78	Beginning Balance		$101,641	$196,511	$169,296	$192,593	$206,475	$254,222
79	Transfers In		20,920	20,920	20,920	20,920	20,920	20,920
80	Transfers In - Existing Sewer Expansion Assessments		46,800	46,800	46,800	46,800	46,800	46,800
81	Transfers In - New Sewer Expansion Fees		26,150	81,065	131,577	122,163	156,027	189,891
82	Transfers Out		0	178,000	178,000	178,000	178,000	178,000
83	Transfer Out - Sewer Expansion Project		0	0	0	0	0	0
84	Transfers Out - Sewer Incentive Credits		0	0	0	0	0	0
85	Interest Rate		1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
86	Interest Income		1,000	2,000	2,000	2,000	2,000	3,000
87	Recognition of Interest Earnings in Revenue Requirements		0	0	0	0	0	0
88	Ending Balance		$196,511	$169,296	$192,593	$206,475	$254,222	$336,833
89	Percent Allocable to Water System		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
90	Amount Allocable to Water System		0	0	0	0	0	0
91	Amount Allocable to Wastewater System		1,000	2,000	2,000	2,000	2,000	3,000

Table 18
City of Stuart
Water & Wastewater Rate Study

Projected Available Fund Balances and Interest Earnings

Line No.	Description	For the Fiscal Years Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	INTEREST INCOME						
	Unrestricted						
92	Water System	$9,228	$7,184	$6,733	$6,790	$6,781	$6,753
93	Wastewater System	9,772	7,816	7,267	8,210	8,219	8,247
94	Total	$19,000	$15,000	$14,000	$15,000	$15,000	$15,000
	Availability Fees						
95	Water System	$16,000	$16,000	$8,000	$1,000	$1,000	$2,000
96	Wastewater System	1,000	2,000	2,000	2,000	2,000	3,000
97	Total	$17,000	$18,000	$10,000	$3,000	$3,000	$5,000
	Sewer Expansion Construction Fund						
98	Water System	$0	$0	$0	$0	$0	$0
99	Wastewater System	0	0	0	1,000	1,000	0
100	Total	$0	$0	$0	$1,000	$1,000	$0
	TOTAL INTEREST INCOME						
101	Water System	$25,228	$23,184	$14,733	$7,790	$7,781	$8,753
102	Wastewater System	10,772	9,816	9,267	11,210	11,219	11,247
103	Total	$36,000	$33,000	$24,000	$19,000	$19,000	$20,000

Notes:
[1] (U) = Interest Earnings unrestricted, assumed available to meet system expenditure requirements
(R) = Interest Earnings restricted, assumed not available to meet system expenditure requirements

Table 19
City of Stuart
Water and Wastewater Rate Study

Projected Debt Service Coverage

Line No.	Description	Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	PROJECTED NET REVENUES						
	System Revenues						
	Sales Revenues						
1	Water - Existing Rate Revenues	$5,311,770	$5,314,734	$5,317,698	$5,320,662	$5,323,626	$5,326,590
2	Wastewater - Existing Rate Revenues	4,985,412	5,049,022	5,124,661	5,192,994	5,261,326	5,329,659
3	Additional Rate Revenues - Water System	0	372,031	770,493	1,197,416	1,328,433	1,462,316
4	Additional Rate Revenues - Wastewater System	0	151,471	312,051	481,579	602,885	729,507
5	Total	$10,297,182	$10,887,258	$11,524,903	$12,192,651	$12,516,269	$12,848,072
6	Other Operating Revenue	160,200	195,300	194,300	194,300	194,300	194,300
7	Unrestricted Interest Income	19,000	15,000	14,000	15,000	15,000	15,000
8	Total System Revenues (Excluding Operating Sewer Expansion Fe	$10,476,382	$11,097,558	$11,733,203	$12,401,951	$12,725,569	$13,057,372
	Operating Expenses						
9	Water System	$4,214,004	$3,847,153	$3,952,601	$4,350,979	$4,767,588	$4,899,623
10	Wastewater System	2,926,878	3,142,744	3,248,179	3,357,303	3,470,841	3,589,001
11	Plus Allowance for Rebate	0	0	0	0	0	0
12	Less Contra Expense	(14,600)	0	0	0	0	0
13	Total Operating Expenses	$7,126,282	$6,989,897	$7,200,779	$7,708,282	$8,238,429	$8,488,624
14	**Net Revenues (Excluding Operating Sewer Expansion Fees)**	$3,350,100	$4,107,661	$4,532,423	$4,693,669	$4,487,140	$4,568,748
15	Operating Sewer Expansion Fees Revenues	$86,350	$227,685	$365,780	$396,756	$508,579	$620,403
16	**Net Revenues (Including Operating Sewer Expansion Fees)**	$3,436,450	$4,335,346	$4,898,203	$5,090,425	$4,995,720	$5,189,151
17	**Total System Debt Service (Senior & Junior Lien Debt)**	$2,041,634	$2,036,256	$2,040,341	$2,991,496	$2,988,781	$2,984,488

Table 19
City of Stuart
Water and Wastewater Rate Study

Projected Debt Service Coverage

Line No.	Description	Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	Projected Debt Service Coverage (Senior & Junior Lien Debt)						
	Excluding Operating Sewer Expansion Fees Revenues						
18	Coverage - Calculated	164%	202%	222%	157%	150%	153%
	Including Operating Sewer Expansion Fees Revenues						
19	Coverage - Calculated	168%	213%	240%	170%	167%	174%
	Projected Debt Service Coverage (Senior Lien Debt Only) [2]						
	Senior Lien Debt Service						
20	Series 2003 Bonds (Unrefunded)	$469,800	$0	$0	$0	$0	$0
21	Series 2006 Refunding Notes	343,393	343,430	342,426	343,289	343,378	343,254
22	Series 2007A Refunding Notes	315,701	780,387	785,938	785,080	783,083	778,883
23	Series 2011 Refunding Notes	380,217	379,917	379,455	379,832	379,025	379,057
24	Total Senior Lien Debt Service	$1,509,111	$1,503,733	$1,507,819	$1,508,201	$1,505,486	$1,501,193
	Excluding Operating Sewer Expansion Fees Revenues						
25	Coverage - Calculated	222%	273%	301%	311%	298%	304%
26	Coverage - Minimum Required	110%	110%	110%	110%	110%	110%
	Including Operating Sewer Expansion Fees Revenues						
27	Coverage - Calculated	228%	288%	325%	338%	332%	346%
28	Coverage - Minimum Required	110%	110%	110%	110%	110%	110%

Table 19
City of Stuart
Water and Wastewater Rate Study

Projected Debt Service Coverage

Line No.	Description	Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	Projected Debt Service Coverage (Junior Lien Debt Only) [3]						
29	Total Senior Lien Debt Service (Including Coverage)	$1,660,023	$1,654,107	$1,658,601	$1,659,021	$1,656,035	$1,651,313
30	Plus Availability Fee Revenues (Including Interest Income)	$83,400	$139,315	$181,827	$165,413	$199,277	$235,141
31	**Net Revenues (Excluding Operating Sewer Expansion Fees)**	$1,773,477	$2,592,869	$3,055,649	$3,200,061	$3,030,382	$3,152,577
32	**Net Revenues (Including Operating Sewer Expansion Fees)**	$1,859,827	$2,820,554	$3,421,429	$3,596,817	$3,538,962	$3,772,979
	Junior Lien Debt Service (SRF Loans)						
33	SRF WW 430400	$178,054	$178,054	$178,054	$178,054	$178,054	$178,054
34	SRF DW 430410	354,468	354,468	354,468	354,468	354,468	354,468
35	Debt Proceeds (Anticipated) - Proposed SRF Loan	0	0	0	575,400	575,400	575,400
36	Debt Proceeds (Anticipated) - Bank Loan Sewer Expansion	0	0	0	141,032	141,032	141,032
37	Debt Proceeds (Anticipated) - Bank Note Other Capital	0	0	0	234,341	234,341	234,341
38	0	0	0	0	0	0	0
39	Total Junior Lien Debt Service	$532,522	$532,522	$532,522	$1,483,295	$1,483,295	$1,483,295
	Excluding Operating Sewer Expansion Fees Revenues						
40	Coverage - Calculated	333%	487%	574%	216%	204%	213%
41	Coverage - Minimum Required	115%	115%	115%	115%	115%	115%
	Including Operating Sewer Expansion Fees Revenues						
42	Coverage - Calculated	349%	530%	642%	242%	239%	254%
43	Coverage - Minimum Required	115%	115%	115%	115%	115%	115%

Table 19
City of Stuart
Water and Wastewater Rate Study

Projected Debt Service Coverage

Line No.	Description	Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022
	OTHER LAWFUL SOURCES AND USES OF FUNDS						
	Sources of Cash						
44	Other Revenues and Transfers	$24,900	$38,600	$24,000	$24,000	$24,000	$24,000
	Operating Sewer Expansion Fees Revenues	86,350	227,685	365,780	396,756	508,579	620,403
45	Availability Fees used to Pay Debt Service	250,000	178,000	178,000	178,000	178,000	178,000
46	Total Sources of Cash	$361,250	$444,285	$567,780	$598,756	$710,579	$822,403
	Uses of cash						
47	Transfer to Renewals and Replacements Fund	$530,339	$523,819	$554,878	$586,660	$620,098	$636,278
48	Capital Funded from Rates	338,000	356,000	362,000	318,000	328,000	338,000
49	Intragovernmental Transfers	786,350	727,685	865,780	896,756	508,579	620,403
50	Investment in Sewer Expansion Project	679,169	705,853	743,992	784,117	803,534	823,442
51	Total Uses of Cash	$2,333,858	$2,313,357	$2,526,650	$2,585,533	$2,260,211	$2,418,123
	NET CASH FLOW						
52	Net Revenues Available for Debt Service	$3,350,100	$4,107,661	$4,532,423	$4,693,669	$4,487,140	$4,568,748
53	Less Annual Debt Service Payments	(2,041,634)	(2,036,256)	(2,040,341)	(2,991,496)	(2,988,781)	(2,984,488)
54	Net Amount Available from Rates for Other Purposes	$1,308,466	$2,071,405	$2,492,082	$1,702,174	$1,498,359	$1,584,260
55	Plus Other Sources of Cash	361,250	444,285	567,780	598,756	710,579	822,403
56	Less Other Uses of Cash	(2,333,858)	(2,313,357)	(2,526,650)	(2,585,533)	(2,260,211)	(2,418,123)
57	Total Net Cash Flow - Increases to Cash (Decreases to Cash)	($664,142)	$202,333	$533,212	($284,603)	($51,272)	($11,460)

Table 19
City of Stuart
Water and Wastewater Rate Study

Projected Debt Service Coverage

Line No.	Description	Fiscal Year Ending September 30, [1] 2017	2018	2019	2020	2021	2022

Footnotes:

[1] Amounts derived from Table 15.
[2] As required by the bond resolution.
[3] As required by the SRF Loan Agreement.

Table 20
City of Stuart
Water and Wastewater Rate Study

Proposed Water Rates

Line No.	Description	Proposed Water Rate Structure [1] Existing	Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	WATER SYSTEM						
1	Proposed Water Rate Increase	N/A	7.00%	7.00%	7.00%	2.00%	2.00%
	RESIDENTIAL - DOMESTIC INSIDE						
2	Monthly Consumer Charge (per Account)	$1.71	$1.83	$1.96	$2.10	$2.14	$2.18
3	Monthly Base Charges (All Meter Sizes)	$12.27	$13.13	$14.05	$15.03	$15.33	$15.64
	Monthly Volume Charge						
4	1 - 4,000	$2.68	$2.87	$3.07	$3.28	$3.35	$3.42
5	4,001 - 8,000	$2.81	$3.01	$3.22	$3.45	$3.52	$3.59
6	8,001 - 12,000	$4.84	$5.18	$5.54	$5.93	$6.05	$6.17
7	12,001 - 25,000	$5.65	$6.05	$6.47	$6.92	$7.06	$7.20
8	25,001 and above	$6.44	$6.89	$7.37	$7.89	$8.05	$8.21
	RESIDENTIAL - IRRIGATION INSIDE						
9	Monthly Consumer Charge (per Account)	$1.71	$1.83	$1.96	$2.10	$2.14	$2.18
10	Monthly Base Charges (All Meter Sizes)	$12.27	$13.13	$14.05	$15.03	$15.33	$15.64
	Monthly Volume Charge						
11	1 - 13,000 [2]	$5.65	$6.05	$6.47	$6.92	$7.06	$7.20
12	13,001 and above [2]	$6.44	$6.89	$7.37	$7.89	$8.05	$8.21
13	RESIDENTIAL - OUTSIDE	125%	125%	125%	125%	125%	125%
	MULTI-FAMILY - DOMESTIC INSIDE						
14	Monthly Consumer Charge (per Account)	$1.71	$1.83	$1.96	$2.10	$2.14	$2.18
15	Monthly Base Charges (per Unit) [3]	$9.21	$9.85	$10.54	$11.28	$11.51	$11.74
	Monthly Volume Charge (per Unit)						
16	1 - 3,000 [3]	$2.68	$2.87	$3.07	$3.28	$3.35	$3.42
17	3,001 - 6,000 [3]	$2.81	$3.01	$3.22	$3.45	$3.52	$3.59
18	6,001 - 9,000 [3]	$4.84	$5.18	$5.54	$5.93	$6.05	$6.17
19	9,001 - 18,500 [3]	$5.65	$6.05	$6.47	$6.92	$7.06	$7.20
20	18,501 and above [3]	$6.44	$6.89	$7.37	$7.89	$8.05	$8.21
21	MULTI-FAMILY - DOMESTIC OUTSIDE	125%	125%	125%	125%	125%	125%

Table 20
City of Stuart
Water and Wastewater Rate Study

Proposed Water Rates

Line No.	Description	Proposed Water Rate Structure [1] Existing	Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	COMMERCIAL - DOMESTIC INSIDE						
22	Monthly Consumer Charge (per Account)	$1.71	$1.83	$1.96	$2.10	$2.14	$2.18
	Monthly Base Charges						
23	5/8"x3/4" Commercial	$12.27	$13.13	$14.05	$15.03	$15.33	$15.64
24	1" Commercial	$30.68	$32.83	$35.13	$37.59	$38.34	$39.11
25	1 1/2" Commercial	$71.15	$76.13	$81.46	$87.16	$88.90	$90.68
26	2" Commercial	$98.15	$105.02	$112.37	$120.24	$122.64	$125.09
27	3" Commercial	$184.02	$196.90	$210.68	$225.43	$229.94	$234.54
28	4" Commercial	$306.72	$328.19	$351.16	$375.74	$383.25	$390.92
29	6" Commercial	$613.43	$656.37	$702.32	$751.48	$766.51	$781.84
30	8" Commercial	$981.49	$1,050.19	$1,123.70	$1,202.36	$1,226.41	$1,250.94
31	10" Commercial	$1,410.88	$1,509.64	$1,615.31	$1,728.38	$1,762.95	$1,798.21
	Monthly Volume Charge						
32	All Consumption	$3.42	$3.66	$3.92	$4.19	$4.27	$4.36
33	COMMERCIAL - DOMESTIC OUTSIDE	125%	125%	125%	125%	125%	125%
	NON-RESIDENTIAL - IRRIGATION INSIDE						
34	Monthly Consumer Charge (per Account)	$1.71	$1.83	$1.96	$2.10	$2.14	$2.18
	Monthly Base Charges						
35	5/8"x3/4" Commercial	$12.27	$13.13	$14.05	$15.03	$15.33	$15.64
36	1" Commercial	$30.68	$32.83	$35.13	$37.59	$38.34	$39.11
37	1 1/2" Commercial	$71.15	$76.13	$81.46	$87.16	$88.90	$90.68
38	2" Commercial	$98.15	$105.02	$112.37	$120.24	$122.64	$125.09
39	3" Commercial	$184.02	$196.90	$210.68	$225.43	$229.94	$234.54
40	4" Commercial	$306.72	$328.19	$351.16	$375.74	$383.25	$390.92
41	6" Commercial	$613.43	$656.37	$702.32	$751.48	$766.51	$781.84
42	8" Commercial	$981.49	$1,050.19	$1,123.70	$1,202.36	$1,226.41	$1,250.94
43	10" Commercial	$1,410.88	$1,509.64	$1,615.31	$1,728.38	$1,762.95	$1,798.21
	Monthly Volume Charge						
44	1 - _____ [*] [2]	$5.65	$6.05	$6.47	$6.92	$7.06	$7.20
45	__,001 and above [*] [3]	$6.44	$6.89	$7.37	$7.89	$8.05	$8.21
	[*] Amount based on Meter Size, ERC Factor multiplied by 13,000 gallons.						
46	NON-RESIDENTIAL - IRRIGATION OUTSIDE	125%	125%	125%	125%	125%	125%

Footnotes:

[1] Proposed rates based on the City's Water and Wastewater Rate Study and are effective for bills rendered on or after October 1 of each fiscal year.

[2] Such amounts are intended to equal the monthly volume charges associated with Blocks 3 & 4 of the Residential Domestic Water Rate, which provides a comparable fee based on the use of water resources. This is based on our assumption that essential indoor use reflects consumption up to 8,000 gallons per month with additional discretionary indoor water use of 4,000 gallons. Comparably the Residential Wastewater Rate structure caps wastewater charges at 12,000 gallons which implies that such additional use is not intended for indoor purposes.

[3] Amounts reflect 0.75 ERCs per multi-family unit.

Table 21
City of Stuart
Water and Wastewater Rate Study

Proposed Wastewater Rates

Line No.	Description	Proposed Wastewater Rate Structure [1] Existing	Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	WASTEWATER SYSTEM						
1	Proposed Wastewater Rate Increase	N/A	3.00%	3.00%	3.00%	2.00%	2.00%
	RESIDENTIAL						
2	Monthly Consumer Charge (per Account)	$1.18	$1.22	$1.26	$1.30	$1.33	$1.36
3	Monthly Base Charges (All Meter Sizes)	$6.51	$6.71	$6.91	$7.12	$7.26	$7.41
	Monthly Volume Charge						
4	1 - 12,000	$6.36	$6.55	$6.75	$6.95	$7.09	$7.23
5	12,001 and above	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
6	RESIDENTIAL - OUTSIDE	125%	125%	125%	125%	125%	125%
	MULTI-FAMILY						
7	Monthly Consumer Charge (per Account)	$1.18	$1.22	$1.26	$1.30	$1.33	$1.36
8	Monthly Base Charges (per Unit) [2]	$4.84	$4.99	$5.14	$5.29	$5.40	$5.51
	Monthly Volume Charge (per Unit)						
9	1 - 8,800 [2]	$6.36	$6.55	$6.75	$6.95	$7.09	$7.23
10	8,801 and above [2]	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
11	MULTI-FAMILY - OUTSIDE	125%	125%	125%	125%	125%	125%

Table 21
City of Stuart
Water and Wastewater Rate Study

Proposed Wastewater Rates

Line No.	Description	Proposed Wastewater Rate Structure [1] Existing	Oct. 1, 2017	Oct. 1, 2018	Oct. 1, 2019	Oct. 1, 2020	Oct. 1, 2021
	COMMERCIAL						
12	Monthly Consumer Charge (per Account)	$1.18	$1.22	$1.26	$1.30	$1.33	$1.36
	Monthly Base Charges						
13	5/8"x3/4" Commercial	$6.51	$6.71	$6.91	$7.12	$7.26	$7.41
14	1" Commercial	$16.28	$16.77	$17.27	$17.79	$18.15	$18.51
15	1 1/2" Commercial	$37.73	$38.86	$40.03	$41.23	$42.05	$42.89
16	2" Commercial	$52.04	$53.60	$55.21	$56.87	$58.01	$59.17
17	3" Commercial	$97.56	$100.49	$103.50	$106.61	$108.74	$110.91
18	4" Commercial	$162.60	$167.48	$172.50	$177.68	$181.23	$184.85
19	6" Commercial	$352.21	$362.78	$373.66	$384.87	$392.57	$400.42
20	8" Commercial	$520.34	$535.95	$552.03	$568.59	$579.96	$591.56
21	10" Commercial	$747.99	$770.43	$793.54	$817.35	$833.70	$850.37
	Monthly Volume Charge						
22	All Consumption	$6.36	$6.55	$6.75	$6.95	$7.09	$7.23
23	COMMERCIAL - OUTSIDE	125%	125%	125%	125%	125%	125%

Footnotes:

[1] Proposed rates based on the City's Water and Wastewater Rate Study and are effective for bills rendered on or after October 1 of each fiscal year.

[2] Amounts reflect 0.75 ERCs per multi-family unit.

Table 22
City of Stuart
Water and Wastewater Rate Study

Comparison of Typical Monthly Residential Bills For Water Service [1]

Line No.	Description	Residential Service for a 5/8" or 3/4" Meter 0 Gallons	3,000 Gallons	7,000 Gallons	12,000 Gallons	25,000 Gallons	35,000 Gallons	50,000 Gallons	75,000 Gallons
	City of Stuart								
1	Existing Rates	$13.98	$22.02	$33.13	$55.30	$128.75	$193.15	$289.75	$450.75
2	Proposed Rates - October 1, 2017	14.96	23.57	35.47	59.20	137.85	206.75	310.10	482.35
3	Proposed Rates - October 1, 2018	16.01	25.22	37.95	63.33	147.44	221.14	331.69	515.94
4	Proposed Rates - October 1, 2019	17.13	26.97	40.60	67.77	157.73	236.63	354.98	552.23
5	Proposed Rates - October 1, 2020	17.47	27.52	41.43	69.15	160.93	241.43	362.18	563.43
6	Proposed Rates - October 1, 2021	17.82	28.08	42.27	70.54	164.14	246.24	369.39	574.64
	Other Florida Utilities:								
7	Brevard County	$14.95	$14.95	$33.67	$65.51	$184.66	$317.36	$516.41	$848.16
8	City of Port St. Lucie	10.35	22.74	41.78	68.73	154.92	221.22	320.67	486.42
9	City of Vero Beach	13.60	16.09	23.31	37.21	101.15	163.70	267.95	441.70
10	City of West Melbourne	13.88	32.63	58.63	92.98	185.93	257.43	364.68	543.43
11	Fort Pierce Utilities Authority	13.88	24.53	38.73	58.26	124.88	178.18	258.13	391.38
12	Indian River County	9.05	15.65	25.33	44.58	140.83	217.83	333.33	525.83
13	Martin County	16.83	23.31	31.95	44.53	92.78	140.48	212.03	331.28
14	Martin County (Proposed FY18)	17.05	23.62	32.38	45.13	94.00	142.30	214.75	335.50
14	Seacoast Utility Authority	20.09	23.15	30.22	50.27	102.40	152.60	243.05	393.80
15	St. Lucie County	22.25	32.90	52.52	87.90	209.60	306.40	451.60	693.60
16	Other Florida Utilities' Average	$15.19	$22.96	$36.85	$59.51	$139.12	$209.75	$318.26	$499.11

[1] Unless otherwise noted, amounts shown reflect residential rates in effect April 2017 and are exclusive of taxes or franchise fees, if any, and reflec rates charged for inside the city service. All rates are as reported by the respective utility. This comparison is intended to show comparable charg for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utilit

[2] Utility is currently involved in a rate study, or is planning one within the next few months.

Table 23
City of Stuart
Water and Wastewater Rate Study

Comparison of Typical Monthly Residential Bills For Wastewater Service [1]

Line No.	Description	Residential Service for a 5/8" or 3/4" Meter 0 Gallons	3,000 Gallons	7,000 Gallons	12,000 Gallons	25,000 Gallons	35,000 Gallons	50,000 Gallons	75,000 Gallons
	City of Stuart								
1	Existing Rates	$7.69	$26.77	$52.21	$84.01	$84.01	$84.01	$84.01	$84.01
2	Proposed Rates - October 1, 2017	7.93	27.58	53.78	86.53	86.53	86.53	86.53	86.53
3	Proposed Rates - October 1, 2018	8.17	28.42	55.42	89.17	89.17	89.17	89.17	89.17
4	Proposed Rates - October 1, 2019	8.42	29.27	57.07	91.82	91.82	91.82	91.82	91.82
5	Proposed Rates - October 1, 2020	8.59	29.86	58.22	93.67	93.67	93.67	93.67	93.67
6	Proposed Rates - October 1, 2021	8.77	30.46	59.38	95.53	95.53	95.53	95.53	95.53
	Other Florida Utilities:								
7	Brevard County	$19.25	$31.46	$47.74	$68.09	$68.09	$68.09	$68.09	$68.09
8	City of Port St. Lucie	15.22	36.64	65.20	72.34	72.34	72.34	72.34	72.34
9	City of Vero Beach	19.89	30.66	45.02	55.79	55.79	55.79	55.79	55.79
10	City of West Melbourne	13.87	28.66	48.38	73.03	137.12	186.42	260.37	383.62
11	Fort Pierce Utilities Authority	15.30	31.77	53.73	70.20	70.20	70.20	70.20	70.20
12	Indian River County	14.58	23.16	34.60	48.90	48.90	48.90	48.90	48.90
13	Martin County	17.45	30.23	47.27	60.05	60.05	60.05	60.05	60.05
14	Martin County (Proposed FY18)	17.68	30.61	47.85	60.78	60.78	60.78	60.78	60.78
15	Seacoast Utility Authority	29.35	31.39	34.11	36.15	36.15	36.15	36.15	36.15
16	St. Lucie County	23.61	44.88	73.24	94.51	94.51	94.51	94.51	94.51
17	Other Florida Utilities' Average	$18.62	$31.95	$49.71	$63.98	$70.39	$75.32	$82.72	$95.04

[1] Unless otherwise noted, amounts shown reflect residential rates in effect April 2017 and are exclusive of taxes or franchise fees, if any, and reflec rates charged for inside the city service. All rates are as reported by the respective utility. This comparison is intended to show comparable charge for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utility

[2] Utility is currently involved in a rate study, or is planning one within the next few months.

Table 24
City of Stuart
Water and Wastewater Rate Study

Comparison of Typical Monthly Residential Bills For Combined Water and Wastewater Service [1]

Line No.	Description	Residential Service for a 5/8" or 3/4" Meter 0 Gallons	3,000 Gallons	7,000 Gallons	12,000 Gallons	25,000 Gallons	35,000 Gallons	50,000 Gallons	75,000 Gallons
	City of Stuart								
1	Existing Rates	$21.67	$48.79	$85.34	$139.31	$212.76	$277.16	$373.76	$534.76
2	Proposed Rates - October 1, 2017	22.89	51.15	89.25	145.73	224.38	293.28	396.63	568.88
3	Proposed Rates - October 1, 2018	24.18	53.64	93.37	152.50	236.61	310.31	420.86	605.11
4	Proposed Rates - October 1, 2019	25.55	56.24	97.67	159.59	249.55	328.45	446.80	644.05
5	Proposed Rates - October 1, 2020	26.06	57.38	99.65	162.82	254.60	335.10	455.85	657.10
6	Proposed Rates - October 1, 2021	26.59	58.54	101.65	166.07	259.67	341.77	464.92	670.17
	Other Florida Utilities:								
7	Brevard County	$34.20	$46.41	$81.41	$133.60	$252.75	$385.45	$584.50	$916.25
8	City of Port St. Lucie	25.57	59.38	106.98	141.07	227.26	293.56	393.01	558.76
9	City of Vero Beach	33.49	46.75	68.33	93.00	156.94	219.49	323.74	497.49
10	City of West Melbourne	27.75	61.29	107.01	166.01	323.05	443.85	625.05	927.05
11	Fort Pierce Utilities Authority	29.18	56.30	92.46	128.46	195.08	248.38	328.33	461.58
12	Indian River County	23.63	38.81	59.93	93.48	189.73	266.73	382.23	574.73
13	Martin County	34.28	53.54	79.22	104.58	152.83	200.53	272.08	391.33
14	Martin County (Proposed FY18)	34.73	54.23	80.23	105.91	154.78	203.08	275.53	396.28
15	Seacoast Utility Authority	49.44	54.54	64.33	86.42	138.55	188.75	279.20	429.95
16	St. Lucie County	45.86	77.78	125.76	182.41	304.11	400.91	546.11	788.11
17	Other Florida Utilities' Average	$33.81	$54.90	$86.57	$123.49	$209.51	$285.07	$400.98	$594.15

[1] Unless otherwise noted, amounts shown reflect residential rates in effect April 2017 and are exclusive of taxes or franchise fees, if any, and reflec rates charged for inside the city service. All rates are as reported by the respective utility. This comparison is intended to show comparable charge for similar service for comparison purposes only and is not intended to be a complete listing of all rates and charges offered by each listed utility

[2] Utility is currently involved in a rate study, or is planning one within the next few months.

Appendix E Sanitary Survey

INSPECTION RESPONSE FORM

PWS ID Number:	**4430259**
PWS Name:	City of Stuart

Please Update Contact Information

Business Name:	City of Stuart
Owner(s) Name:	Sam T. Amerson, P.E.
Mailing Address:	121 SW Flagler Avenue Stuart, Florida 34994
Phone:	772 288 5331
Fax:	772 288 5381
E-mail Address:	samerson@ci.stuart.fl.us

Please Forward Response to:
Department of Environmental Protection
Drinking Water Section
Attention: Mark Peters
400 N Congress Avenue, Suite 200
West Palm Beach, Florida 33401
or e-mail :mark.peters@dep.state.fl.us

In response to the Department's Sanitary Survey Report for the subject public water system dated January 24, 2013 , the following actions were done to correct the listed deficiencies (if applicable)

Item #	Corrective Action	Date Completed
1.	The O & M manuals are updated and were provided for your review on December 12th and 13th. Further clarification is needed.	
2.	Vents for raw water wells will be added as the wells are rehabilitated. Please provide a raw water well vent configuration.	
3	Attached please find the IDSE submitted to the USEPA on September 22, 2009.	January 25, 2013
4.	As noted, the City will clarify whether a permit is needed from the Department prior to the start of the project.	January 25, 2013

I certify the above information is accurate.

Name of PWS Owner/ Samuel T. Amerson, P.E. Public Works Director
(Please type or print)

PWS Owner/Representative Signature: _____ Date: 1/28/13

IDSE Submission

Confirmation Page

Your Plan / Report was submitted successfully! Please print this page for your reference.

Confirmation # 42254

Date Submitted: 09/17/2009

If you have selected sending by hardcopy in the Attachments section or wish to submit a hard copy version of your plan, report, or attachments in addition to electronically submitted files please mail or e-mail the files to one of the following addresses:

Mailing Address:

US EPA-IPMC
PO Box 98
Dayton, OH 45401-0098

E-mail Address:

stage2mdbp@epa.gov

Home

SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:
US EPA IPMC
PO Box 98
DAYTON OH 45401-
0098

COMPLETE THIS SECTION ON DELIVERY

A. Signature ☐ Agent ☐ Addressee

B. Received by (Printed Name) C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Certified Mail ☐ Express Mail
☐ Registered ☒ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7009 1410 0001 3767 2286

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

IDSE Report for Standard Monitoring

Home Help

Preview/Submit

Please review the summary of your information below. If you would like to edit your information please select the section you would like to work on from the navigation menu to the right. You will be returned to that section to make your updates. If you would like to save a copy of your completed plan click the GENERATE PDF link at the bottom of this page. This will open a PDF file in a separate window for you to save and/or print.

Note: Once you have clicked Submit you will not be able to access your plan again. If you want to retain a copy of your plan for yourself you must click the GENERATE PDF link BEFORE submitting your plan.

I. General Information
II. Stage 2 DBPR Requirements
III. Monitoring Results
Part A - Deviations
Part B - Location
Part C - Method
Part D - IDSE TTHM
Part E - IDSE HAA5
Part F - Stage 1 TTHM
Part G - Stage 1 HAA5
IV. Justification Stage2 DBPR Sites
V. Peak Historical Month
VI. Proposed Monitoring Schedule
VII & VIII. Schematic & Attachments
Preview/Submit

I. IDSE General Information

*PWS ID	FL4430259
*PWS Name	STUART CITY OF - WA
*PWS Address	121 SW FLAGLER AVENUE
*City	STUART
*State	FL
*Zip	34994
*Population Served	16800
*System Type	CWS
*Source Water Type	GW
*Buying / Selling Relationships	Neither

C. PWS Operations

Residual Disinfectant Type	Chlorine	Chloramines	Other
Number of Disinfected Sources	Surface		GWUDI
	Ground 1		Purchased

D. Contact Person

*Contact Name	Jody Davenport
Title	Compliance Specialist
Phone Number	5616001251 ext.
Fax	(772) 288-1405
E-mail Address	jdavenport@ci.stuart.fl.us

II. Stage 2 DBPR Requirements*

A. Number of required Stage 2 DBPR Sites:

Total	4
Highest TTHM	2
Stage 1 DBPR	1
Highest HAA5	1

D. IDSE Schedule

Schedule 3

C. Required Stage 2 DBPR Monitoring Frequency

During peak historical month (1 monitoring period)

Every 90 days (4 monitoring periods)

III. Monitoring Results

A. Did you deviate in any way from your approved standard monitoring plan?

Yes No

If YES, explain:

Dual samples for locations 1, 2, 3 and 4 were not collected for the first and second quarterly events.

Because of the omission, sampling was conducted on 3/24/2009 and 7/20/2009 for locations 1, 2, 3 and 4. (During periods of higher temperature conditions.)

Samples,in addition to the required number for SP7, were collected on 2/11/2009 & 5/11/2009.

B. Where were your TTHM and HAA5 samples analyzed?

In-House Is your in-house laboratory certified? Yes No

Certified Laboratory Name of certified laboratory HBEL, INC

C. What method(s) was used to analyze your TTHM and HAA5 samples?

TTHM	HAA5
EPA 502.2	EPA 552.1
EPA 524.2	EPA 552.2
EPA 551.1	EPA 552.3
	SM 6251 B

D. IDSE Standard Monitoring Results - TTHM

Site ID [1]	Data Type	TTHM (mg/L)				LRAA
1 SP 1 TTHM	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	39.498
	Sample Result	23.10	30.60	68.59	35.70	
2 SP 2 HAA5	Sample Date	03/24/2009	05/11/2009	07/20/2009	08/11/2009	38.493
	Sample Result	37.40	53.57	21.70	41.30	
3 SP 3 HAA5	Sample Date	03/24/2009	05/11/2009	07/20/2009	08/11/2009	38.228
	Sample Result	34.40	50.61	24.70	43.20	
4 SP 4 TTHM	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	36.435
	Sample Result	26.20	30.80	48.54	40.20	
5 SP 5 POE	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	35.245
	Sample Result	32.00	31.70	49.68	27.60	
6 SP 6 ART	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	34.808
	Sample Result	26.20	30.60	55.03	27.40	

E. IDSE Standard Monitoring Results - HAA5

Site ID [1]	Data Type	HAA5 (mg/L)				LRAA
1 SP 1 TTHM	Sample Date	03/24/2009	05/11/2009	07/20/2009	08/11/2009	18.508

	Sample Result	16.13	14.70	24.39	18.81	
2 SP 2 HAA5	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	16.302
	Sample Result	8.40	18.50	16.90	21.41	
3 SP 3 HAA5	Sample Date	11/10/2009	02/11/2009	05/11/2009	08/11/2009	14.375
	Sample Result	7.68	17.60	13.60	18.62	
4 SP 4 TTHM	Sample Date	03/24/2009	05/11/2009	07/20/2009	08/11/2009	17.968
	Sample Result	14.80	17.90	20.97	18.20	
5 SP 5 POE	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	13.86
	Sample Result	8.48	14.90	16.60	15.46	
6 SP 6 ART	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	19.58
	Sample Result	24.60	15.53	18.28	19.91	

F. Stage 1 DBPR Compliance Monitoring Results - TTHM

Site ID [1]	Data Type	TTHM (mg/L)				LRAA
1 SP7 Stage	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	38.418
	Sample Result	25.20	30.60	58.57	39.3	
2	Sample Date					
	Sample Result					
3	Sample Date					
	Sample Result					
4	Sample Date					
	Sample Result					
5	Sample Date					
	Sample Result					
6	Sample Date					
	Sample Result					
7	Sample Date					
	Sample Result					
8	Sample Date					
	Sample Result					

G. Stage 1 DBPR Compliance Monitoring Results - HAA5

Site ID [1]	Data Type	HAA5 (mg/L)				LRAA
1 SP7 Stage	Sample Date	11/10/2008	02/11/2009	05/11/2009	08/11/2009	14.43
	Sample Result	6.08	14.10	16.60	20.94	
2	Sample Date					
	Sample Result					
3	Sample Date					
	Sample					

	Result	
4	Sample Date Sample Result	
5	Sample Date Sample Result	
6	Sample Date Sample Result	
7	Sample Date Sample Result	
8	Sample Date Sample Result	

IV. Justification of Stage2 DBPR Compliance Monitoring Sites*

#	Stage 2 Compliance Monitoring Site ID	Site Type	Justification
1.	SP 1	Highest TTHM	Standard Monitoring location #1 had the highest TTHM LRAA
2.	SP 2	Highest TTHM	Standard Monitoring location #2 had the second highest TTHM LRAA
3.	SP 7	Stage 1 DBPR	Stage 1DBPR location had high TTHM LRAA. (.075 lower than location #2)
4.	SP 6	Highest HAA5	Standard Monitoring location #6 had the highest HAA5 LRAA

V. Peak Historical Month

A. *Peak Historical Month August

B. Is Your Peak Historical Month the Same as In Your IDSE Standard Monitoring Plan?

Yes
No

If no, explain how you selected your new peak historical month.

VI. Proposed Stage2 DBPR Compliance Monitoring Schedule*

	Projected Sampling Date (date or week) [1]
Stage 2 Compliance	

	Monitoring Site ID[1]	Period 1	Period 2	Period 3	Period 4
1	SP 1	12/2013 3rd v	3/2014 3rd w	6/2014 3rd w	9/2014 3rd w
2	SP 2	12/2013 3rd v	3/2014 3rd w	6/2014 3rd w	9/2014 3rd w
3	SP 7	12/2013 3rd v	3/2014 3rd w	6/2014 3rd w	9/2014 3rd w
4	SP 6	12/2013 3rd v	3/2014 3rd w	6/2014 3rd w	9/2014 3rd w

[1] *period = monitoring period. Complete for the number of periods from Section II.C*

VII & VIII Schematic & Attachments

The following is a list of attachments that have already been submitted.

File Name	Date Uploaded
None submitted.	

If you prefer to send attachments via mail or e-mail, please check the box for "Sending attachments by mail".
You may mail your attachments to one of the following addresses:

Mailing Address:
US EPA-IPMC
PO Box 98
Dayton, OH 45401-0098

E-mail Address:
stage2mdbp@epa.gov

Sending Attachments by Mail

Enter a description of the items that will be mailed.

IDSE Report For Standard Monitoring

SUBMIT GENERATE PDF

Stage Two Disinfection By-Products Standard Monitoring Plan

SP 1 540 SW Indian River CT
6 Inch Main

SP 2 1108 Dolphin DR
4 Inch Main

SP 3 306 NW River Dr
6 Inch Main

SP 4 Jet Center Aviation Blvd
8 Inch Main

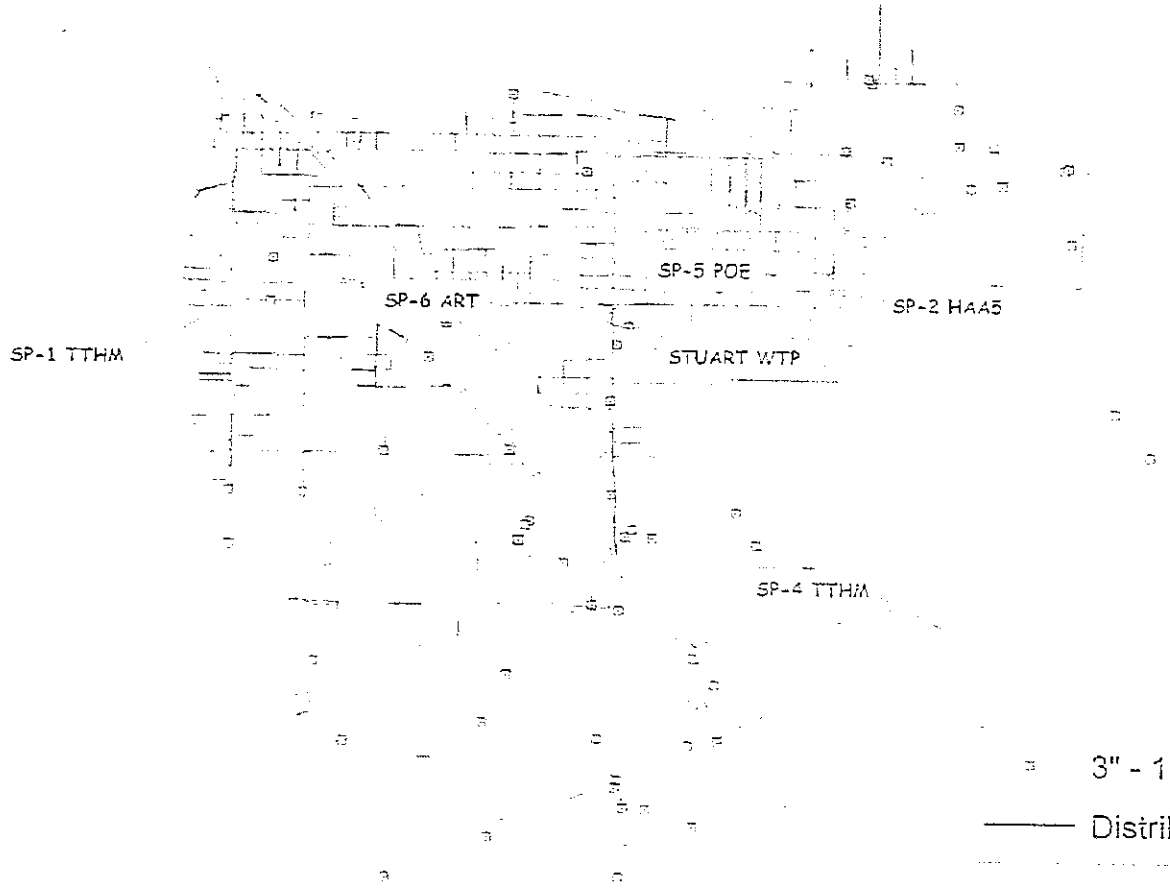
SP 5 1002 Palm Beach Road
6 Inch Main

SP 6 120 SE Lonita St
6 Inch Main

SP 7 Stage 1 Site Indian Street @ SE Old Saint Lucie Blvd.
6 Inch Main

STAGE 2
DISINFECTION BYPRODUCTS
STANDARD MONITORING PLAN

Stuart



Woodside, Mike

From:	Davenport, Jody
Sent:	Tuesday, September 23, 2008 1:15 PM
To:	Peters, David
Cc:	Parks, Jim; Woodside, Mike
Subject:	FW: Stage 2 D/DBP Rule: Approval of Standard Monitoring Plan City of Stuart (FL4430259)

Good afternoon Dave

The sampling plan I completed and submitted to the EPA on 4/13/2007 has been reviewed and approved. Jim and Mike have received their copies and Mike has placed the sampling events on his schedule.

Jody

-----Original Message-----
From: Burns.Robert@epamail.epa.gov [mailto:Burns.Robert@epamail.epa.gov]
Sent: Tuesday, September 23, 2008 12:00 PM
To: Davenport, Jody
Cc: virginia.harmon@dep.state.fl.us; Thomas.Chris@epamail.epa.gov
Subject: Stage 2 D/DBP Rule: Approval of Standard Monitoring Plan City of Stuart (FL4430259)

EPA Region 4 has reviewed your proposed Standard Monitoring Plan, and finds that it complies with the Initial Distribution System Evaluation (IDSE) regulation found in Title 40, Code of Federal Regulations Part 141, Subpart U. Your Standard Monitoring Plan is approved.

The IDSE Regulation is part of the Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR). According to the IDSE regulation, community water systems on your schedule (Schedule 3) are to begin their IDSE monitoring according to their submitted Standard Monitoring Plan. Standard Monitoring must be complete by September 30, 2009. At the conclusion of Standard Monitoring, you are required to write and submit an IDSE Report, where you will report on the results of your sampling and propose monitoring locations for the Stage 2 DBPR Locational Running Annual Averages. The IDSE Report will be due to EPA Region 4 no later than January 1, 2010. The Stage 2 DBPR monitoring and compliance calculation will not begin until October 1, 2013. For more information about the requirements of the IDSE Report, please refer to the IDSE Guidance Manual located on the Agency's website at http://www.epa.gov/safewater/disinfection/stage2/compliance_idse.html.

Your water system must continue to monitor for disinfection byproducts as required by the Stage 1 Disinfection Byproducts Rule. Primary enforcement authority for Stage 1 DBPR rests with the Florida Department of Environmental Protection, and you must be in compliance with Florida regulations during and after the IDSE Standard Monitoring period.

If you have any questions about this approval action and subsequent requirements, please contact me at (404) 562-9456.

EPA Region 4 will be sending you a formal approval letter to memorialize this action.

Regards,

Robert Burns
Senior Environmental Engineer

Program Manager, Microbials and Disinfection Byproducts
Program Manager, Drinking Water Information Management
U.S. EPA Region 4 - Southeast
(w) 404-562-9456

MDBP Program Team: Regional Staff/rep1.prn

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
Southeast District Office
400 N. Congress Avenue, 3rd Floor
West Palm Beach, FL 33401
561-681-6600

RICK SCOTT
GOVERNOR

JENNIFER CARROLL
LT GOVERNOR

HERSCHEL T VINYARD JR.
SECRETARY

January 24, 2013
ELECTRONIC CORRESPONDENCE

City of Stuart
c/o Mr. Samuel T. Amerson, P.E.
121 SW Flagler Avenue
Stuart, FL 34994
samerson@ci.stuart.fl.us

PW- Martin County
City of Stuart
Public Water System
PWSID # 4430259

RE: Sanitary Survey

Dear Mr. Amerson:

The Department would like to thank you for the courtesy extended by Mr. Jim Parks, Mr. Mike Woodside, and Ms. Jody Davenport for the assistance provided during the sanitary survey of the referenced public water system conducted by Department staff on December 12 and 13, 2012. During the referenced inspection and subsequent records review, the followmg minor deficiencies were noted:

- Operation and maintenance (O&M) manual needs to be updated.
- All wells were permitted without vents; this issue was discussed with staff, and they have decided to add vents through the disinfection ports.

Recommendations:

- The City was advised to submit the Stage 2 Disinfection Byproducts (DBPs) monitoring plan to the Department for review and approval.
- The City was also advised to consult with the Department when in doubt as to whether or not a permit or notification is required for a project.

Please respond within 30 days of the date of this letter, using the attached response form, confirming that the noted deficiencies have been addressed. Please be aware that this letter does not supersede other Department correspondence, notification of deficiencies in other areas, enforcement action, etc. If you have any questions, please contact **Mark Peters at (561) 681-6751** or via e-mail at mark.peters@dep.state.fl.us.

Sincerely,

Jose L. Calas, P.E.
Drinking Water Program Manager
Southeast District

JLC/ mep/ jip

cc: Michele Owens – DEP/WPB - Michele.owens@dep.state.fl.us
Judith Perez – DEP/WPB Judith.I.Perez@dep.state.fl.us
Jim Parks jparks@ci.stuart.fl.us
Mike Woodside mwoodside@ci.stuart.fl.us

Large System Sanitary Survey Form

[FORM PROTECTION ON] [FORM PROTECTION OFF]

SURVEY SUMMARY

SURVEY ESSENTIALS

Water System Name: City of Stuart
Date(s) Surveyed: 12/12/2012 and 12/13/2012
Survey Inspector(s): Perez/Peters
Person(s) Contacted: Jim Parks, Chief Operator and Mike Woodside, Laboratory Technician/Operator

WATER SYSTEM INFORMATION

PWS ID: 4430259
Phone: 772 288 5343
Email: jparks@ci.stuart.fl.us
System (Office) Address: 121 SW Flagler Avenue, Stuart, Florida 34994
Cell: 772 418 1952
Fax Number: 772 288 5395
Directions to water system office or plant: 1003 Palm Beach Road, located at the intersection of Palm Beach Road and 10th Street.

OWNER INFORMATION

Owner Name: City of Stuart c/o Samuel T. Amerson, P.E.
Contact Title: PW Director
Owner Address: 121 SW Flagler Avenue
City: Stuart State: Fl Zip: 34994
Owner Phone: 772 288 5331
Cell: 772 260 9613
Fax Number: 772 288 5381
Email: samerson@ci.stuart.fl.us

OPERATOR INFORMATION

Operator Name: Jim Parks, Chief Operator
Lead Operator Class & Certification Number: A5096
Operator Address: 1003 Palm Beach Road
City: Stuart State: FL Zip: 34994
Operator Phone: 772 288 5343
Cell: 772 418 1952
Fax Number: 772 288 5395
Email: jparks@ci.stuart.fl.us

SYSTEM CHARACTERISTICS SUMMARY

Source Summary:
Number of Sources: 30 Surficial Aquifer Wells
☐ Surface Name of Source(s):
☐ Purchase Name of System(s):
☒ Ground Water

Treatment Summary:
Number of Plants: One Number of Operators: Seven
☒ Disinfection ☒ Aeration ☒ Coagulation
☒ Stabilization ☒ Filtration ☐ Flocculation
☒ Corrosion Control ☒ Softening ☐ Reverse Osmosis

Service Area Characteristics Summary:
☒ City or Community ☐ Residential ☐ Mobile Home Park ☐ Institution ☐ Medical ☐ School ☐ Wholesaler ☐ Other:
Number of Service Connections: 4,300 Population Served: 17,726 Approx number of outstanding DEP permits None

Demand & Capacity: 2011
Maximum Daily Demand: 4.367
Total Design Capacity: 6.0 MGD
Total Storage Capacity: 3.0 MG
Average Daily Demand: 3.043
Stand-by Power Capacity: 975 KW
Firm Capacity: 6.0 MG
Comment:

SYSTEM COMPLIANCE SUMMARY

Past Compliance Status Summary:
Date of last inspection: 5/27/2011 Results: ☒ In compliance ☐ Deficiencies, but not significant ☐ Out of compliance
Date of last sanitary survey: 4/26/2010 Results: ☒ In compliance ☐ Deficiencies, but not significant ☐ Out of compliance

Current Sanitary Survey Results:
☒ In Compliance ☐ Deficiencies, but not significant ☐ Out of compliance
Comment:

TREATMENT

TREATMENT CAPACITY

Treatment Capacity: 6.0 MGD Standby Power Capacity: 975 KW Treatment Firm Capacity: 6.0 MGD
Maximum demand under 75% of operating capacity? ☒ Yes ☐ No *If not, what is the percentage?* 72%
Firm capacity exceed the average daily demand? ☒ Yes ☐ No Stand-by power capacity exceeds average daily demand? ☒ Yes ☐ No
Comment:

CHEMICAL FEED SYSTEMS

Chemicals used? (list all or use attachment) Sodium Hypochlorite, Anhydrous Ammonia, Anionic Polymer, Sodium Hexametaphosphate, Calcium Hydroxide, Hydrofluosilicic Acid

Chemicals meet the NSF Standards?	☒ Yes	☐ No	☐ Unknown	Chemical storage appear to be compliant?	☒ Yes ☐ No
Facilities & chemicals properly labeled?	☒ Yes	☐ No		Are all chemical feed systems tied to flow?	☒ Yes ☐ No
Doses & quantities measured & recorded?	☒ Yes	☐ No		Are injection points visible?	☒ Yes ☐ No
Operators trained to use safety equipment?	☒ Yes	☐ No		SOP for chemical handling?	☒ Yes ☐ No
Redundant equipment & spare parts kept?	☒ Yes	☐ No		Do treatment rooms have adequate room lighting?	☒ Yes ☐ No
Corrosive vapors properly controlled	☒ Yes	☐ No		Safety comply with *Water Treatment Plant Design*, Table 15.5?	☒ Yes ☐ No
Injection point proper & ensures mixing?	☒ Yes	☐ No		Treated sample tap compliant?	☒ Yes ☐ No

Comment:

SOURCE (GROUNDWATER)

GROUNDWATER WELLS

Well Name or Number	1	2A	3	4	5	6
Florida Unique Well Identification	AAH8121	AAH8118	AAH8120	AAH8117	AAH8119	AAH8116
Year Drilled	2012	1997	1950	1960	1960	1960
Depth Drilled	120	127	123	120	120	120
Aquifer Name	Surficial	Surficial	Surficial	Surficial	Surficial	Surficial
Depth & Diameter of casing?	118' 14"	110' 8"	105' 8"	105' 6"	105' 6"	105' 6"
Depth of Screen & Material	80' 120'	105' 123'	105'123'	105'120'	105'120'	105'120'
Depth of grouting & type?	50' Cement	50'Cement	0 N/A	0 N/A	0 N/A	0 N/A
Depth to Static Water Level?	19.2	15.2	18.2'	5.6'	16.92'	21.7
Is the drawdown measured?	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA
Is the site subject to flooding?	NO	NO	NO	NO	NO	NO
Is the well below grade?	NO	NO	NO	NO	NO	NO
Potential pollution sources near?	Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster
Contaminated, UDI, or ASR Well?	yes	yes	yes	yes	yes	yes
Is lightning protection provided?	YES	YES	YES	YES	YES	YES
Is the well housed or fenced?	YES	YES	YES	YES	YES	YES
Pump Type	Submersible	Submersible	Submersible	Submersible	Submersible	Submersible
Horse Power	10	7.5	7.5	5.0	5.0	5.0
Rated Pump Capacity (GPM@PSI)	240	220	220	170	170	170
Normal Yield (GPM @ PSI)	120	150	210	145	160	105
Proper raw water tap?	YES	YES	YES	YES	YES	YES
Proper casing height?	YES	YES	YES	YES	YES	YES
Well head properly sealed?	YES	YES	YES	YES	YES	YES
Proper casing vent?	NO	NO	NO	NO	NO	NO
Dumpline installed?	YES	YES	YES	YES	YES	YES
Proper Check Valve?	YES	YES	YES	YES	YES	YES
Air-relief valve installed?	YES	YES	YES	YES	YES	YES
Proper Water Meter?	YES	YES	YES	YES	YES	YES
Meter check for accuracy?	YES	YES	YES	YES	YES	YES
Stand-by Capacity?	YES	YES	YES	YES	YES	YES
Overall Site Condition	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD

Comments: Well 1: re-drilled, ARV screen missing, Well 2A: will rehab for low yield. Well 4: will replace pump and motor. Well 6: is off line (No yield)

GROUNDWATER WELLS						
Well Name or Number	7	8	9	10	11	12
Florida Unique Well Identification	AAH8115	AAH8112	AAH8123	AAH8126	AAH8124	AAH8125
Year Drilled	2012	1997	1960	1964	1964	1964
Depth Drilled	118'	120'	130'	135'	135'	135'
Aquifer Name	Surficial	Surficial	Surficial	Surficial	Surficial	Surficial
Depth & Diameter of casing?	118' 14"	115' 6"	105' 6"	105' 8"	120' 8"	120' 8"
Depth of Screen & Material	87' 117'	105' 120'	105'120'	120'135'	120'- 135'	120'- 135'
Depth of grouting & type?	50' Cement	0 N/A	0 N/A	0 N/A	0 N/A	0 N/A
Depth to Static Water Level?	27.3	45.3	19.5'	22.06'	22.16'	19.1
Is the drawdown measured?	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA
Is the site subject to flooding?	NO	NO	NO	NO	NO	NO
Is the well below grade?	NO	NO	NO	NO	NO	NO
Potential pollution sources near?	SWALE/ Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster	Turbocombuster
Contaminated, UDI, or ASR Well?	yes	yes	yes	yes	yes	yes
Is lightning protection provided?	YES	YES	YES	YES	YES	YES
Is the well housed or fenced?	YES	YES	YES	YES	YES	YES
Pump Type	Submersible	Submersible	Submersible	Submersible	Submersible	Submersible
Horse Power	10	5	5	7.5	7.5	7.5
Rated Pump Capacity (GPM@PSI)	240	170	170	220	220	220
Normal Yield (GPM @ PSI)	120	115	135	170	190	145
Proper raw water tap?	YES	YES	YES	YES	YES	YES
Proper casing height?	YES	YES	YES	YES	YES	YES
Well head properly sealed?	YES	YES	YES	YES	YES	YES
Proper casing vent?	NO	NO	NO	NO	NO	NO
Dumpline installed?	YES	YES	YES	YES	YES	YES
Proper Check Valve?	YES	YES	YES	YES	YES	YES
Air-relief valve installed?	YES	YES	YES	YES	YES	YES
Proper Water Meter?	YES	YES	YES	YES	YES	YES
Meter check for accuracy?	YES	YES	YES	YES	YES	YES
Stand-by Capacity?	YES	YES	YES	YES	YES	YES
Overall Site Condition	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD
Comments: Well 7: Re-drilled, ARV screen missing. Well 9: Rehabbed						

GROUNDWATER WELLS						
Well Name or Number	13	14	15A	22	23	24
Florida Unique Well Identification	AAH8127	AAH8128	AAH8129	AAH8139	AAH8112	AAH8114
Year Drilled	1967	1967	1997	1967	1967	1977
Depth Drilled	126	120	126'	126'	126'	130'
Aquifer Name	Surficial	Surficial	Surficial	Surficial	Surficial	Surficial
Depth & Diameter of casing?	112' 8"	104' 8"	112' 8"	105' 8"	105' 8"	105' 8"
Depth of Screen & Material	112' 126'	104' 120'	112'126'	105'122'	N/A	N/A
Depth of grouting & type?	0	0	0 N/A	0 N/A	0 N/A	0 N/A
Depth to Static Water Level?	22.0	20.3	16.58'	9.58'	15.16'	13.5
Is the drawdown measured?	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA	YES/SCADA

Is the site subject to flooding?	NO	NO	NO	NO	NO	NO
Is the well below grade?	NO	NO	NO	NO	NO	NO
Potential pollution sources near?	SWALE/ Turbocombuster	SWALE/ Turbocombuster	Turbocombuster	NO	SWALE	SWALE
Contaminated, UDI, or ASR Well?	yes	yes	yes	NO	yes	NO
Is lightning protection provided?	YES	YES	YES	YES	YES	YES
Is the well housed or fenced?	YES	YES	YES	YES	YES	YES
Pump Type	Submersible	Submersible	Submersible	Submersible	Submersible	Submersible
Horse Power	7.5	7.5	7.5	7.5	7.5	7.5
Rated Pump Capacity (GPM@PSI)	220	220	200	200	200	229
Normal Yield (GPM @ PSI)	196	160	120	105	170	160
Proper raw water tap?	YES	YES	YES	YES	YES	YES
Proper casing height?	YES	YES	YES	YES	YES	YES
Well head properly sealed?	YES	YES	YES	YES	YES	YES
Proper casing vent?	NO	NO	NO	NO	NO	NO
Dumpline installed?	YES	YES	YES	YES	YES	YES
Proper Check Valve?	YES	YES	YES	YES	YES	YES
Air-relief valve installed?	YES	YES	YES	YES	YES	YES
Proper Water Meter?	YES	YES	YES	YES	YES	YES
Meter check for accuracy?	YES	YES	YES	YES	YES	YES
Stand-by Capacity?	YES	YES	YES	YES	YES	YES
Overall Site Condition	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD

Comments:

Wells 1-15A are subject to contamination from the Turbocombuster site; those wells are actually part of the groundwater remediation plan. Well 15A is offline for rehab.

Wells 16-21 are currently under Grumman/Vought control; Grumman is a remediation site that provides raw water to the City. Of the City wells, only Well #20 is currently being used by Grumman. Grumman constructed 6 recovery wells (1-6); only recovery wells #2 and 6 are online. Grumman controlled wells were not a part of this survey.

GROUNDWATER WELLS						
Well Name or Number	25	26	27	28	29	30
Florida Unique Well Identification	**AAH8113**	**AAH8138**	**AAH8134**	**AAH8136**	**AAH8135**	**AAH8137**
Year Drilled	1977	1979	1979	1979	1979	1979
Depth Drilled	130′	135′	135′	135′	135′	135′
Aquifer Name	**Surficial**	**Surficial**	**Surficial**	**Surficial**	**Surficial**	**Surficial**
Depth & Diameter of casing?	105′ 8″	105′ 8″	105′ 8″	105′ 8″	105′ 8″	126′ 8″
Depth of Screen & Material	N/A	105′ 120′	N/A	N/A	N/A	120′135′
Depth of grouting & type?	0 N/A	N/A	0 N/A	0 N/A	0 N/A	0 N/A
Depth to Static Water Level?	Out of service	8.92′	7.16′	12.83′	6.66′	8.16′
Is the drawdown measured?	**YES/SCADA**	**YES/SCADA**	**YES/SCADA**	**YES/SCADA**	**YES/SCADA**	**YES/SCADA**
Is the site subject to flooding?	NO	NO	NO	NO	NO	NO
Is the well below grade?	NO	NO	NO	NO	NO	NO
Potential pollution sources near?	YES	No	NO	Fuel Tank	SWALE	SWALE
Contaminated, UDI, or ASR Well?	yes	NO	NO	yes	YES	YES
Is lightning protection provided?	YES	YES	YES	YES	YES	YES
Is the well housed or fenced?	YES	YES	YES	YES	YES	YES
Pump Type	Submersible	Submersible	Submersible	Submersible	Submersible	Submersible
Horse Power	7.5	20	20	20	20	15
Rated Pump Capacity (GPM@PSI)	220	400	400	400	400	380
Normal Yield (GPM @ PSI)	*	315	425	470	385	270
Proper raw water tap?	YES	YES	YES	YES	YES	YES
Proper casing height?	YES	YES	YES	YES	YES	YES
Well head properly sealed?	YES	YES	YES	YES	YES	YES

Proper casing vent?	YES	YES	YES	YES	YES	YES
Dumpline installed?	YES	YES	YES	YES	YES	YES
Proper Check Valve?	YES	YES	YES	YES	YES	YES
Air-relief valve installed?	YES	YES	YES	YES	YES	YES
Proper Water Meter?	YES	YES	YES	YES	YES	YES
Meter check for accuracy?	YES	YES	YES	YES	YES	YES
Stand-by Capacity?	YES	YES	YES	YES	YES	YES
Overall Site Condition	GOOD	GOOD	GOOD	GOOD	GOOD	GOOD

Comments: Well 25: Not in use (dry cleaner contamination), being sampled once/month. Well 28 & 29: landfill VOC contamination. Well 30: was rehabbed after last SS.

GROUNDWATER QUANTITY, QUALITY, AND PROTECTION

Total Source Capacity (TSC) exceeds Maximum Daily Demand (MDD)?	☒ Yes	☐ No	
TSC (excluding best well) exceed the Average Daily Demand?	☒ Yes	☐ No	
Does the Water Management Permitted Capacity exceed the MDD?	☒ Yes	☐ No	
Any routinely utilized interconnections with neighboring systems?	☐ Yes	☒ No	
Any unused or improperly abandoned wells within the system?	☒ Yes	☐ No	See individual well comments
Is water system using the highest quality sources known?	☒ Yes	☐ No	
Do all source(s) maintain compliant water quality standards?	☐ Yes	☒ No	See individual well comments
Does the system have a wellhead protection program?	☒ Yes	☐ No	
System enact a wellhead protection program (with setbacks)?	☒ Yes	☐ No	
Does the system have an emergency spill response plan?	☒ Yes	☐ No	
Are the synthetic organic chemical (SOC) waivers accurate?	☒ Yes	☐ No	

Comments:

DISINFECTION - PLANT INFORMATION	Plant Name	Plant Name	Comment
Chlorinator Type (gas, hypo, chloramination)	**Hypochlorite & Ammonia**		
Condition of Chlorination Equipment	Good		
Capacity (PPD, GPD)	**792 GPD**		
Chlorine Feed Rate (PPD, GPD)	175		
Max Day Run Time (Hr/Day)	24Hr/Day		
Is chlorinator manual or flow paced?	Flow Paced		
Loss of chlorination alarm function?	Yes		
Chlorine leak detection functioning?	Yes		
Chlorine detection equipment & alarms tested?	Yes		
Operation and maintenance manual onsite?	Yes		
Compliant housing/security	Yes		
Overall condition of facility	Good		
Stand-by Power Capability?	Yes		
POE Chlorine Residual/pH	3.9 / 8.93		
HYPO CHLORINATION			
Sodium or Calcium Hypo Chlorite?	Sodium		
Positive Displacement Pump?	No		
Solution strength	12%		
How often replenished?	As Needed		
Solution tank compliant? (cover/measure/drain)	Yes		
Adequate spill containment?	Yes		
CHLORAMINATION			
Chlorine to ammonia ratio? (5:1 recommended)	6.6:1		
Is the ammonia flow-paced?	Yes		
Ammonia added before or after chlorine?	After		
Frequency of free chlorine "burn"?	Bi-Annually		
Backflow prevention from chlorine chambers?	Yes		

Any bacteriological MCL's in last 12 months? No If yes, explain?

Comments:

OTHER TREATMENTS (CHECK ☐ IF APPLICABLE OR OPTIONALLY REMOVE SECTION IF NOT APPLICABLE)

☒CORROSION CONTROL

Why is corrosion control practiced? Precaution Only

What chemicals are used? ☒PO4 ☐Aqua-Mag® ☐Other:

Results of current lead and copper exceed action level? ☐ Yes ☒ No Are water quality parameters tested? ☒ Yes ☐ No

What are the characteristics of the water entering and leaving the treatment plant? Non-aggressive, pH balanced

Distribution system sampling for the corrosion control program conducted? ☒ Yes ☐ No

Comments:

☒STABILIZATION

Why is stabilization practiced? Precaution Only

Stability Index of effluent (Langelier) 1.0 Average Chemical(s) used Sodium Hexametaphosphate

Are dusty and dry chemicals, and feed equipment housed separately? ☒Yes ☐No Is proper and adequate ventilation provided? ☒Yes ☐No

Appropriate safety equipment available & in use? ☒Yes ☐No Are the buildings as clean and as dry as possible? ☒Yes ☐No

Comments:

Comments:

☒AERATION

Why is aeration used? VOC Removal

What type of aeration system is used? Packed media with forced air

What parameters are monitored to evaluate the performance of the process? 524.2 (VOCs & Group 2 [purgeable] unregulated contaminants)

Is the aerator isolated from any contaminants which could be pulled from the air supply? ☒ Yes ☐ No Is screening intact? ☒ Yes ☐ No

Appropriate mesh size (#24)? ☐ Yes ☐ No Aerator adequately covered? ☒ Yes ☐ No Chlorination after aeration? ☒ Yes ☐ No

What is the condition of the aerator, both inside and out?

Comments:

☒SOFTENING

Why is softening used? Aesthetics

What are treatment goals? To maintain a pH of 9.0

Performing adequate process control testing? ☒Yes ☐No Is the facility tracking the chemicals used? ☒Yes ☐No

Is the facility meeting the TOC removal requirements of the Stage 1 DBP Rule? ☒Yes ☐No

Comments:

☒FLUORIDATION

Proper concentration of fluoride in the distribution system? ☒Yes ☐No Fluoride concentrations tested in the system daily? ☒Yes ☐No

Are fluoride concentrations consistent? ☒Yes ☐No Is the testing performed correctly? ☒Yes ☐No

When was the testing instrument last calibrated? Device self calibrates (DR2800) How often is the saturator tank cleaned? As Needed

Is the electrical system wired with a fail-safe? ☒ Yes ☐ No Is there a scale for weighing the solution tank? ☒Yes ☐No ☐NA

Comments:

☒COAGULATION

List types: Anionic Polymer List types of coagulant ads: Polymer

Rapid mix unit visually appear adequate? ☐Yes ☐No Coagulant used at all times the plant is in operation? ☒Yes ☐No

What type and combination of coagulants are being used? FBS A730

Does the plant have multiple mix units? ☒Yes ☐No How often is maintenance done? As needed

Is there a process control plant for coagulation addition? ☐Yes ☐No Is the rapid mix process adequate? ☒Yes ☐No

Mechanical equipment working? ☒Yes ☐No Any hydraulic inadequacies? ☐Yes ☒No Is the rate of mixing adjustable? ☒Yes ☐No

Comment:

☒SEDIMENTATION

Is sedimentation process adequate? ☒Yes ☐No

What type of sedimentation/clarification process and facilities are being used? Solids contact units (upflow clarifiers)

Is flow distributed evenly to all basins? ☒Yes ☐No Is the inlet flow distributed uniformly over the full cross section? ☒Yes ☐No

Does the plant have multiple units with some that are not in use? ☒Yes ☐No Are the idle basins in a condition to be used if needed? ☒Yes ☐No

Is the mechanical equipment working? ☒Yes ☐No Are there any hydraulic inadequacies? ☐Yes ☒No

What is the surface overflow rate? 2.18/per sq ft Detention time? 90 Minutes Velocity flow 2,083 GPM

Within the generally accepted range? ☒Yes ☐No Does there appear to be too much sludge in the basin(s)? ☐Yes ☐No

Impacting settled water performance? ☐Yes ☒No How is sludge removed from the clarifier(s)? Main drains and Blow downs

How often is sludge removed? Every 5 Minutes What is the settled water turbidity? 1.32 NTU Does it meet the general criteria? ☒Yes ☐No

Comment:

FILTRATION

Type of filtration system is being used? ☒ Gravity ☐ Pressure ☐ Constant ☐ Declining rate Other: There are six filters
What kind of media has been installed? ☒ Mono ☐ Dual ☐ Multi ☐ Other: 25' x 15' each or 375 sq. ft. / filter
Filtration process performing adequately (mudballs/cracks)? ☒ Yes ☐ No Is there adequate pre-treatment? ☒ Yes ☐ No
Are there rapid fluctuations in the flow through of the filter? ☐ Yes ☒ No Are filters ever "bumped" to extend filter runs? ☐ Yes ☒ No
Is filter performance assessed? ☒ Yes ☐ No Are filters & related equipment in good condition? ☒ Yes ☐ No
Meters calibrated or checked for accuracy? ☒ Yes ☐ No Filter gallery piping in good condition? ☒ Yes ☐ No Is it color coded? ☒ Yes ☐ No
Are there any cross-connections observed? ☐ Yes ☒ No Is there a floor drain to remove all leaking water from the filter gallery floor? ☒ Yes ☐ No
What initiates a backwash? Time, turbidity, and loss of head
Is there a backwash SOP in place? ☒ Yes ☐ No Backwash flow rate measurable? ☒ Yes ☐ No Backup backwash system? ☒ Yes ☐ No
Operating filter flow rates reduced when another filter is backwashed? ☐ Yes ☒ No
Can the backwash flow be varied to allow for the varying conditions? ☒ Yes ☐ No If so, can the operator adjust the rate of flow? ☒ Yes ☐ No
Are newly backwashed filters brought back into service at low rates that are gradually increased (ramped-up)? ☒ Yes ☐ No
Re-wash (filter-to-waste) capability available? ☐ Yes ☒ No Used? ☐ Yes ☐ No ☒ N/A
System meeting the disinfection byproduct precursor removal requirements of the Stage 1 Disinfectants/Disinfection Byproducts Rule? ☒ Yes ☐ No
System required to prepare disinfection profile? ☐ Yes ☒ No Is the profile available for review? ☐ Yes ☐ No
Any individual filter excursions occurred in past? ☐ Yes ☒ No If so, actions taken :
Operators received thorough Actiflo training? ☐ Yes ☐ No
Comment:

DISTRIBUTION

MAINS, HYDRANTS, & VALVES

Material: ☒ PVC ☒ Ductile Iron ☒ Steel ☒ Concrete ☒ Asbestos-Cement Pipe Size Max. (in) 24 Min 1 PSI Max 70 Min 60
Are main breaks recorded? ☒ Yes ☐ No Standard Operating Procedures (SOP) for main repair? ☒ Yes ☐ No
Are all connections metered? ☒ Yes ☐ No Meters (installed after 2003) NSF approved? ☒ Yes ☐ No
Flushing program compliant? ☒ Yes ☐ No # dead ends: 2 # flush points/hydrants? 48 # fire hydrants? 493 Any Auto-flush? ☒ Yes ☐ No
Valve maintenance program compliant? ☒ Yes ☐ No # of in-line valves: 2795 How often exercised? As needed

CROSS-CONNECTION CONTROL (CCC)

Written CCC Program Compliant? ☒ Yes ☐ No Is the program adequately implemented? ☒ Yes ☐ No Annual Testing Required: ☒ Yes ☐ No
Total Number of Devices: 170 Approx. # RPZ's: ____ DCVA's: ____ PVB's: ____ Other: ____ Approx. # of tests last year: ____
Any cross-connections observed during survey? ☐ Yes ☐ No If yes, describe:

MAPS, ENGINEERING, AND PERMITTING

MAPS INCLUDE: ☒ Lines (all) ☒ Valves ☒ Flush/Fire Hydrants ☐ Storage/Booster Pumps ☒ Interconnections
☒ Line Size ☒ Line Material ☐ Updates ☐ Air relief/Blow-off Valves ☐ Complaints
SOP for new line installation and clearance? ☒ Yes ☐ No Hydraulic model been performed? ☒ Yes ☐ No
Approximate number of outstanding permits distribution permits? None Any currently in use without clearance? ☐ Yes ☒ No

RESIDUAL DISINFECTANT AND MONITORING

Chorine Residual Max (mg/L): 3.8 Min 1.6 Are residuals tested in the system daily? ☒ Yes ☐ No How many sampling sites? One

FIELD TESTING				
Free and/or total Cl (MGL)	2.2 Sawgrass Business Center			
pH				

STORAGE FACILITIES

Tank Name or Number	GST 1	GST 2	GST 3				
Storage Type	Ground	Ground	Ground				
Tank Material	Concrete	Concrete	Concrete				
Capacity (Gallons)	1 MG	1 MG	1 MG				
Watertight Roof/Hatch?	Yes	Yes	Yes				
Venting/Screens Proper?	Yes	Yes	Yes				
Overflow Proper?	Yes	Yes	Yes				
Level/PSI Indicator Functional?	Yes	Yes	Yes				
On/Off PSI							
Flow-through or Float?	Flow-through	Flow-through	Flow-through				
Drain & Bypass Installed?	Yes	Yes	Yes				
Compliant Security?	Yes	Yes	yes				
Overall Condition?	Good	Good	Good				
Date of last annual inspection	5/2011	5/2011	5/2011				
Year of last 5 year inspection?	2011	2011	2011				
Year of last washout	2011	2011	2011				

Storage capacity exceed 25% of the max day? ☒Yes ☐No Is the interior tank coating NSF/ANSI approved? ☒Yes ☐No
Do any of the ground storage tanks have baffles? ☒Yes ☐No Any elevated storage tanks utilize altitude valves? ☐Yes ☒No
Do the storage tanks have a proper turnover? ☒Yes ☐No Do the storage facilities utilize low level alarms? ☒Yes ☐No
How are tanks levels controlled: ☐Manually ☐Auto (onsite) ☒Auto (SCADA)

Comment:

PUMPS AND CONTROLS

Pump Name or Model	1	2	3	4	5	
Type	Centrifugal	Centrifugal	Centrifugal	Centrifugal	Centrifugal	
Year Installed	2006	2006	2006	2011	1967	
Year of last servicing	2012	2012	2012	2011	2012	
Horsepower	150	150	150	150	150	
Pump Capacity-MG/day	3.88	3.88	3.88	3.88	3.88	
Standby Capacity?	Yes	Yes	Yes	Yes	Yes	
Proper valves/gauges?	Yes	Yes	Yes	Yes	Yes	
Overall Condition?	Good	Good	Good	Good	Good	
Housing/Security?	Yes	Yes	Yes	Yes	Yes	

Adequate access for maintenance & pump removal? ☒Yes ☐No Pump lubrication NSF/ANSI Approved? ☒Yes ☐No
Are transmission lines visible and in good condition? ☒Yes ☐No Low flow or failure alarm provided? ☒Yes ☐No
Are Protective Guards/Fire Extinguishers Provided? ☒Yes ☐No Are adequate spares available? ☒Yes ☐No
Overall Capacity Compliant? ☒Yes ☐No Firm Capacity Compliant? ☒Yes ☐No Standby Power Capacity Compliant? ☒Yes ☐No

Comment:

MONITORING, REPORTING, & DATA VERIFICATION

MONITORING PLANS AND PROGRAMS

Required Monitoring Plans: ☒Bacteriological ☒DBP ☒Pb/Cu ☒CCC ☒Emergency Preparedness ☒Other: _____
Adequate monitoring in place? ☒ Yes ☐ No Is monitoring program adequately maintained and followed? ☒ Yes ☐ No
Proper monitoring procedures? ☒ Yes ☐ No Results adequately recorded? ☒ Yes ☐ No Records maintained? ☒ Yes ☐ No
Timely submittal of samples? ☒ Yes ☐ No Compliance samples analyzed by a Certified Lab? ☒ Yes ☐ No

MONITORING FACILITIES AND EQUIPMENT

Testing facilities adequate? ☒ Yes ☐ No ☐ Not Applicable Testing equipment adequate? ☒ Yes ☐ No
Are the reagents in date? ☒ Yes ☐ No Proper procedures for calibrating monitoring equipment? ☒ Yes ☐ No
Which parameters does the system monitor? ☒Chlorine ☒pH ☒F ☐PO4 ☐Fe ☐H2S ☐Other(s) _____

FILE REVIEW

Does the system maintain adequate compliance records? ☒ Yes ☐ No System in compliance with parameters below? ☒ Yes ☐ No

Compliance Schedule: The following parameters are due during the year shown.

NO_2/NO_3:2013 Inorganic:2014 Secondary:2014 VOC:* Pb/Cu:2013 DBPs:2013 Rads:2017 SOC:2014 Asbestos:2020

Comments: *Continue sampling for VOCs according to sampling plan developed to monitor wellfield contamination.

SYSTEM MANAGEMENT AND OPERATION

ADMINISTRATION

Formal Organization Chart: ☒ Available ☐ Not available Operating authority to make decisions: ☒ Sufficient ☐ Insufficient
Administrators familiar with the SDWA: ☒ Yes ☐ No Planning Process: Formal and adequate: ☒ Yes ☐ No

INFORMATION MANAGEMENT

Does the utility manage the following information (check if yes):
☒ Maintaining plans ☒ Updating maps ☒ Handling customer complaints
☒ Collecting O & M data ☒ SOPs ☒ Maintenance Records ☒ Financial Records
Does the system track typical operating data such as unaccounted-for water? ☒ Yes ☐ No
Cost/unit of production? ☐ Yes ☐ No Customer Complaints? ☒ Yes ☐ No
Are financial, operational data and maintenance records tracked via a PC? ☒ Yes ☐ No

COMMUNICATION

Communication effective between management, operations, & FDEP? ☒ Yes ☐ No
Cooperation adequate between the system & other agencies/organizations? ☒ Yes ☐ No
Cooperation level between system and local fire department? ☒ Effective ☐ Needs improvement.

PLANNING

Emergency response plan includes: ☒Communication Chart ☒Written Agreements ☒Disaster Plan ☒Standby Power Info ☒Inventories
Written available plans for: ☒Sampling & monitoring ☐Materials Survey ☒Water Quality Parameters ☒Repair replacement & expansion

PERSONNEL

Proper staffing ☒Yes ☐No Proper qualifications ☒Yes ☐No Proper training ☒Yes ☐ No

FACILITIES AND EQUIPMENT

Preventative Maintenance Program in place? ☒ Yes ☐ No
Facilities for storing parts, equipment, vehicles, traffic control devices, & supplies sufficient? ☒ Yes ☐ No
Are facilities for personnel adequate? ☒ Yes ☐ No Are system facilities adequate? ☒ Yes ☐ No
Maintenance of facilities adequate? ☒ Yes ☐ No Equipment properly sized? ☒ Yes ☐ No
Stand-by capacity meet requirements? ☒ Yes ☐ No Is stand-by equipment exercised at least monthly? ☒ Yes ☐ No

FINANCE

Financing & budget satisfactory: ☒ Yes ☐ No
Funds allocated properly: ☒ Yes ☐ No
Training funds sufficient: ☒ Yes ☐ No
Is there a water conservation policy/program? ☒ Yes ☐ No
Were any deficiencies identified or is technical assistance recommended for this element? ☐ Yes ☒ No

Comments: Emergency Response Plan is comprehensive: drought, hurricane, and terrorism. OM manual needs to be updated

OPERATOR STAFFING REQUIREMENTS

Treatment Category/Class: 1/A
Lead Operator Name & Class/Cert. Number: Jim Parks A5096
Staffing Requirements: 24/7/365
Total Number of Operators Staffed 7
Staffing meet FAC 62-699? ☒ Yes ☐ No
Name(s) of all other operator(s) and Class & Cert. number: M. Woodside A12938, H. Kindel A13408, K. Williams A6349, M. Meehan A16158, S. Earl C4749, A. Saban C15042

Comments: Plant staffed 24/7, operators initial at the end of each shift.

TECHNICAL ASSISTANCE

Technical assistance providers (tap) recommended? ☐ Yes (see enclosed tap information) ☒ No tap recommended at this time
CPE required? ☐ Yes ☒ No
Should a CTA be performed? ☐ Yes ☐ No

Comments:

Inspector Signature _____ Date: January 24, 2013

Reviewer's Signature _____ Date: January 24, 2013

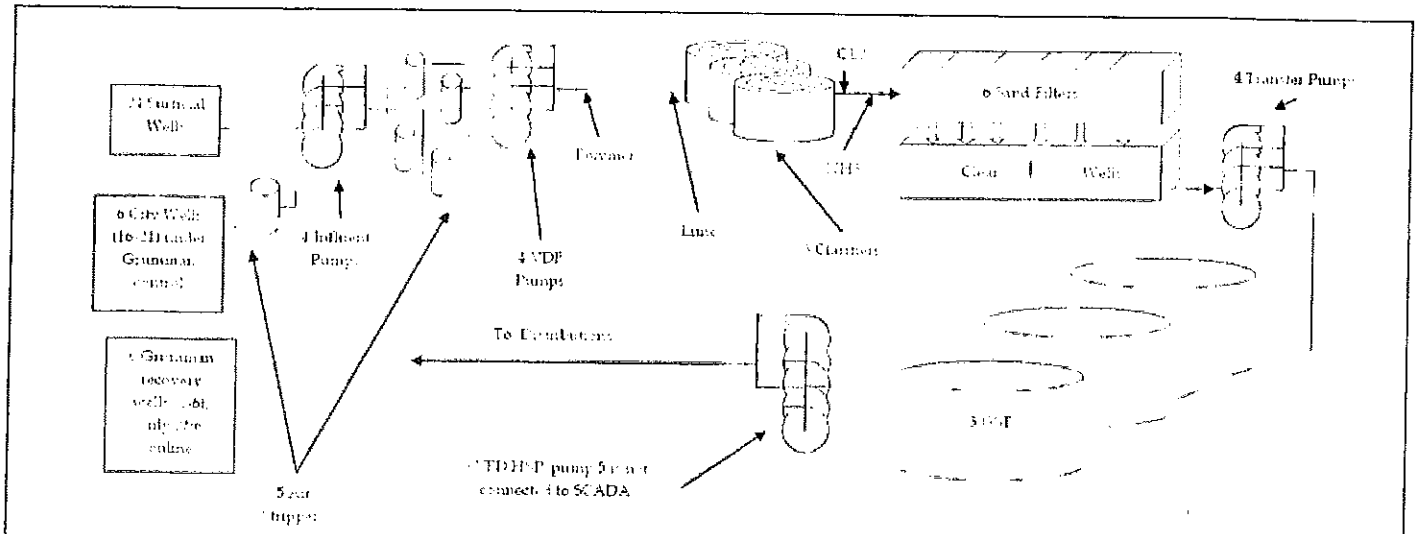
COMMENTS:

The city was advised to submit DBP II plan to DEP for approval

SUMMARY OF DEFICIENCIES AND RECOMMENDATIONS FOR TECHNICAL ASSISTANCE:

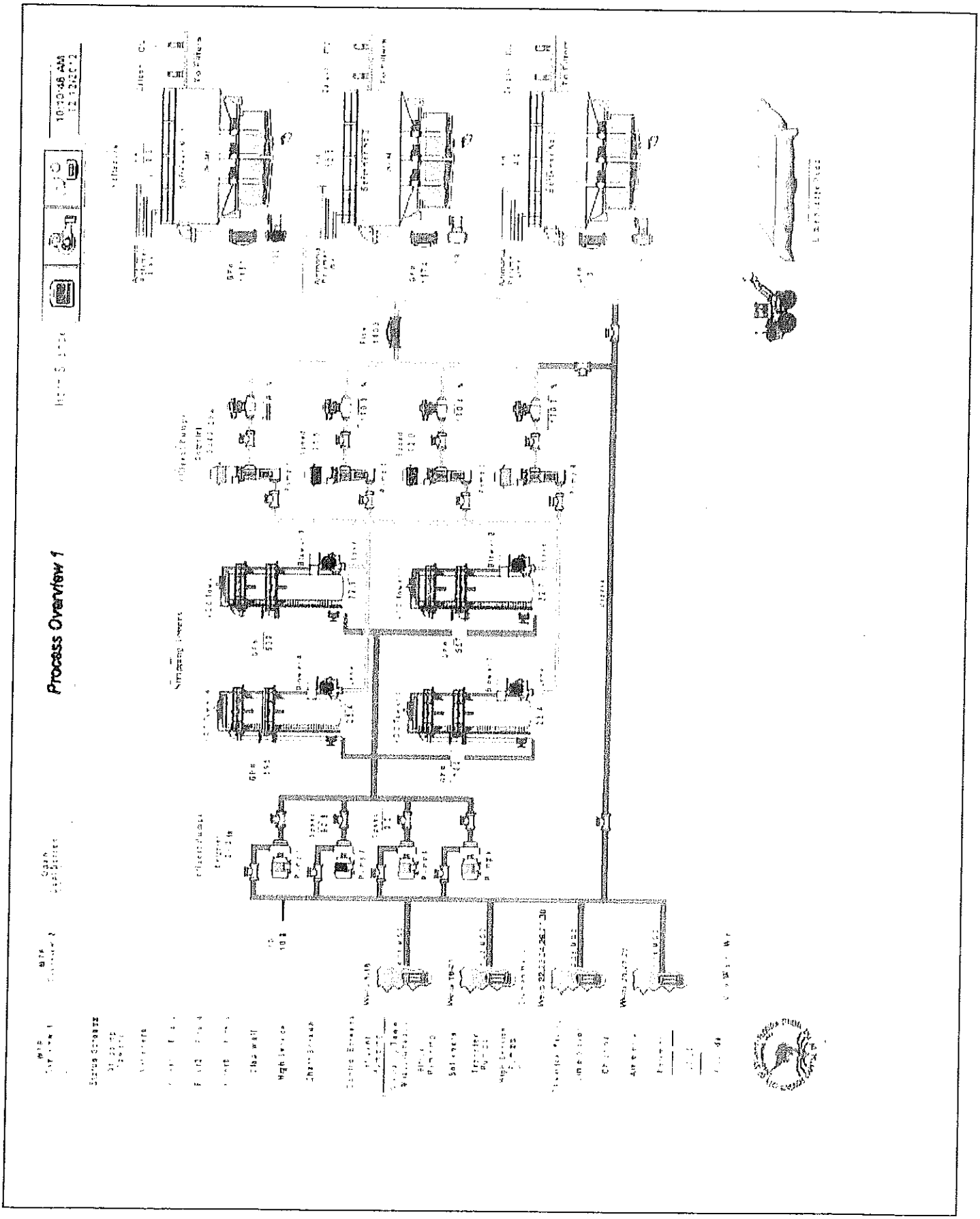
- **O&M manual needs to be updated**
- **All wells were permitted without vents; the issue was discussed with staff, and they have decided to add vents through the disinfection port.**
- **Consult with the Department when in doubt whether or not a permit or a notification is needed for future projects.**

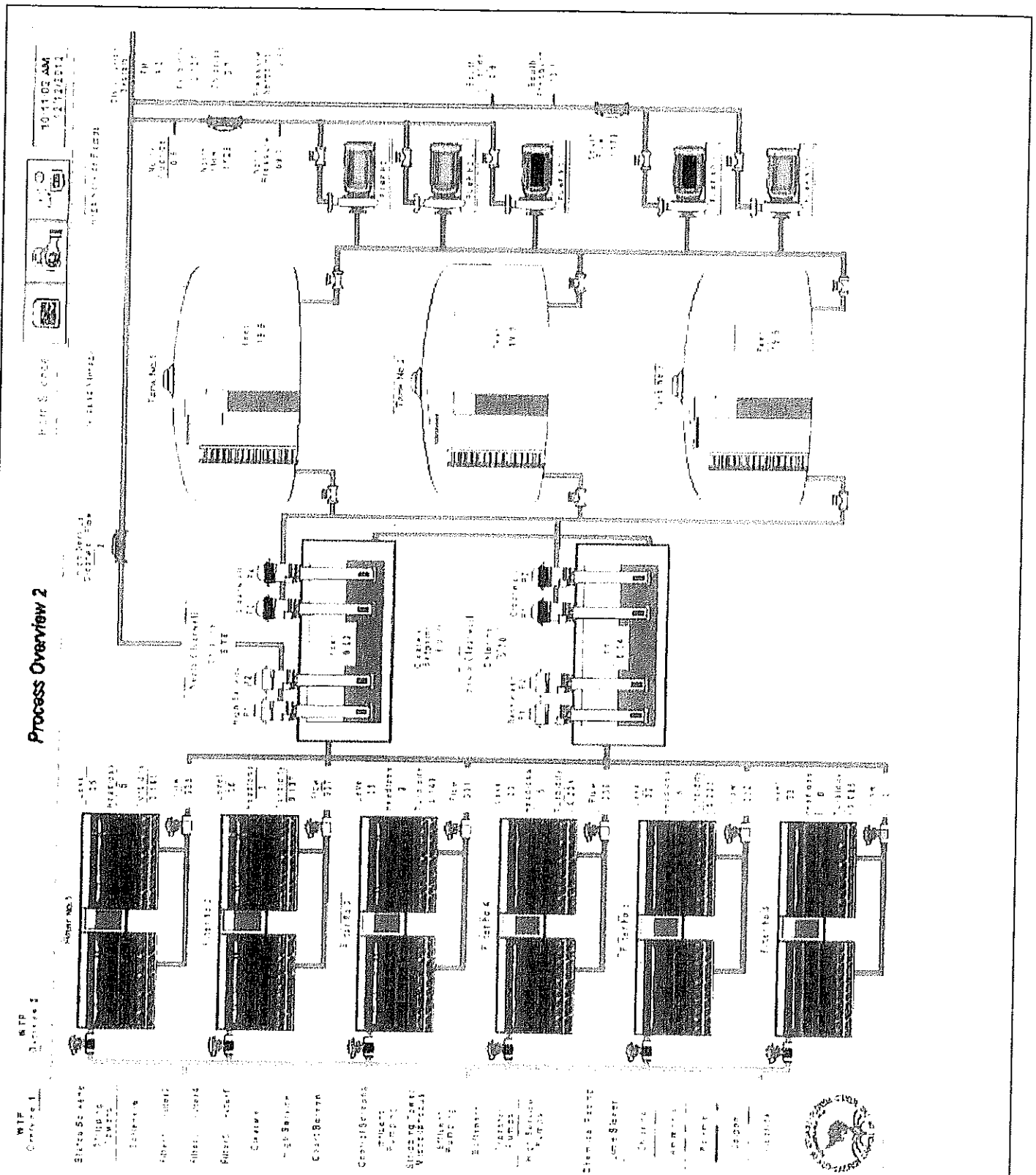
SYSTEM DIAGRAM

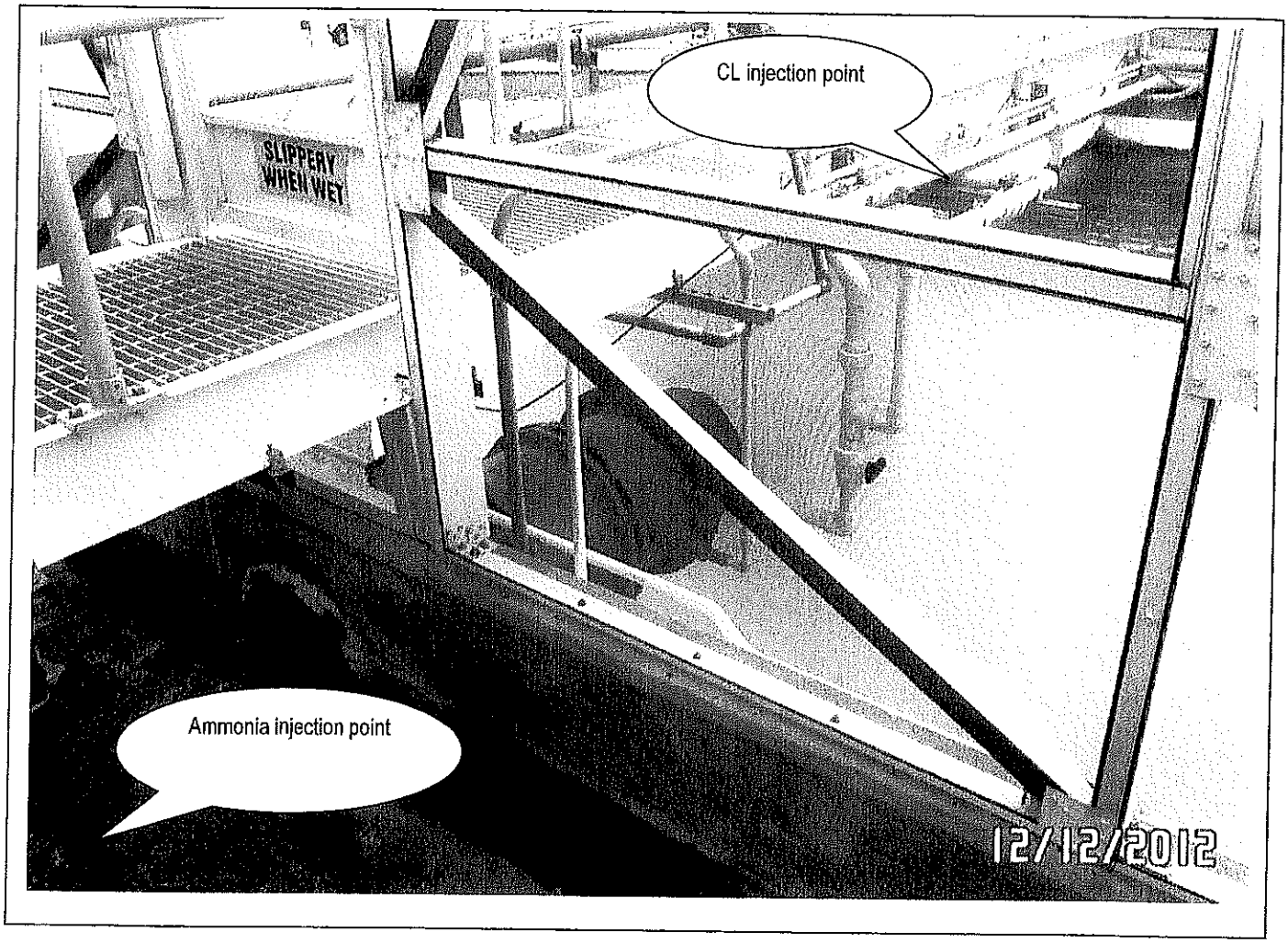


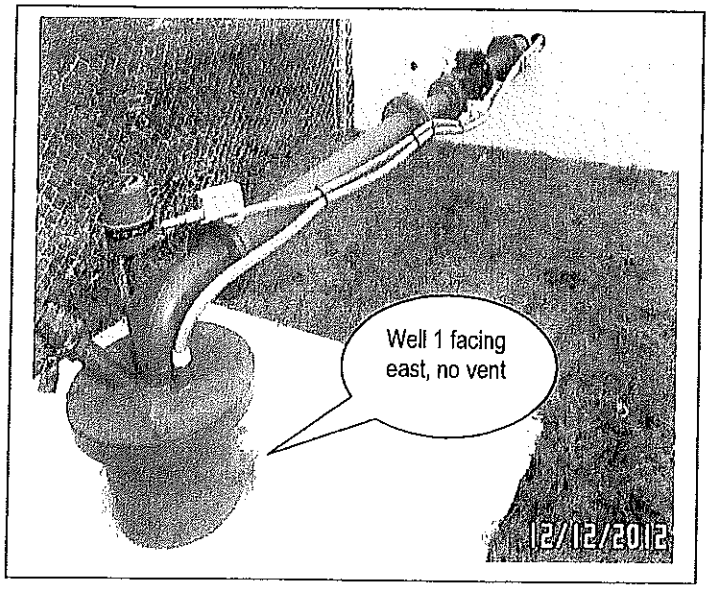
4130250 City of Stuart Sanitary Survey
12/12/2012 and 12/13/2012
Perez/Peters

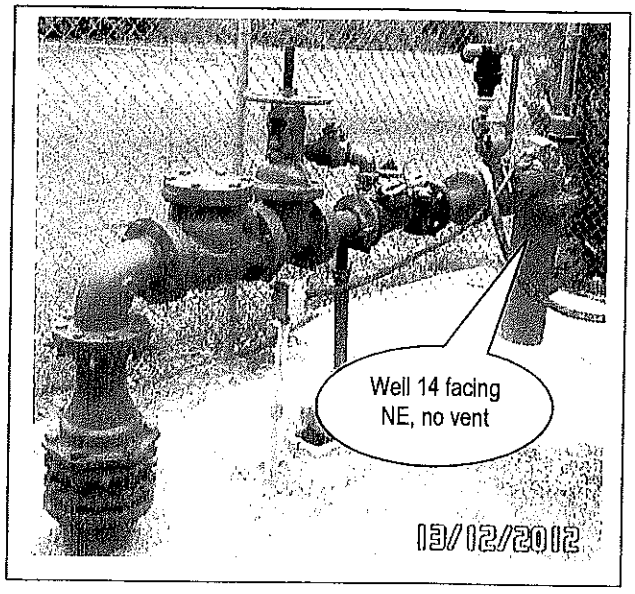
PHOTOS

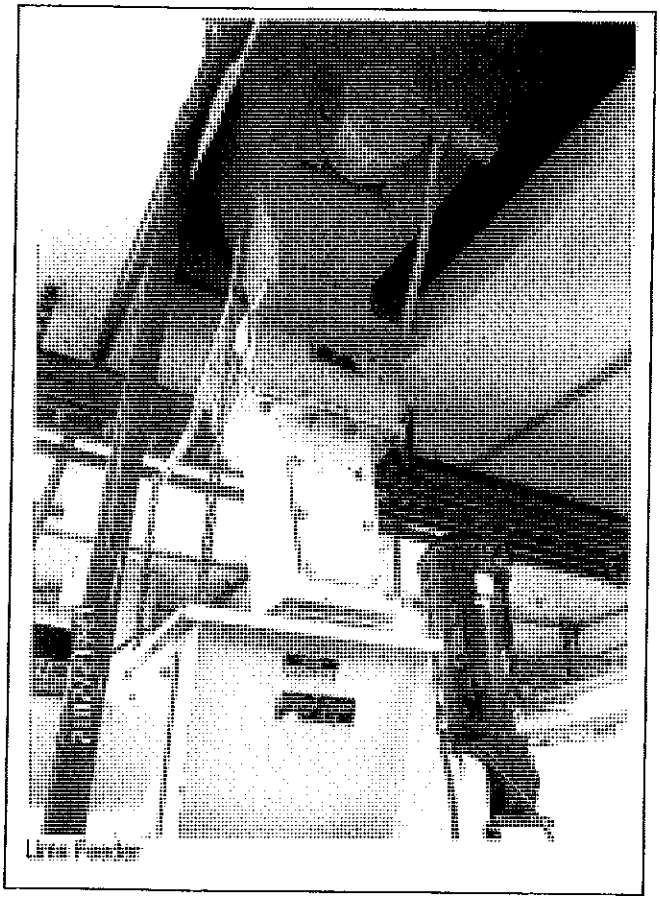



Process Overview 2

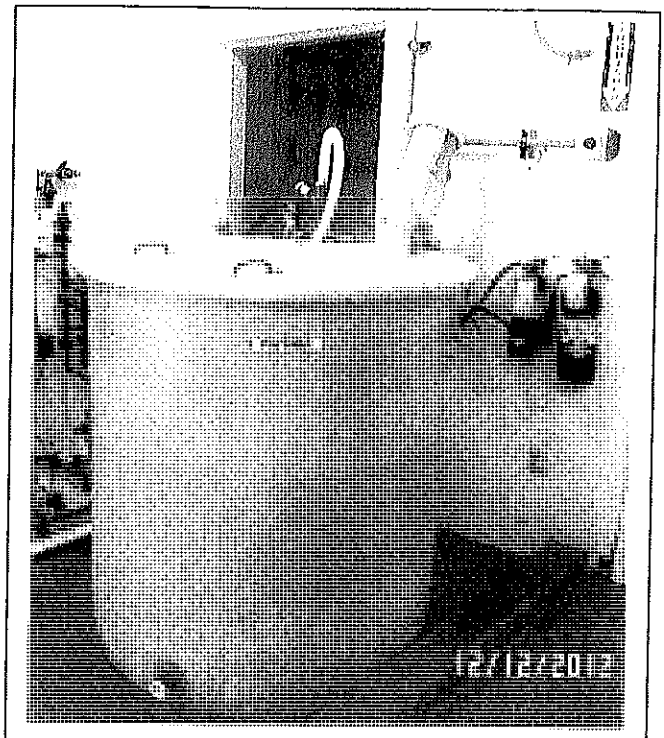

CL injection point
SLIPPERY WHEN WET
Ammonia injection point
12/12/2012


Well 1 facing east, no vent
12/12/2012

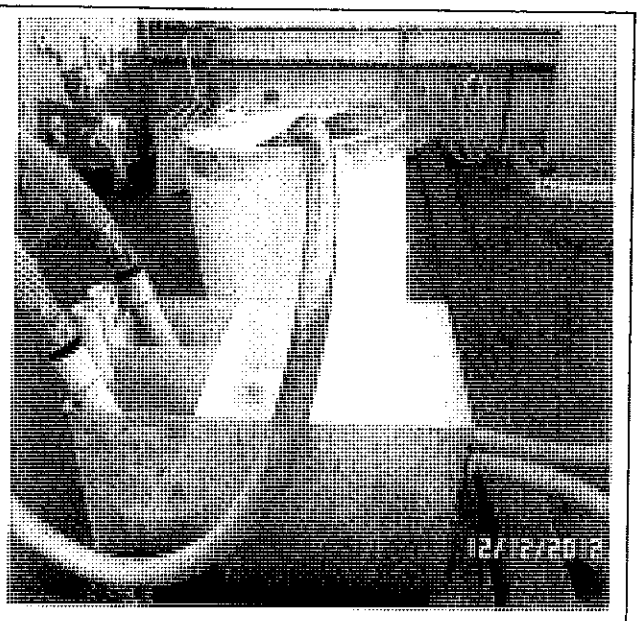

Well 14 facing NE, no vent
13/12/2012



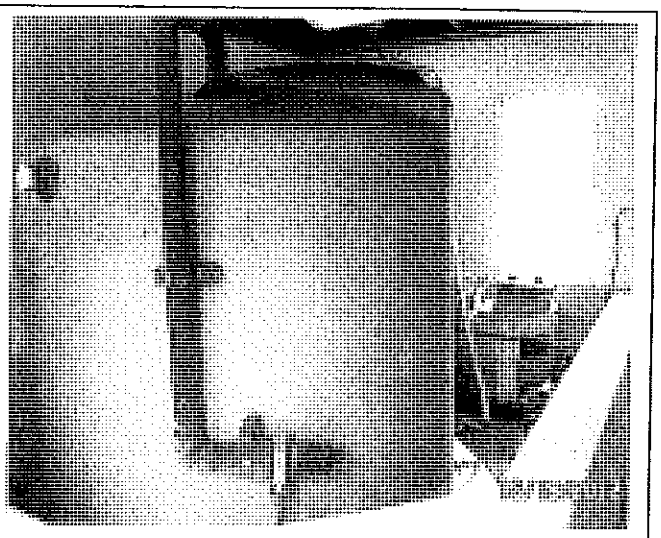
Lime Feeder



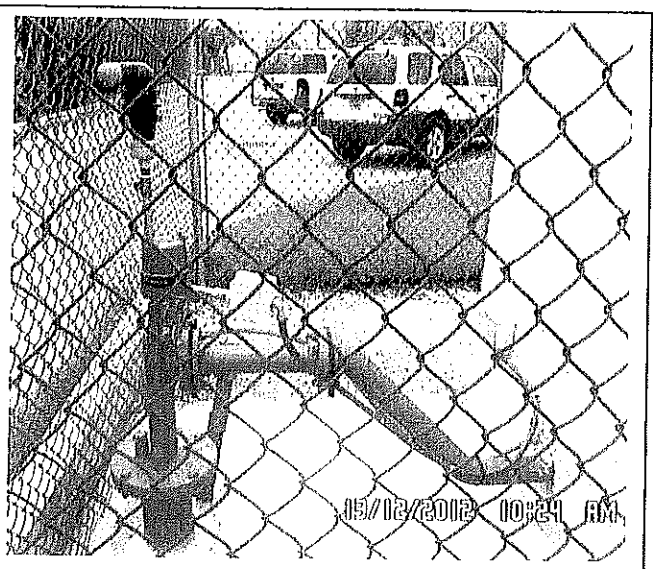
Polymer feed system



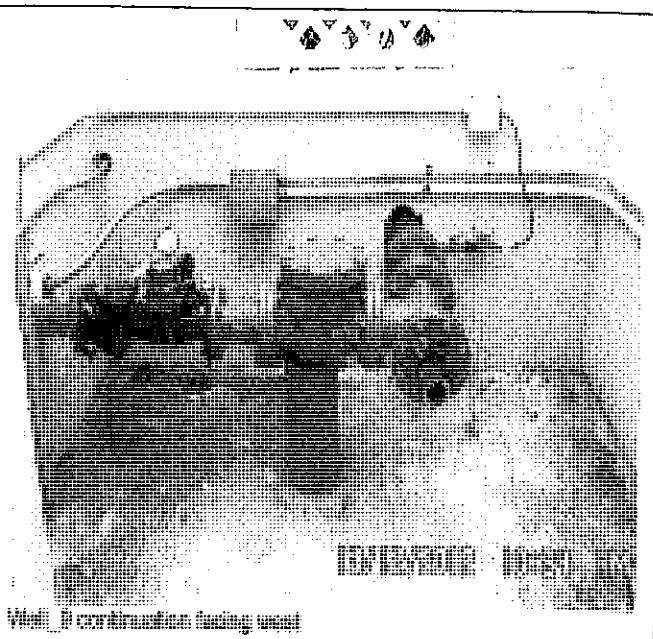
Lime slurry



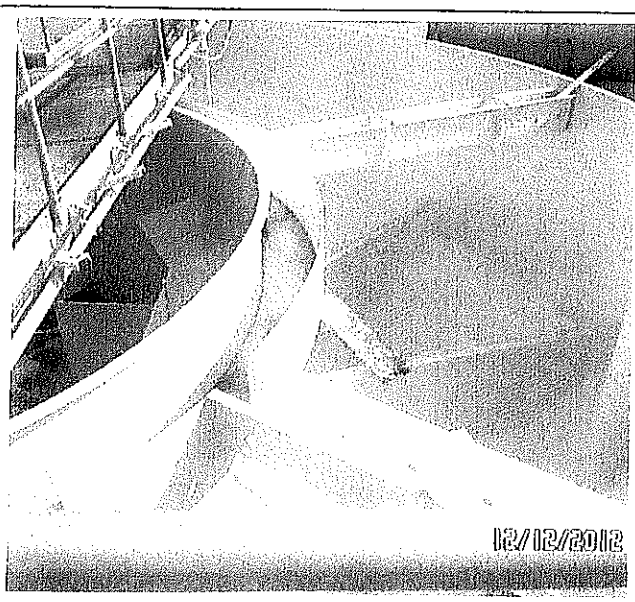
Fluoride Room



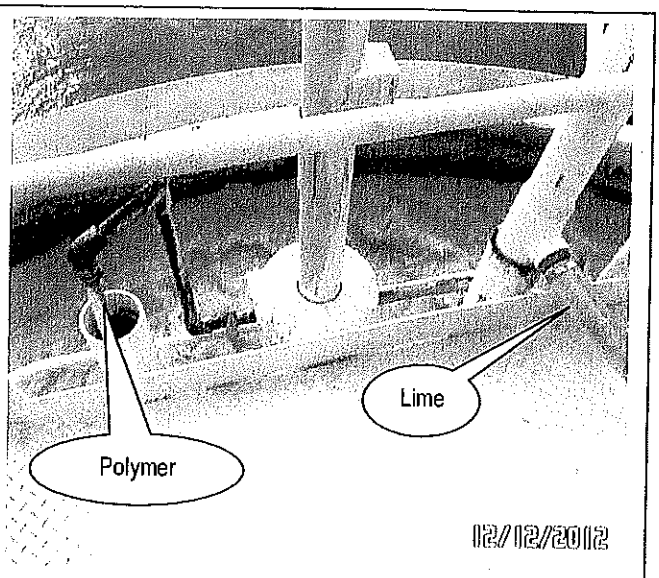
Well_9 facing west (No vent)



Well_9 continuation facing west



Clarifier 3 out of service for rehab



Lime and polymer injection point (Clarifier 2 facing south)

INSPECTION RESPONSE FORM

PWS ID Number: **4430259**
PWS Name: City of Stuart

Please Update Contact Information
Business Name:
Owner(s) Name:
Mailing Address:

Phone:
Fax:
E-mail Address:

Please Forward Response to:
Department of Environmental Protection
Drinking Water Section
Attention: Mark Peters
400 N Congress Avenue, Suite 200
West Palm Beach, Florida 33401
or e-mail :mark.peters@dep.state.fl.us

In response to the Department's Sanitary Survey Report for the subject public water system dated , the following actions were done to correct the listed deficiencies (if applicable)

Item #	Corrective Action	Date Completed

(Attach additional sheets if necessary)

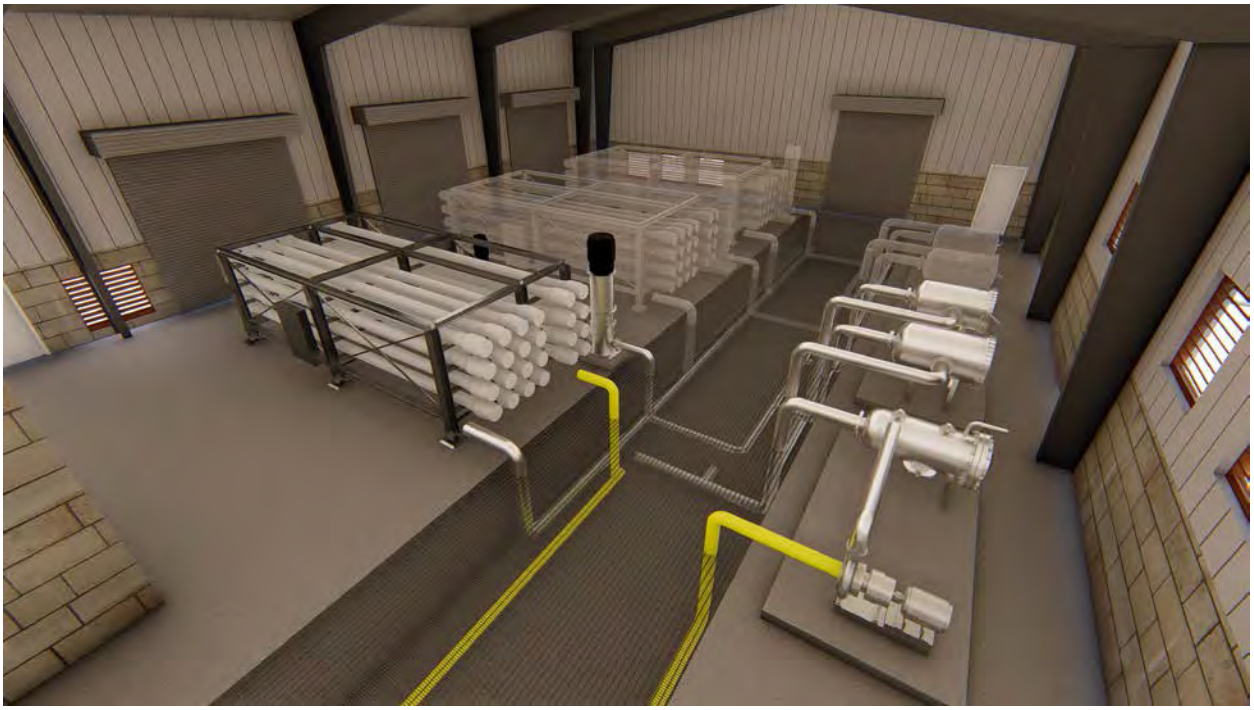
I certify the above information is accurate.

Name of PWS Owner/Representative: _____
(Please type or print)

PWS Owner/Representative Signature: _____ Date: _____

Appendix F City of Stuart- Alternative Water Supply Technical Memorandum No. 5, 6, and 7 AWS Conceptual Design

Hazen and Sawyer
2101 NW Corporate Boulevard, Suite 301
Boca Raton, FL 33431 • 561.997.8070









City of Stuart – Alternative Water Supply Technical Memorandum No. 5, 6, and 7 AWS Conceptual Design

Final Report
Hazen No. 41024-006
April 20, 2018

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1. Project Description

1.1 City Has Decided to Invest in Alternative Water Supply

The City of Stuart (City) owns and operates a water treatment plant (WTP) with a permitted treatment capacity of 6.0 million gallons per day (mgd). The City treats raw water from the surficial aquifer system (SAS). The water wellfield is comprised of a total of 30 production wells of which 23 are active and 7 are inactive due to contamination remediation efforts. Wells PW-1, PW-3 and PW-5 are also temporarily inactive due to perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) contamination.

The WTP treats water via conventional lime softening technology. The finished water complies with all water quality standards. The WTP also includes air stripping to remove volatile organic compounds (VOCs) to achieve compliance with water quality standards. The City plans to construct an anion-exchange treatment train to remove PFOA and PFOS contamination. The anion-exchange system is anticipated to become operational in 2019.

The SAS has been the City's water source for many years. Certain factors are threatening the reliability and availability of this water source. These factors include groundwater contamination, potential for salt water intrusion, and potential impacts on adjacent wetlands and other legal users. The City has implemented treatment barriers and monitoring plans that provide its customers with drinking water that meet all current regulations.

Due to the ongoing threats to the existing water supply and potential for more stringent future drinking water regulations, the City desires to diversify its supply options by investing in the Floridan Aquifer System (FAS) as an alternate water supply (AWS). As a result, the City retained Hazen and Sawyer (Hazen) to evaluate FAS AWS alternatives and plan the recommended alternative. A series of technical memorandum (TM) are being prepared that document the findings of the evaluation and plan the recommended FAS AWS alternative.

1.2 Purpose of this Technical Memorandum

The purpose of this TM is summarized as follows:

1. Define the evaluated AWS alternatives
2. Present current raw water quality data for the AWS alternatives and document assumptions relative to water quality deterioration over time
3. Perform a preliminary screening of the AWS alternatives and discard alternatives deemed not feasible
4. Document design criteria for feasible AWS alternatives
5. Conceptually plan the AWS water supply, RO treatment facilities and concentrate disposal
6. Prepare cost opinions for the AWS facilities

2. Floridan Aquifer System Overview

2.1 Investing in the FAS Would Diversify the City's Water Supply

Traditionally, the SAS has been the water source for the upper east coast of Florida, which includes the City of Stuart. The SAS is an unconfined to semi-confined aquifer with a thickness that varies from 50 to 250 feet, the City's production wells vary in depth from 117 to 135 feet. The SAS consists of three hydrogeological zones: surficial sands, primary water producing zone, and a deeper less permeable zone. This aquifer is recharged by rainfall and local surface water bodies and the water produced mainly fresh (i.e. low chloride concentration) and high in hardness.

The SAS provides the City a source of fresh water that is treated via lime softening and filtration. Based on population forecasts and water demand forecasts, the City's existing SAS water supply is sufficient to meet demand through the year 2040, subject to permit renewal due in 2029. The continued use of the SAS is feasible under existing water quality regulations. It is noted that the SFWMD identifies the SAS as a limited water supply (SFWMD, 2016). However, other issues have driven the City to assess the feasibility of diversifying its supply by investing in the FAS as an AWS, as described below.

The City's existing SAS wells withdrawal rates are limited due to the potential for wetland impacts, potential for saltwater intrusion, and ongoing contamination challenges. The City has successfully addressed all challenges associated with wetland impacts, potential for saltwater intrusion, and contamination in the SAS. The City produces water that complies with all regulatory requirements. Due to the ongoing threats to the existing water supply and potential for more stringent future drinking water regulations, the City desires to diversify its supply by investing in the FAS as an AWS.

Due to contamination and potential for saltwater intrusion concerns, the City is proactively planning to phase in RO facilities as describe in TM 3. The phasing of the RO facilities is presented in Table 2-1. The total build-out finished water capacity would be 3.0 mgd.

Table 2-1: Reverse Osmosis Treatment Facility Assumptions

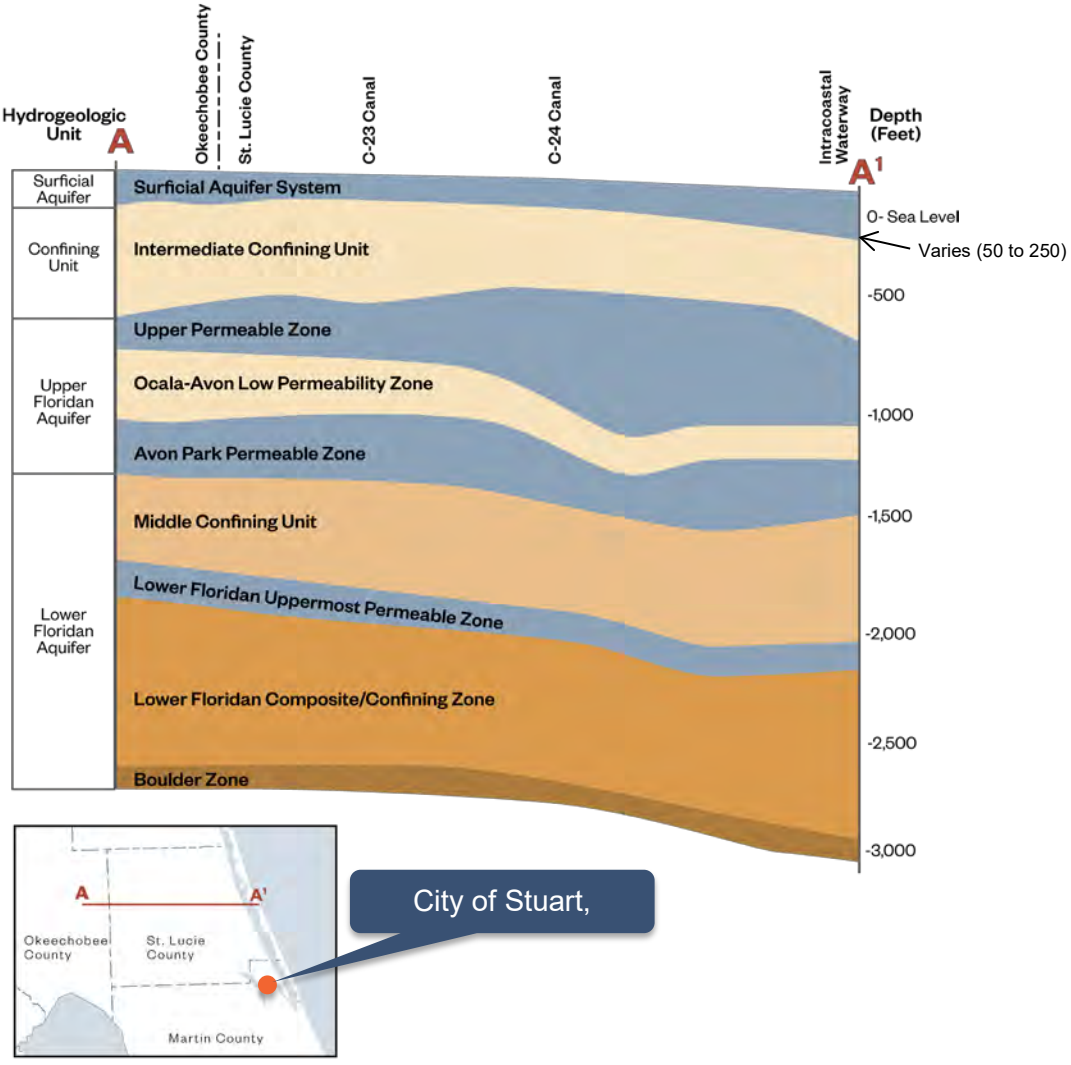
Phase	Incremental Finished Water Capacity (mgd)	Year On-Line
1	1.0	2022
2	1.0	2027
3	1.0	2032

The FAS is composed of the Upper Floridan Aquifer (UFA) and the Lower Floridan Aquifer (LFA). In the study area, the Upper Permeable Zone (UPZ) and the Avon Park Permeable Zone (APPZ) compose the UFA. The following sections provide an overview of key characteristics of the FAS.

2.2 Hydrogeological Cross Section

Figure 2-1 illustrates a generalized hydrogeologic cross section of the FAS near the City of Stuart. The figure illustrates three potential water supply zones are as follows:

- Upper Floridan Aquifer Upper Permeable Zone (UPZ)
- Upper Floridan Aquifer Avon Park Permeable Zone (APPZ)
- Lower Floridan Aquifer Uppermost Permeable Zone (LFA)



Source: SFWMD *2016 Upper East Coast Water Supply Plan Update*, Figure 1-2.

Figure 2-1: Hydrogeologic Cross Section

2.3 FAS Hydrogeological Nomenclature

This TM uses the hydrogeological nomenclature established the Upper East Coast Water Supply Plan 2016 Update (SFWMD, 2016), which is based on the United States Geological Survey (USGS) Professional Paper 1807 (Williams & Kuniansky, Revised March 2016) and discussions among water management districts. The information listed below is specific to the Stuart area and is provided for informational purposes for groundwater modeling and permit review stakeholders:

1. The East Coast Floridan Model (ECFM) uses the nomenclature developed by Reese and Richardson, who identified and mapped the Avon Park Permeable Zone (APPZ). (Reese & Richardson, 2008).
2. The Ocala-Avon Low Permeability Zone (OCAPLPZ) illustrated in Figure 2-1 is roughly equivalent to the MC1 of Reese and Richardson (2008).
3. The middle confining (MC) unit illustrated in Figure 2-1 is roughly equivalent to the MC2 of Reese and Richardson (2008).

2.4 Upper Floridan Aquifer Upper Permeable Zone

The UPZ occurs at approximately 700 to 1,000 feet below land surface in St. Lucie / Martin Counties. Water from this aquifer is brackish. Since there are no UPZ wells in the City of Stuart, data from nearby UPZ water supply wells were used to estimate the depth of the proposed UPZ wells in the City of Stuart. The UPZ, generally, has better water quality than deeper aquifers within the UFA; as a result, water from the UPZ is used for irrigation and agriculture within the Upper East Coast areas (SFWMD, 2016). When used as a drinking water source, RO treatment is required to achieve drinking water standards.

2.5 Upper Floridan Aquifer Avon Park Permeable Zone

The APPZ occurs at approximately 1,100 to 1,500 feet below land surface in St. Lucie / Martin Counties. Since there are no APPZ wells of this type in the City of Stuart, data from Martin County APPZ water supply wells were used to estimate the depth of similar wells in the City of Stuart. The location of the APPZ can vary significantly between adjacent wells from approximately 200 to 300 feet.

Water from this aquifer is brackish to saline and its productivity is significantly higher than the SAS. Due to the brackish nature of the water produced in this aquifer, treatment processes such as RO are required to achieve drinking water standards.

2.6 Lower Floridan Aquifer

The LFA occurs at approximately 2,000 to 2,100 feet below land surface in St. Lucie / Martin Counties. This aquifer consists of a series of permeable zones separated by semi-confining units. This aquifer produces water with high chloride concentrations. Therefore, like the UFA, membrane treatment such as RO is required to achieve drinking water standards. No public water supplier is currently using the LFA.

3. Alternative Water Supply Alternatives

3.1 Introduction

This section briefly summarizes the alternative water supply (AWS) alternatives that are evaluated in this TM.

3.2 Alternative 1: Replace lime softening plant with nanofiltration treatment and add Floridan Aquifer wells and reverse osmosis treatment

This alternative evaluates the use of the existing surficial aquifer system (SAS) wellfield and the replacement of the existing lime softening water treatment plant (WTP) with nanofiltration treatment. The proposed nanofiltration treatment facility would be in the athletic park located west of the existing WTP. Additionally, raw water from the surficial aquifer wellfield will be supplemented with raw water from the Floridan Aquifer System (FAS), which will then be treated with reverse osmosis (RO) treatment.

3.3 Alternative 2: Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Upper Floridan Upper Permeable Zone) and reverse osmosis treatment

This alternative evaluates the continued use of the existing SAS wellfield and the existing lime softening WTP. The raw water from the surficial aquifer wellfield will be supplemented with raw water from the Upper Permeable Zone (UPZ) within the Upper Floridan Aquifer, which requires RO treatment.

3.4 Alternative 3: Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Upper Floridan Avon Park Permeable Zone) and reverse osmosis treatment

This alternative evaluates the continued use of the existing SAS wellfield and the existing lime softening WTP. The raw water from the surficial aquifer wellfield will be supplemented with raw water from the Avon Park permeable zone (APPZ) within the Upper Floridan Aquifer, which requires RO treatment.

3.5 Alternative 4: Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Lower Floridan Aquifer Uppermost Permeable Zone) and reverse osmosis treatment

This alternative evaluates the continued use of the existing SAS wellfield and the existing lime softening WTP. The raw water from the surficial aquifer wellfield will be supplemented with raw water from the Lower Floridan Aquifer (LFA), which requires RO treatment.

4. Floridan Aquifer System Water Quality

4.1 Introduction

Chemical, physical, and biological characterization of Floridan Aquifer System (FAS) wells within the limits of the City is not available. Consequently, preliminary raw water quality data was obtained based on data from wells nearby the City. The following sections summarize these data.

4.2 Current Floridan Aquifer Water Quality

Table 4-1 summarizes key water quality parameters – based on data from nearby wells – for the FAS under current conditions or Year 0.

Table 4-1: Floridan Aquifer System Water Quality – Current Conditions (Year 0)

Parameter	UPZ(1)	APPZ(2)	LFA(3)	
			Approx. 1,800' Depth	Approx. 1,900' Depth
Depth (ft)	810	1,370	1,765 – 1,808	1,900 - 1,950
pH	7.50 – 7.90	7.70 – 7.90	8.90	7.70
Total Dissolved Solids (TDS) (mg/L)	3,000 – 5,000(4)	5,700 – 6,400	4,850	24,100
Conductivity (mg/L)	4,400 – 4,600	6,600 – 7,900	6,700	34,400
Sodium (mg/L)	600 - 630	850 - 975	1,200	8,000
Chlorides (mg/L)	~2,000	2,200 – 2,500	2,600	18,100
Iron (mg/L)	0.02 – 0.05	NA	0.74	2.05
Sulfate (mg/L)	150 – 175	280 - 290	284	1,285

Notes:

(1) UPZ: Upper Permeable Zone

(2) APPZ: Avon Park Permeable Zone

(3) LFA: Lower Floridan Aquifer

(4) Based on the results published by the SFWMD - Simulations of the 2013 and 2040 Scenarios Using the East Coast Floridan Model Upper East Coast Water Supply Plan November 2015.

The basis for the water quality data presented in the above table is described in the following subsections.

4.2.1 Upper Permeable Zone (UPZ)

Data from wells constructed at the depth range of 700 to 1,000 feet were used establish the UPZ water quality. These wells had a diameter that ranged from 4 to 8 inches. The UPZ, generally, has better water

quality than the APPZ in northern part of St. Lucie County. As a result, water from the UPZ in St. Lucie County is used for irrigation and agriculture (SFWMD, 2016).

4.2.2 Avon Park Permeable Zone (APPZ)

Data from Martin County and North Palm Beach County wells constructed in the depth range of 1,200 to 1,500 feet were used to establish the APPZ water quality. The data in the above table were chosen based on "worst-case" water quality and proximity to the City of Stuart.

4.2.3 Lower Floridan Aquifer (LFA)

Currently, no LFA wells are used for public water supply in the Upper East Coast (SFWMD, 2016). Consequently, minimal LFA water quality data are available.

LFA water quality was obtained from an existing dual zone monitoring well located in Fort Pierce, Florida. The first monitoring zone is at a depth of approximately 1,800 feet below land surface. The second monitoring zone is at a depth of approximately 1,900 feet below land surface. The water at 1,900 feet is much lower quality than the water at 1,800 feet below land surface.

Upconing of water, movement of more saline water from a lower depth into the production zone, is a major concern given the large increase in salinity over a short change in depth illustrated by the data above. Hence, it was assumed that water quality will degrade to match the LFA data at 1,900 feet as shown in Table 4-1.

4.2.4 Collection of Water Quality Data During Well Construction is Recommended

The water quality parameters reported in Table 4-1 provide a basis for planning. It is recommended that actual raw water quality data be collected during FAS well construction to be used as the basis for refining the detailed design of the membrane treatment process.

4.3 Forecasted Floridan Aquifer Water Quality

Table 4-2 summarizes 20-year projected water quality for key parameters for the Floridan Aquifer.

Table 4-2: Floridan Aquifer System Water Quality – Projected Conditions (Year 20)

Parameter	UPZ	APPZ	LFA
Depth	810	1,370	1,950
pH	7.70	7.70	7.70
TDS (mg/L)	4,400	14,700	24,100
Conductivity (mg/L)	5,000	12,700	34,400
Sodium (mg/L)	640	975	8,000

Table 4-2: Floridan Aquifer System Water Quality – Projected Conditions (Year 20)

Parameter	UPZ	APPZ	LFA
Chlorides (mg/L)	~2,500	7,200	18,100
Iron (mg/L)	0.05	NA	2.05
Sulfate (mg/L)	220	290	1,285

The Upper Floridan (i.e., UPZ and APPZ) water quality forecast was based on available historical data trends projected 20-years from current conditions. No historical data were available for the LFA. Hence, it was assumed that the water quality in a LFA well would degrade to match the current LFA data at 1,900 feet as shown in Table 4-1.

4.4 UPZ is Recommended Based on Groundwater Modeling

Grandusky, Lamb and Associates, Inc. (GLA) prepared a groundwater model to assess changes in water quality over time in the UPZ and APPZ. The model findings are presented in TM 5A, 6A & 7A. GLA recommended UPZ wells over APPZ due deterioration of water quality in the APPZ over time. A key GLA finding is that total dissolved solids (TDS) may rise from 6,000 mg/L to approximately 14,000 mg/L in the APPZ over the next 20 years. In comparison, the model results indicate that TDS may rise from approximately 4,000 mg/L to approximately 5,000 mg/L in the UPZ over the next 20 years. Figure 4-1 illustrate the forecasted change in TDS over the next 20-years in the UPZ and APPZ.

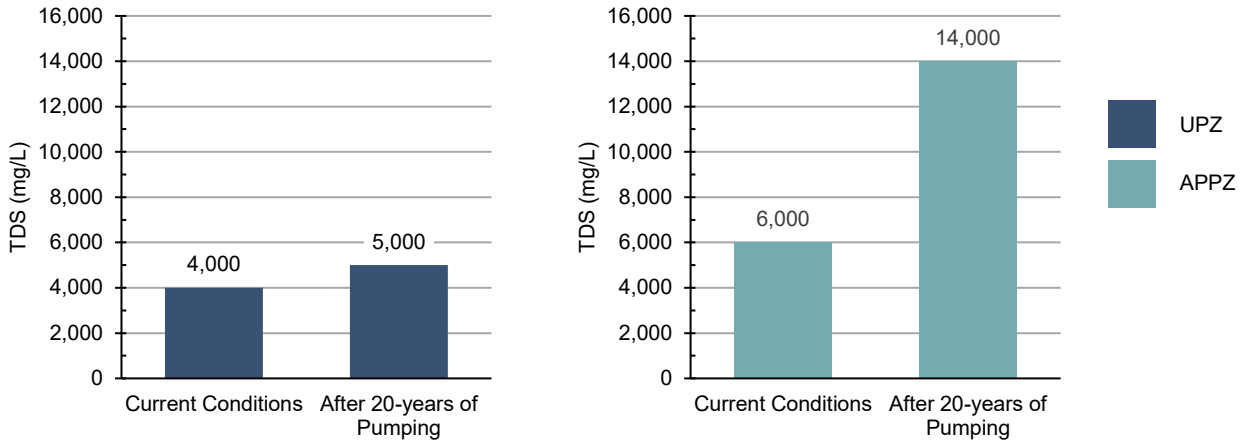


Figure 4-1: Floridan Aquifer TDS Increase with Time

Based on forecasted TDS changes and other factors, GLA recommended the UPZ as the AWS for the City.

4.5 20-Year Power Cost of Floridan Aquifer

Based on the above water quality data, it is roughly estimated that the membrane feed pressure and booster pressure will range from Year 0 to Year 20 as summarized in Table 4-3.

Table 4-3: Estimated Membrane Pressure

Parameter	UPZ		APPZ		LFA	
	Current	20-year Projection	Current	20-year Projection	Current	20-year Projection
Feed Pressure (psi)	160-185	180-205	175-210	340-370	220	750
Booster Pressure (psi)	80	80	80	80	100	100

Note: Feed and booster pressures were calculated based on water quality assumptions and historical trends summarized in Sections 4.2 and 4.3. It is anticipated that variations in TDS and chloride concentrations will have a direct impact in membrane pressure requirements.

Figure 4-2 illustrates the 20-year electrical power cost for operating a 1-mgd finished water capacity RO train treating water from the three FAS production zones. The power cost is based solely on power consumption associated with the membrane system feed pressure assuming continuous operation and change in feed pressure is assumed to occur at an equal annual rate from current to 20-year projected conditions. Power costs were calculated assuming a unit power cost of $0.0841/kw-h.

The high feed pressures and power consumption rate needed for the treating the LFA, make the LFA undesirable when other options are feasible.

Energy recovery devices will be used to recover energy from the membrane concentrate and to transfer this energy to the booster pumps. Therefore, no additional power will be required for booster pressure. The use of energy recovery devices will minimize power costs, these savings in cost are summarized in

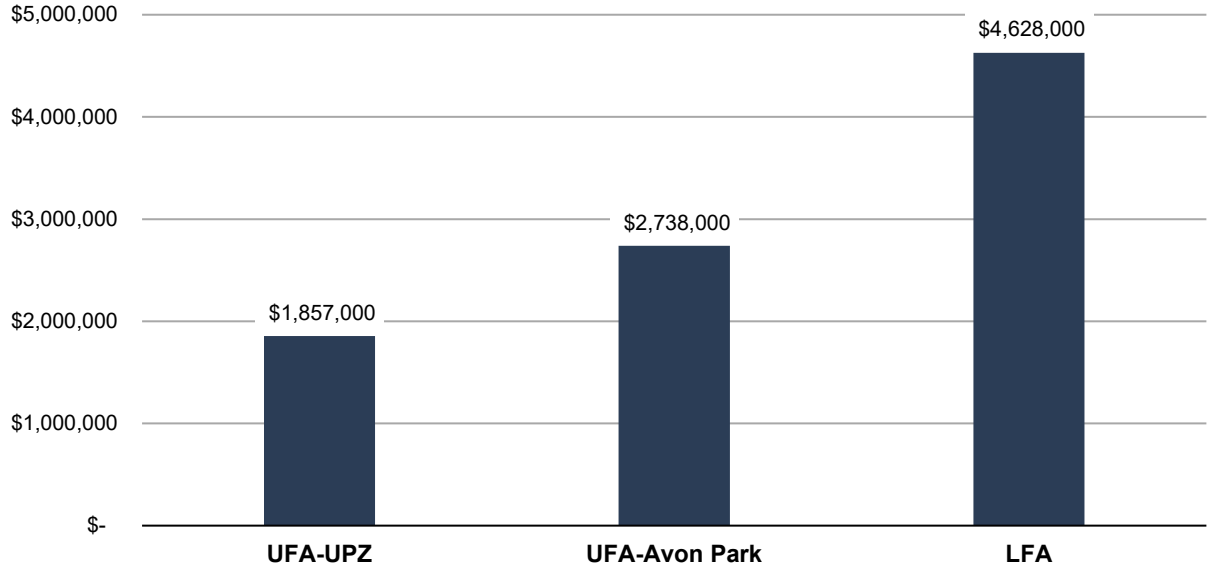


Figure 4-2: 20-Year Power Cost for Floridan Aquifer System Water Supplies

Figure 4-3. Power savings were calculated assuming booster pressure remains constant through 20 years and the plant operates continuously.

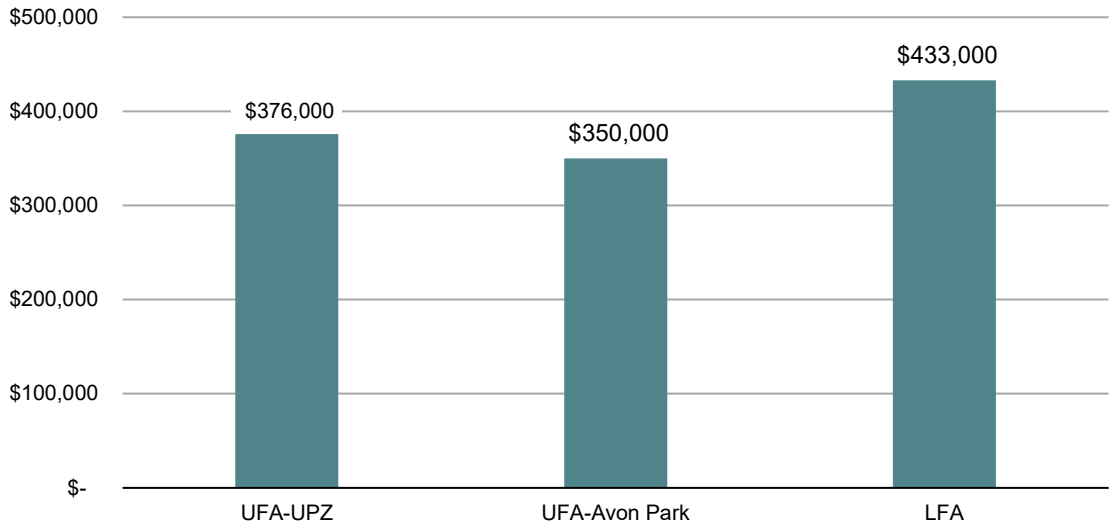


Figure 4-3: 20-Year Power Savings for Floridan Aquifer System Water Supplies

4.6 Conclusions and Recommendations

- The SFWMD reports that water in the LFA has chloride concentrations approach seawater (SFWMD, 2016). The LFA has higher operating and capital costs than the UPZ and APPZ.
- The high salinity in the LFA (i.e., TDS = 24,100 mg/L) make this aquifer less desirable than the UPZ and the APPZ. The LFA is discarded from further evaluation in this TM.
- The current water quality of the UPZ is less saline that the APPZ. Trends from wells owned by nearby utilities indicate that the water quality of the APPZ will become much more saline (i.e., TDS = 14,700 mg/L) than the UPZ (i.e., TDS = 4,400 mg/L) over the next twenty years. Groundwater modeling prepared by Grandusky, Lamb and Associates, Inc. confirmed these trends.
- Based on the forecasted future TDS increase in the APPZ, the UPZ is recommended as the AWS for the City of Stuart.

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5. Preliminary Screening of AWS Alternatives

5.1 Introduction

The purpose of this section is to present an initial screening of the alternatives and provide an opinion on the efficacy of each. For convenience, Table 5-1 describes each alternative.

Table 5-1: AWS Alternatives

Alternative	Description	Disposition of Existing Lime Softening Plant	Alternative Water Supply	
			Source	Treatment Process
1	Replace lime softening plant with nanofiltration treatment and add Floridan Aquifer wells and reverse osmosis treatment	Replace with Nanofiltration WTP	Upper Floridan Aquifer (UFA)	Reverse Osmosis
2	Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Upper Floridan Upper Permeable Zone) and reverse osmosis treatment	Continue Operation of Existing Lime Softening Plant	Upper Floridan Aquifer Upper Permeable Zone (UPZ)	Reverse Osmosis
3	Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Upper Floridan Avon Park Permeable Zone) and reverse osmosis treatment	Continue Operation of Existing Lime Softening Plant	Upper Floridan Aquifer Avon Park Permeable Zone (APPZ)	Reverse Osmosis
4	Continued operation of existing lime softening plant plus add Floridan Aquifer wells (completed in the Lower Floridan Aquifer Uppermost Permeable Zone) and reverse osmosis treatment	Continue Operation of Existing Lime Softening Plant	Lower Floridan Aquifer Uppermost Permeable Zone (LFA)	Reverse Osmosis

5.2 Alternative 1 is Not Feasible

Under Alternative 1 the existing lime softening plant would be replaced with nanofiltration treatment and Floridan Aquifer wells and reverse osmosis treatment would be added as an alternative water supply.

The City requested that this study conceptually plan continued use of the SAS water supply with treatment via a new nanofiltration treatment plant. Figure 5-1 illustrates a conceptual site plan for a 7.0

mgd finished water capacity membrane treatment plant. The membrane building is sized to house two 2.0 mgd finished water capacity nanofiltration treatment skids that would treat the SAS water supply. The building is sized to house three 1.0 mgd finished water capacity RO treatment skids.

The existing WTP does not have sufficient site space to construct nanofiltration treatment along with RO treatment. Consequently, City would have to repurpose the soccer field at the 10th Street / Guy Davis Sports Complex to provide sufficient land to construct the membrane treatment facility and its ancillary facilities (i.e., backup power, degasifiers, odor control, fuel storage, chemical facilities, electrical building, etc.). City staff indicated that repurposing the soccer field at the 10th Street / Guy Davis Sports Complex is not feasible. Hence, it is recommended that Alternative 1 be discarded from further evaluation in this TM; it is not feasible.

5.3 Alternative 2 is Feasible and Recommended

Under Alternative 2 the existing lime softening plant would continue to treat the surficial aquifer supply and Floridan Aquifer wells and reverse osmosis treatment would be added as an alternative water supply. The Floridan Aquifer wells would supply water from the UPZ.

The proposed RO treatment facilities would be constructed on the existing WTP site. There appears to be sufficient site space exists to support the RO treatment facility and its ancillary facilities. Hence, Alternative 2 is deemed feasible from a space planning perspective.

Ground water modeling prepared by Grandusky, Lamb and Associates, Inc. indicates that TDS may rise from approximately 4,000 mg/L to approximately 5,000 mg/L in the UPZ over the next 20 years. Additionally, GLA indicated that TDS may rise from 6,000 mg/L to approximately 14,000 mg/L in the APPZ over the next 20 years.

The large TDS increase forecasted for the APPZ would require that the proposed AWS electrical equipment, motors, pumps, conductors, etc. to be oversized to accommodate the expected future degradation in water quality. This would increase the construction cost of the proposed AWS facility designed for the APPZ (Alternative 3) relative to an AWS facility designed for the UPZ (Alternative 2). Hence, Alternative 2 is recommended.

5.4 Alternative 3 is Feasible but Not Recommended

Under Alternative 3 the existing lime softening plant would continue to treat the surficial aquifer supply and Floridan Aquifer wells and reverse osmosis treatment would be added as an alternative water supply. The Floridan Aquifer wells would supply water from the APPZ.

The proposed RO treatment facilities would be constructed on the existing WTP site. There appears to be sufficient site space to support the RO treatment facility and its ancillary facilities. Hence, Alternative 3 is deemed feasible from a space planning perspective. Given the large TDS increase forecast for the APPZ, Alternative 3 is not recommended.

5.5 Alternative 4 is Not Feasible

Under Alternative 4 the existing lime softening plant would continue to treat the surficial aquifer supply and Floridan Aquifer wells and reverse osmosis treatment would be added as an alternative water supply. The Floridan Aquifer wells would supply water from the Lower Floridan Uppermost Permeable Zone.

As indicated in Section 4, the LFA has much higher operating cost, higher construction cost, and lower water quality relative to the UPZ and APPZ. Hence, it is recommended that Alternative 4 be discarded from further evaluation in this TM; it is not economically feasible.

5.6 Recommendations

The following recommendations are offered:

- Alternatives 1, 3 and 4 are not recommended.
- Alternative 2 is recommended. Alternative 2 includes continued operation of existing lime softening plant plus add Upper Floridan Upper Permeable Zone (UPZ) wells and reverse osmosis treatment.
- The AWS treatment facilities would be designed to treat initial and future UPZ water quality.
- For detailed design, it is recommended that the TDS be assumed to degrade to approximately 6,000 mg/L after approximately 50 years of pumping the UPZ[1].

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[1] The assumed TDS of 6,000 mg/L is based on the Grandusky, Lamb and Associates, Inc. ground water model water quality forecast.

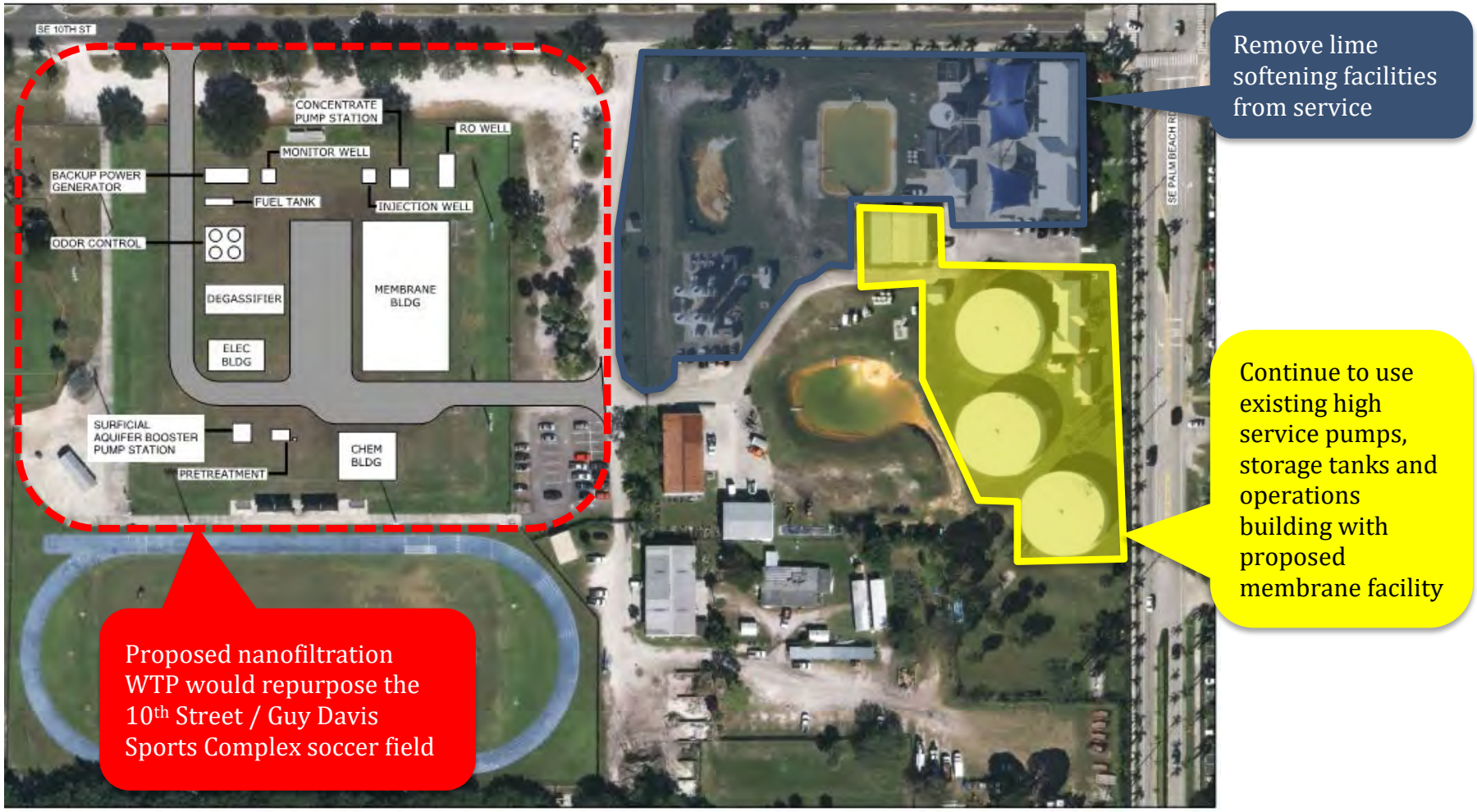


Figure 5-1: Nanofiltration WTP Site Plan

6. Raw Water Supply Conceptual Plan

6.1 Introduction

This section of the technical memorandum (TM) conceptual plans Floridan Aquifer System (FAS) wells for alternative water supply (AWS) Alternative 2. The reverse osmosis (RO) facility and the associated FAS wells will be constructed in phases as indicated in Section 2.1.

6.2 Number of Wells Needed

The number of FAS wells needed is based on the following criteria:

- *Raw Water Production Capability*: The proposed Phase 1 RO facility is sized to produce an estimated 1.0 mgd of permeate at an estimated recovery rate of 70 percent. At a 70 percent recovery rate, each FAS well would need to provide 1.43 mgd. A total of three FAS wells would be needed to supply the RO facility at build-out.
- *Standby Capacity*: The existing SAS wellfield will provide standby capacity for the proposed FAS well production flow. Hence, backup FAS wells are not included.
- *Coordination Between Wells and Treatment Skids*: The proposed Phase 1 RO facility will include one treatment skid with a capacity of 1.0 mgd of permeate. Consequently, one well will provide 1.43 mgd of the raw water required to produce 1.0 mgd of permeate at 70 percent recovery by the RO membrane treatment skid.

6.3 Proposed Well Locations

A variety of factors are used to assess the viability of a site for the construction of a water production well. These factors include if the property is owned by the City, the zoning for the site, the method of water disposal during construction, the likelihood of public opposition to the construction, the jurisdiction responsible for permitting the site, and many others. The City indicated that the athletic field west of the City's WTP is owned by the City of Stuart. Construction of FAS wells on this site is feasible. Figure 6-1 illustrates the proposed FAS well locations.

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Figure 6-1: Proposed Floridan Aquifer System Well Location Map

Table 6-1 presents certain location data for the proposed FAS wells.

Table 6-1: Proposed FAS Well Location Data

Parameter	FA-1	FA-2	FA-3
Latitude	27°11'18.21"N	27°11'23.84"N	27°11'12.66"N
Longitude	80°14'13.39"W	80°14'25.21"W	80°14'27.26"W
Pump Capacity	1.5 mgd	1.5 mgd	1.5 mgd
Separation Distance from Nearest FAS Well	≈ 1,180 feet	≈ 1,180 feet	≈ 1,150 feet
Year On-Line	2021	2026	2031

6.4 Recommended Well Separation Distance

Maximizing well separation distance is recommended to minimize drawdown interactions between wells, potentially accelerating water quality degradation due to "up-coning" (i.e., the upward movement of water from lower depths).

6.5 Conceptual Well Cross Section

The proposed FAS wells will withdraw from the Upper Floridan Aquifer (UFA) from the Upper Permeable Zone (UPZ). Figure 6-2 illustrates a conceptual UPZ well cross section. Wells constructed in the UPZ are artesian. Artesian wells naturally flow to ground surface without the use of pumps.

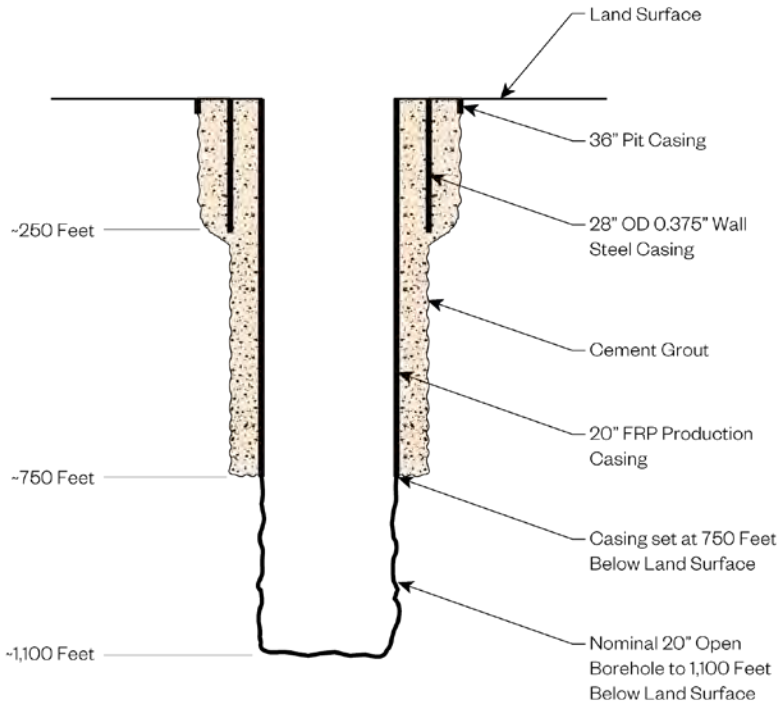


Figure 6-2: Conceptual UPZ Well Cross Section

6.6 Well Construction Challenges

6.6.1 Introduction

Review of available hydrogeologic information in the general area of interest (i.e., location) typically provides insight of sub-surface conditions and is a relatively quick and inexpensive. While this can

provide initial insight and guidance for formulating a drilling and testing plan for well construction, the accuracy of information as well as the location of the facility could be of concern. Hence, the question is whether consideration should be given to construction of an "exploratory well", or a "test well" (a.k.a., pilot well) in advance of the final well? Advantages and disadvantages related to construction of exploratory and test wells are presented below.

6.6.2 Exploratory Well

The main advantage of constructing a small diameter exploratory well is that you have control of data collection at the site-specific area of interest. Depending on location, sub-surface conditions may vary and present challenges that require setting casings at depth different than planned.

An exploratory well provides a roadmap for the well completion. Detailed testing during exploratory well construction assures accuracy in assessing underground conditions. Exploratory wells are typically less costly than a full-scale well as they are constructed by drilling a small diameter borehole. The exploratory well enables design of a more tailored testing and construction plan for the full-scale wells.

Disadvantages of constructing an exploratory well include added costs. Mobilization is a significant part of well construction and adding an additional well, even though as a small diameter exploratory well, increases the total project cost. The use of the exploratory well after data collection is complete could also be considered a disadvantage. For example, what can the exploratory well be used for after construction? In some instances, it could be used as a monitor well or perhaps converted for use as a production well. The diameter of the well is important when assessing options for future use. The overall project schedule may also be longer when an exploratory well program is employed.

6.6.3 Full-Scale Test Well with Pilot Hole

Construction of full-scale test well is used more often than the exploratory well approach to reduce overall project costs and expedite project schedules. Construction of a full-scale test well with little to no prior knowledge of the anticipated underground conditions has risks. Minimizing these risks requires a robust drilling and testing plan to address unknowns that results in a costlier well. This is especially true in areas where variable underground conditions are known to exist such as the FAS near the City.

To accurately establish casing depths and identify zones of interest, a drilling approach using pilot-hole drilling is recommended. Pilot-hole drilling basically consists of extending a small diameter borehole to identify sub-surface conditions in advance of reaming a larger diameter borehole. For example, a 6-inch pilot hole may be extended to 1,100 feet to confirm if the hydrogeologic conditions are suitable for setting a casing at 1,000 feet during construction of a full-scale well.

Data collection from the pilot-hole would occur first, and the open-hole section would be grouted to the desired casing setting depth. An exploratory well would have identified the best casing depth and a reamed borehole would have been drilled without the pilot-hole. Back-plugging formations is not the best option as the ability to truly seal the deeper formation may be an issue and possibly result in migration of worse quality water into the desired zone. Design of a full-scale test well without an exploratory well also requires a more robust schedule of values and changes to the total project coast can be anticipated

since the exact depth for casing settings is unclear. There may also be additional standby time associated with additional testing of a full-scale test well.

6.6.4 Recommendation

There are FAS wells constructed in the Upper Floridan Aquifer in nearby municipal water supply wells for Martin County, Town of Jupiter and Seacoast Utilities Authority. Well drillers have significant experience drilling FAS wells in the region. Hence, the cost of an exploratory well can be avoided. It is recommended that the first FAS well be designed as a full-scale test well with pilot hole.

6.7 Plan for Water Quality Degradation

6.7.1 Introduction

Water quality degradation of the Floridan Aquifer is a concern. Groundwater modeling prepared by Grandusky, Lamb and Associates, Inc. indicate that the total dissolved solids (TDS) may increase to approximately 5,000 mg/L after 20 years of pumping. This section offers recommendations relative to planning for water quality degradation.

6.7.2 SFWMD District Opinion

The South Florida Water Management District (SFWMD) report titled "*Simulation of the 2013 and 2040 Scenarios Using the East Coast Floridan Model Upper East Coast Water Supply Plan*" (SFWMD, 2015b) offered the following opinion:

> *A conservative approach is recommended for future users that are targeting the APPZ as their primary source of water for the eastern coastal counties of the SFWMD. Model simulations and observed data suggest that sustained withdrawals from this aquifer generally result in water quality degradation in these areas, sometimes reaching or exceeding TDS concentrations of 8,000 to 10,000 mg/L. Utilities have had to backfill wells, install additional wells to improve well spacing, implement adaptive management strategies for well rotation, and take other measures to compensate for changing water quality issues associated with prolonged withdrawals from the APPZ. It is recommended that exploratory well drilling and aquifer testing be conducted at the time of wellfield construction to provide a better understanding of the water quality beneath the target zone. In addition, wellfields should be designed to minimize well interference even at higher transmission costs, and flexibility should be built into the design of water treatment plants to accommodate higher TDS concentrations.*

6.7.3 Recommendation

While the above SFWMD statements was written relative to the APPZ, certain aspects of this statement also apply to the UPZ. The key message is that water quality degradation of the FAS over time is a fact. Treatment facilities utilizing the FAS must be designed robustly with flexibility to accommodate water quality changes. The following recommendations are offered relative to designing the proposed AWS facility to accommodate water quality changes:

1. Design the treatment facility to treat raw water with a TDS of 4,000 mg/L that will degrade to 6,000 mg/L (i.e., the estimated TDS in the UPZ after 50 years of pumping).
2. Design the electrical system with upsized wiring, motors and electrical feed equipment to accommodate the estimated future water quality.
3. Design the membrane feed pump to be able to add impeller bowels to increase feed pressure as water quality degrades. Size the membrane feed pump motor, variable frequency drive and electrical wiring to accommodate the future addition of pump impeller bowels.

6.8 Floridan Aquifer System Pumping Restrictions

Due to concerns regarding water availability and water quality, there are restrictions on pumps for FAS wells in Martin and St. Lucie counties. Restricted Allocation Area (RAA) criteria in Subsection 3.2.1.D of the Applicant's Handbook prohibit the use of pumps on flowing Floridan Aquifer System wells in Martin or St. Lucie counties (SFWMD, 2015a) unless one of the following exemptions are true:

1. The pump was in place before March 2, 1974.
2. The proposed pump is installed to increase pressure in attached piping, not to increase the flow above the natural flow from the well.
3. A study shows the withdrawals will not interfere with presently existing legal users.
4. The pump is installed temporarily for freeze protection.
5. The pump is installed temporarily during a declared water shortage.

The modeling prepared by Grandusky, Lamb and Associates, Inc. (GLA) indicates that the proposed pump capacities recommended in this TM will not impact existing legal users. Consequently, exemption three is true and equipping the proposed FAS wells with pumps is allowable under SFWMD rules.

6.9 Wellfield Components

Key wellfield components would be designed based on the following:

- *Piping*: Raw water transmission main will be High Density Polyethylene (HDPE).
- *Pump*: Submersible style pumps allow a lesser amount of dissolved oxygen from entering the pipe network than do surface mounted (i.e., turbine pumps with extended shaft and the motor mounted above grade) pumping equipment. Minimizing the entrance of dissolved oxygen into the pipe network is an important design goal. Therefore, submersible style pumps are recommended.
- *Wellhead*: Wellhead piping would be 316L stainless steel. Each well would be equipped with surge relief, a flushing connection for periodic sand removal and chemical injection connections for well disinfection.

- *Telemetry*: City staff requested that telemetry between the proposed wells and the WTP be fiber optic cable. This approach is feasible.
- *Controls*: The well pump will be controlled locally through the pump Local Control Panel (LCP). Each well would be equipped with a programmable logic control and be controllable remotely at the WTP.

Figure 6-3 illustrates a conceptual cross section of the wellhead.

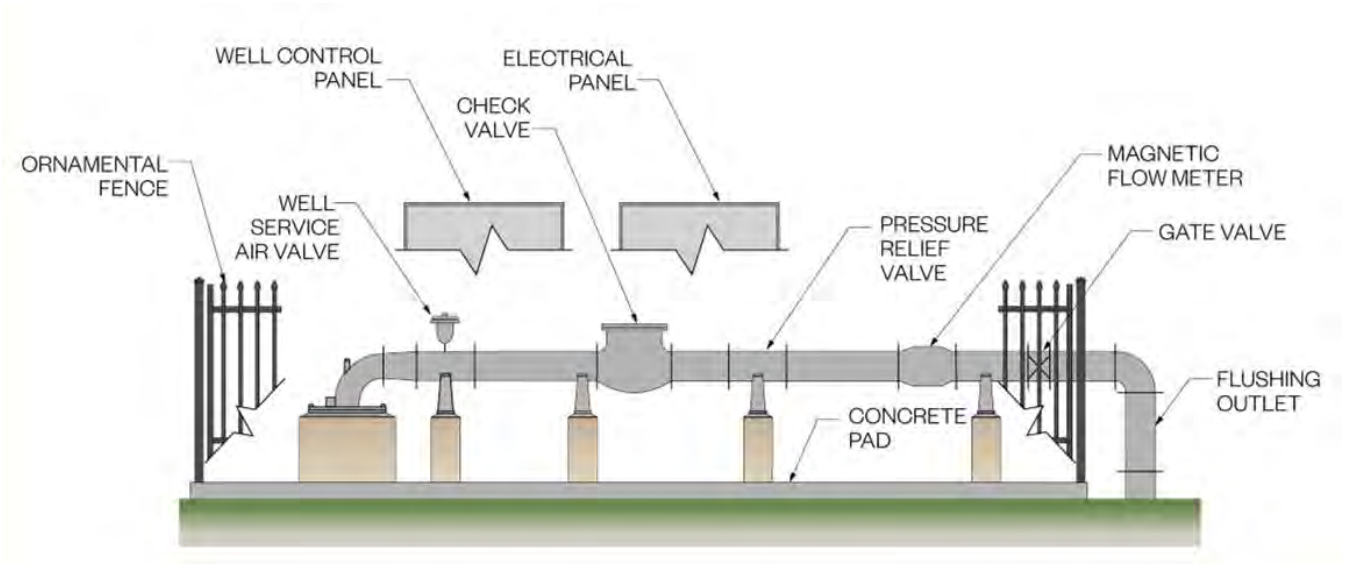


Figure 6-3: Conceptual Florida Aquifer Wellhead Cross Section

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7. Reverse Osmosis Treatment Conceptual Plan

7.1 Introduction

Reverse osmosis (RO) treatment technology is required to treat the proposed Floridan Aquifer System (FAS) water supply. This section provides conceptual design criteria for the proposed RO treatment process.

7.2 RO System Process Flow Diagram

Figure 7-1 shows a simplified process flow diagram for the proposed RO treatment process. Key elements of the RO process are as follows:

- Finished water quality goals
- Pretreatment, including:
  - Hydrocyclone Sand Separators
  - Chemical Pretreatment
  - Cartridge Filters
- Membrane System Bypass Valve
- Membrane feed pumps
- RO membrane trains
- Chemical post-treatment, including:
  - Sodium hydroxide
  - Carbon dioxide
  - Corrosion inhibitor
- Transfer pumping
- Blending with lime softened water
- Concentrate disposal
- Backup power supply

Preliminary design criteria and preliminary design decisions for these key elements are presented in the following subsections.

7.3 Site Plan

Figure 7-2 shows a conceptual site plan illustrating the location of the major RO system components on the existing WTP site. There appears to be sufficient space at the existing WTP to accommodate the proposed RO facilities. It is noted that construction at the site will be highly difficult due to the limited land availability. Furthermore, the construction will be disruptive to ongoing operation of the existing WTP. These challenges can be overcome with carefully prepared design documents.

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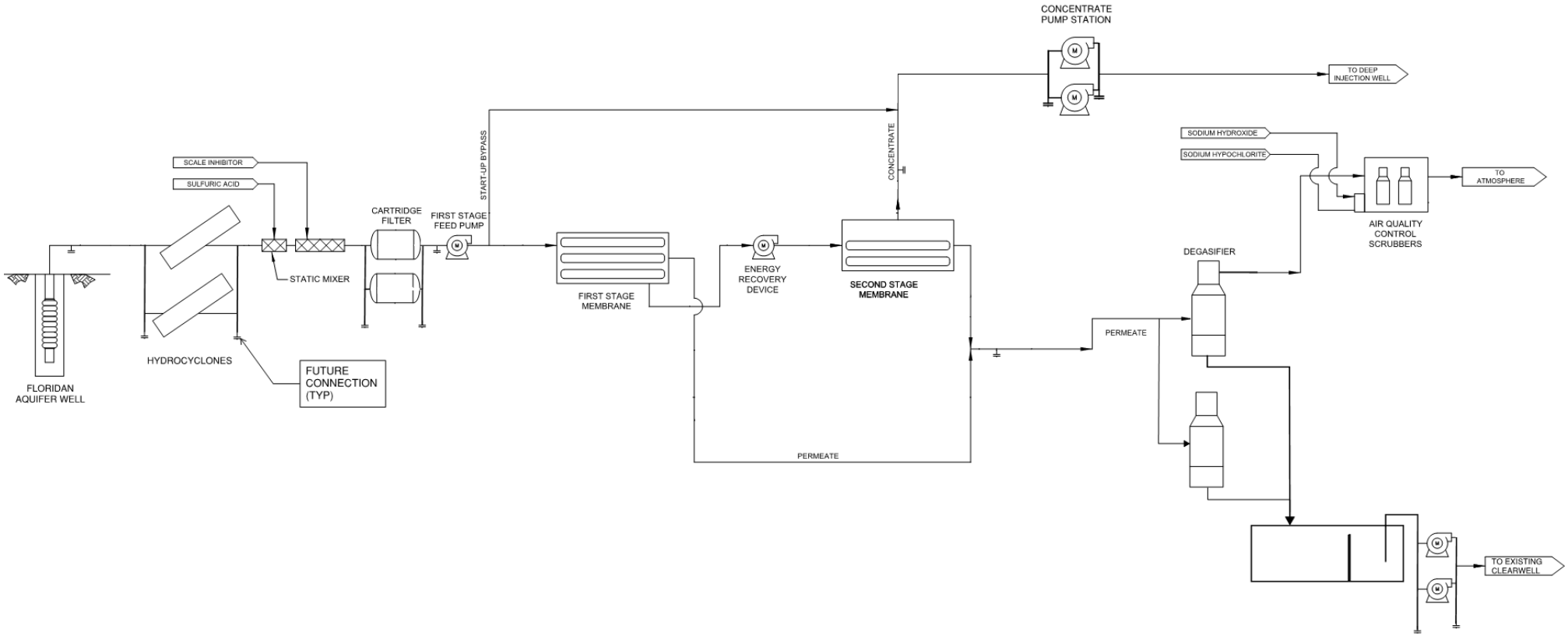


Figure 7-1: RO System Process Flow Diagram

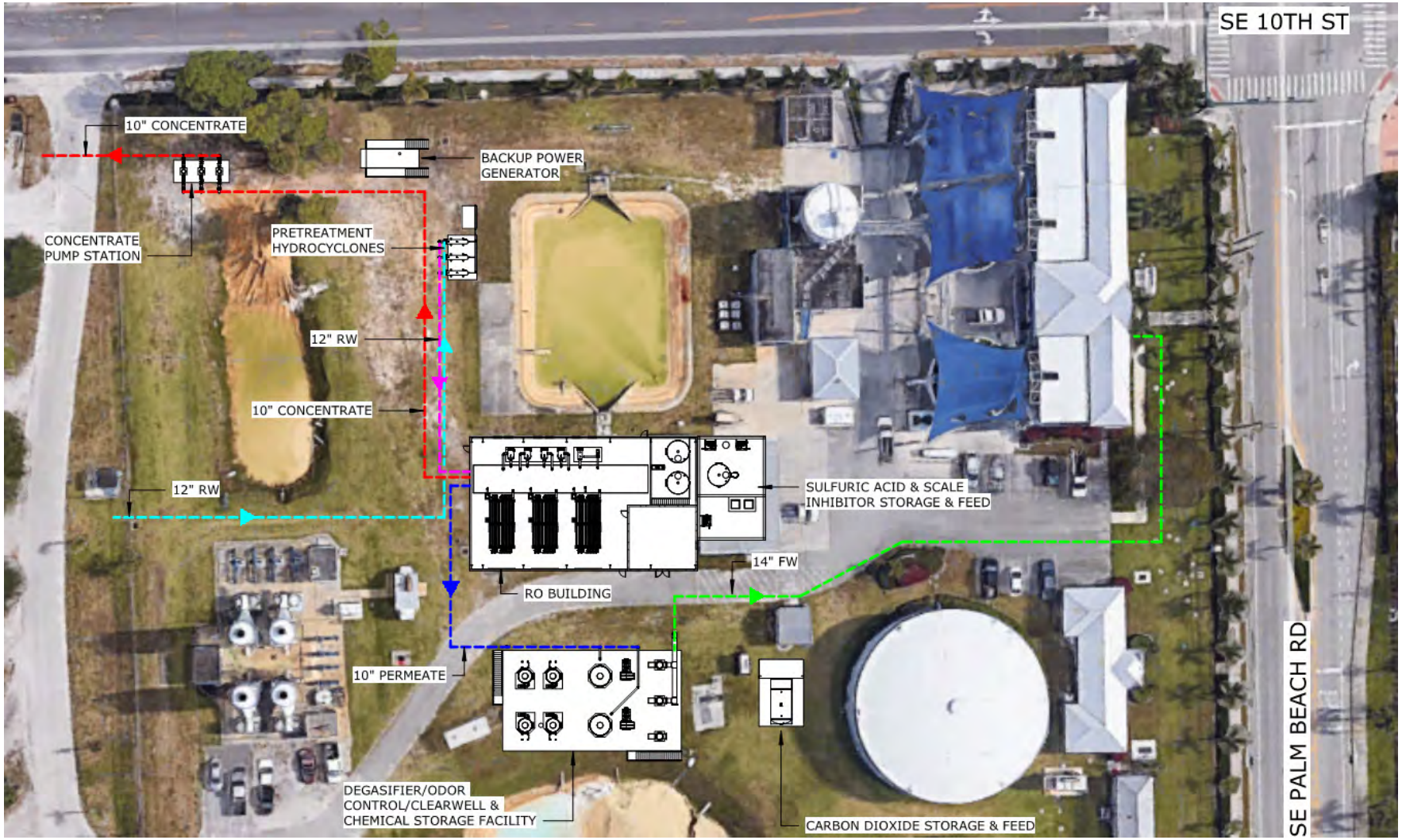


Figure 7-2: RO Conceptual Site Plan

7.4 Finished Water Quality Goals

Blended (i.e., RO permeate and lime softened water) finished water quality will meet all federal and state primary and secondary drinking water quality standards, health advisory levels, and the City of Stuart aesthetic levels for hardness. Key finished water quality goals are summarized in Table 7-1.

Table 7-1: Finished Water Quality Goals

Parameter	Units	Value
Hardness	mg/L as $CaCO_3$	60 – 80
Alkalinity	mg/L as $CaCO_3$	>50
pH	--	7.0 – 8.5
Color	CU	<6
Chlorides	mg/L	< 100
Sodium	mg/L	< 60

Note. Water quality values are based on a blend of approximately 25% RO degasified permeate and 75% lime softened water.

The final composition of the blended finished water would be defined during detailed design.

7.5 Design Criteria

7.5.1 Introduction

This section presents preliminary design criteria for the sizing of the major treatment processes.

7.5.2 Pretreatment

Prior to RO treatment, raw water needs to be pre-treated to remove particles to protect the membranes and minimize scaling and fouling potential. Pretreatment will consist of the following:

- Hydrocyclone Sand Separators
- Chemical Pretreatment
- Cartridge Filters

These pretreatment components are described below.

7.5.2.1 Hydrocyclone Sand Separators

The use of sand cyclone separators is proposed as the first barrier for protecting the RO membranes by removing sand and silt that is occasionally produced. RO membranes are excellent for the removal of dissolved solids; however, they can be easily plugged by sand or silt. Therefore, sand separators

will be installed to minimize potential fouling of the RO membrane surfaces due to particulates (i.e. sand) in the feed water. The conceptual design criteria are summarized in Table 7-1.

Table 7-1: Sand Cyclone Separators Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Number of Units	--	One (1) Duty One (1) Standby
Flow per Unit	gpm mgd	2,014 2.90

7.5.2.2 Chemical Pretreatment

Chemical pretreatment is required to control the formation of scale on the membrane surfaces, which will aid in maintaining the operational effectiveness and life of the membranes. The chemicals required for conditioning of the raw water upstream of the cartridge filters are sulfuric acid and scale inhibitor. Sulfuric acid is used to lower the feed water pH which reduces the membrane scaling potential. In addition, the addition of sulfuric acid inhibits oxidation of soluble iron.

Scale inhibitor is provided to condition the feed raw water and assist with the prevention of precipitation of sparingly soluble salts and silica. As the feed water becomes more concentrated, the saturation limit of soluble salts may be surpassed and precipitation may occur on the RO membranes (scaling). Scale formation results in increased operating costs (i.e., higher pumping pressure and increased chemical cleaning) and potentially increased salt passage. Scale inhibitors act to complex dissolved ions and increase the saturation limit of the salts. Selection of the correct scale inhibitor for a giving application is important.

The sulfuric acid system will include a bulk storage tank within a containment area while the scale inhibitor system will use totes rather than a bulk storage tank. Both systems will be equipped with day tanks, transfer pumps, metering pumps, and controls. The following general design criteria is used for sizing of chemical system components.

1. Bulk storage tanks will be sized to store a chemical volume that is contain 1.5 times a truck load or at least 30 days of average chemical usage, whichever is greater.
2. Day tanks shall provide 24-30 hours of chemical supply based upon the maximum design feed rate.
3. The firm pumping capacity of metering pumps (largest pump out of service) shall have sufficient capacity to provide the maximum design chemical dosage at the maximum flow.
4. Containment areas around the tanks will be provided. The containment areas will be sizes to contain the volume of one full bulk storage tank.

Sulfuric acid and scale inhibitor conceptual design criteria is summarized in Table 7-2 and 7-3.

Table 7-2: Sulfuric Acid Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Concentration	%	98
Specific Gravity		1.84
Solution Weight	lb/gal	15.05
Feed Location	--	Upstream of Cartridge Filters
Chemical Dose	mg/L	60 – 70 (1)
Bulk Storage Tank Number Storage Capacity Min. Storage Time	 -- gal day	 1 5,250 30
Day Tank Number Storage Time	 -- hr	 1 24 - 30
Metering Pumps Number Type Feed Rate	 -- -- gph	 1 Mechanic/Hydraulic Diaphragm 2.0 – 2.5
Materials Tanks Piping	 --	 Carbon Steel Alloy 20

Notes.
(1) Chemical dose was calculated based on a target pH of 6.0 and preliminary membrane performance projections. Chemical dose will need to be confirmed and adjusted based on specific raw water quality characteristics.

Table 7-3: Scale Inhibitor Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Concentration	%	100
Specific Gravity	--	1.00
Solution Weight	lb/gal	8.33
Feed Location	--	Upstream of Cartridge Filters
Chemical Dose	mg/L	2- 5 (1)

Table 7-3: Scale Inhibitor Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Storage Totes		
Number	--	2
Storage Capacity	gal	275
Min. Storage Time	day	30
Day Tank		
Number	--	1
Storage Time	hr	24 - 30
Metering Pumps		
Number	--	1
Type	--	Solenoid
Feed Rate	gph	0.1 – 0.3
Materials		
Tanks	--	Per manufacturer
Piping		Polyvinyl Chloride (PVC)

Notes.
(1) Selection of scale inhibitor and dose will vary based on specific raw water quality characteristics and goals.

7.5.2.3 Cartridge Filters

In addition to chemical conditioning, the conditioned feed water will be filtered by 5-micron nominal pore size cartridge filters immediately before the first stage membrane feed pumps. Cartridge filters will provide additional protection by removing fine silt particles. Cartridge filters provides low cost protection for the more expensive downstream membrane system. Phase 1 will include two cartridge filters, one duty and one standby. Each cartridge filter will be sized for the treatment capacity of the RO skid. Conceptual design criteria are summarized in Table 7-3.

Table 7-3: Cartridge Filters Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Number of Units	--	One (1) Duty One (1) Standby
Vessel Orientation	--	Horizontal
Cartridge Rating	micron	5
Cartridge Loading Rate per 10 inch		
Average Loading Rate	gpm/LF	4
Maximum Loading Rate	gpm/LF	6
Flow per Vessel (@ RO 70% recovery)	gpm mgd	992 1.43
Cartridge Housing Material	--	316 stainless steel

7.5.3 Membrane System Bypass Valve

It is common industry practice when starting a RO plant to bypass the initial flow of raw water to waste prior to starting an RO train. There are several reasons for doing this. The initial flow of raw water is usually more turbid than normal because of oxidation of constituents such as hydrogen sulfide or biological activity that may have occurred while the system was idle. Chemical pretreatment systems, especially pH adjustment, need time to stabilize chemical dosages and pH. Time may also be needed to start the required number of well pumps and accommodate well startup protocols such as initial blowoffs. Startup bypass flow is continued until parameters such as turbidity, pH, oxidation reduction potential (ORP), flow and pressure are in acceptable ranges. Target bypass flow is usually approximately the same as the feed flow to one RO train so that transition to production is relatively "bumpless".

A startup bypass valve is generally opened sufficiently to obtain the target flow, which is diverted to the concentrate disposal system. The "by-pass flow" is often greater than the maximum concentrate flow during operation. Consequently, the concentrate pipeline and other components must be sized to accommodate this short-term "by-pass flow". Alternatively, bypass flow can be directed to a detention basin. At the end of the bypass cycle, water is admitted to the initial RO train as the bypass valve slowly closes and the RO feed pump speed ramps up. It is generally not necessary to bypass water when subsequent RO trains are started. In the event of abnormal operating conditions such as power failure or raw water high pressure, the bypass valve would go to a fully open position. For this reason, it is preferable that the bypass valve actuator can open the valve without electrical power.

7.5.4 First Stage Feed Pumping

One dedicated RO feed pump will be provided per train. The purpose of the first stage feed pumps is to increase the pressure of the feed water to overcome the osmotic pressure, fouling, and total head losses in the system. The conceptual design criteria are summarized in Table 7-4.

Table 7-4: First Stage Feed Pump Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)	
		UPZ	APPZ
Number of Units	--	One dedicated per train	
Feed Flow [1]	gpm mgd	992 1.43	992 1.43
Feed Pressure	ft	430 - 480	480 - 850
Motor	HP	200	300
Pump Control	--	VFD	VFD
Materials of Construction (wetted parts)	--	316 Stainless Steel	

It is recommended that the detailed design proceed assuming that the AWS will be from the UPZ.

7.5.5 Second Stage (Interstage) Boost Pumps

Second stage or interstage boost pumps will be driven by energy recovery devices. Energy recovery devices recover pressure from the membrane concentrate and this energy is transferred to boost the driving pressure to the second stage. In addition to providing power savings, second stage booster helps balance the flux between the first and second stage while providing the necessary energy for proper second stage operation. A summary of the conceptual design criteria is summarized in Table 7-5.

Table 7-5: Second Stage Feed Pump Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)	
		UPZ	APPZ
Number of Units	--	One dedicated per train	
Feed Flow [1]	gpm mgd	495 0.71	495 0.71
Boost Pressure	ft	185	185

It is recommended that the detailed design proceed assuming that the AWS will be from the UPZ.

7.5.6 Reverse Osmosis Membrane Trains

Phase 1 construction of the RO facility will have a permeate production capacity of 1.0 mgd with provisions to accommodate future expansion to 3.0 mgd permeate. Therefore, the initial phase of the design will include one RO train with a capacity of 1.0 mgd in a two-stage membrane configuration. Table 7-6 summarizes the design criteria. Membrane trains will be provided as skid mounted units by a membrane manufacturer.

Table 7-6: RO Membrane Train Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)	
		UPZ	APPZ
Number of Units	--	One train	
Feed Flow	mgd	1.43	1.43
Permeate Flow	mgd	1.00	1.00
Concentrate Flow	mgd	0.43	0.43
Number of Stages per Train	--	2	2
Average Flux [1]	gfd	11.6	11.6
Number of Elements per Train	--	196	196
Permeate Recovery	%	70	70
Feed Pressure	psi	185 - 205	210 - 370

Table 7-6: RO Membrane Train Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)	
		UPZ	APPZ
Booster Pressure	psi	80	80
Permeate TDS	mg/L	65 – 90	50 – 380
Permeate Chlorides	mg/L	35 – 50	30 – 230

Notes.
(1) Flux and pressures vary based on raw water quality as well as total membrane available area (number of elements).

It is recommended that the RO membrane train detailed design proceed assuming that the AWS will be from the UPZ.

7.5.7 Membrane Clean-in-Place

RO membranes are susceptible to scaling and fouling during operation, which impacts membrane performance by increasing pressure loss, reduction in permeate flow, and impacts on permeate water quality. Chemical cleanings are necessary to remove foulants and scale. The major components of the clean-in-place system include:

- Chemical tanks with immersion heaters and mixers
- Cartridge filter
- Transfer pump
- Cleaning pump

7.5.8 Degasification and Odor Control

Degasification is provided to condition the permeate water by removing hydrogen sulfide, carbon dioxide, and other dissolved gasses. Since the raw water entering the plant has hydrogen sulfide concentrations that could cause odor-control issues and since the WTP is located near residential neighborhoods, the proposed system will be equipped with air quality control scrubbers. The proposed degasifier and scrubber systems will be located downstream of the membrane treatment process. Table 7-7 presents the conceptual design criteria.

Table 7-7: Degasifiers and Odor Control Scrubbers Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Degasifiers		
Number of Units	--	One (1) Duty One (1) Standby

Table 7-7: Degasifiers and Odor Control Scrubbers Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Hydrogen Sulfide Concentration	mg/L	2.0 – 2.5
Permeate Flow per Degasifier	mgd	2.0
Gas Removal Efficiency	%	95 – 98%
Tower Diameter	ft	9.0
Tower Overall Height	ft	26
Number of Blowers	--	One (1) Duty One (1) Standby
Odor Control Scrubbers		
Number of Units	--	One (1) Duty One (1) Standby
Number of Stages	--	2
Min. Removal Efficiency	%	99

7.5.9 Chemical Post-treatment

Chemical such as sodium hydroxide, carbon dioxide, and/or hydrated lime will be used to increase the pH level of the permeate water, adding alkalinity, and achieve a more stable and less corrosive finished water. These chemicals will be added to the RO permeate after the degasification process to increase the pH and alkalinity. Sizing of chemical equipment will follow the same criteria as described in section 7.3.2. Conceptual design criteria are summarized in Table 7-8.

In addition, corrosion inhibitor will be added to reduce the corrosion potential in the distribution system. This chemical will also be added after degasification and prior to blending with lime softened water. Table 7-8 provides a summary of corrosion inhibitor feed and storage system.

Table 7-8: Post-Treatment Chemicals Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Sodium Hydroxide		
Concentration	%	50
Specific Gravity	--	1.53
Solution Weight	lb/gal	12.76
Feed Location	--	Downstream of Degasification
Chemical Dose	mg/L	30 – 50 (1)
Bulk Storage Tank Number	--	1

Table 7-8: Post-Treatment Chemicals Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Storage Capacity	gal	6,000
Min. Storage Time	day	30
Day Tank		
Number	--	1
Storage Time	hr	24 - 30
Metering Pumps		
Number	--	1
Type	--	Mechanic/Hydraulic Diaphragm
Feed Rate	gph	1.2 – 2.5
Materials		
Tanks	--	Carbon Steel
Piping		CPVC
Carbon Dioxide		
Concentration	%	100
Specific Gravity [2]	--	1.52
Feed Location	--	Downstream of Degasification
Chemical Dose	mg/L	25 – 30 [1]
Bulk Storage Tank		
Number	--	1
Storage Capacity	gal	2,000
Min. Storage Time	day	30
Corrosion Inhibitor		
Concentration	%	32 - 36
Specific Gravity	--	1.03
Solution Weight	lb/gal	11.10
Feed Location	--	Downstream of Degasification
Chemical Dose	mg/L	1 - 5 [1]
Storage Totes		
Number	--	2
Storage Capacity	gal	275
Min. Storage Time	day	30
Day Tank		
Number	--	1
Storage Time	hr	24 - 30
Metering Pumps		
Number	--	1
Type	--	Mechanic/Hydraulic Diaphragm
Feed Rate	gph	0.03 – 0.16
Materials	--	
Tanks		Per manufacturer

Table 7-8: Post-Treatment Chemicals Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Piping		PVC

Notes:
(1) Chemical dose will vary based on specific raw water quality characteristics, permeate water quality and finished water quality goals.
(2) Gas specific gravity relative to air.

7.5.10 Degasifier Clearwell and Transfer Pumps

A clearwell will collect the degasified permeate. It is assumed that the RO permeate will be conveyed to the existing filter clearwell and blended with the lime softened water. Other blending options exist and will be evaluated during detailed design. If blending in the existing filter clearwell is selected during detailed design, the transfer pumps may not be needed. Hydraulic analysis during detailed design would determine if the proposed transfer pumps are needed.

7.5.11 Backup Power Supply

It is recommended that backup emergency power be supplied to the proposed RO membrane facility via a new stand-alone diesel engine generator with enclosure and belly tank located on a slab on-grade. The generator would be within a weatherproof sound attenuating enclosure with a belly tank below the enclosure. Personnel access stairs / platforms would be designed on both sides of the enclosure sub-base tank. Conceptual design criteria for the proposed diesel engine generator is summarized in Table 7-10.

Table 7-10: Emergency Diesel Engine Generator Design Criteria

Description	Criteria (Phase 1)
EPA Emission Standard	Tier 4
Estimated Maximum Running Load	500 kW / 570 kVA
Generator Size	750 kW
RPM / Voltage	1,800 rpm / 480 volts
Cooling Type	Air Cooled Radiator
Fuel Type	Diesel
Enclosure Type	Sound Attenuated

7.6 RO Treatment Facility Conceptual Layouts

7.6.1 Pretreatment – Sand Cyclone Separators

Conceptual layout of the sand cyclone separator pretreatment system is shown Figure 7-3. This layout includes the installation of two units to provide full redundancy. Space and provisions for the installation of a third unit will be provided.

7.6.2 RO Membrane Building

Figures 7-4A and B shows the conceptual layout of the RO membrane building. The building will be a pre-engineered metal building housing the RO trains, cartridge filters, feed pumps, clean-in-place system, and electrical room. The building footprint is sized to allow phased expansion to three membrane trains (build-out condition), additional cartridge filters, and feed pumps.

7.6.3 Post-Treatment Facilities

The degasifier structure will be sized to accommodate the installation of two degasifiers and associated odor control scrubbers to provide full system redundancy. In addition, two vertical turbine transfer pumps will be installed on this structure with provisions for the addition of a future pump to meet build out conditions. The structure will be an elevated structure to allow the clearwell to be directly under the degasifier units. Additional space under this elevated structure will be used to house post-treatment chemicals. Figures 7-5A, B, C and D show the conceptual layout of the post-treatment structure.

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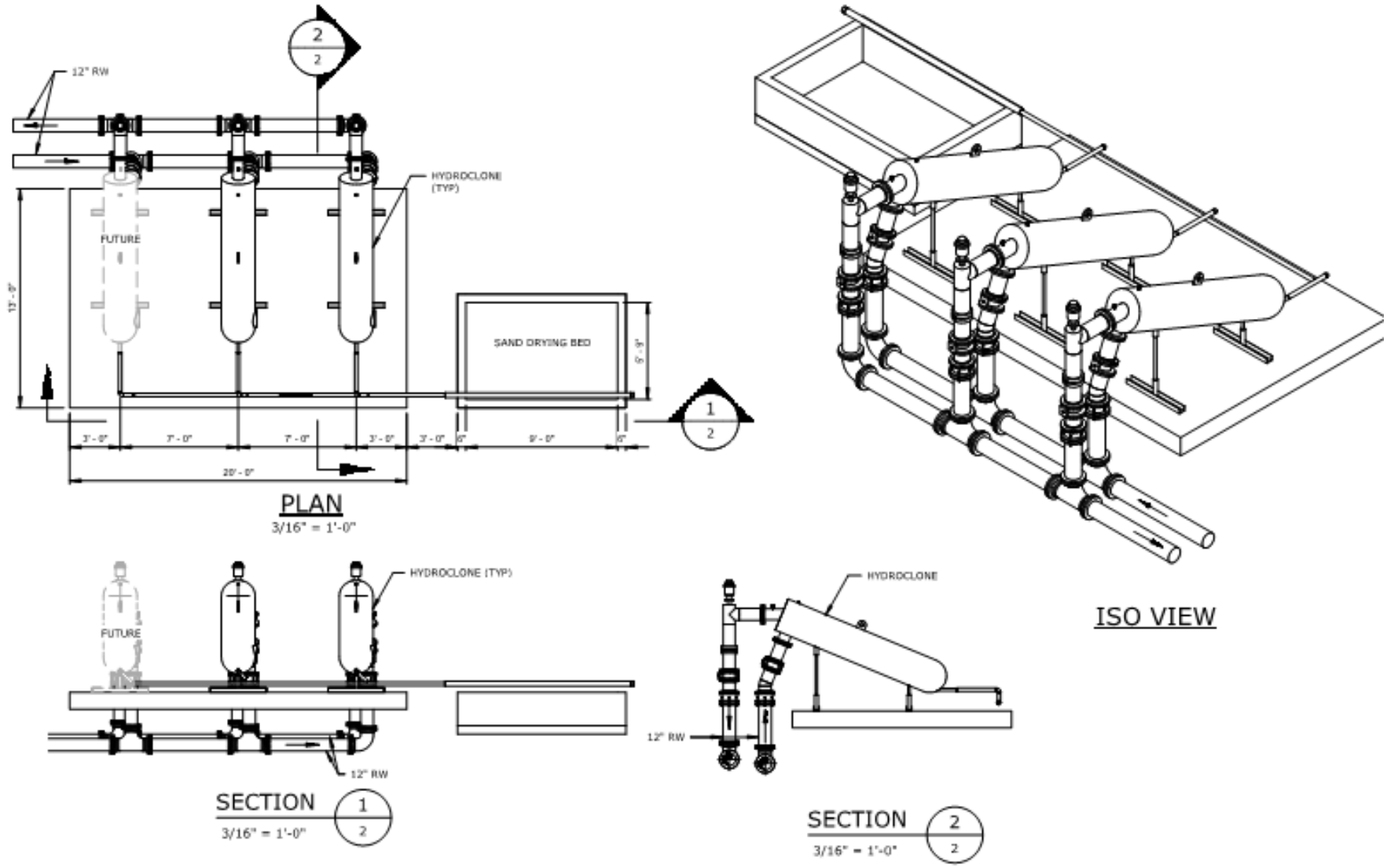


Figure 7-3: Sand Cyclone Separators Conceptual Illustration

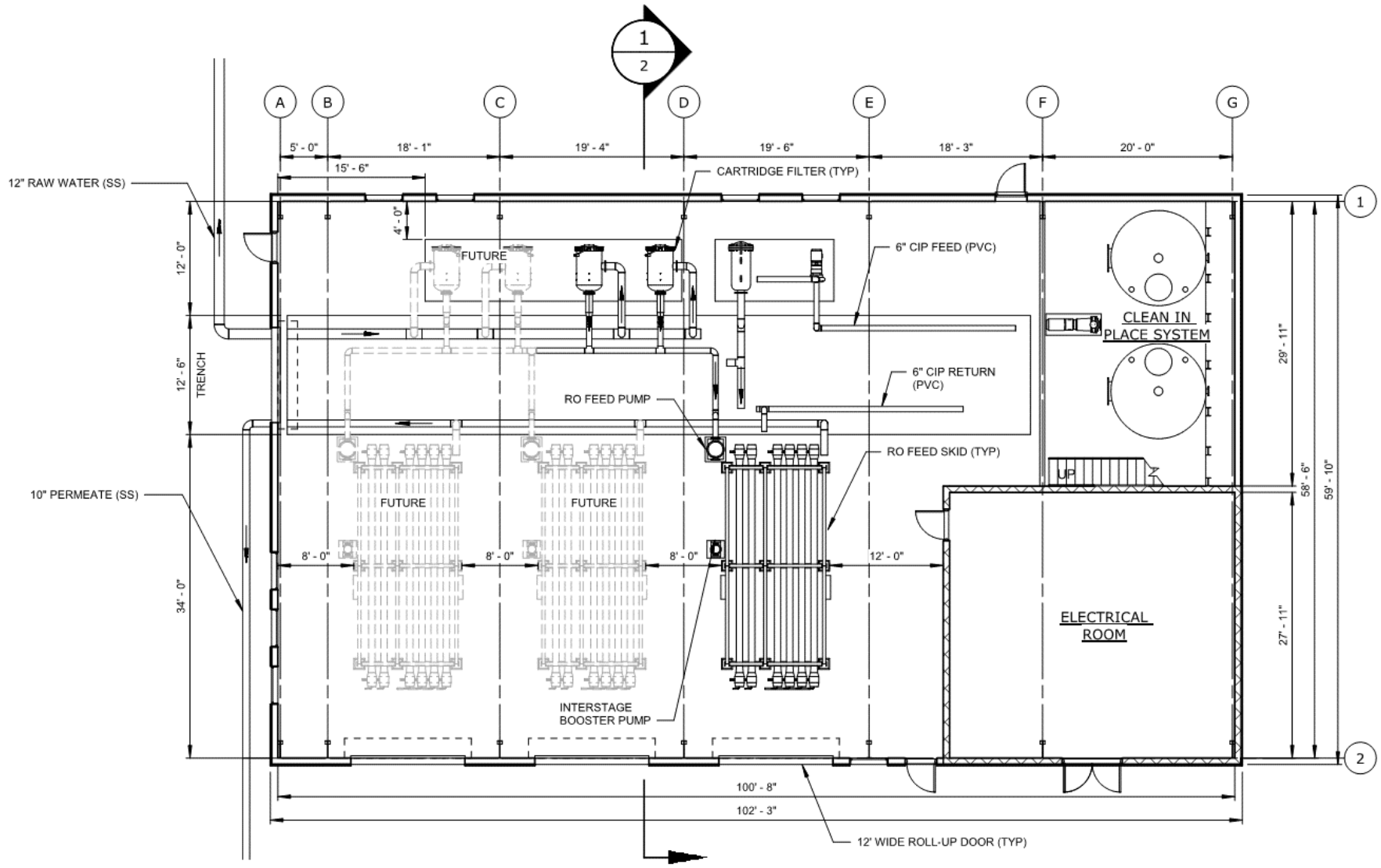


Figure 7-4A: Membrane Building Conceptual Plan



Figure 7-4B: Membrane Building Conceptual Exterior View

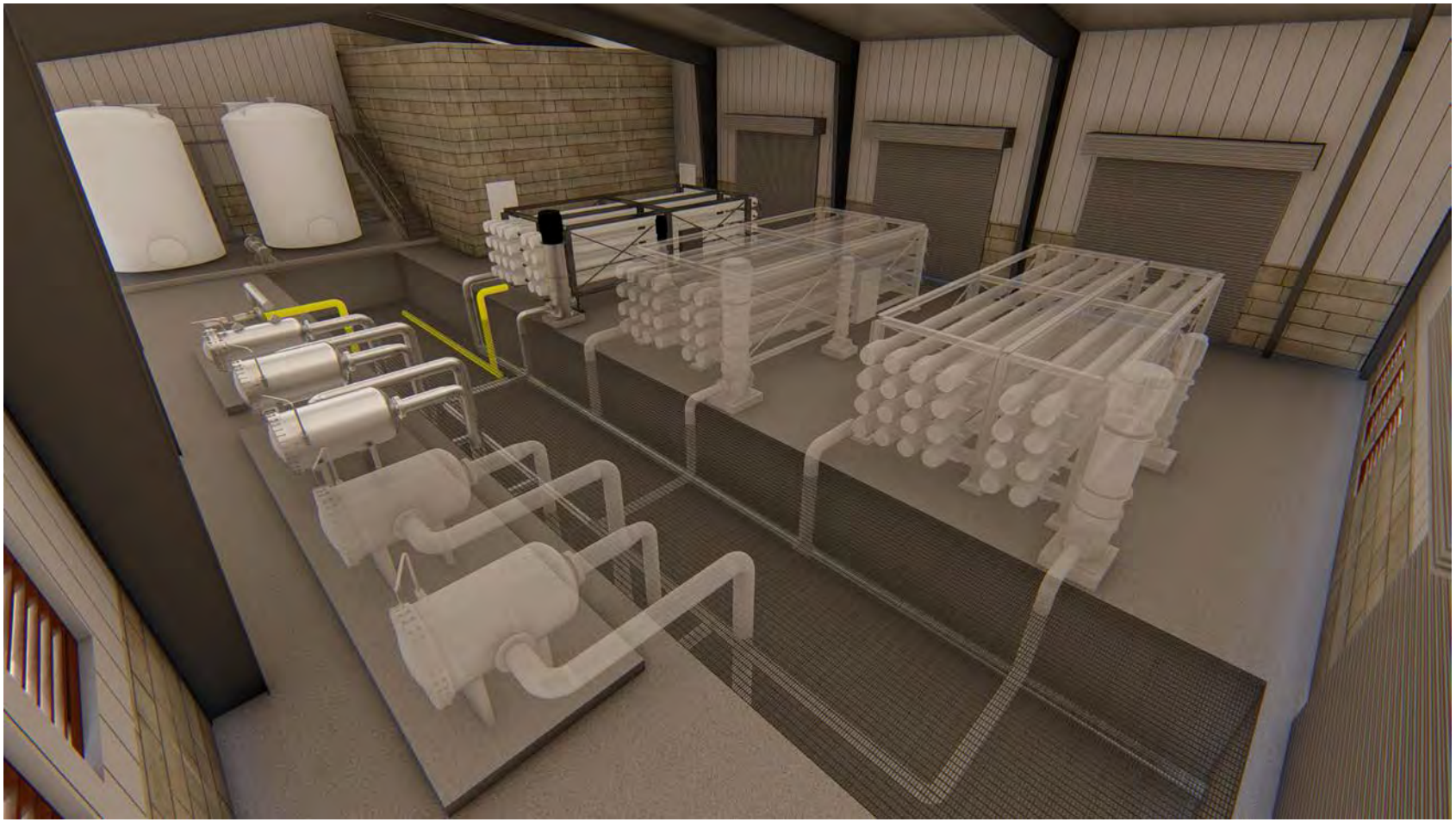


Figure 7-4B: Membrane Building Conceptual Interior View

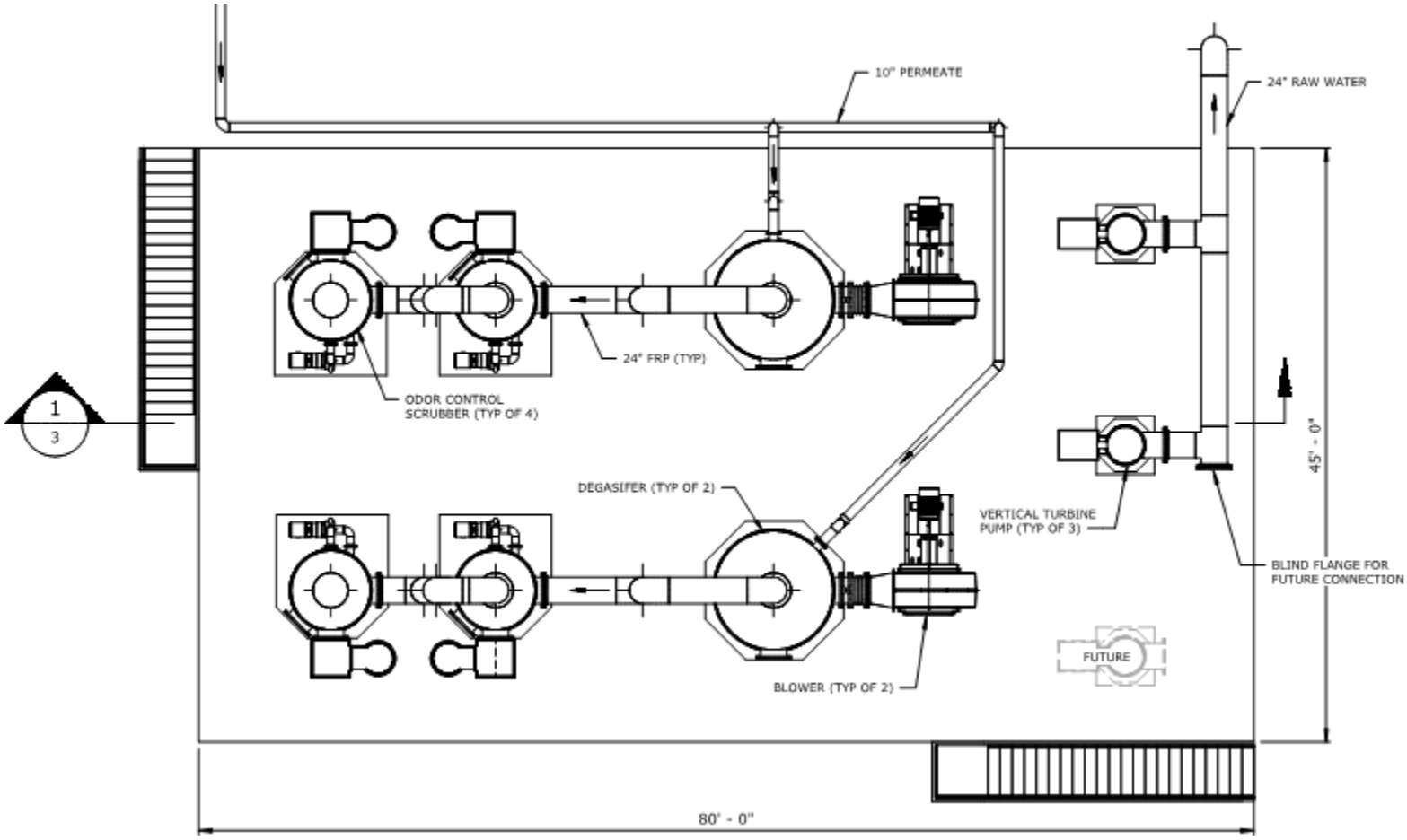


Figure 7-5A: Post-treatment Facilities Conceptual Layout – Upper Plan

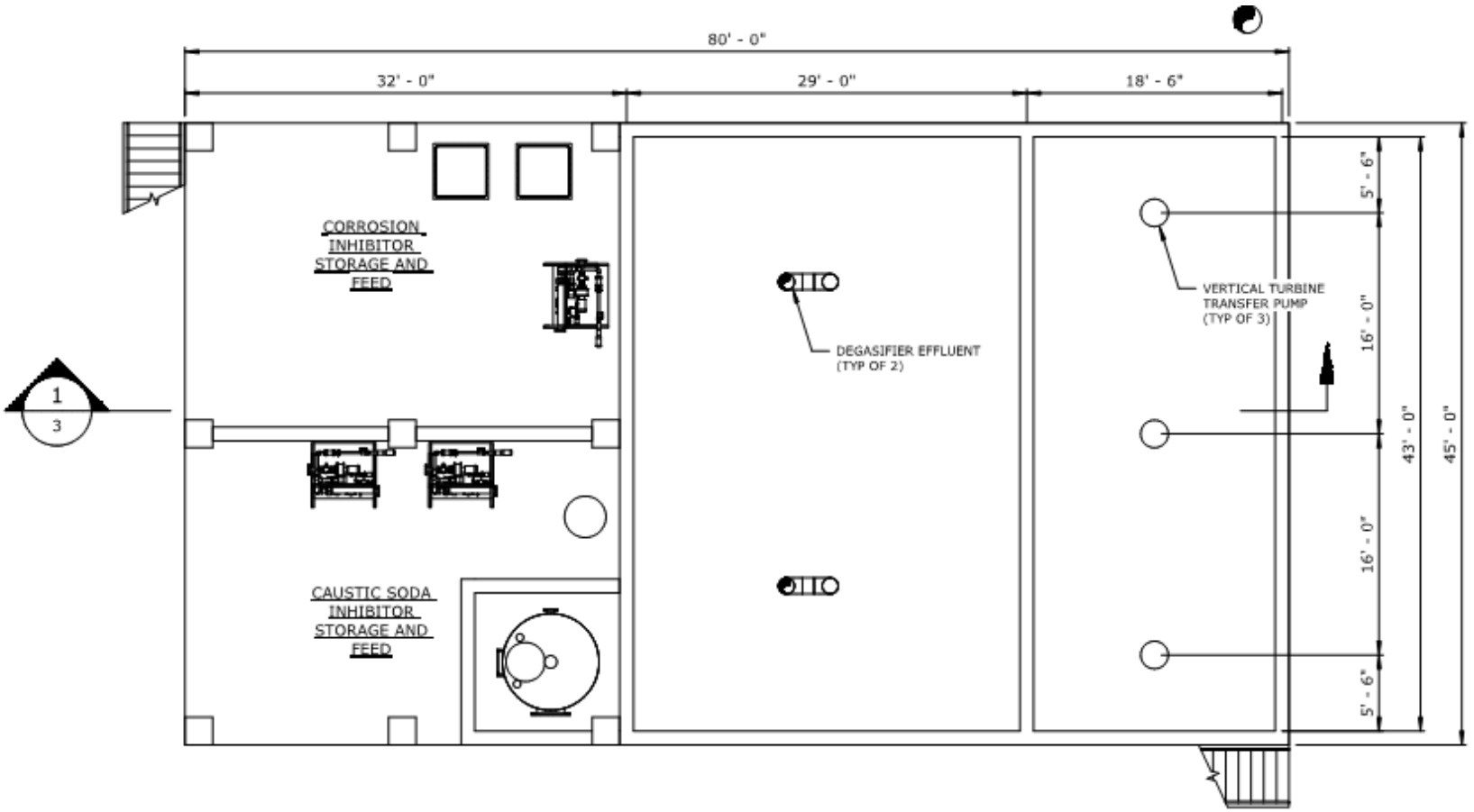


Figure 7-5B: Post-treatment Facilities Conceptual Layout – Lower Plan

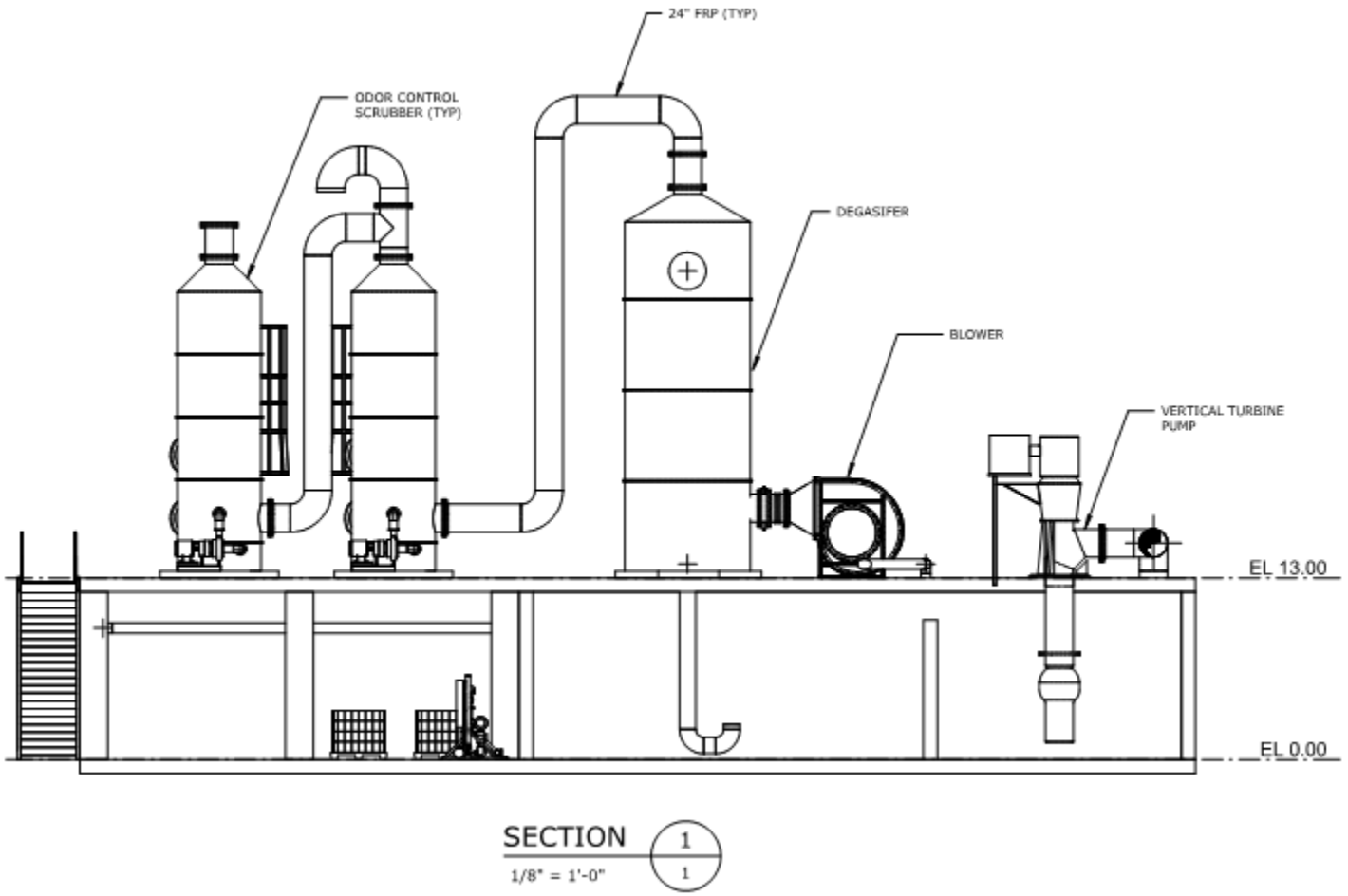


Figure 7-5C: Post-treatment Facilities Conceptual Layout – Section

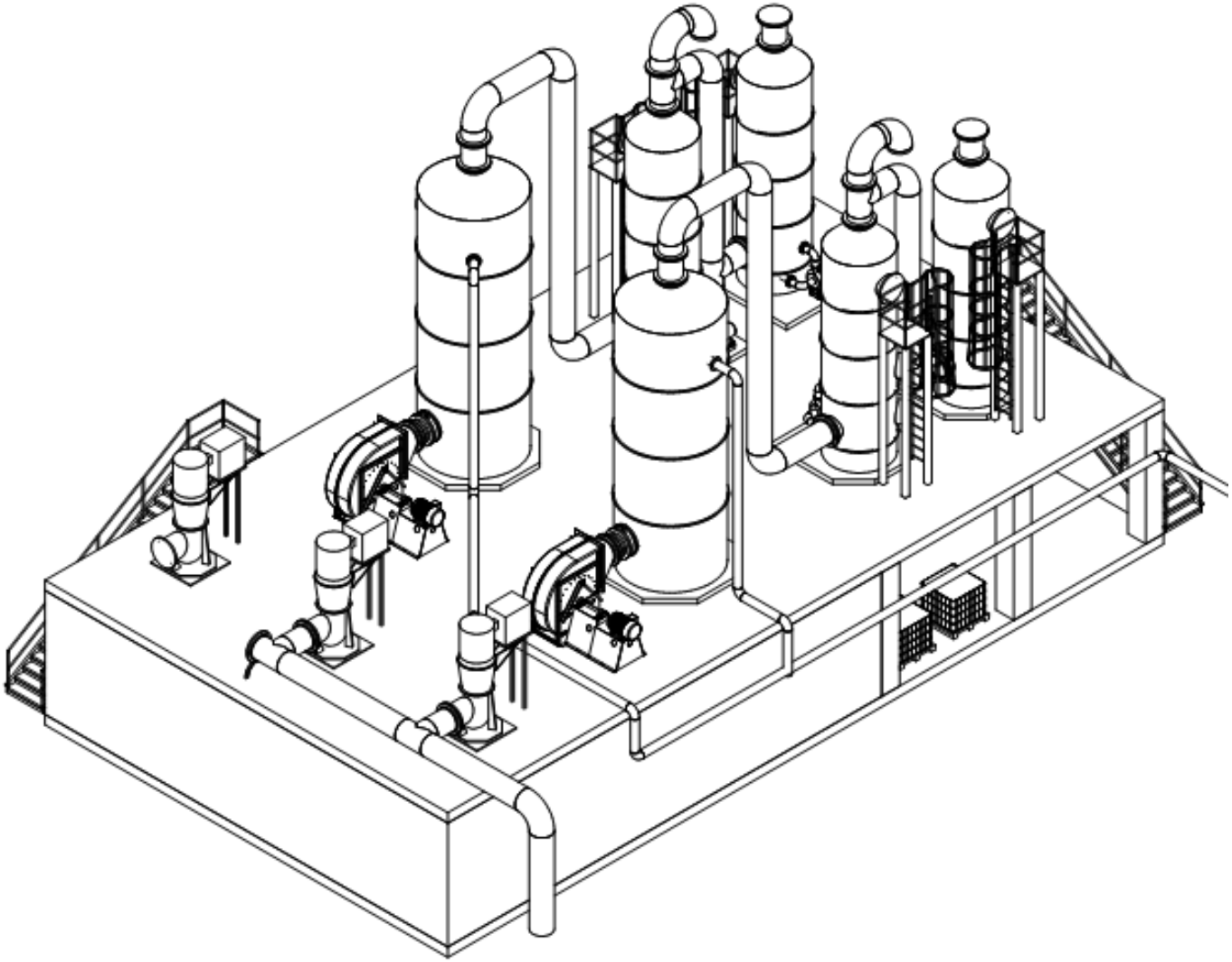


Figure 7-5D: Post-treatment Facilities Conceptual Layout – Isometric

7.6.4 Chemical Feed and Storage Facilities

The proposed RO system requires storage of the following chemicals:

1. Sulfuric Acid
2. Scale Inhibitor
3. Sodium Hydroxide
4. Corrosion Inhibitor
5. Carbon Dioxide

Figure 7-6 illustrates the proposed sulfuric acid and scale inhibitor storage and feed building. The sodium hydroxide and corrosion inhibitor will be stored in the space available under the odor control scrubbers (post-treatment elevated structure), as shown in Figures 7-5 B. Carbon dioxide storage and feed equipment is illustrated in Figure 7-7.

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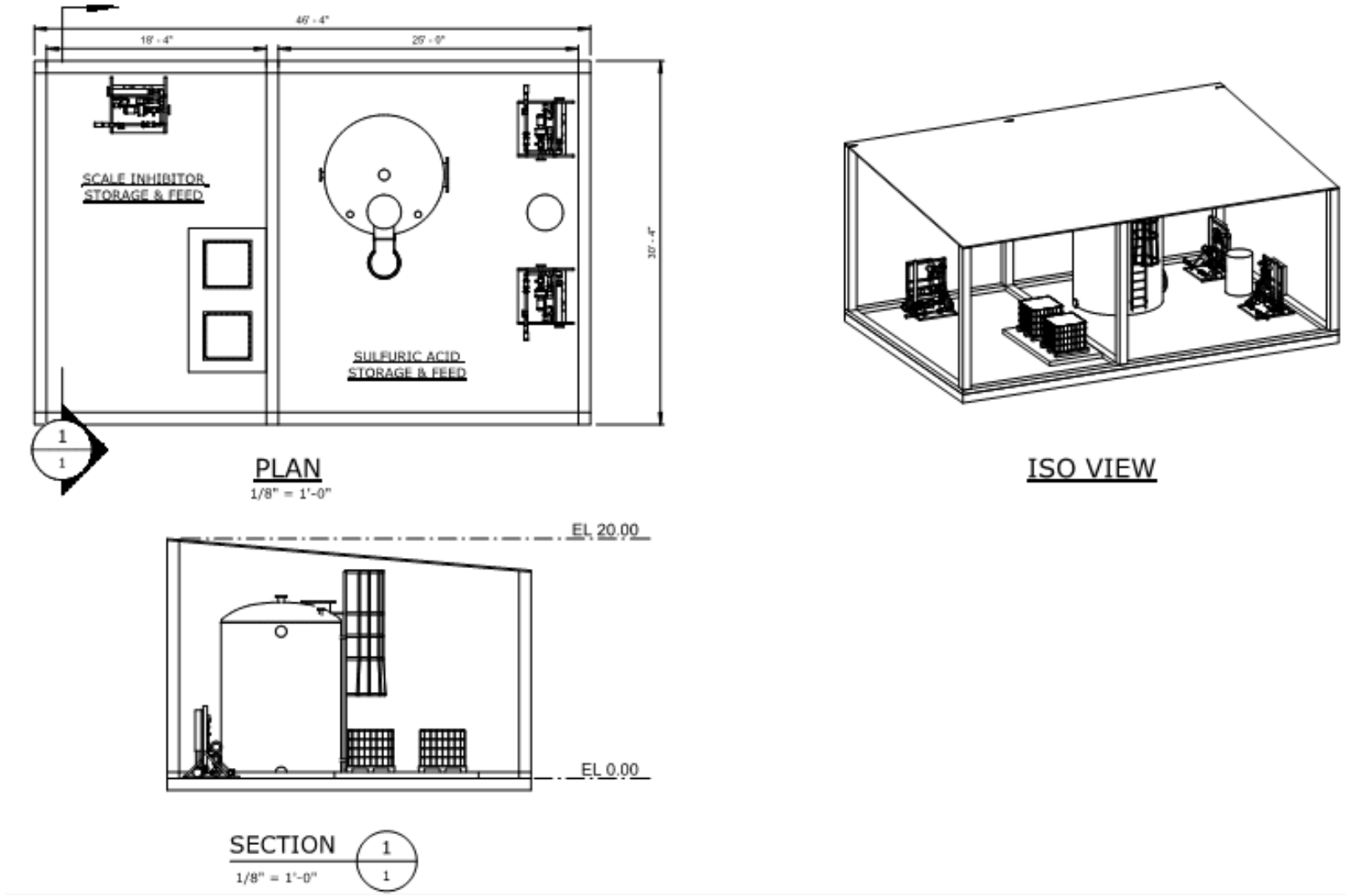


Figure 7-6: Pretreatment Chemical Building Conceptual Layout

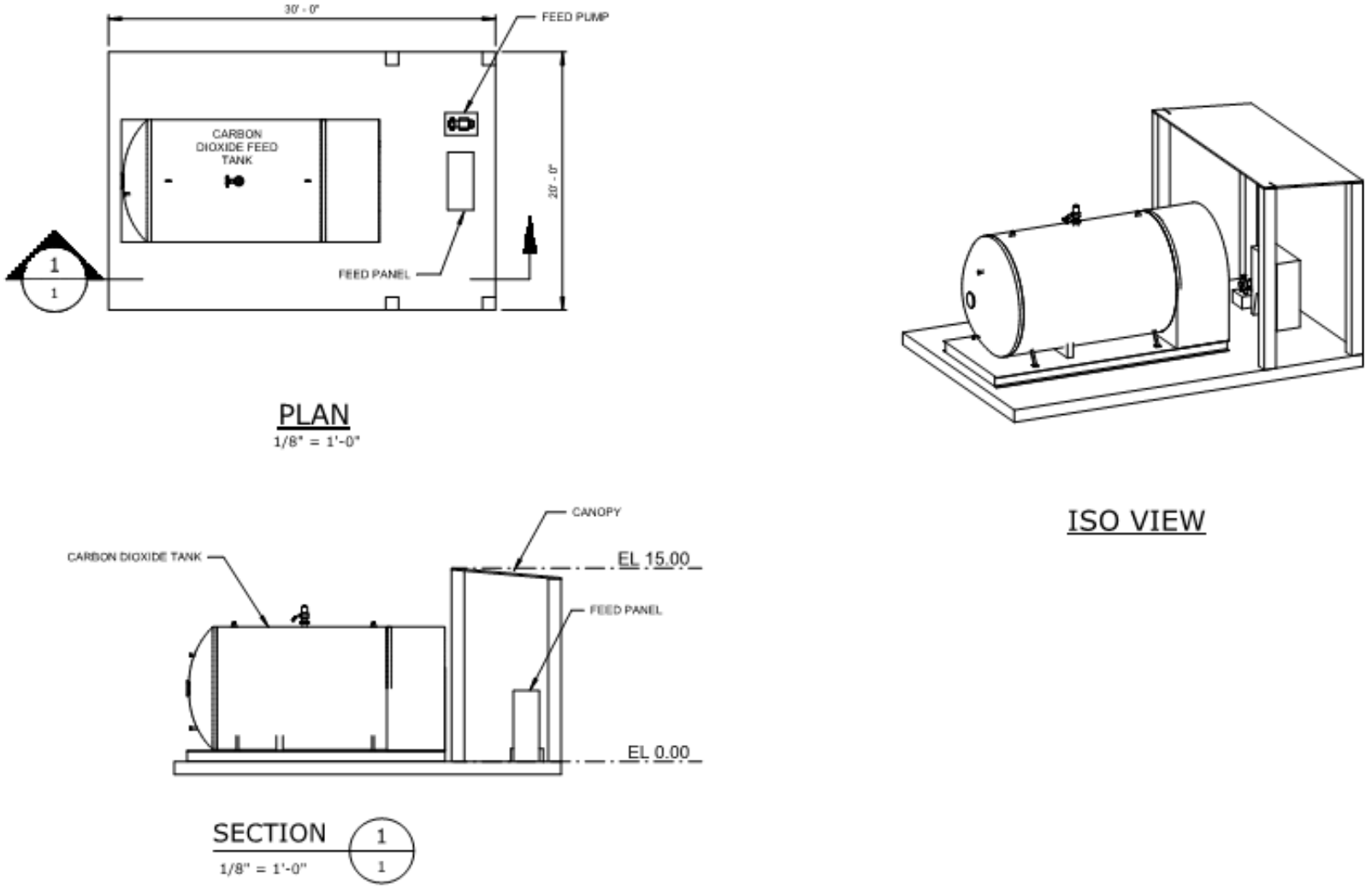


Figure 7-7: Carbon Dioxide Conceptual Layout

7.6.5 Backup Power Supply

The proposed backup emergency power consists of a stand-alone diesel engine generator with enclosure and belly tank located on a slab on-grade. Typical layout of a backup power supply is shown in Figure 7-8.

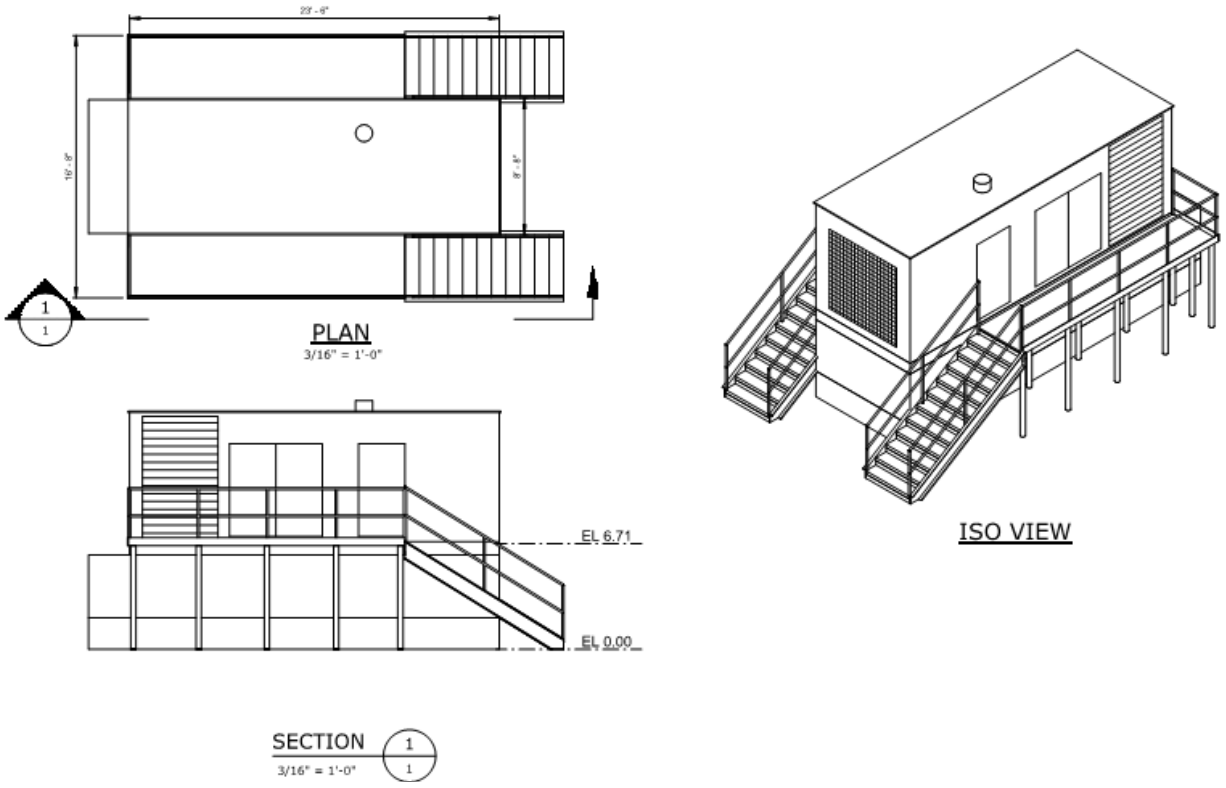


Figure 7-8: Backup Power Generator Typical Layout

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8. Concentrate Disposal

8.1 Introduction

Concentrate – the by-product of the reverse osmosis (RO) treatment process – is estimated to be produced at 0.43 mgd for each proposed RO skid in operation based on a 70 percent recovery rate. Three 1.0 mgd finished water capacity RO skids are planned through a three-phase build-out. Hence, up to 1.3 mgd of concentrate will be generated if all three phases are implemented.

The concentrate is a brine solution that must be disposed of safely to protect the environment. This section evaluates the feasibility of the following concentrate disposal methods:

- Alternative 1: Discharge to Surface Water
- Alternative 2: Mix Concentrate with Water Reclamation Facility Influent
- Alternative 3: Disposal via Existing Water Reclamation Facility IW-2
- Alternative 4: Convert Existing Water Reclamation Facility IW-2 to Tubing and Packer Well
- Alternative 5: New Tubing and Packer Injection Wells at the WTP

The following subsections document the evaluation.

8.2 Alternative 1: Discharge to Surface Water

Disposal of membrane concentrate to a surface water would require permitting through both state and county agencies. Although the Florida Administrative Code (FAC) classifies concentrate as a water treatment by-product, it is regulated as an industrial discharge. Therefore, such a discharge would undergo a rigorous permitting review. As defined by the FAC, the discharge of concentrate to a surface water would have to comply with the state antidegradation policy, meet receiving water quality standards, and not cause or contribute to the impairment of the water body. Items also addressed include toxicity and ionic imbalance of the receiving water resulting from the concentrate discharge.

Permitting a concentrate discharge to a surface water would likely require lengthy and costly studies and result in an uncertain chance of success. Hence, Alternative 1 is not recommended.

8.3 Alternative 2: Mix Concentrate with Water Reclamation Facility Influent

The City's water reclamation facility (WRF) operates under Florida Department of Environmental Protection (FDEP) permit number FLA041459 and has a permitted treatment capacity of 4 mgd annual average daily flow. Based on discussions with plant staff, this facility has an average daily flow of approximately 1.63 mgd. This section assesses the efficacy of mixing the RO concentrate with the WRF influent at the head of the WRF.

The RO membrane concentrate will be generated at a flow rate of 1.43 mgd assuming a 70% recovery. The predicted concentrate characteristics are summarized in Table 8-1. For this evaluation, concentrate characterization was based on the use of the APPZ. It also assumed that the constituents listed below will comprise most of the TDS and will have the most significant impact on operations at the City's WRF.

Table 8-1: Estimated RO Concentrate Characteristics (Year 0)

Parameter	Units	Value
Potassium (K^+)	mg/L	110
Sodium (Na^+)	mg/L	3,170
Chloride (Cl^-)	mg/L	6,700
Calcium (Ca^{+2})	mg/L	500
Magnesium (Mg^{+2})	mg/L	615
Silica (SiO_2)	mg/L	25
Sulfate ($SO4^{-2}$)	mg/L	1,200
$HCO3^-$	mg/L	210
TDS	mg/L	12,700

Table 8-2 estimates the characteristics of blended WRF effluent and RO concentrate. It is assumed that the inorganic components from the RO membrane concentrate will pass through the WRF. Data on WRF influent characteristics are not available for the parameters in Table 8-2. Hence, this analysis assumed that the wastewater influent concentrations for these constituents are not of significance. Since these constituents will pass through the system, the table below summarizes the estimated concentrations in the blended effluent flow based on the average daily WRF influent flows.

Table 8-2: Blended WRF Effluent Characteristics

Parameter	Units	WRF Average Daily Flow + RO Concentrate (mgd)
Potassium (K^+)	mg/L	23
Sodium (Na^+)	mg/L	668
Chloride (Cl^-)	mg/L	1,412
Calcium (Ca^{+2})	mg/L	105
Magnesium (Mg^{+2})	mg/L	130
Silica (SiO_2)	mg/L	5
Sulfate ($SO4^{-2}$)	mg/L	253
$HCO3^-$	mg/L	44
TDS	mg/L	2,677

A general literature review was performed to identify some of the potential effects of blending RO concentrate at the WRF. These effects include the following:

- *Settleability* - Several studies have reported that settleability may be affected by high monovalent ion (i.e., sodium concentration). The exchange of divalent cations for monovalent cations (i.e. Na+, K+) in the floc may affect settling of the floc by weakening biopolymer bonds and causing the release of soluble proteins. This phenomenon may also affect the dewaterability of the waste activated sludge (WAS). It is possible that some settling effects may be observed from the secondary clarifiers during minimum flows. It is recommended that nitrification, effluent BOD and secondary effluent TSS concentrations be monitored regularly for signs of plant upset. If necessary, it should be considered to take the RO skid out of service at night during the plants lowest flows to avoid the higher transient concentrations that may be observed at night.

- *Effects on Biological Process* - Typically only very high chloride concentrations would cause biological inhibition. For example, chloride concentrations greater than 8,000 mg/L would typically inhibit nitrification (Water Research Foundation, 2008). Reduction in BOD degradation is not expected below 5,000 mg/L. One study showed, however, a 25% reduction in nitrification rate at a NaCl concentration of 3,000 mg/L in a batch assay (Campos, Lema, & Mosquera-Corral, 2002). The aeration basins should be monitored for signs of toxicity.

- *Precipitation Potential* - Precipitation of calcium carbonate or other compounds may increase the solids generated within the facility. The conditions could be present where precipitation may occur prior to mixing with the wastewater flow. It is recommended that the pipeline pressure be monitored for signs of clogging with precipitate. Additional analysis is recommended to determine precipitation potential within the treatment processes.

- *Structural and Corrosion Concerns* - In addition to the potential effects on the biological processes within the plant, other impacts to the plant infrastructure are possible including corrosion of concrete and metal due to sulfates, sulfide or chloride. Concentrate from RO treatment of groundwater may include hydrogen sulfide which may increase corrosion of concrete and other components.

- *Effluent TDS* - Although deep wells do not typically have a TDS limit, FDEP may implement a limit and require conductivity monitoring. For example, the Loxahatchee River District (LRD) currently blends nanofiltration concentrate from the Town of Jupiter Water Plant with its wastewater effluent before it is discharged down a deep injection well. LRD is required to meet a daily average TDS value of 1,000 mg/L and is required to continuously monitor conductivity. Based on the estimated values presented in Table 8-2, estimated effluent TDS concentration exceed the 1,000 mg/L limit established for LRD.

Determination of the feasibility of blending RO concentrate at the WRF requires detailed study along with meeting with the FDEP to assess the likelihood of permitting this option. Alternative 2 is not currently recommended.

8.4 Alternative 3: Disposal via Existing Water Reclamation Facility IW-2

The standard method of disposal is via a Class I injection well. Chapter 62-528 (titled "Underground Injection Control") of the Florida Administrative Code (FAC) governs the construction and permitting of injection wells in the State of Florida. Class I standards require that injection wells used for disposal of concentrate be constructed as an "industrial" type that includes a tubing and packer type systems. Chapter 62-528 also requires that a dual-zone monitor well be constructed within 150 feet of an injection well.

The City's Water Reclamation Facility (WRF) includes two Class I injection wells, IW-1 and IW-2 that are operated under permit number 0043090-128-UO. IW-2 is the primary injection well and IW-1 serves as a backup. The current operating permit expires on September 23, 2018. Table 8-3 present data on the existing injection wells.

Table 8-3: Existing Injection Wells

Well No	Class	Longitude	Latitude	Total Well Depth (ft bls)	Total Casing Depth (ft bls)	Construction Completion Date	Inner Casing Diameter (inch)	Max. Fluid Velocity (fps) (1)	Rated Capacity (mgd)
IW-1	I	-80.24981218	27.19593476	3,305	2,670	1974	10.4	10	3.5
IW-2	I	-80.24836607	27.19640282	3,252	2,887	1997	23.0	10	10

Note.

(1) Permit allows for 12 fps during planned testing, maintenance, or emergency conditions.

IW-1 and IW-2 are permitted for the discharge of only secondary treated effluent from the WRF, purge from the on-site monitoring wells, and potentially groundwater produced during redevelopment. Hence, the existing injection wells are not feasible for concentrate disposal under their current configuration. The limited capacity of IW-1 likely makes reconfiguration to allow disposal of concentrate not feasible. The efficacy of reconfiguring IW-2 for concentrate disposal is assessed in the next subsection.

8.5 Alternative 4: Convert Existing Water Reclamation Facility IW-2 to Tubing and Packer Well

8.5.1 Introduction

Converting the existing IW-2 at the WRF to a tubing and packer well would allow it to receive RO concentrate under FDEP regulations. Converting IW-2 to a tubing and packer well will downsize the inner casing from an inside diameter of 23.0 inches to 14.5 inches. Key requirements of this alternative are as follows:

- Capacity of IW-2 After Conversion to a Tubing and Packer Well
- Concentrate Disposal Pipeline
- Concentrate Pump Station

The following subsections summarize the above requirements.

8.5.2 Capacity of IW-2 After Conversion to a Tubing and Packer Well is Acceptable

The current capacity of IW-2 at a velocity of 8.0 fps is 15.0 mgd. Reducing the inside diameter to 14.5 inches reduces IW-2 capacity to 5.9 mgd. Figure 8-1 summarizes the capacity of IW-2 versus the total estimated flow to be disposed – including WRF effluent plus the RO bypass flow of 1.43 mgd – through the year 2040. IW-2 would have sufficient capacity to dispose of the WRF effluent and the RO concentrate following conversion to a tubing and packer well. Hence, Alternative 4 is feasible.

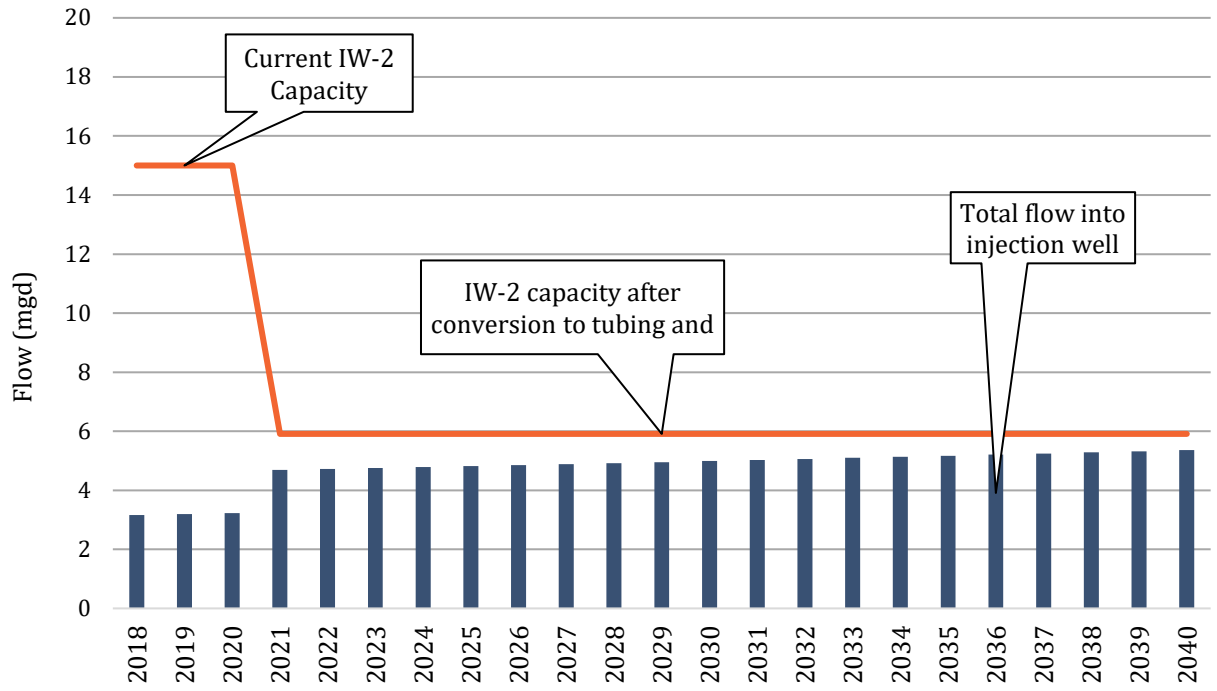


Figure 8-1: Estimated Flows to be Disposed in IW-2

8.5.3 Concentrate Pipeline

A 10-inch pipeline is required for conveying the RO concentrate from the RO facility to the existing WRF for disposal via IW-2. Figure 8-2 illustrates a preliminary pipe route for the proposed concentrate pipeline. Additionally, the concentrate pipeline would convey the raw water from the RO facility during bypass-startup.

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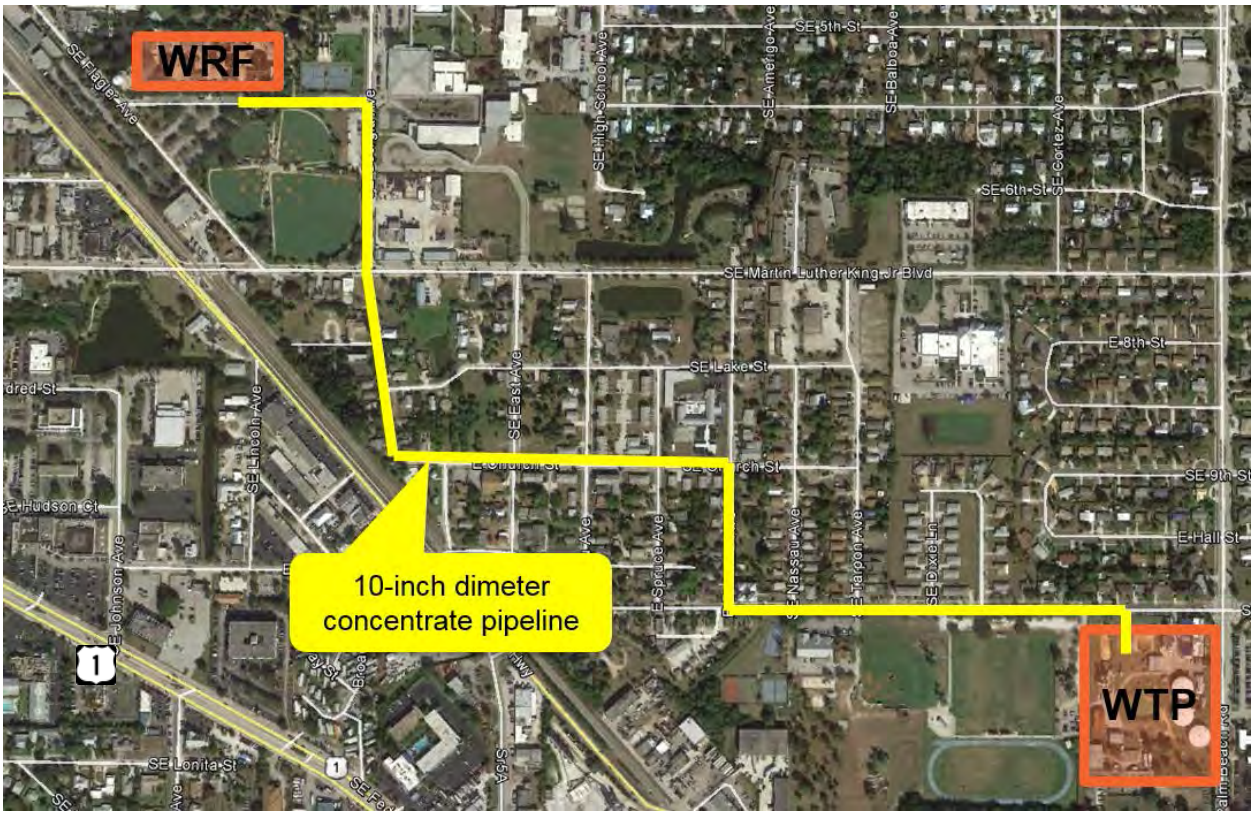


Figure 8-2: Concentrate Pipeline Conceptual Routing Plan

When conveying concentrate, the pipeline is considered in "normal operations" mode. When conveying raw water during startup, the pipeline is considered in "bypass-startup" mode. Target bypass flow is usually approximately the same as the feed flow to one RO train. Table 8-4 summarizes the flow rate and velocity in the concentrate pipeline during these two operating modes.

Table 8-4: Flow Rate and Velocity in Concentrate Pipeline

RO Phase	Normal Operations		Bypass-Startup	
	Flow Rate (mgd)	Velocity (fps)	Flow Rate (mgd)	Velocity (fps)
Phase 1	0.43	1.22	1.43	4.05
Phase 2	0.86	2.43	1.43	4.05
Phase 3	1.29	3.65	1.43	4.05

The pipeline may require a surge suppression system such as a hydropneumatic tank to protect it from water hammer. Analysis during detailed design will define the need for surge protection of the concentrate pipeline. It is recommended that the concentrate pipeline be made from 316 stainless steel aboveground piping and HDPE for underground piping.

It is desirable to have the proposed concentrate pipeline operational prior to the start of testing of the FAS well. The concentrate pipeline may be a means for disposal of water produced during FAS well testing. It

is recommended that FDEP be contacted during detailed design to determine if it would permit the pipeline and IW-2 for disposal of FAS test water.

8.5.4 Concentrate Pump Station

A concentrate pump station may be needed at the WTP to convey the concentrate to the WRF. Table 8-5 summarizes the conceptual design criteria for the concentrate pump station.

Table 8-5: Concentrate Pump Station Conceptual Design Criteria

Description	Unit	Criteria (Phase 1)
Number of Pumps	--	One (1) Duty One (1) Standby
Flow (@ 70% Recovery)	gpm mgd	600 0.86
Motor	HP	20
Motor Control	--	VFD

Figure 8-3 shows the conceptual layout of the concentrate pump station. Phase 1 will include two pumps to provide full redundancy. Space for a third pump and provisions for future expansion will be included.

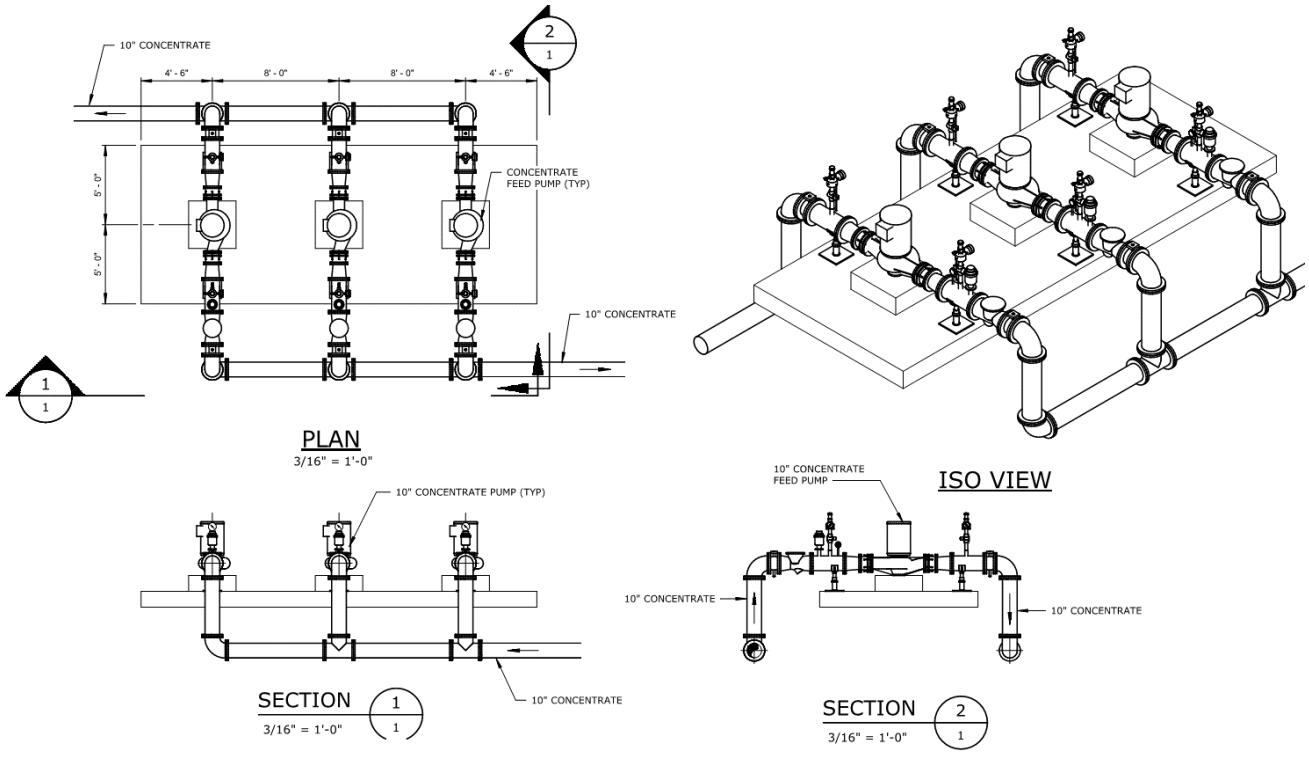


Figure 8-3: Concentrate Pump Station Conceptual Layout

8.6 Alternative 5: New Tubing and Packer Injection Wells at the WTP

8.6.1 Injection Well Site Plan

Alternative 5 would include constructed two new tubing and packer injection wells, along with a dual zone monitor well, at adjacent property to the west side of the WTP. Figure 8-4 illustrates a preliminary site plan that lays out the drill rigs, drill string loading areas, staging, motor control centers, mud system, temporary electrical substation and construction trailers.

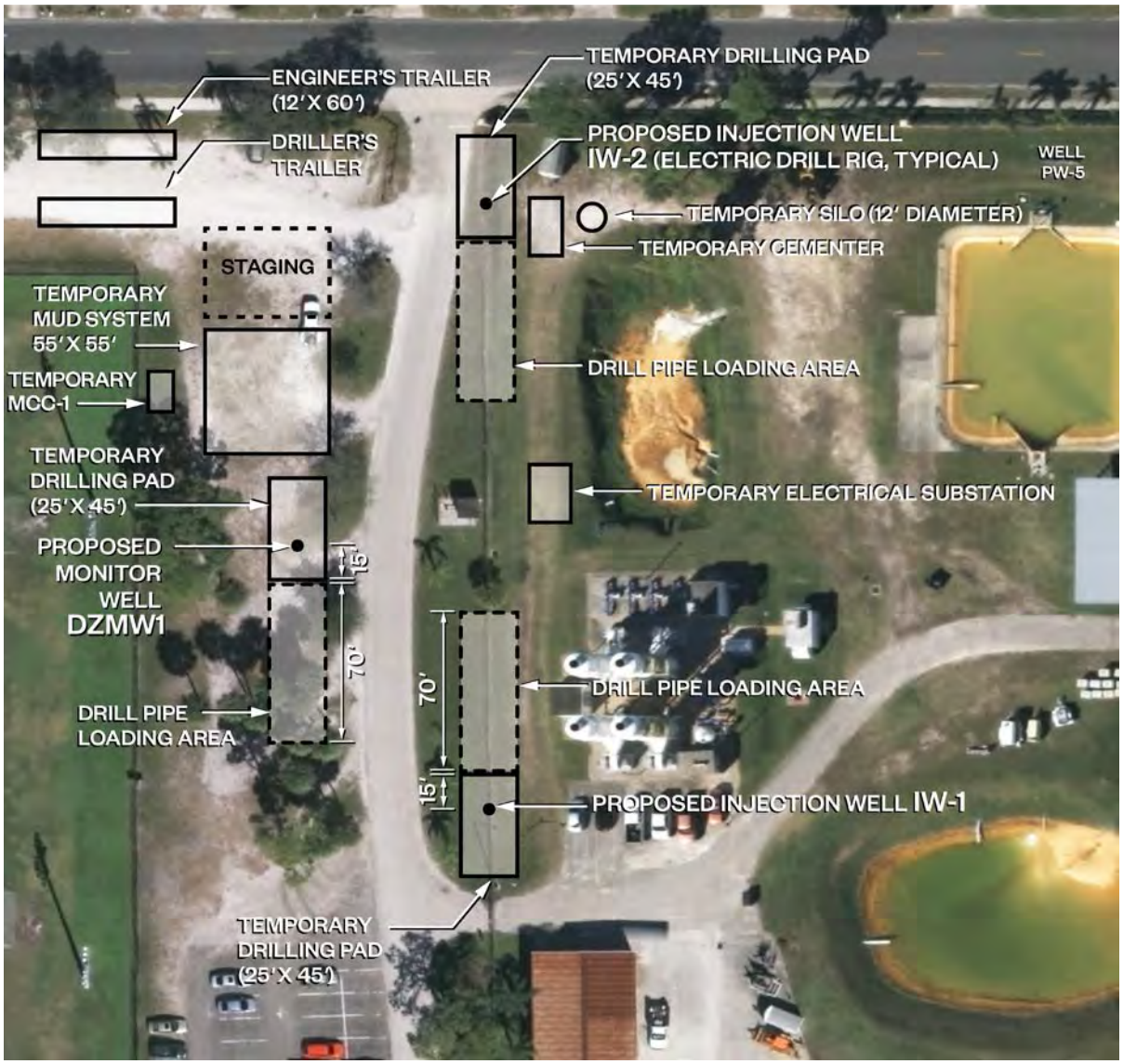


Figure 8-4: New Injection Wells at the WTP

8.6.2 Construction Challenges

Alternative 5 is feasible. However, certain challenges existing, as follows:

- The proposed injection wells are within 500 feet of existing well PW-5. This does not meet the minimum setback requirements of the FDEP. However, a variance is feasible.
- Site space for construction of this Alternative is limited, but feasible. This site space limitation impacts construction sequencing of the proposed RO facilities. Furthermore, the site space limitation may raise the construction cost.
- Alternative 5 is more costly than Alternative 4.
- Construction noise will likely violate City ordinances.

8.6.3 Concentrate Disposal Well Construction Noise Will Likely Result in Customer Complaints

The construction of an injection well requires multiple types of equipment that vibrate and produce noise. Additionally, injection well construction is most economically performed on an around the clock (24-hour, 7 days per week) basis. Recent sound level at an injection well construction site measured between 60 to 70 decibels (dB) at a 10-ft distance from the noise source. Non-repetitive (periodic) noise during injection well construction will likely peak between 80 to 90 dB. These data were measured at a project utilizing electric powered mud system and drill rig. Electric powered equipment produces lower sound levels than similar sized diesel driven equipment.

Figure 8-5 illustrates the decibel ranges for common sounds. It is presented to facilitate understanding of the impact of 60 to 70 dB on the nearby residents.

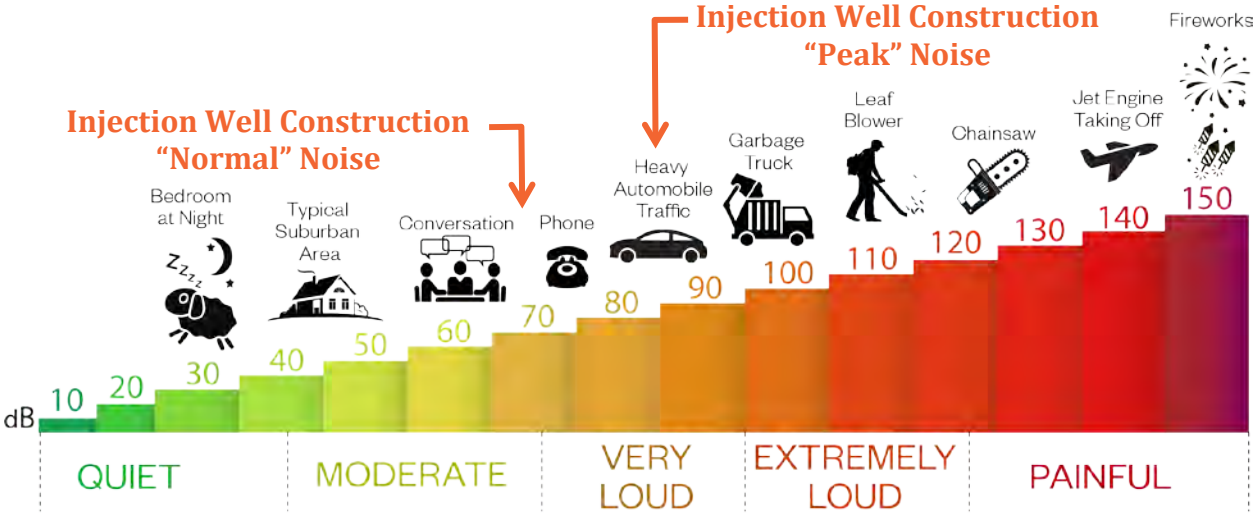


Figure 8-5: Sound Levels

City Code of Ordinances, Chapter 20, Article VI defines noise, its measurement and its regulation. Section 20-151 defines the maximum permissible sound levels, measured at 50 feet from the source of the noise, shall be 80 dB from 8:00 a.m. until 10:00 p.m., and 60 dB from 10:00 p.m. until 8:00 a.m. always throughout the City.

Injection well construction sound level at night would be very close to, and possibly exceed the City's 60 dB limit (10:00 p.m. until 8:00 a.m.). Even if the City's sound limits are not exceeded, the City can expect to receive noise complaints from its residents. Construction of a sound attenuating enclosure around the injection well construction site is likely not economically feasible.

If this alternative is implemented, it is recommended that the City develop a plan to meet with the residents nearby the construction site to explain the importance of the project and the likely noise level prior to start of construction. Additionally, it is recommended that electric driven drilling equipment be specified to limit noise. Furthermore, the construction documents would require continuous noise and vibration monitoring.

The City may need to obtain a variance from its noise ordinance to legally perform injection well construction. It is recommended that the City determine the feasibility of obtaining a noise ordinance variance if this alternative is selected for design.

8.6.4 Recommendation

Based on discussion with City staff, Alternative 5 is not desirable from a budgetary perspective. Hence, it is recommended that Alternative 5 be discarded from further consideration.

8.7 Alternate Disposal Location During Injection Well Mechanical Integrity Testing

8.7.1 MIT Requirements

Mechanical integrity testing of injection wells is required every five years by the FDEP. The purpose of the testing is to document that there is no movement of fluids into or between underground sources of drinking water (USDWs) that the injection well passes through. The testing requires that injection well be removed from service for approximately one week. During this timeframe, an alternate method of disposal of concentrate will be required.

Feasible alternate disposal alternatives are presented in the following subsections.

8.7.2 Alternative 1: Convert IW-2 at the WRF Plus Construct Injection Well at WTP

Under Alternative 1, construct one tubing and packer injection wells along with a dual-zone monitor well at the WTP; use the injection well at the WTP as the primary means of concentrate disposal. Convert IW-2 at the WRF to a tubing and packer well (along with constructing a concentrate disposal pipeline from the WTP to the WRF) and use it as the alternate means of disposal during MIT of the WTP injection well. This alternative is estimated to cost about $4 million more than Alternative 3.

8.7.3 Alternative 2: Construct Two Injection Wells at the WTP

Under Alternative 2, construct two tubing and packer injection wells along with a dual-zone monitor well at the WTP. This alternative is estimated to cost about $6 million more than Alternative 3.

8.7.4 Alternative 3: Remove RO Facility from Service During MIT

Under Alternative 3, convert IW-2 at the WRF to a tubing and packer well (along with constructing a concentrate disposal pipeline from the WTP to the WRF). Do not construct an alternate means of concentrate disposal. Rather, shut down the RO facility during MIT of IW-2 at the WRF. During the timeframe that the RO facility is shut down, the City could increase production from its lime softening facility. Additionally, the City could purchase finished water from Martin County to meet demand during the timeframe that the RO facility is shut down for the MIT.

8.7.5 Opinions and Recommendation

The following opinions and recommendation are offered:

- All alternate disposal alternatives are technically feasible.
- Alternative 1 and 2 have certain permitting and construction challenges. These challenges are described in subsection 8.6. It is believed that these challenges can be overcome.
- From a budgetary perspective Alternative 3 is preferable to Alternatives 1 and 2.
- Alternative 3 is recommended for detailed design.

8.8 Recommended Concentrate Disposal System

The above concentration disposal alternatives were reviewed with the City staff during a workshop. Based on City input, the following concentrate disposal system is recommended:

- Concentrate disposal Alternative 4 (Convert Existing Water Reclamation Facility IW-2 to Tubing and Packer Well) is recommended.
- Alternate disposal method during MIT Alternative 3 (Remove RO Facility from Service During MIT) is recommended.

8.9 Injection Well Procurement Risk Mitigation Strategy

Construction of tubing and packer injection wells and dual-zone monitor wells requires specialty contractors. Conventional bidding of this type of work is a risk to the City. This risk can be managed by pre-qualifying injection well contractors or sole sourcing a known qualified contractor. It is recommended that the City pre-qualifying injection well contractors and then negotiate pricing with the top qualified contractor for modifying IW-2 at the WRF.

8.10 Miami-Dade Ocean Outfall Legislation Program

The ongoing Miami-Dade Water and Sewer Departments Ocean Outfall Legislation (OOL) Program recently solicited (solicitation #RTQ-00566) pre-qualification submittals from well drillers to establish a pool of qualified contractors to construct 23 deep injection wells along with 12 dual-zone monitor wells. Construction is scheduled to commence in 2019. This program will likely reduce availability of qualified injection well contractors and drive-up injection well construction costs.

8.11 Reclaimed Water Blending Opportunity

The City's Water Reclamation Facility (WRF) is a conventional activated sludge treatment facility that was originally built in 1955. The plant's current capacity is 4.0 mgd on an annual average daily flow basis. Treated effluent from the facility is disposed of via the reclaimed water system or the deep injection well system.

There may be an opportunity to augment the reclaimed water supply by blending a portion of the concentrate from the proposed RO process with the reclaimed water. Based on experience gained from design of concentrate / reclaimed blending system at the Loxahatchee River District disposal well, the permitting is challenging and feasible. The blending ratio will be dependent on the two water qualities to ensure remaining below the maximum contaminate levels. We recommend that the City further evaluate the efficacy of concentrate / reclaimed blending to augment irrigation supplies and possibly offset potable demand.

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9. Site Development Planning

9.1 Purpose

The purpose of this section is to present key site information. The data presented establish certain key design criteria needed for the detailed design and permitting phases.

9.2 Key Site Information

The proposed RO facilities would be constructed on the existing WTP site. Key site information is presented in Table 9-1.

Table 9-1: Key Site Information

Parameter	Value
Address	1002 Palm Beach Road Stuart, Florida 34994
County	Martin County
Property Appraiser's Parcel ID Number	09-38-41-000-000-00010-3
Latitude	27° 11' 20" N
Longitude	80° 14' 15" W
Township	38S
Range	41E
Section	9
Zoning	Public
Flood Zone	Zone X - areas of minimal flood hazard

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9.3 Zoning

Figure 9-1 illustrates the zoning for the WTP and the property to the west of the WTP. These properties are zoned as "Public". Consequently, constructing water treatment facilities at this existing WTP is an allowed use under the City's Land Development Code. Three FAS wells are planned for the City owned property to the west of the WTP. Well construction is an allowed use under the City's Land Development Code.



Figure 9-1: Zoning Map

9.4 Flooding is Likely Not a Concern at the WTP

The elevation of the existing WTP is 11 to 12-feet per Google Earth. The Federal Emergency Management Agency flood map tool indicates that the WTP and the surrounding area is within flood zone "X" which is an area of minimal flood hazard and the area is higher than the elevation of the 1 in 500-year flood. The National Oceanic and Atmospheric Administration (NOAA) sea level rise tool set at a sea level rise of 6-feet showed no impact on the WTP (NOAA, 2018).

Setting the finished floor elevation of proposed facilities to match the floor elevations of existing WTP structures would likely result in floor elevations higher than the 500-year flood elevation. Hence, flooding due to rising sea level is likely not a concern for the WTP site and the area near the WTP.

10. Integration with Existing Facilities

10.1 Modifications to Existing Equipment

No modifications are anticipated to existing chemical systems (i.e. sodium hypochlorite, fluoride), finished water pumping, or storage. The RO system permeate will be used in the near-term to off-set water flow from the lime softening WTP and will not be used to add extra flow.

10.2 Lead and Copper Rule Corrosion Inhibitor Pilot Testing

Corrosion inhibitors are proprietary formulations. Testing is required to assess corrosion inhibitor performance. It is recommended that as part of this project that the City design and construct a pilot unit – such as the one illustrated in Figure 10-1 – to pilot test multiple corrosion inhibitors following RO plant startup. The testing would identify one or more corrosion inhibitor that minimizes lead and copper corrosion. The pilot unit apparatus would hold multiple metal coupons for testing corrosion rates at 60, 90 and 180 days. The unit would include multiple metering pumps for dosing the corrosion inhibitor. Additionally, the pilot unit would simulate Lead and Copper Rule (LCR) standing overnight water samples inside of copper tubing that has multiple lead soldered joints. The findings would be documented in a report.



Figure 10-1: Example Corrosion Pilot Unit

10.3 Ground Water Rule Four-Log Virus Treatment via Disinfection

The existing WTP is certified for four-log virus treatment under the Ground Water Rule (GWR) using chloramine disinfection. The proposed RO facility along with blending of water from the lime softening plant would be designed to continue to achieve four-log virus treatment. Once the RO facility is designed, the City would need to re-apply with FDEP for four-log virus treatment certification. Feasible options for achieving four-log virus treatment will be evaluated as part of the detailed design.

10.4 Finished Water Blending

Two options for blending the RO permeate with the lime softened water exist, as follows:

- Blending Option 1: Under this option, the RO permeate from the proposed degasifier clearwell would be conveyed the existing filter clearwells for blending with the lime softened water. The blended water would then be pumped from the filter clearwells to the on-site water storage tanks.

- Blending Option 2: Under this option, the RO permeate from the proposed degasifier clearwell would be pumped into the existing storage tank fill piping. Blending would occur in the piping and the existing water storage tanks.

The schematics prepared for this TM assumed that blending option 1 would be implemented. It is recommended that during detailed design, bench-scale testing assess the efficacy of these blending options under several blending ratios. Furthermore, calculations would be prepared to assess which option was more robust relative to continued compliance with four-log virus treatment under the Ground Water Rule.

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11. Permitting

This section documents the likely permit applications needed for the proposed alternative water supply facilities from the Florida Department of Environmental Protection (FDEP), South Florida Water Management District (SFWMD), Florida Department of Health in Martin County (FDOH-MC), and Martin County Environmental Protection and the City of Stuart. The permits anticipated for the construction of the RO facility include:

Table 11-1: Permit Applications Needed

Agency	Application Name	Application Form	Permitted Component	Responsible for Application
FDEP	Application for a Specific Permit to Construct PWS Components	DEP Form 62-555.900(1)	RO Facility	Engineer
FDEP	Certification Request for Four-Log Virus Treatment of Ground Water	Custom Report Prepared by Engineer	RO Facility	Engineer
FDEP	Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation	DEP Form 62-555.900(9)	RO Facility	Engineer
FDEP	Storage Tank Facility Registration Form (can be applied for on-line at: http://www.fldepportal.com/go/submit-registration/)	DEP Form 62-761.900(2)	Storage of: • Diesel Fuel • Sulfuric Acid • Sodium Hydroxide	Engineer
City of Stuart	City of Stuart Building Division Construction Permit Application	Construction Permit Application	RO Facility	Engineer
City of Stuart	City of Stuart Development Department Site Permit Application	Site Permit Application	RO Facility	Engineer

Table 11-1: Permit Applications Needed

Agency	Application Name	Application Form	Permitted Component	Responsible for Application
SFWMD	Water Use Permit (WUP)	SFWMD's Water Use Permit Applicant's Handbook	FAS Well	Engineer & Hydrogeologist
SFWMD	State of Florida Permit Application to Construct, Repair, Modify or Abandon a Well	DEP Form 62-532.900(1)	FAS Well	Well Drilling Contractor
FDEP (delegated to the Florida Department of Health in Martin Count)	Application for a Specific Permit to Construct PWS Components	DEP Form 62-555.900(1)	FAS Well	Engineer
FDEP	Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation	DEP Form 62-555.900(9)	FAS Well	Engineer
SFWMD	State of Florida Well Completion Report	DEP Form 62-532.900(2)	FAS Well	Well Drilling Contractor
City of Stuart	FAS Well Construction and Testing Report[1]	Custom Report Prepared by Engineer	FAS Well	Engineer
FDEP	Notice of Intent to Use the General Permit for Construction of Water Main Extensions for PWSs - Alternate	DEP Form 62-555.900(7)	Raw water pipeline	Engineer
City of Stuart	City of Stuart Building Division Public Utility Permit Application	Public Utility Permit Application	Raw water pipeline	Engineer

[1] The "FAS Well Construction and Testing Report" is not required to be prepared by any permitting agencies. Rather, it is recommended that the City require its water supply well engineer-of-record to prepare this report to fully document key construction and testing information. Cataloging well construction and testing results in a single report is critical for long-term management of this infrastructure.

Table 11-1: Permit Applications Needed

Agency	Application Name	Application Form	Permitted Component	Responsible for Application
FDEP	Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation	DEP Form 62-555.900(9)	Raw water pipeline	Engineer
FDEP	Notification/Application For Constructing A Domestic Wastewater Collection/Transmission System	DEP Form 62-604.300(8)(a)	Concentrate pipeline	Engineer
City of Stuart	City of Stuart Building Division Public Utility Permit Application	Public Utility Permit Application	Concentrate pipeline	Engineer
FDEP	Request For Approval To Place A Domestic Wastewater Collection/Transmission System Into Operation	DEP Form 62-604.300(8)(b)	Concentrate pipeline	Engineer
FDEP	Application to Construct/Operate/Abandon Class I, III, or V Injection Well System	DEP Form No. 62-528.900(1)	WRF IW-2 Modification	Engineer
City of Stuart	Deep Injection Well IW-2 Modification Construction Completion Report[2]	Custom Report Prepared by Engineer	WRF IW-2 Modification	Engineer

[2] The "Deep Injection Well IW-2 Modification Construction Completion Report" is not required to be prepared by any permitting agencies. Rather, it is recommended that the City require its injection well engineer-of-record to prepare this report to fully document key construction and testing information. Cataloging well construction and testing results in a single report is critical for long-term management of this infrastructure.

12. Cost Estimates

12.1 Introduction

This section summarizes the conceptual level Engineer's Opinion of Probable Project Cost and the anticipated Operation and Maintenance (O&M) costs associated with the proposed RO facility. In accordance with the American Association of Cost Engineering (AACE) International published guidelines the estimates presented in this report is Class 5 classification as defined in Recommended Practices 18R-97.

Class 5 estimates are made without detailed engineering data and employ cost curves, scaling-up or down factors, and similar methodology. The expected accuracy range for such an estimate is between -30 and +50 percent. These estimates are often referred to as "conceptual" estimates. Though they have a wide range of accuracy, Class 5 estimates have several important applications such as quickly determining overall project feasibility and screening alternatives.

12.2 Bid Packages

12.2.1 Introduction

Development of separate bidding packages facilitates bidding to contractors that specialize in certain construction, such as well drilling. It is recommended that the City's alternative water supply (AWS) project be broken down in three bid packages, as follows:

12.2.2 Bid Package 1: Wells

Bid Package 1 would include the following elements:

- Floridan Aquifer Test Well FA-1
- WRF Deep Injection Well IW-2 conversion to a tubing and packer well

It is recommended that Bid Package 1 Floridan Aquifer Test Well FA-1 be constructed as early as possible in the overall schedule. This would allow early acquisition of water quality and hydrogeological data needed for the pre-design pilot testing of the reverse osmosis treatment.

12.2.3 Bid Package 2: Wellhead and Pipelines

Bid Package 2 would include the following elements:

- Floridan Aquifer Well FA-1 Wellhead
- Raw Water Pipeline from FA-1 to WTP
- Concentrate disposal pipeline from WTP to WRF

12.2.4 Bid Package 3: Reverse Osmosis WTP

Bid Package 2 would include all elements for the reverse osmosis (RO) water treatment plant (WTP).

12.3 Capital Cost

Tables 12-1 through 12-3 presents opinions of probable project cost (inclusive of construct cost plus engineering/administration fee) for the recommended AWS facilities. The cost is broken down for each bid package.

Table 12-1
Bid Package 1: Wells
Opinion of Probable Project Cost

Item	Cost
Well FA-1 (UPZ Production Zone)	$1,700,000
Contingency (30%)	$510,000
Convert WRF IW-2 to T&P Well	$2,000,000
Construction Cost Subtotal - Bid Package 1	$4,210,000
Engineering / Administration (20%)	$842,000
Opinion of Probable Project Cost - Bid Package 1	**$5,052,000**

Table 12-2
Bid Package 2: Wellhead and Pipelines
Opinion of Probable Project Cost

Item	Extended Cost
Wellhead	$650,000
10-inch HDPE Raw Water Pipeline	$84,000
10-inch HDPE Concentrate Disposal Pipeline	$696,000
Air Release Valves	$60,000
Contingency (30%)	$447,000
Construction Cost Subtotal - Bid Package 2	$1,937,000
Engineering / Administration (20%)	$387,400
Opinion of Probable Project Cost - Bid Package 2	**$2,324,400**

Table 12-3
Bid Package 3: Reverse Osmosis WTP
Opinion of Probable Project Cost

Item	Cost
Membrane Plant	$5,710,000
Contingency (30%)	$1,713,000
Construction Cost Subtotal - Bid Package 3	$7,423,000
Engineering / Administration (20%)	$1,484,600
Opinion of Probable Project Cost - Bid Package 3	**$8,907,600**

Table 12-4 totalizes the project cost for the bid packages.

Table 12-4
AWS Project
Opinion of Probable Project Cost

Item	Cost
Bid Package 1: Wells	$5,052,000
Bid Package 2: Wellhead and Pipelines	$2,324,400
Bid Package 3: Reverse Osmosis WTP	$8,907,600
Total	**$16,284,000**

12.4 Operation and Maintenance Costs

12.4.1 Introduction

This section estimates the annual costs operation and maintenance (O&M) for a 1.0 mgd RO membrane facility.

12.4.2 Chemical Dosages

Chemical costs were developed based on preliminary chemical dosages presented in Table 12-5, a raw water flow of 1.43 mgd and a permeate flow rate of 1.0 mgd.

Table 12-5: Preliminary Estimate of Chemical Dose

Chemical	Unit	Dose
Sulfuric Acid	mg/L	65
Scale Inhibitor	mg/L	3.0
Corrosion Inhibitor	mg/L	5.0
Sodium Hydroxide	mg/L	40
Carbon Dioxide	mg/L	30

12.4.3 Maintenance Costs

Maintenance costs were developed based replacement frequency experienced by facilities with similar treatment processes as well as engineering judgement. For membrane replacement costs, it was assumed that membranes are replaced every 5 years. For cartridge filter replacement cost, it was assumed that the replacement frequency is every 6 months. These frequencies can change depending on raw water quality characteristics as well as overall system maintenance practices.

12.4.4 Energy Costs

Energy costs were estimated based on a permeate flow rate of 1.0 mgd at a membrane recovery of 70%. The RO system's total energy cost was calculated based on a unit power cost of $0.10 per kilowatt-hour (kW-hr). The energy costs include power consumption for the equipment listed below:

- One (1) UFA well pump (continuous operation)
- One (1) RO membrane feed pump (continuous operation) – for this calculation an average pressure between current condition and 20-year projected condition was assumed
- One (1) clean-in-place pump (12 hours of operation every three months)
- Five (5) chemical metering pumps (continuous operation)
- One (1) degasifier blower (continuous operation)
- One (1) transfer pump (continuous operation)
- One (1) concentrate pump (continuous operation)

12.4.5 Annual O&M Costs

The annual O&M costs associated with the 1.0 mgd RO facility are shown in Figure 12-1.

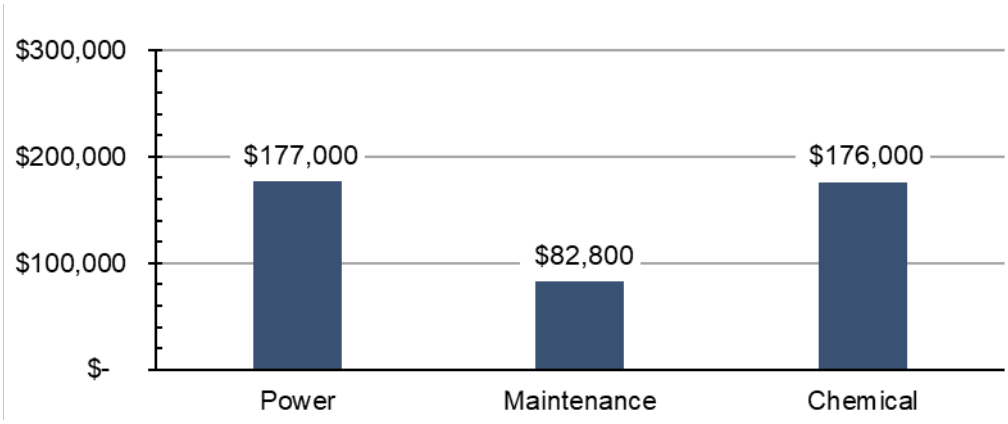


Figure 12-1: Annual O&M Cost

13. AWS Recommendations

This technical memorandum (TM) evaluated a series of alternative water supply (AWS) alternatives, water supplies and treatment residual disposal options. The TM has recommendations dispersed through many sections of the document. For convenience, the key recommendations presented in this TM are consolidated in this section. The key recommendations of this TM are as follows:

1. The Upper Permeable Zone (UPZ) of the Upper Floridan Aquifer is recommended for the AWS.
2. Three UPZ wells with a capacity of 1.43 million gallons per day (mgd) each are recommended. Each well is sized to provide raw water to one reverse osmosis (RO) membrane train.
3. It is recommended that the membrane treatment plant be constructed on the WTP site. Additionally, it is recommended that the membrane building be sized to house three RO membrane trains. Each membrane train would have a finished water capacity of 1.0 mgd.
4. It is recommended that the three wells and RO trains be constructed in phases as follows:
    - Phase 1: Well FA-1 and RO Train 1 in the year 2022
    - Phase 2: Well FA-2 and RO Train 2 in the year 2027
    - Phase 3: Well FA-3 and RO Train 3 in the year 2032
5. It is recommended that disposal of RO concentrate (brine) be achieved by the following:
    - Convert existing Water Reclamation Facility injection well IW-2 into a tubing and packer well.
    - Alternate disposal method during mechanical integrity testing would be to remove the RO Facility from service and meet the balance of water demand by increasing the output of the lime softening WTP. This operating strategy would likely only need to be implemented once every five years for a one-week duration.
    - The City could also purchase finished water from Martin County to meet demand during the timeframe that the RO facility is shut down during mechanical integrity testing.

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14. References

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Appendix G City of Stuart Water Treatment Plant Treatment Investigation for PFC Compounds

CITY OF STUART WATER TREATMENT PLANT

TREATMENT INVESTIGATION FOR PERFLUORINATED COMPOUNDS (PFC's) PFOA AND PFOS

Prepared for:
City of Stuart
March 2017
UPDATED June 2018





Prepared by:
Kimley»Horn

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Project No. 144967008

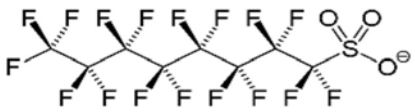
CITY OF STUART
TREATMENT INVESTIGATION FOR PERFLUORINATED COMPOUNDS (PFC's)
PFOA AND PFOS

March 16, 2017
Updated June 2018

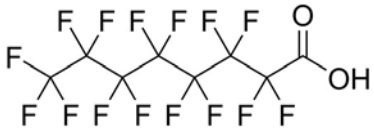
1 BACKGROUND

The Environmental Protection Agency (EPA) established the Third Unregulated Contaminant Monitoring Rule (UCMR 3) in 2012 and required yearly assessment monitoring of public drinking water systems in 2013, which regulates a number of emerging contaminants of concern that have been found in water sources around the Country. The City of Stuart was required to monitor for these contaminants as a public water system (PWS) which serves more than 10,000 people since 2013. In particular for the City of Stuart, perfluorinated compounds (PFC's), perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) are the contaminants of concern which have consistently been detected above the minimum reporting level (MRL) since the rule was promulgated. The chemical composition of these compounds is illustrated below:

PFOS



PFOA



Although a provisional health advisory for PFOS/PFOA combined was set at 0.600 ug/L, or 600 parts per trillion (ppt) in 2009, in May 2016 EPA established a value of 0.07 ug/L, or 70 parts per trillion (ppt), as a Health Advisory Level (HAL) for the combined PFOS and PFOA levels for public drinking water systems. Since the inception of the UCMR 3, the City of Stuart's water treatment system's point of entry (POE) has historically experienced samples with PFC levels above this HAL. The HAL's provide information on contaminants that can cause human health effects and are known or anticipated to occur in drinking water. EPA's HAL's are non-enforceable and provide technical guidance to state agencies and other public health officials on health effects, analytical methodologies, and treatment technologies associated with drinking water contamination

Although the source of PFC contamination found in the groundwater is not fully known, given the environmental sources suspected for the contribution of these contaminants, the source of measured PFCs are suspected to be either from a direct point source contamination using fire-fighting foam entering groundwater. Given elevated levels found in several supply wells within a clustered area, it is believed that a point source is the major contributor to these elevated levels. Refer to Figure A illustrating the PFC (PFOA + PFOS) levels measured in each supply well and POE.

Based on the results from the sampling and technical research for PFC removal, conventional treatment currently in use at the water treatment plant of using air stripping of the raw water to remove volatiles and other known contaminants followed by lime softening and filtration is not effective at removing PFC's. Refer to *Table ES.1 – Summary of PFAS removals for various treatment processes*, **Water Research Foundation 2016 Web Report, Treatment Mitigation Strategies Accordingly**, for supporting information. Based on this information and other research, the existing treatment system provides inadequate treatment for the removal and/or reduction of PFC's in order to meet the established regulations and the City's treatment goals.

Given the PFC contaminant's concentration in the raw water, it is not anticipated that blending with other wells with lower PFC levels as a treatment method to reduce PFC levels in the finish water will be acceptable to meet the PFC removal goals. Using the 70 ppt HAL (combined PFOA and PFOS) as an upper limit for each well, an alternative treatment method will be necessary to maintain use of the groundwater wells. There is also on-going research outside of the EPA that has suggested lower allowable concentrations of PFOA, PFOS, and other PFC's is recommended. For instance, The State of New Jersey was in the process of promulgating a maximum contaminant level for PFOA of **14** ppt at the time of this report, nearly five times lower than the HAL EPA has established. If adopted, it will be the only legal limit on PFOA in the nation.

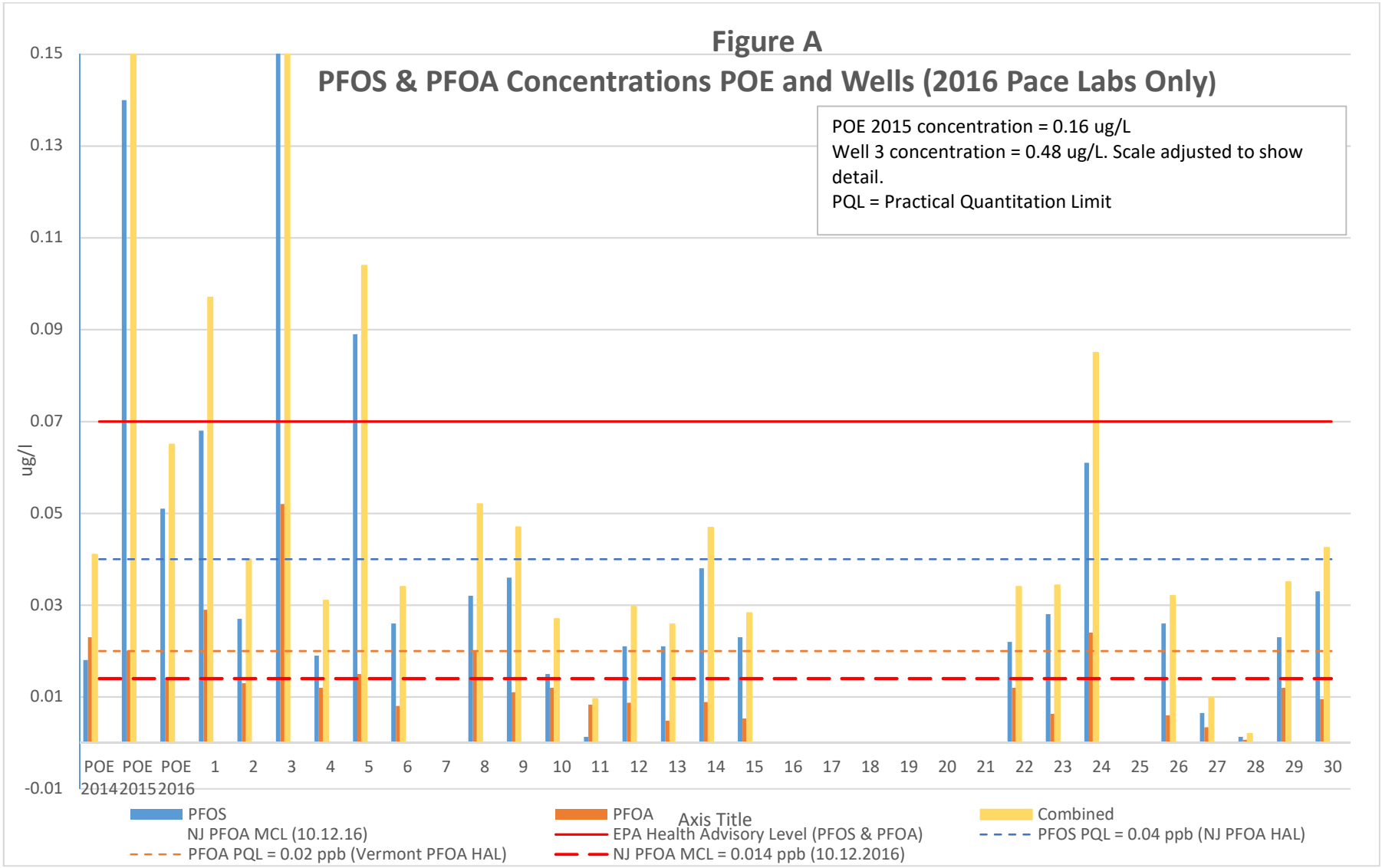
The intent behind this report is to evaluate the most feasible and best available treatment alternatives in reducing these contaminant levels and identifying short-term and potential long-term solutions to the City's water supply challenges with respect to PFC's. The short-term solution should include either replacing lost capacity from these wells with finished water from existing finish water interconnects, or restore the functional use of the existing groundwater wells containing elevated PFC levels with an alternative treatment method. The short-term solution should be implemented immediately, with a long-term plan to reduce the dependence on the existing surficial groundwater supply.

2 APPROACH

The existing groundwater supply has limitations due to challenges with other historical contaminants, including the recent presence of PFCs and some of the emerging contaminants of concern. Accordingly, the approach to the City's water supply concerns revolves around

Figure A

PFOS & PFOA Concentrations POE and Wells (2016 Pace Labs Only)



achieving compliance for the existing water source and customers as well as a sustainable supply for the future of the City. The short-term solution involves analyzing, selecting and implementing the treatment technologies available to treat and remove the currently present PFCs from the produced water prior to distribution. The focus of this evaluation supports the short-term alternatives available to achieve such treatment and enable the City to achieve compliance. Goals for the short-term evaluation include the paramount compliance with UCMR regulations followed by minimizing the capital and operation expenses for the short-term solutions.

The long-term approach involves implementing a consistent and reliable treatment method to remove emerging contaminants or securing a sustainable water source free of contaminants beyond traditional salinity and organic contaminants. Although not included in the scope of this project, the approach should consider evaluating alternative water supplies including the lower Floridan aquifer, surface water, or some combination of these and other alternative water sources. Further analysis should include the treatment options of these alternative water sources, capital expense, operation expense, pilot verification of treatment and the long-term sustainability for the City's water utility.

The current water supply is derived from the surficial aquifer which has limited withdrawal capacity and is highly scrutinized by the South Florida Water Management District due to its influence on the surrounding water table. In addition, its close proximity to the surface yields it as suspect to contamination from surface application of chemicals and reclaimed water. Specifically, these contaminants include the PFCs, and others listed in Table 3-1. This evaluation addresses the desktop analysis of multiple treatment alternatives.

Longer term raw water supply focused on alternative water sources should be evaluated in the future for sustainability, treatment feasibility, regulatory considerations, and financial efficiency for the City. Alternative water sources identified can be used as the sole source of supply water or used in combination with the existing surficial influenced wells or another alternative supply. Once one or multiple sources are identified and committed, treatment pilots should be engaged to demonstrate successful treatment as well as operational feasibility to support operational commitments to the Utility's staff and financial resources.

The existing surficial aquifer is a limited source of raw water, and the City does not have any alternative water supply sources, other than interconnects with neighboring utilities. Additionally, the existing surficial aquifer has a number of existing contaminants that further limit the withdrawal capacity, and with the recent discovery of PFC contaminants, further limits the Utilities ability to meet future water system demands and drinking water standards. **Table 1** provides a list of current and historical known contaminants that require advanced treatment beyond conventional lime softening and filtration.

Currently, there is no known groundwater contaminant level established for PFC's that would trigger corrective cleanup actions or potential funding at the PFC levels measured in the wells. Additionally, the use of reclaim water for irrigation and continued recharge of the surficial aquifer has no regulations for these emerging contaminants. However, reclaim water quality standards are currently under review by the regulatory agencies, which may trigger monitoring and/or potential treatment for these emerging contaminants. Subsequently, the City's actions should address these contaminants in both the drinking water and potential discharge to the wastewater treatment system in order to minimize any discharge of these contaminants to the environment.

The short-term solution should include either replacing lost capacity from these wells with finished water from existing finish water interconnects, or restore the functional use of the existing groundwater wells containing elevated PFC levels with an alternative treatment method. Restoring capacity of the raw water supply wells which contain PFC levels above the HAL, must include an advanced treatment method not currently used at the existing facility. Pilot testing using the most cost-effective, best known track record of reducing PFC's was developed and implemented in order to identify design criteria, operational experience, and capital and operating costs associated with the selected treatment option.

Table 1 CONTAMINANTS OF CONCERN - City of Stuart Wells

	Water Quality	Unit	Influent (range)	MCL/HAL
	Parameter			
	PFC (PFOS)**	ug/L	0.046 - 2.1	-
	PFC (PFOA)**	ug/L	0.0048-0.052	-
	PFC (PFOS + PFOS) (max)	ug/L	0.050 - 2.15	0.070
>	1,4-Dioxane**	ug/L	0.130	-
>	Methyl-tert-butyl-ether	ug/L	1.800	-
>	cis-1,2-Dichloroethylene (DCE)	ug/L	0.3-42.4	70.0
>	1,2 Dichloropropane (DCP)	ug/L	1.2-39.0	-
>	1,2,3-Trichloropropane (1,2,3-TCP)*	ug/L	1.0-23.8	-
>	Trichloroethylene (TCE)	ug/L	5.00	-
>	Tetrachloroethylene (PCE)	ug/L	0.65	3.0
>	Vinyl Chloride	ug/L	0.13	1.0
>	Chlorobenzene	ug/L	0.34	-
>	Benzene	ug/L	1.30	1.0

* UCMR3 List

** UCMR3 and UCMR4 List

> Treatment currently in place

3 SHORT-TERM TREATMENT OPTIONS

The existing treatment system provides conventional treatment, consisting of aeration and air-stripping of volatile organic compounds, lime softening, filtration and disinfection. Conventional filtration and lime softening have limited effectiveness at removing PFCs found in the raw water. It is also evident from the water quality test results taken at the POE and individual wells, that PFC's are unaffected through the existing treatment plant. Refer to Figure 1. As such, conventional treatment is not an option for continued treatment and reduction of these emerging contaminants. Therefore, alternative treatment options were researched and evaluated that would effectively remove these contaminants in a cost effective manner.

Viable treatment methods that are known to be effective at removing PFC's include:

1. **(An) Ion Exchange (AIX, or IX)**
2. **Granular activated carbon (GAC)**
3. **Membrane treatment (RO & NF)**
4. Other Treatment Methods - Chemical Oxidation/Reduction, Thermal & Electro-chemical, Biological treatment

Based on the research, literature reviewed, and discussions with manufacturers, sorption processes, such GAC and AIX, and membrane treatment provide the most effective removal of PFC's from water streams. Chemical oxidation, advanced oxidation and reduction processes, and thermal and electro-chemical processes are processes that show promise, but many of them are still in the research mode, have limitations, and have no full-scale track record. Each one is site specific and may be complimentary and more effective as combined systems, but may be more suitable in wastewater streams, where other interferences exist. These treatment methods were not evaluated further, due to their more research driven techniques and limited full scale installations that exist for the treatment of groundwater.

The primary treatment goal is to remove the PFC's from the raw water, followed by reduction or removal of other known contaminants and upcoming UCMR's that may be of concern. The other volatiles and contaminants listed in Table 3-1 is the secondary goal of implementing a new treatment process.

Total organic carbon (TOC) reduction with a new treatment process is also a benefit which would improve the disinfection byproduct results in the finish water. The benefit of reducing TOC levels has a two-fold effect, addressing the short-term treatment goals and allow long-term continued use of the system.

Table 3.1 - PERFORMANCE CRITERIA for FULL-SCALE GAC SYSTEM

Parameter	Unit	Influent (range)	Effluent Requirement (max)*
Water Quality			
PFC (PFOS)*	ng/l	70 - 400	50
PFC (PFOA)*	ng/l	20 - 50	20
PFC (PFOS + PFOS) (max)	ng/l	100 - 500	60
1,4-Dioxane*	ug/l	0.130	-
cis-1,2-Dichloroethylene (DCE)	ug/l	3.1	-
1,2 Dichloropropane (DCP)	ug/l	1.2-39.0	-
1,2,3-Trichloropropane (1,2,3-TCP)*	ug/l	1.0-23.8	-
Trichloroethylene (TCE)	ug/l	5.0	-
Tetrachloroethylene (PCE)	ug/l	5.0	-
Vinyl Chloride	ug/l	0.1	-
Chlorobenzene	ug/l	0.34	-
Benzene	ug/l	1.30	-
TOC	mg/l	5.0 - 8.0	-
UVA $_{254}$	cm^{-1}	0.1 - 0.35	-
pH	-	7.2	-
Alkalinity (as $CaCO_3$)	mg/l	286	-
Calcium hardness (as $CaCO_3$)	mg/l	294	
Iron	mg/l	0.43	-
Hydrogen sulfide	mg/l	0.2 - 0.6	-
Ammonia (as N)	mg/l	0.16	-
Temperature	deg F	81	-
BV to 50% breakthrough* (min)			10,000

* UCMR3 List

3.1 ION EXCHANGE

Ion exchange is an exchange of ions between two electrolytes or between an electrolyte solution and a complex. Typical ion exchangers are ion exchange resins (functionalized porous or gel polymer), zeolites, montmorillonite, clay, and soil humus. Ion exchangers are either cation exchangers that exchange positively charged ions (cations) or anion exchangers that exchange negatively charged ions (anions). Typical ion exchange systems include softeners, which replace or remove calcium (hardness) with sodium.

Ion exchange resins from different manufacturers tend to deliver varying results on PFC removal. Research indicates that fresh resin presents a higher removal efficiency than continuous regeneration approaches (Appleman, 2012). The removal efficiency is estimated to be largely based on molecular weight of the fluorine chains. The longer chains such as PFOS typically have better removal efficiency in cases where ion exchange has been shown

to provide some removal of the PFC's. Generally, in the cases where ion exchange has provided some level of removal, the smaller versus larger fluorine hydrocarbon chains were removed at approximately 46% and 92%, respectively (Appleman, 2012). According to the WRF Web Report #4322, *Treatment Mitigation Strategies for Poly- and Perfluoroalkyl Substances*, 2016, Amberlite IRA-400 resin was found to have a higher capacity than GAC for both PFOS and PFOA removal. However, contact times for IX are much longer than typical bed volumes used for conventional IX treatment, and conventional regeneration techniques were not sufficient to regenerate the resins. Recent experience with IX piloting has been directed away from regenerating the resins and running the bed volumes to exhaustion.

Other studies have indicated waters with contaminated with PFC's that contained higher natural organic matter (NOM) were more effectively removed using IX, possibly due to the interaction between the PFC's and NOM.

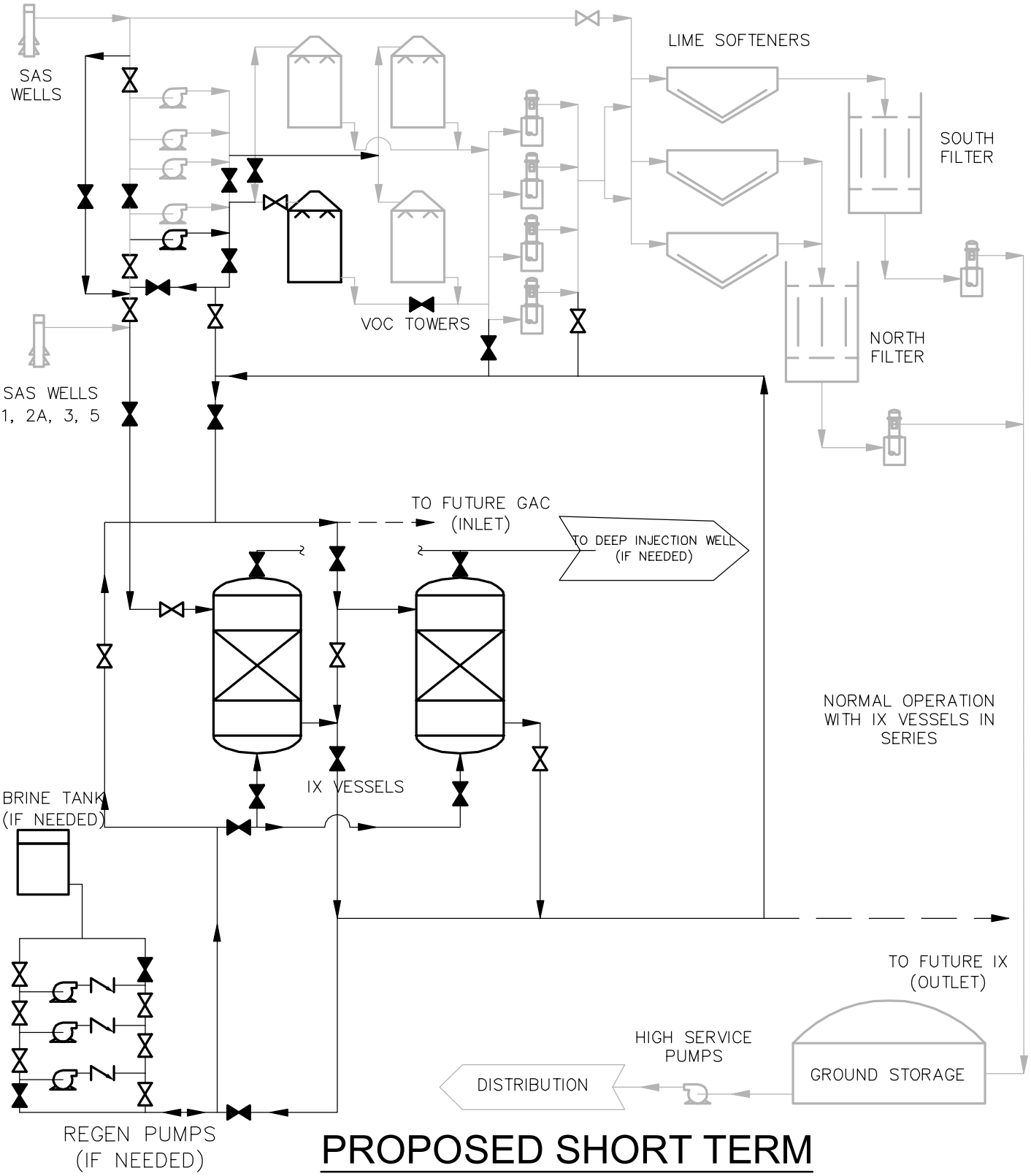
Given the research that has been conducted, ion exchange has the potential to provide removal of PFCs and should be considered on a case by case basis compared to the contaminants present and the Utility's goals. Recent advances in IX technology and recent pilot studies have shown IX resins that were originally designed to remove perchlorates from contaminated water have shown outstanding performance in removing PFC's at extended bed volume cycles down to non-detect levels. Small scale pilot testing was conducted at the conclusion of the initial final draft report, which has triggered modification of this report to include IX performance. The following process flow diagram **(Figure A)** is a schematic depiction of the integration of GAC into the City's existing process.

Some of the advantages of using IX include:

- Specific, yet partial removal of contaminants with select media
- Requires low operating pressures
- No hazardous chemicals required for treatment
- Much higher bed volume treatment than GAC (> 10 times)
- Regeneration not required, lowered operating costs

The disadvantages include:

- Potential to lose resin and require regular purchase of new resin
- Maintenance can be intensive with several mechanical transfer processes if resins regenerated
- ~~Brine disposal includes waste of elevated chloride loaded waste stream through a dedicated forcemain to the deep injection well, resulting in significantly higher costs~~ recent experience does not require regeneration of resin



PROPOSED SHORT TERM MODIFICATIONS - ION EXCHANGE (IX)

= NORMALLY CLOSED

= NORMALLY OPEN

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Drawing name: K:\WPB_Civil\144967008 - UCMR3 & PFC Evaluation\CAD\PlanSheets\PILOT.dwg FIG-A Jun 26, 2018 1:08pm by: Evan.Ghidella

SCALE	Kimley»Horn	MAR. 2016	CITY OF STUART	DESIGN ENGINEER: MARK D. MILLER	SHEET NUMBER
DESIGNED BY	© 2018 KIMLEY-HORN AND ASSOCIATES, INC.			FLORIDA P.E. LICENSE NUMBER: 45320	FIG-A
DRAWN BY	1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411	PROJECT NO. 144967008		DATE:	
CHECKED BY	PHONE (561) 845-0665 FAX (561) 863-8175 WWW.KIMLEY-HORN.COM CA 00000696				

3.1.1 Conceptual Level Engineer's Opinion of Probable Cost

Non-labor operating costs are mainly composed of ion exchange resin replacement, and regeneration cost and brine disposal cost IF the resins are regenerated. Operating costs are estimated based on average annual design flow conditions. Ion exchange resin replacement and regeneration with sodium chloride is estimated at $0.20 per 1,000 gallons of treated average flow. If regenerated resin used, brine disposal cost is estimated at $0.15 per 1,000 gallons of ion exchange treated flow, which includes pumping of spent brine directly to the City's WWTP. Both the resin supply and brine disposal costs are subject to CPI cost increases and could lead to increased operating expenses. Labor costs, power costs and other existing operating costs are not included in this estimate. The conceptual level operational cost estimates for the ion exchange system are shown in **Table 3-1** below.

Table 3-1. Conceptual Level Annual AIX Operational Cost Estimate

ADD Capacity (MGD)	MDD Capacity (MGD)	Operating Costs ($ per 1,000 gallon produced)	Estimated Annual Operating Cost (0.525 MGD treated per day)
0.525	0.75	$ 0.35	$ 67,069

The conceptual level of capital costs estimated for ion exchange treatment construction are shown in **Table 3-2**. The estimated costs are based on treating the average day demand flow rate of 0.525 MGD. The cost shown includes the ion exchange treatment systems and pre-filtration to prevent sand and silt build-up on the resins. The brine as well as the ancillary resin regeneration system, brine storage and transfer systems, and resin storage and system controls needed for full operation of the ion exchange treatment system was not included in the table of costs, since the newer generation IX resins are assumed to be run through to exhaustion of the resin when PFC levels start to breakthrouth. **Table 3-2** below provides a summary of the estimated costs for the ion exchange treatment alternative.

3.2 Granular Activated Carbon

Activated carbon is commonly used adsorb natural organic compounds, taste and odor compounds, and synthetic organic chemicals in drinking water treatment. Adsorption is both the physical and chemical process of accumulating a substance at the interface between liquid and solids phases. Activated carbon is an effective adsorbent because it is a highly porous material and provides a large surface area to which contaminants may adsorb. The two main types of activated carbon used in water treatment applications are granular activated carbon (GAC) and powdered activated carbon (PAC).

Table 3-2. Conceptual Level AIX Capital Cost Estimate

Item	Size/Units	Quantity	Unit or Material Cost	Total Cost
General Requirements	L.S.	1	$ 50,000	$ 50,000
Site Civil (slab, site work)	L.S.	1	$ 110,000	$ 110,000
Site Mechanical (RWM piping, u/g)	L.S.	1	$ 90,000	$ 90,000
Electrical (new service, MCC, VFD's)	L.S.	1	$ 120,000	$ 120,000
12-inch FM (WTP to WWTP)	FT	5300	$ 90	$ -
DIW upgrades	L.S.	1	$ -	$ -
Process				
Ion Exchange (vessels, filters, resin)	MGD-ADD	1.00	$ 0.47	$ 470,000
Instrumentation & Controls	L.S.	1	$ 80,000	$ 80,000
Total Construction Cost				**$ 920,000**
Contingency	% of Const.	15%	$ 138,000	$ 138,000
Engineering Planning, Design and Permitting	% of Const.	12%	$ 126,960	$ 126,960
Total Budget				**$ 1,184,960**

Multiple carbon manufacturers and carbon bases of their carbon components have been utilized to effectively remove PFCs in water sources. The testing researched has resulted in a variance of active removal rates and bed volumes. The carbon base material, loading rates, raw water contaminants, nominal organic matter (NOM) and TOC, and granule size have all contributed to the length of run time, removal of specific contaminants and regeneration frequency. Despite the variations in these criteria, the treatment technology is overall effective at removing PFCs of concern for the City of Stuart.

In general, waters with TOC and NOM in the raw water significantly reduces the bed volumes to contaminant breakthrough. This results in more frequent regeneration and more costly operations. Relating to the City of Stuart's ground water supply, organics are going to be present and are most likely going to reduce the longevity of each carbon load. It

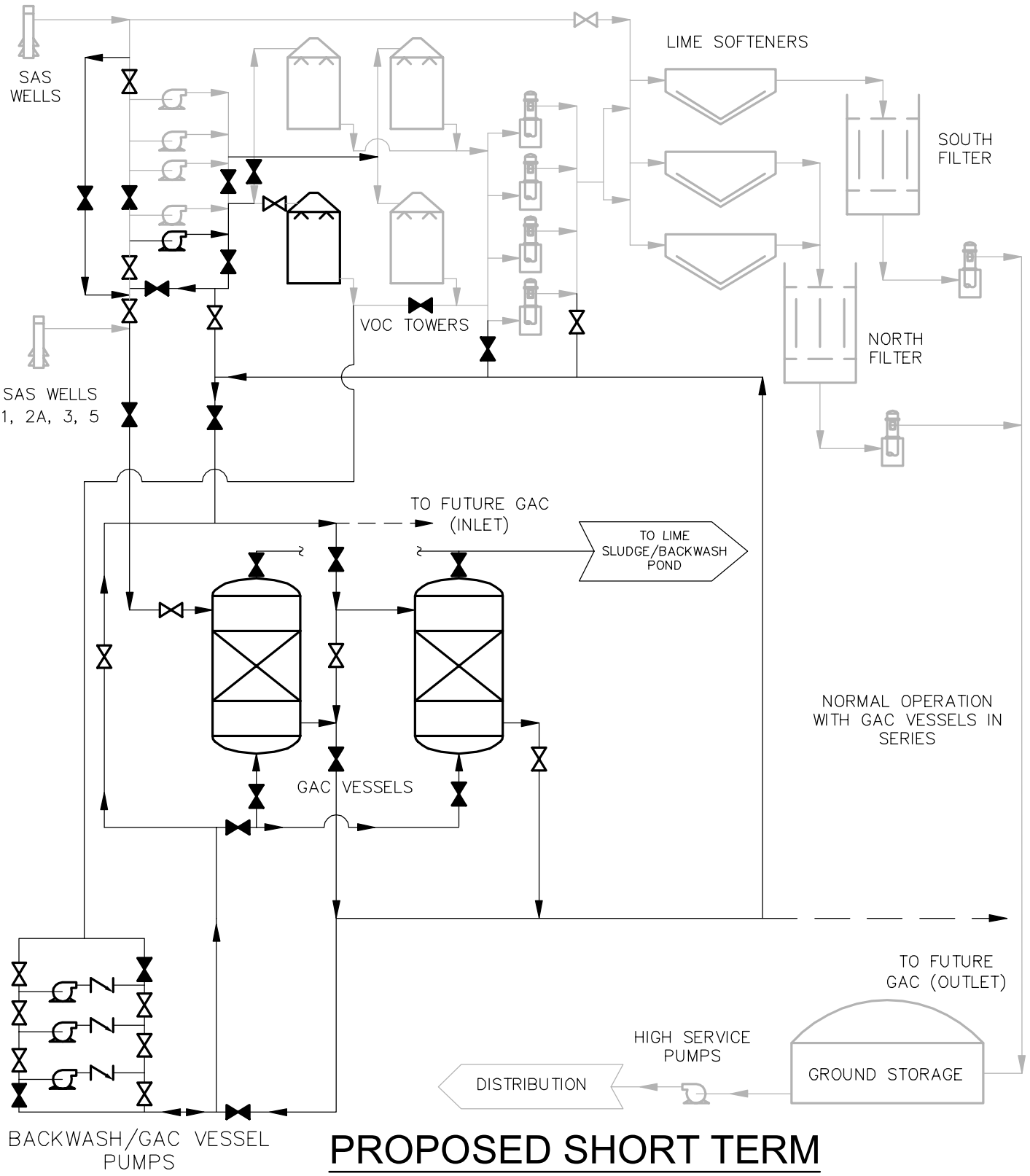
is anticipated that the frequency of full breakthrough would be around the 10,000 bed volumes (Appleman, 2012).

At the pilot scale, small columns of GAC can be exposed to a steady stream of raw water to simulate the actual operating conditions of the Utility. Pilot testing is typically completed using 4-inch columns filled with a known quantity of GAC. As the water is processed through the GAC the water quality parameters are analyzed on the treated side of the GAC media. As the specific parameters of concern consume the GAC adsorption sites within the media, they will be identified in the treated water. This is termed as the initial breakthrough and the beginning stages of degrading removal of the specified contaminant. At this point, the carbon will become less efficient at removing the contaminant and the engineering analysis can be used to determine the percentage of breakthrough that can be allowed while maintaining compliance with the regulatory conditions. Once the GAC reaches its limit for obtaining regulatory compliance, it is considered exhausted and requires regeneration or replacement with virgin media. This process reveals the design parameters for the full-scale design and operation of the GAC treatment process and can be scaled up directly to the full-scale treatment.

At the full-scale treatment design and operation, the process is administered in the same fashion. The pressurized carbon vessels are much larger and hold from 20,000 to 40,000 pounds of GAC and require backwash cycles as the pressure buildup in the vessel typically escalates prior to the exhaustion of the carbon media. The breakthrough of the contaminants is observed similarly to the breakthrough described for the pilot scale operation. The frequency of regeneration is similar to the process observed in the pilot scale adjusted for the quantity of flow at the full-scale treatment. As noted above, the full-scale treatment and operation closely resembles the process experienced in the pilot scale treatment and operation. The following process flow diagram **(Figure B)** is a schematic depiction of the integration of GAC into the City's existing process.

Some of the advantages of using GAC include:

- Proven technology with numerous installations
- Requires low operating pressures
- No chemicals required for treatment
- Less maintenance than other treatment alternatives
- High percentage removal of specific contaminants
- Can be designed for full or partial removal of contaminants
- Regenerated GAC minimizes operational costs



PROPOSED SHORT TERM MODIFICATIONS - GRANULAR ACTIVATED CARBON

⋈ = NORMALLY CLOSED

⋈ = NORMALLY OPEN

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Drawing name: K:\WPB_Civil\144967008 - UCMR3 & PFC Evaluation\CAD\PlanSheets\PILOT.dwg FIG-B Jun 26, 2018 1:09pm by: Evan.Ghidella

SCALE	Kimley»Horn	MAR. 2016	CITY OF STUART	DESIGN ENGINEER: MARK D. MILLER	SHEET NUMBER
DESIGNED BY	© 2018 KIMLEY-HORN AND ASSOCIATES, INC.			FLORIDA P.E. LICENSE NUMBER: 45320	FIG-B
DRAWN BY	1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411	PROJECT NO. 144967008		DATE:	
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- Capital expense for installation is low compared to other alternatives
- Allows hardness and alkalinity through for treated water stability

The disadvantages include:

- Spent carbon must be regenerated offsite
- GAC is consumed by hydrogen sulfide (H_2S), iron, DOC and TOC which can reduce the removal efficiency and significantly shorten the regeneration cycles, resulting in increased operating costs
- Iron can blind over the media, greatly reducing the treatment effectiveness of the GAC
- Large loading of backwash/rinse flow disposal into the onsite backwash basin for the lime softening facility
- Operational expenses may be higher than the other alternatives due to the frequent estimation of regeneration cycles

3.2.1 Conceptual Level Engineer's Opinion of Probable Cost

Estimated operating costs for the various treatment levels is presented in **Table 3-3** for GAC treatment. Non-labor operating costs are mainly composed of the cost of GAC regeneration. Operating costs are estimated based on average annual design flow conditions. The largest contributor to the operating expenses for GAC center around the supply and regeneration of the GAC media, its transport to and from
a regeneration facility, and steady replacement through each regeneration cycle. GAC regeneration costs are estimated using $1.35 per pound of GAC and a GAC consumption rate of 0.64 pounds per 1,000 gallons treated prior to breakthrough. Backwash disposal costs, labor costs, and other existing operating costs are not included in this estimate. Overall, total operating costs are estimated to be $0.58 per 1,000 gallons produced for the respective treatment level considered.

Table 3-3. Conceptual Level Annual GAC Operational Cost Estimate

ADD Capacity (MGD)	MDD Capacity (MGD)	Operating Costs ($ per 1,000 gallon produced)	Estimated Annual Operating Cost (0.525 MGD treated per day)
0.525	0.75	$ 0.58	$ 111,143

The conceptual level of capital costs estimated for GAC treatment construction are shown in **Table 3-4**. The estimated costs are based on treating the average day demand flow rate of 0.65 MGD. The cost shown includes the GAC treatment systems, as well as the ancillary

backwash systems and controls needed for full operation of the GAC treatment system. **Table 3-4** below, provides a summary of the estimated costs for the GAC treatment alternative.

Table 3-4. Conceptual Level GAC Capital Cost Estimate

Item	Size/Units	Quantity	Unit or Material Cost	Total Cost
General Requirements	L.S.	1	$ 50,000	$ 50,000
Site Civil (slab, site work)	L.S.	1	$ 80,000	$ 110,000
Site Mechanical (RWM piping, u/g)	L.S.	1	$ 80,000	$ 80,000
Electrical (new service, MCC, VFD's)	L.S.	1	$ 95,000	$ 120,000
Process				
Recirc/booster pumps	L.S.	1	$ 50,000	$ 50,000
Granular Activated Carbon (vessels, GAC, rinse pumps)	MGD-ADD	1.00	$ 0.38	$ 380,000
Instrumentation & Controls	L.S.	1	$ 80,000	$ 80,000
Total Construction Cost				$ 870,000
Contingency	% of Const.	15%	$ 130,500	$ 130,500
Engineering Planning, Design and Permitting	% of Const.	12%	$ 120,060	$ 120,060
Total Budget				**$ 1,120,560**

3.3 MEMBRANE TREATMENT

Research suggests that membrane treatment is a viable option for removal of the contaminants listed in the UCMR 3 and the suggested contaminants in the drafted UCMR 4. However, there is no known full-scale membrane treatment system that is currently in operation and that demonstrates consistent reliable rejection of these contaminants. Depending on the level of treatment desired and the contaminants present, nanofiltration (NF) membranes can be implemented to provide effective removal of the PFCs regulated by the UCMR 3 and UCMR 4. As with several other technologies listed within this analysis, the smaller carbon chain PFCAs such as perfluorobutanoic acid (PFBA) are more challenging to remove. Nanofiltration membranes were observed to remove greater than 90% of the PFCs in both a flow through and recycled treatment approach (Appleman, 2012).

Where more effective treatment removal is needed, brackish water reverse osmosis (RO) membranes have shown to remove greater than 90% of all the contaminants listed and greater than 95% of all contaminants listed over the molar mass of 300 g/mol (Appleman, 2012). Even with the molar mass driving most of the rejection abilities, the RO membrane is estimated to remove greater than 95% of PFBAs found in the raw water which are the smallest chain of PFCs. Therefore, membrane treatment provides the best available technology and highest removal efficiency of all the PFC's down to the smallest molecular weight than the other treatment methods. While research indicates that membrane elements appear to reject the PFBAs, PFCs and PFOAs at a high rate, it is suggested that the City pilot membrane elements to confirm the rejection rates as well as compare the performance of elements from different manufacturers.

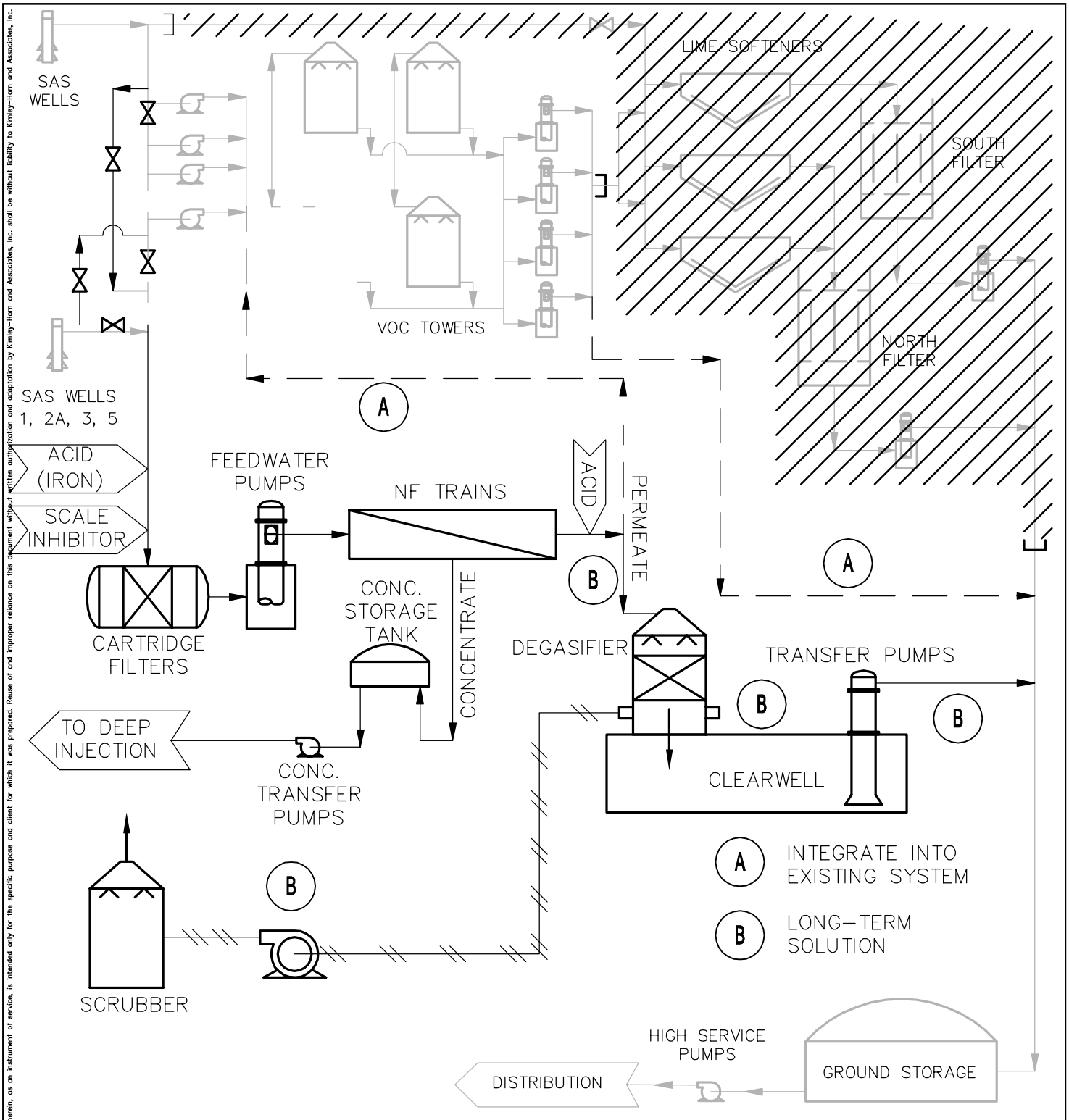
At the pilot scale, a single element testing unit can be utilized to show rejection characteristics of selected membranes. The performance can be quickly compared by simulating the projected recovery of multiple elements within the full-scale system. Typical single element pilot tests focus on the lead and tail elements of the system as well as a representative middle element within the membrane train. Samples taken from the raw feed stream, permeate and concentrate can be analyzed to monitor the respective performance from the membrane elements. If further testing is desired to simulate the full membrane train's performance and any fouling potential, a pilot scale membrane test can be initiated using 4-inch elements mocking the projected staging array. The following process flow diagram **(Figure C**) is a schematic depiction of the integration of membranes into the City's existing process.

Some of the advantages of using membrane treatment include:

- High percentage of removal of contaminants
- Continuous operation of consistent treatment quality
- Automated process controls for operators
- Lowest operating costs compared to the comparable alternatives
- Can be tested at small scale to identify the effective removal of contaminants

The disadvantages include:

- Concentrate disposal is required resulting in increased DIW usage
- Direct forcemain required to convey concentrate to DIW for disposal
- New chemicals introduced to the plant operation (acid for pH adjustment, anti-scalant for membrane process)
- Capital expense is larger than other alternatives



PROPOSED SHORT TERM/LONG TERM MODIFICATIONS NANOFILTRATION

⋈ = NORMALLY CLOSED

⋈ = NORMALLY OPEN

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Drawing name: K:\WPB_Civil\144967008 - UCMR3 & PFC Evaluation\CAD\PlanSheets\PILOT.dwg FIG-C Jun 26, 2018 1:09pm by: Evan.Ghidella

SCALE DESIGNED BY DRAWN BY CHECKED BY	Kimley»Horn © 2018 KIMLEY-HORN AND ASSOCIATES, INC. 1920 WEKIVA WAY SUITE 200, WEST PALM BEACH, FL 33411 PHONE (561) 845-0665 FAX (561) 863-8175 WWW.KIMLEY-HORN.COM CA 00000696	MAR. 2016 PROJECT NO. 144967008	CITY OF STUART	DESIGN ENGINEER: MARK D. MILLER FLORIDA P.E. LICENSE NUMBER: 45320 DATE:	SHEET NUMBER FIG-C

- Operator interaction and instrument technician required for day to day operation

3.3.1 Conceptual Level Engineer's Opinion of Probable Cost

Traditionally, membrane operational costs and concentrate disposal have been the prohibiting factor in integrating membrane treatment. Since the City's WTP currently has a deep injection well for wastewater effluent injection, the concentrate disposal expense includes repumping the concentrate down the deep well. Given that the anticipated feed pressures for this raw water quality are expected to be less than 100 psi, the non-labor operating costs are much more comparable to, if not less expensive, than other treatment technologies. For this operating expense analysis, we have calculated the power consumption using 100 psi as the feed pressure and the remaining concentrate pressure to transport the concentrate to the effluent storage and disposal site.

The non-labor operating costs are mainly composed of energy (feed pumping) cost, membrane replacement cost (5-year replacement), and concentrate disposal cost (repumping down the deep injection well). The conceptual level operating costs are estimated based on average annual design flow conditions. Membrane feed power costs are estimated using $0.12 per KWH and 100 psi net feed pressure, which results in a cost of $0.25 per 1,000 gallons of membrane permeate produced. Concentrate disposal pumping results in a cost of $0.05 per 1,000 gallons of membrane permeate produced, which results in total membrane operational costs of $0.30 per 1,000 gallons of membrane permeate produced. Concentrate disposal is assumed to be via a pipeline to the WWTP, using residual concentrate pressure from the membrane systems. In order to provide an air gap between the membrane concentrate and the injection well, a booster pump station is necessary and the capital and operating costs are included. Membrane replacement cost is estimated at $0.05 per 1,000 gallons of permeate produced. Labor costs, deep injection well maintenance, additional chemical costs and other existing operating costs are not included in this conceptual level cost estimate.

Table 3-5. Conceptual Level Annual Membrane Operational Cost

ADD Capacity (MGD)	MDD Capacity (MGD)	Operating Costs ($ per 1,000 gallon produced)	Estimated Annual Operating Cost (0.525 MGD treated per day)
0.525	0.75	$ 0.30	$ 57,488

The conceptual level of capital costs estimated for membrane treatment system construction are shown in **Table 3-6**. The estimated costs are based on producing the average day demand flow rate of 0.525 MGD. The cost shown includes the membrane

treatment systems, as well as the ancillary cleaning system, concentrate storage and disposal systems.

Table 3-6. Conceptual Level Membrane Capital Cost

Item	Size/Units	Quantity	Unit or Material Cost	Total Cost
General Requirements	L.S.	1	$ 50,000	$ 50,000
Site Civil (slab, site work)	L.S.	1	$ 110,000	$ 110,000
Site Mechanical (RWM piping, u/g)	L.S.	1	$ 90,000	$ 90,000
Electrical (new service, MCC, VFD's)	L.S.	1	$ 150,000	$ 150,000
12-inch FM (WTP to WWTP)	FT	5300	$ 90	$ 477,000
DIW upgrades	L.S.	1	$ 250,000	$ 250,000
Process				
Building	SQFT	8000	$ 110	$ 880,000
Membrane Treatment	MGD-ADD	1.00	$ 1.05	$ 1,050,000
Instrumentation & Controls	L.S.	1	$ 150,000	$ 150,000
Total Construction Cost				**$ 3,207,000**
Contingency	% of Const.	15%	$ 481,050	$ 481,050
Engineering Planning, Design and Permitting	% of Const.	12%	$ 442,566	$ 442,566
Total Budget				**$ 4,130,616**

3.4 Other Treatment Options

The following methods of treatment are primarily research driven and show some degree of effectiveness, either as standalone process or in addition to other forms of treatment such as GAC, IX, or together. These were not further evaluated, but were not ignored since this contamination is emerging and still being defined.

Advanced oxidation processes (AOP's), such as chemical oxidation, electrochemical oxidation, ultraviolet treatment, photolysis, photocatalysis, activated persulfate oxidation, and other oxidative reduction processes, appear to be successful in degrading PFASs, especially
PFOA and PFOS.

Electrochemical oxidation destroys contaminants through two mechanisms: (1) direct anodic or (2) indirect. When contaminants are destroyed by direct anodic oxidation, contaminants will adsorb onto the anode surface and are destroyed by an electron transfer reaction. In indirect oxidation, contaminants are destroyed in solution by oxidation through strong oxidants generated by cathodic electrochemical reactions. This process has been used to treat many different contaminants, including phenols, dyes, and endocrine-disrupting chemicals. Electrochemical oxidation can have long life spans and is versatile, energy efficient, automated, and cost-effective. It can also be used on different volumes of gases, liquids, and solids and is relatively easy and inexpensive to construct and operate. There are a wide variety of electrode materials that can be used, however, their cost is a major limitation as well as the difficulty of building the electrodes compared with other electrode materials. In general, electrochemical oxidation has some limitations. Production of toxic by-products may also occur when treating PFAS-contaminated wastewater mixed with other harmful substances, including chlorine gas, hydrogen fluoride, bromate, perchlorate, and absorbable organic halides. Future research is needed for these options since degradation of different PFASs, including polyfluoroalkyl compounds can occur. Furthermore, only two studies have observed PFAS destruction when using electrochemical oxidation in the presence of aqueous film-forming foams (AFFF) impacted or PFAS-contaminated synthetic groundwater. More studies need to be conducted with environmental matrices to determine whether electrochemical oxidation is suitable for PFAS remediation. Photolysis, photocatalysis, activated persulfate oxidation, and other UV-induced oxidation are also promising treatment methods, but again, require similar research as electrochemical oxidation have not been fully developed into full scale implementation.

Thermal degradation of PFASs involves breaking the C–C and C–F bonds with high temperatures to produce perfluoroalkyl radicals that will subsequently decompose and form similar degradation products as photolytic treatment of PFASs. Thermal treatment methods include thermal chemical reactions, incineration, sonochemistry, sub- or supercritical, microwave-hydrothermal, and high-voltage electric discharge, all of which are still in research modes.

Incineration is one of the most common ways to destroy hazardous compounds and to reduce waste, but can result in harmful emissions. Incineration of PFASs, including PFOS, ammonium perfluorooctanoate (APFO), and PFOA, has been successful at temperatures ranging from 600 degrees Celsius to 1,000 degrees Celsius (USEPA, 2003; Krusic and Roe, 2004; Krusic et al., 2005; Yamada et al., 2005; Taylor et al., 2014).

Sonochemical degradation of PFASs is another treatment process that occurs through the application of ultrasound to an aqueous medium. When ultrasound is applied, cavitation bubbles form during the rarefaction (negative pressure) portion of sound waves. The cavitation bubbles will implode, creating extreme temperatures and pressures (14,000 psi) within its cavity. Highly reactive intermediates and radicals, including hydroxyl radicals, hydrogen atom, and oxygen atom, form during cavitation bubble collapse. This combination of highly reactive species and high temperatures and pressures has made sonolytic decomposition of PFASs successful, but again is only at the research level.

Microbial degradation of PFASs has only been observed to occur with polyfluoroalkyl substances. Several other studies have used different treatment methods to degrade PFASs, including ozonation under alkaline conditions, permanganate, and ball milling. Ozonation is a commonly used advanced oxidation processes (AOP) in at least one-third of water treatment plants in the United States. Ozonation of PFOA and PFOS was viable within 4 h when pretreating with O3 at pH 4–5, followed by pH adjustment to 11, but environmental matrices containing humic acid may inhibit ozonation (Lin et al., 2012a). Permanganate is also widely used as an oxidizing agent for iron and manganese, taste and odor control, microorganism control, and degradation of other hazardous pollutants. Permanganate removed about 50% PFOS, but with only 5% fluoride yield at elevated temperatures and very low Ph (65 degrees Celsius and pH 4.2). Although complete PFOS decomposition could not be achieved, degradation efficiency of permanganate improved with increasing temperatures and was not inhibited by the addition of organic acids, including oxalic, tartaric, succinic, citric, and humic acid.

In contrast to ozone and permanganate, ball milling is a type of mechanochemical (MC) destruction method that has been used to destroy PFOS and PFOA (Zhang et al., 2013b). Reactions take place at the surface of the ball mills while mechanic force is applied, such as shaking. This process effectively destroyed PFOS (<0.2% PFOS remained with 92.3% fluoride yield) after 6 h of ball milling. When potassium hydroxide (KOH) was added, PFOS and PFOA were completely destroyed with higher fluoride yields. This treatment option is energy intensive and requires significant storage capacity due to the residence times required.

In general, most of these advanced treatment options are still considered research at the time of writing this report, and do not have any known full-scale installations with any proven operational track record. Therefore, further consideration of these treatment options is not feasible or recommended at this point.

4 PILOT TESTING

Given the relatively minimal testing history and research completed on PFCs and the limited full scale treatment systems that have been in operation, it was recommended that the City of Stuart perform a pilot test immediately to identify the best method of treatment for the Utility. Specific technologies to be tested include GAC, NF, low pressure RO, and ion exchange (jar test and pilot test level) as those technologies showed the most effective removal of PFCs in the research that has been conducted. The pilot testing will help to identify the operating costs related to regeneration of the GAC and ion exchange medias, as well as the feed pressures effective for membrane treatment. Further, design specifics can be identified to support the preliminary and final design of the full-scale treatment.

It is important to dedicate the pilot testing to the worst case supply to ensure that the desired level of water quality can be obtained as well as develop a conservative review of the capital and operating costs. In the City of Stuart's Utility, it is recommended to identify the worst case source water and commence the pilot testing at that location. Should the well not present access for pilot testing onsite, a split stream of the water supply can be plumbed to the nearest available area for operating the various pilot testing units.

Pilot testing IX was not initially conducted due to the significantly higher capital costs associated with constructing a separate pipeline to the WWTP for disposal of spent brine regenerant to the WWTP, and additional costs and handling of salt and brine for the regeneration. Simply disposing of the spent regenerant to the WWTP would create higher than desired salinity in the treated wastewater effluent used in the City's reclaim system as well. However, once the GAC pilot testing was completed, Evoqua installed IX resins in the vessels in order to conduct some long-term testing of PFC removal using a Dowex PSR2 Plus IX resins.

4.1.1 GAC Pilot Testing – Conducted

GAC pilot testing offers a lot of flexibility in performing tests quickly and efficiently. The pilot testing recommendation includes securing a four-column GAC pilot where multiple carbon manufacturers and carbon bases can be compared and conducting a small scale rapid column test (RSSCT). Onsite monitoring and sampling will be required to ensure that all PFC parameters can be tracked as the media exhausts its adsorption capabilities.

Additional pilot testing was recommended and completed by Calgon Carbon Corporation (CCC) by taking a water sample from the respective well, sending the sample to the manufacturer's lab to complete an accelerated column test (ACT), which can provide a more rapid insight into the carbon's removal capabilities than a column test stand. While the RSSCT's and ACT's aren't anticipated to be 100% scalable to the full-scale treatment, they

should give a strong indication as to the water quality expectations, regeneration frequency, and anticipated breakthrough timeframes. The current results from the ACT are provided below and summarized in the attached report, ***Accelerated Column Test (ACT) Study: Removal of Perfluorinated Compounds from Groundwater using Filtrasorb 400 12x40 Activated Carbon,*** *prepared December 5, 2016.*

The ACT was conducted using Calgon's F-400 12x40 activated carbon to determine the bed life for reduction of PFCs as well as TOC and Color removal. The column test simulated a 10-foot diameter vessel containing 20,000 lbs granular activated carbon operating at 500 gallons per minute. This system and operation conditions simulated a 9.3 minute effective bed contact time (EBCT) based upon A.D. packing density, and 10.8 minute EBCT after backwashing. At completion, the ACT simulated 500 days of operation.

Figure 1 shows the plotted breakthrough curves for PFOS and PFOA versus simulated days of operation. Figure 2 shows the plotted breakthrough curves for TOC and Color versus simulated days of operation. The following conclusions can be drawn from the data generated in this ACT:

- The feed contained average PFC concentrations of 86 and 13 ppt for PFOS and PFOA, respectively, for a combined average of 99 ppt.

- The column effluent achieved initial breakthrough above the minimum detection limit after 60 simulated days of operation. The combined effluent concentrations for PFOS and PFOA reached higher than 70 ppt after nearly 180 simulated days of operation, equating to a carbon use rate of 0.16 lbs GAC per 1000 gallons treated. See Figure 1 for plotted breakthrough curves for PFOS and PFOA versus simulated days of operation.

- The feed contained an average TOC concentration of 9.6 mg/L (ppm) and an average apparent color of 23.

- The column effluent achieved initial breakthrough above detection limit for TOC after ~11 simulated days of operation, which equates to a carbon use rate of 2.66 lbs / 1000 gallons treated.

- TOC achieved 50% breakthrough after ~20 simulated days, which equates to a carbon use rate of 1.45 lbs / 1000 gallons treated. The initial breakthrough for

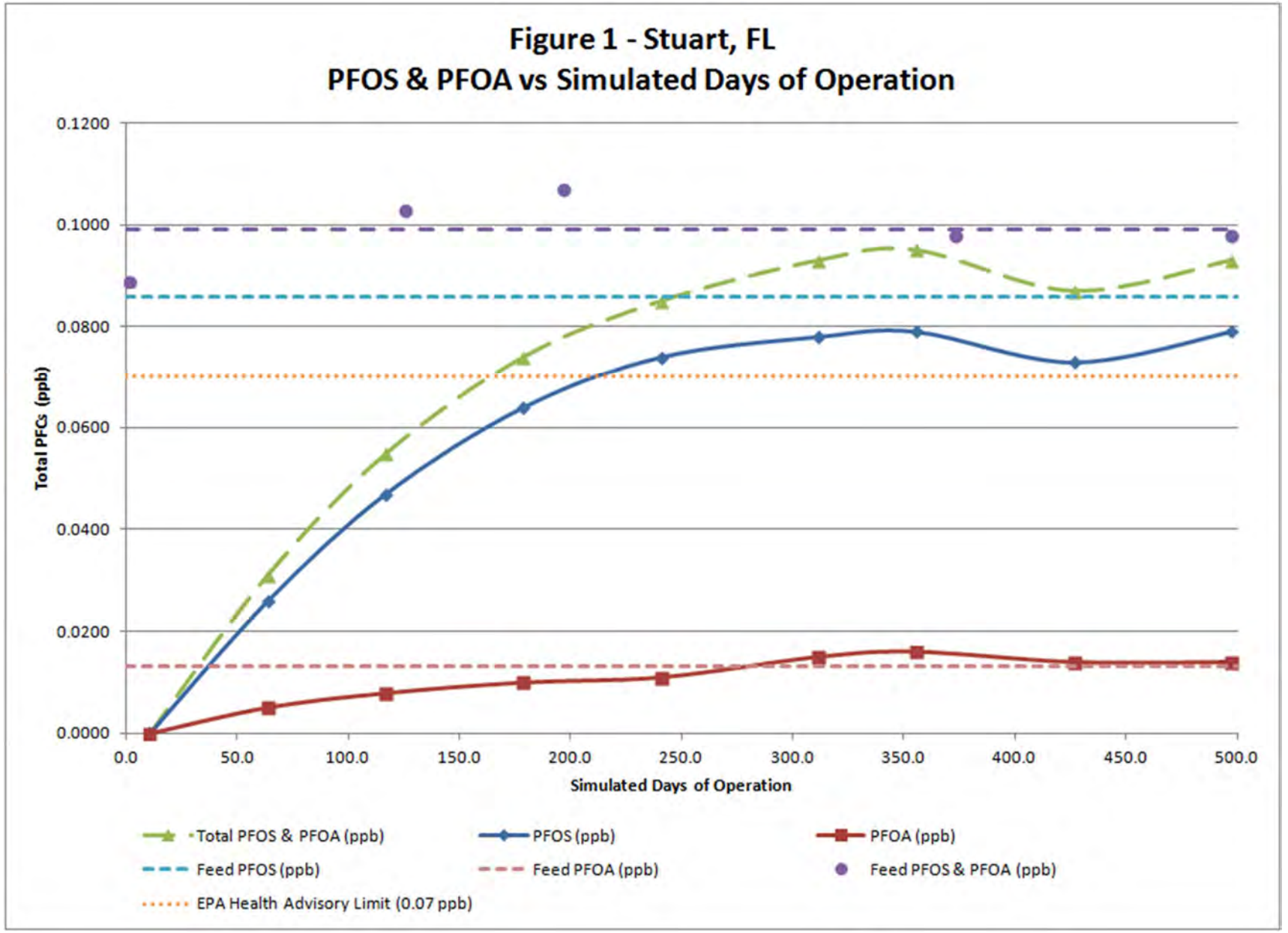
color was observed at the same time and reached 50% of feed at ~73 simulated days of operation.

- Figure 3 indicates the bed volumes to provide sufficient treatment are greater than 20,000. Assuming the influent concentration of the PFOS/PFOA combined is nearly four (4) times the ACT results, the bed volumes are expected to be less than 10,000 to provide sufficient treatment of PFC's to less than the EPA limit of 70 ppt.

The ongoing RSSCT column testing being conducted was determined to be inconclusive at the time of this report preparation. Ongoing pilot testing using GAC and AIX concurrently and in series will be conducted and presented at a future date, if found to be successful.

Some of the early testing data suggests several of the following issues should be considered in the design of a proposed GAC system. Some of these include:

- Iron and TOC levels will affect PFC treatment negatively. Competition for the carbon sites exists when elevated levels of iron and TOC exist, reducing the carbons absorption ability for PFC removal. Additionally, any oxidized form of iron which occurs will blind over the top layers of GAC, further reducing the absorption capability of the GAC. Therefore, it is important to prevent oxidation of iron prior to the GAC beds.
- The existing VOC towers may improve GAC performance since they appear to reduce overall iron levels in the raw water through the tower packing. Iron levels appear to decrease by more than 50% through the towers based on field testing, and since some of the TOC's are bound up with iron, may also reduce TOC levels through the towers. Historically, the VOC towers are cleaned regularly due to the buildup of foulants, of which may be a conglomeration of iron, sulfide (converted to sulfur) and organics. Therefore, the proposed GAC piping confirmation should include operating the GAC vessels in series after the VOC towers.


Figure 1 - Stuart, FL
PFOS & PFOA vs Simulated Days of Operation
Total PFCs (ppb)
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
Simulated Days of Operation
Total PFOS & PFOA (ppb)
PFOS (ppb)
PFOA (ppb)
Feed PFOS (ppb)
Feed PFOA (ppb)
Feed PFOS & PFOA (ppb)
EPA Health Advisory Limit (0.07 ppb)

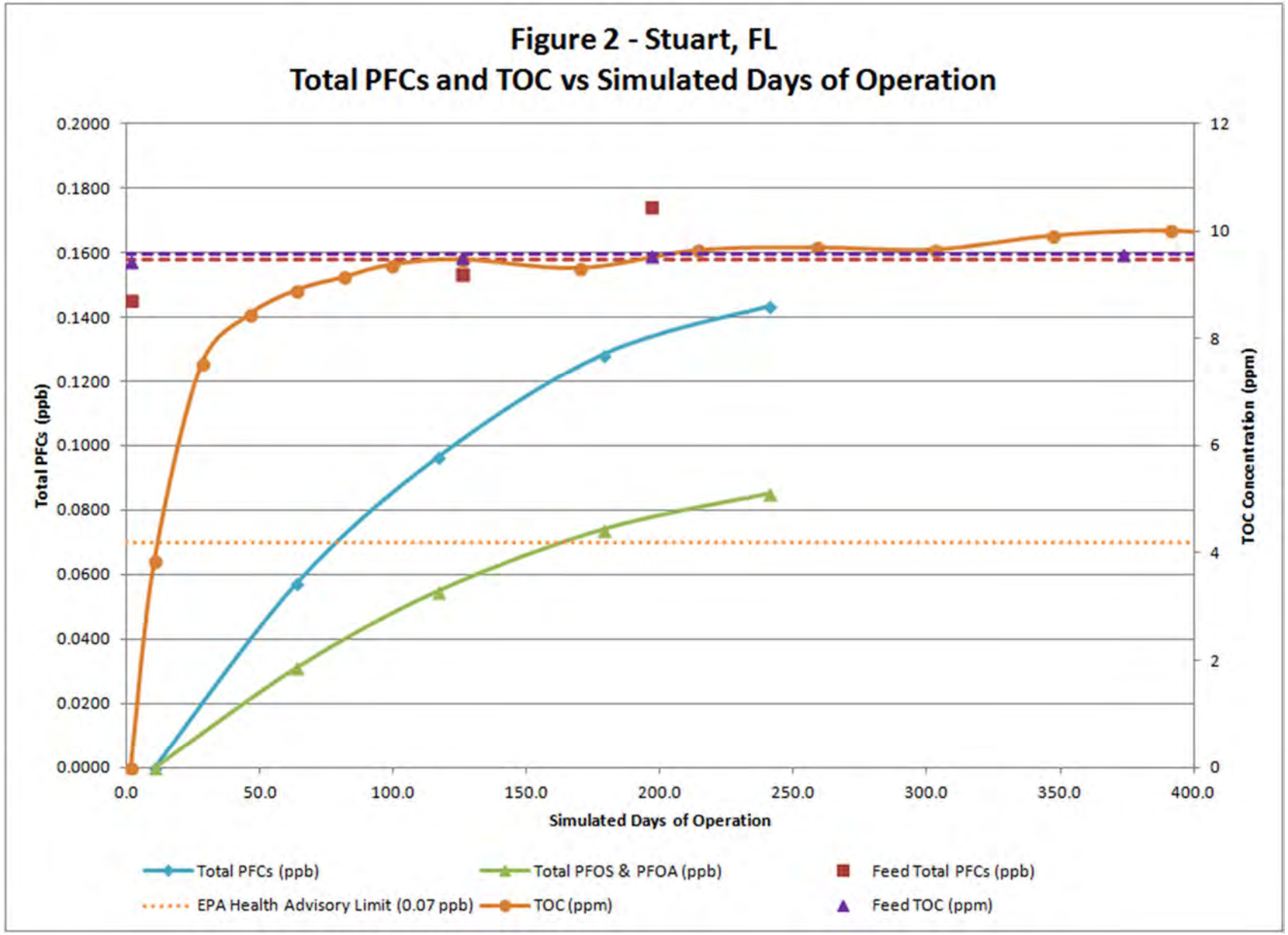
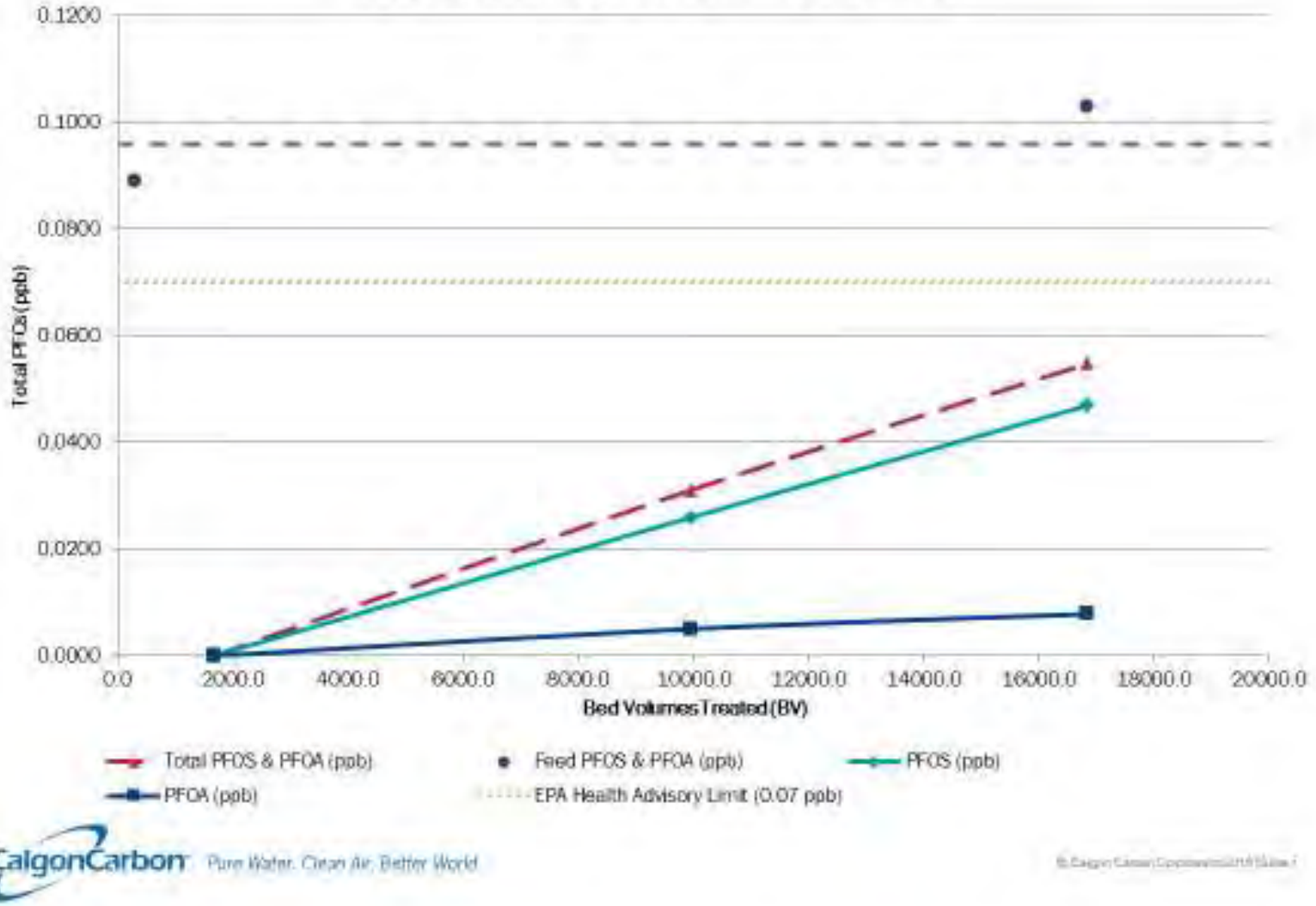

Figure 2 - Stuart, FL
Total PFCs and TOC vs Simulated Days of Operation
Total PFCs (ppb)
TOC Concentration (ppm)
Simulated Days of Operation
0.2000
0.1800
0.1600
0.1400
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
12
10
8
6
4
2
0
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
Total PFCs (ppb)
Total PFOS & PFOA (ppb)
Feed Total PFCs (ppb)
EPA Health Advisory Limit (0.07 ppb)
TOC (ppm)
Feed TOC (ppm)

Figure 3 - Stuart, FL
PFOS & PFOA vs Bed Volumes Treated



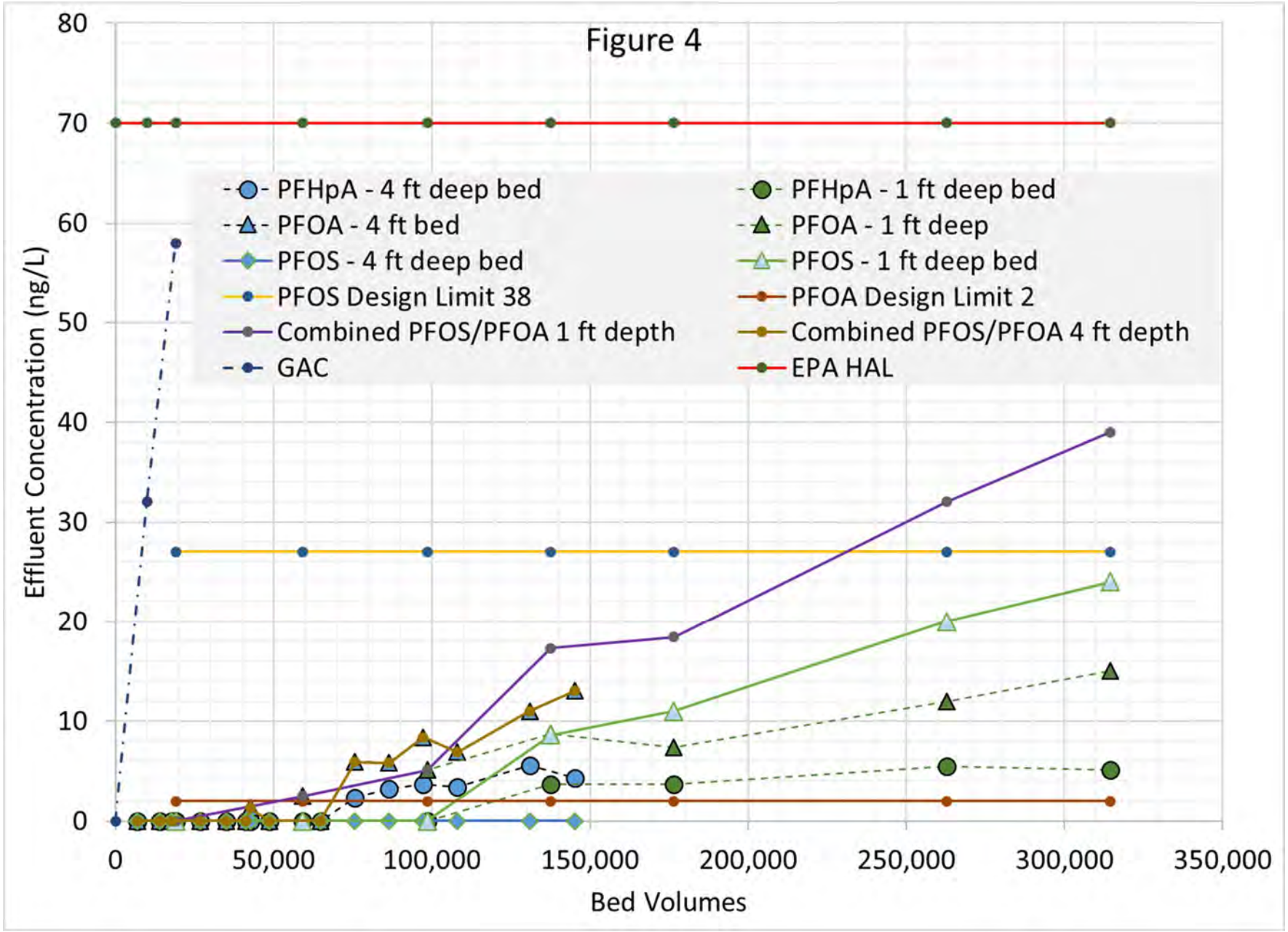
4.1.2 Ion Exchange Pilot Testing – Conducted with Evoqua

Ion exchange treatment was at first, believed to be too expensive due to the disposal of the waste brine regenerant. Concentrating the PFC's and elevating the salt content in the waste stream did not make this option feasible, since the waste could not be disposed of via sanitary sewer since most of the treated wastewater was reused for reclaim water. therefore, the waste would have to be piped separately to the wastewater plant, where it could be pumped and disposed of via the deep injection well (DIW). The DIW would also have to be modified to receive the waste stream, requiring it be converted to an industrial rated DIW. Capital and operating costs would therefore be higher for IX versus GAC.

Based on the significant additional costs to install a separate pipeline from the WTP to the WWTP for brine waste disposal, and the additional costs and handling of salt and brine feed system, AIX was initially not pursued further. However, continued pilot testing was conducted by Evoqua as a trial to test some of the ion exchange resins that exhibited PFC adsorption. As pilot testing continued with several types of IX resins, specifically Dowex PSR2 plus being the most effective of the ones being tested, the removal efficiency and long-term removal presented IX to be the most apparent cost effective treatment method for removal of PFC's.

Figure 4 illustrates the plotted breakthrough curves for PFOS and PFOA at different resin depths, versus bed volumes. Compared to GAC, the breakthrough of combined PFOA and PFOS was more than 20 times longer than GAC using the design limit of 38 PPT. Typically, the break even costs of GAC vs IX are in the range of 4:1, with GAC being 4 times less expensive per cubic foot than IX.

- Similar to the GAC testing, the feed contained an average TOC concentration of 10 mg/L (ppm) and an average apparent color of 25. The resin treatment appeared to be unaffected by these constituents, assuming the iron was no oxidized and suspended material did not foul the resin.
- Figure 4 indicates the bed volumes to provide sufficient treatment are greater than 200,000, assuming PFC level breakthrough is less than the 38 PPT design level.
- Based on extensive literature review, laboratory testing capabilities, on-going research, and stricter water quality requirements in other states, it is recommended the City target treatment removal levels less than 10 ng/L up to 20 ng/L combined PFOS/PFOA.
- With these lower target removal levels, it is anticipated IX can remove PFC's up to 150,000 bed volumes.


Figure 4
Effluent Concentration (ng/L)
Bed Volumes
0
10
20
30
40
50
60
70
80
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
PFHpA - 4 ft deep bed
PFOA - 4 ft bed
PFOS - 4 ft deep bed
PFOS Design Limit 38
Combined PFOS/PFOA 1 ft depth
GAC
PFHpA - 1 ft deep bed
PFOA - 1 ft deep
PFOS - 1 ft deep bed
PFOA Design Limit 2
Combined PFOS/PFOA 4 ft depth
EPA HAL

4.1.3 Membrane Pilot Testing – Not Conducted

Reverse osmosis (RO) treatment has been identified as a more effective treatment alternative for removing PFCs, mostly due to the molecular weight cutoff for membrane rejection compared to the relatively large molecular weight of the PFCs. Across all sizes of carbon chains, the removal has been identified as greater than 90% for most contaminants and over 95% for the remainder of the PFCs. Pilot testing for reverse osmosis is very similar to the steps described for NF with the exception of the membrane used for piloting. Generally, the units available to test NF are also capable of producing the higher pressures needed to operate RO membranes.

Nanofiltration (NF) offers a low operating cost membrane treatment alternative due to its low driving pressures and lower rejection which helps stabilize the permeate stream with minimal post treatment re-stabilization needed. Research indicates high removals (greater than 95% rejection) of PFCs which should be confirmed on the actual water source. In order to test the NF membrane's rejection capabilities, analyzing a single element's performance can be completed quickly and efficiently using a single element test unit fed with raw water. Additional multi-element pilot testing with concentrate staging is necessary to identify representative full-scale feed pressures, fouling conditions, recovery optimization and further water quality confidence. These tests are typically achieved through a 4-inch element pilot configured with concentrate staging and potentially inter-stage boost pumps as required to simulate full-scale treatment conditions.

5 DESIGN CRITERIA

Each of the treatment alternatives present varying levels of treatment for consideration by the City. To confine the treatment expectations, the following subsections quantify the general design parameters for each alternative.

5.1 GRANULAR ACTIVATED CARBON

Based on the potable water capacity needed for supply to its customers, the City's minimal design conditions and equipment are defined within Table 5.1 below.

The GAC system is relatively efficient in water production. The waste is composed of backwashing and rinsing of the media beds both on media replacement and with the routine operation. Much like a traditional filter, the GAC media will collect debris which will increase the differential pressure of across the media. As the differential pressure reaches a design set point, the media will require a 30-minute backwash followed by a 10-minute rinse. Each time the media is reloaded after regeneration, a backwash and rinse cycle is initiated prior to turning the vessel back into operation.

TABLE 5.1 DESIGN CRITERIA for FULL-SCALE GAC SYSTEM		
Parameter	**Unit**	**Value**
Design Flow		
Maximum Daily Flow	MGD	0.750
	gpm	521
Average Daily Flow	MGD	0.640
	gpm	444
GAC Contactor Vessels		
Type	Vertical, Round	
Number	each	2
Flow per Vessel	gpm	222
Diameter	ft	10
Height (min)	ft	20
GAC Media		
Type	coal- or coconut -based	
Media Depth	ft	8.50
Effective particle size (min-max)	mesh	8 - 40
Specific Gravity		0.6
EBCT (min)	min	10.00
GAC weight (approx, min)	lbs	20,000
Density (min)		26
Filtration Rate	gpm/sf	2.83
Backwash Rate	gpm/sf	15.3
Backwash Rate	gpm	1200

The backwash system incorporates a backwash pump, storage tank and disposal to an onsite wastewater collection system. Backwash flow rates for the GAC are 15 GPM/ft^2 or 1,200 GPM for 30 minutes duration with a 10-foot diameter vessel. Following the backwash, a rinse is required to remove any fines or remaining debris at 3 GPM/ft^2 or 240 GPM for a duration of 10 minutes. Total flows utilized in the backwash process are shown in **Table 5-1** below:

Table 5-1. Backwash Criteria

Cycle	Flow Rate (GPM)	Total Consumption (Gallons)
Backwash Cycle	1,200 GPM	36,000 Gallons
Rinse Cycle	240 GPM	2,400 Gallons

The anticipated backwash frequency can vary based on the constituents found in the raw feed water. Similar systems are backwashing each vessel once per week. Utilizing two vessels, the

quantity of waste stream water pumped to the influent of the wastewater treatment plant through the backwashing and rinse cycles totals approximately 77,000 gallons per week or an average of 11,000 gpd. Given the relatively large flow rate over the backwash cycle and the potential to surge the wastewater system, it would be necessary to provide a backwash waste storage tank to store and slowly repump the waste stream to the wastewater treatment headworks.

The proposed process flow diagram (PFD) includes two GAC absorber vessels that can be operated in parallel or series, and provide adequate GAC bed volume to treat up to 0.75 mgd (520 gpm) of raw water capacity, which supports water from wells 1, 3, and 5 having 180 gpm, 180 gpm, and 140 gpm of pumping capacity, respectively. The proposed piping configuration provides flexibility to treat raw water prior to and after the VOC towers, and discharges treated water to the suction of the VOC effluent pumps, or after prior to the lime softening treatment units (see Figure C-1).

5.2 ION EXCHANGE

Based on pilot testing of the IX resin, and the fact that the resin would and could not be regenerated to remove the PFC's, the design of an IX treatment system that would be used to treat PFC's to exhaustion was developed with some of the following criteria.

- The resin should not be backwashed once installed initially as it alters chromatographic profile across the resin bed and can result in early breakthrough of PFA's and shorter service life
- Prefiltration is necessary to prevent buildup of suspended solids on the resin and blinding over of the resin. 10 – 50 micron (µm) bag filters recommended.
- Lead/Lag operation recommended to maintain effluent PFC levels below non-detect. Once breakthrough on lead, resin regenerated OR removed and disposed of and lag put into lead service.
- Acrylic based resins shed TOC better when considering regeneration with brine and removal of NOM. Therefore, regeneration should not be implemented for PFC removal.
- Since PFC treatment system only rated for 4 mgd, up to 2 MGD of bypass to the VOC towers (current operation) could be provided through either a dedicated pump, or control bypass valve.
- Prechlorination of the IX resin is not recommended by any of the resin manufacturers and can breakdown the resins. Therefore the location of the IX system within the existing treatment system should be before chlorination, or prior to the VOC towers.
- The IX system should be designed to allow full treatment of the raw water system since detectable levels of PFC's exist in the majority of supply wells (see Figure A)
- Other volatiles and contaminants are not expected to affect the IX resin, but should be listed and tested to confirm there is no impact on the PFC removal effectiveness. Table 5.2 provides the constituents of concern.

TABLE 5.2

City of Stuart - Detected Constituents in Raw Water

	Detected range	units	HAL/ MCL	units	Design Raw Water (ug/L)	Target Reduction (ug/L)
Methyl-tert-butyl-ether	*1.8*	*ug/L*	***U***	*ug/L*	*1.8*	-
1,1-Dichloroethane	*0.23*	*ug/L*	***U***	*ug/L*	*0.23*	-
Chloromethane	*0.38-0.51*	*ug/L*	***U***	ug/L	0.51	-
Tetrachloroethylene (PERC)	*0.65*	*ug/L*	***0***	*ug/L*	*0.65*	-
1,2-Dichlorobenzene	*0.25*	*ug/L*	***600***	*ug/L*	*0.25*	-
Benzene	*1.3*	*ug/L*	***0***	*ug/L*	*1.3*	-
Vinyl Chloride	*0.8-12.5*	*ug/L*	***1***	*ug/L*	*1.3*	-
cis-1,2-Dichloroethylene	*0.3-42.4*	*ug/L*	***70***	*ug/L*	*40*	-
trans-1,2-Dichloroethylene	*1.1*	*ug/L*	***0.1***	*ug/L*	*1.1*	-
Chlorobenzene	*0.34*	*ug/L*	***100***	*ug/L*	-	-
Perfluorooctanesulfonic acid (PFOS)	**0.051-0.470**	ug/L	**0.070**	ug/L	**0.500**	**ND (0.0025)**
Perfluorooctanoic acid (PFOA)	**0.014-0.052**	ug/L	**0.070**	ug/L	**0.100**	**ND (0.0012)**
Perfluorononanoic acid (PFNA)	0.011-0.014	ug/L			**0.014**	-
Perfluoroheptanoic acid (PFHpA)	0.0035-0.027	ug/L			**0.027**	-
Perfluorohexanesulfonic acid (PFHxS)	0.011-0.26	ug/L			**0.26**	-
Perfluorobutanesulfonic acid (PFBS)	0-0.041	ug/L			**0.041**	-
Perfluoro-1-hexanesulfonic acid	0.015-0.47	ug/L			**0.47**	-
Perfluoro-1-octanesulfonic acid	0.046-0.38	ug/L			**0.38**	-
Hydrogen Sulfide (Total)	0.1 - 0.8	mg/L			0.6	-
Sulfate	10 - 25	mg/L	250		15	-
Chloride	25 -60	mg/L	250		50	-
Nitrate	<8	mg/L	10		5	-
Alkalininty (as $CaCO_3$)	210 - 310				280	-
TOC	3.7 - 10.4	mg/L			8.0	-
Iron	0.04 - 0.65	mg/L	0.3	mg/L	0.5	-
Color	15 - 40	CU	15	CU	30	-
pH	7.0 - 7.6				7.4	-
Calcium Hardness (as $CaCO_3$)	280 - 350				300	-
TDS	320 - 410	mg/L	500	mg/L	410	-
VOC's						6/7/2018
Parameters to Remove						

The following design criteria was developed based on resin manufacturer performance data and pilot test results. In general, the treatment system should include lead/lag operation, where treatment vessels are operated in series, providing the ultimate barrier in preventing any breakthrough of PFC's before they are detected. Since there is no on-line continuous monitoring of PFC's test equipment currently available, this is the preferred method of operation.

IX DESIGN CRITERIA

Pretreatment:	Bag Filters (10 micron)
PFC Treatment	
Capacity:	**75% Full Scale** (WTP = 6 MGD MDF) 4.0 MGD (2,800 gpm)
Number of Vessels:	4 w/ 1 O/S
Vessel Diameter:	12 ft
Vessel Area:	113 sq ft
Orientation:	Lead/Lag (series)
Loading:	12.4 gpm/sqft 700 - 1,400 gpm/vessel
Vessel SW Depth:	9 ft (8.0 – 10.0 ft)
dP across vessel:	1.5 – 2 psi/ft bed 5.25 – 10 psi
Empty Bed Contact Time (EBCT) resin:	2.4 – 3.0 minutes
Resin Depth:	4 ft – 5 ft
Resin Volume:	452 cft/vessel 565 cft/vessel (max) 1,808 - 2,260 cft TOTAL
Topping/Guard Depth:	0 - 1 ft
Topping/Guard Volume:	113 cft/vessel 452 cft TOTAL
Resin Types:	Purolite - PFA694E DOW - Dowex PSR2 Calgon - CalRes 2301, CalRes 2304
Topping Type:	Ion Exchange Resin Granular Activated Carbon (GAC)

Desired Treatment Capacity (to non-detect)

Design	**80,000 BV (Bed Volumes)**
Maximum projected	**150,000 BV (Bed Volumes)**

5.3 MEMBRANE TREATMENT

Based on the potable water capacity needed for supply to its customers, the City's minimal design conditions and equipment are defined within the following table:

DESIGN CRITERIA for FULL-SCALE MEMBRANE SYSTEM

Parameter	Unit	Value
Design Flow		
Maximum Daily Flow	MGD	0.750
	gpm	521
Average Daily Flow	MGD	0.640
	gpm	444
Permeate Daily Flow	MGD	0.750
	gpm	521
Concentrate Daily Flow	MGD	0.132
	gpm	92
Membrane Elements		
Membrane Element Diameter	inches	8
Membrane Element Length	inches	40
Nominal Membrane Surface Area	ft^2/element	400
Vessel Length	elements	7
Membrane Treatment Trains		
Treatment Trains	units	2
System Average Flux	$g/ft^2/day$	15
Minimum Recovery	percent	85%
Membrane Array	ratio	2:1
SCADA Automation	-	-

Membrane treatment was not piloted or pursued further due to the costs and successful removal using IX treatment. Additionally, the existing lime softening treatment process currently in-place provides hardness removal, membrane softening, or nanofiltration would be a duplicated treatment process.

6 SUMMARY AND RECOMMENDATIONS – SHORT-TERM OPTIONS

Several treatment processes were evaluated to determine the best fit for the short-term and long-term approach to solidify the City's potable water production needs. The primary concern for this evaluation focused on emerging contaminants removal in order to achieve compliance with the current and oncoming UCMR regulations. The short-term solutions are defined with recommended steps for pilot testing, full-scale implementation and operation. The long-term solutions are conceptual in nature and require a much more thorough investigation to select a permanent solution.

6.1 REVIEW OF TREATMENT ALTERNATIVES

Multiple alternative treatment methods were evaluated using previous experience and current water quality parameters to treat the current surficial aquifer supply as the primary water source. The three short-term alternatives that research suggests significant water quality improvement based on the projected performance are GAC, membranes, and ion exchange treatment. Each was compared for operating and capital cost as well as their respective net present value as shown in **Table 6-1** below. The combination of capital and operating costs are plotted in **Figure 6** to project the annual expense over the first 20 years of operation.

6.2 SHORT-TERM RECOMMENDATIONS

The three treatment alternatives considered for the Utility's WTP are each projected to remove the emerging contaminants to an acceptable level for UCMR regulatory compliance. The recommendations have been based on the ability to achieve treatment compliance for the Utility as well as capital expense and operational expense. After reviewing these categories for each alternative, this section provides a discussion of the treatment alternative selection that is recommend for short-term solution for the City's Utility.

Table 6-1. Capital, Operating and NPV Cost Summary

Treatment Alternative	Capital Cost	Annual Operating Cost	20-Year NPV: Capital and Operating Cost
Ion Exchange	$ 1,184,960	$ 67,069	$ 2,526,335
GAC	$ 1,120,560	$ 111,143	$ 3,343,410
Membranes	$ 4,130,616	$ 57,488	$ 5,280,366
Martin County Utilities	$ N/A	$ 394,200	$ 7,884,000

Based on the combination of capital and operating costs, it is recommended that the Utility pursue ion exchange (IX) treatment alternative for this facility. Although the GAC treatment alternative provides the lowest initial capital cost for the three alternatives, the operating costs for IX clearly provide a more rapid return on investment as compared to GAC. The net return on investment shows IX is the most cost effective treatment alternative beyond 1 – 2 years of operation.

Additionally, IX provides the necessary treatment capabilities to effectively remove the emerging contaminants from the raw water supply coupled with flexibility to increase removal through increasing the media regeneration frequency. The annual operating expenses are slightly more than the membrane treatment alternative however, the capital cost differential doesn't support the short-term or even long-term (20-years) application of membrane treatment. **Table 6-1** highlights the operational and capital expense for operating the facility over the course of 20 years. As shown in the capital and operating costs figure, GAC provides the second most cost effective solution for the City's treatment. Since this option will most likely be a short-term solution to the City's demand, buying water from Martin County Utilities is the most cost effective short-term solution (3 years +/-) even though the operating costs are much higher than one of the treatment options. The long-term economic differential is graphically depicted in **Figure 6** and numerically with the net present value shown in **Table 6-1**.

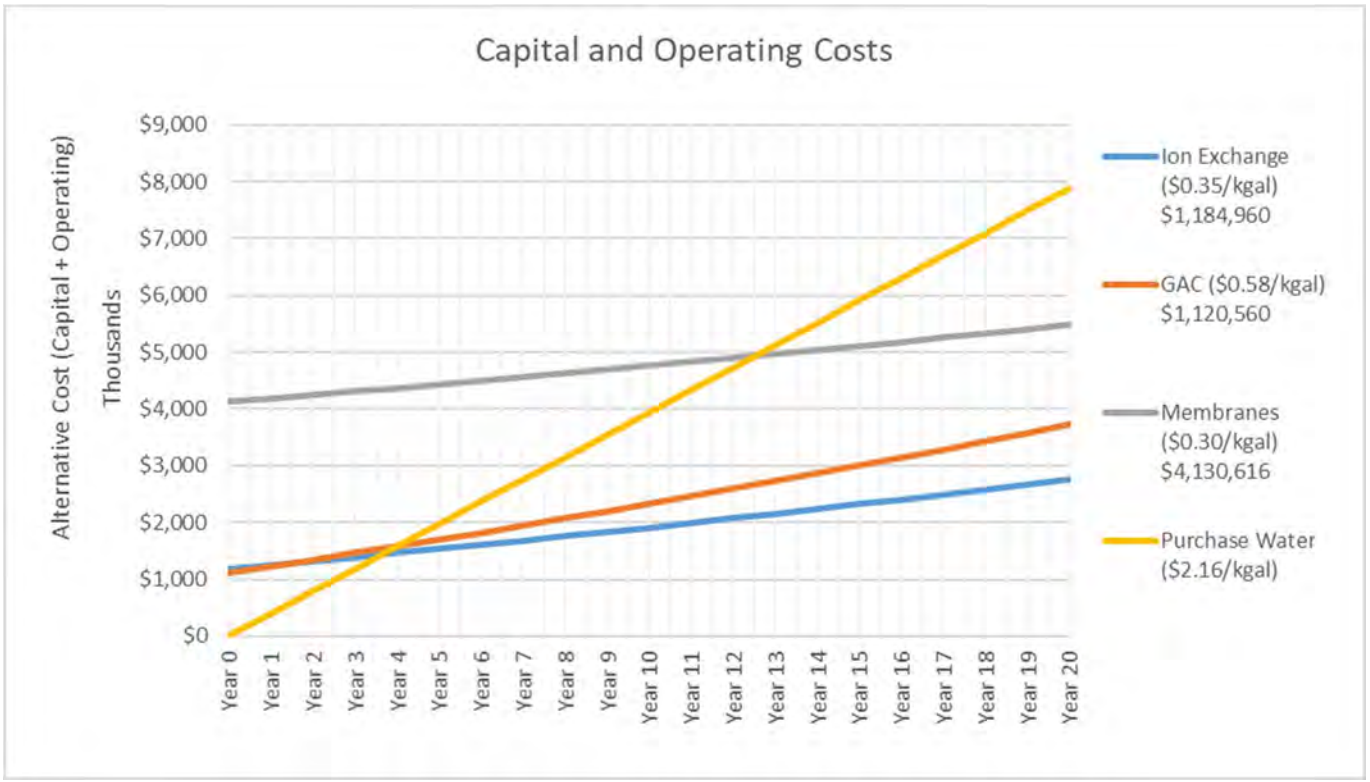


Figure 6. Capital and Operating Cost 20-Year Projection

Depending on the water source selected for the long-term supply for the City's potable water, the IX treatment alternative may be used for full treatment or in conjunction with another treatment alternative to achieve regulatory compliance and water quality preferences set by the City. Further analysis and testing may be completed to confirm the treatment alternatives necessary for long-term future water supplies, however, at the time of the completion of this report, IX is the best available technology for removing PFC's from this raw water and appears it will remain the most effective treatment method removing PFC's down to low non-detect levels.

SUMMARY OF SHORT-TERM OPTIONS

The shallow aquifer is becoming less dependable and susceptible to emerging contaminants of concern and unregulated compounds that may or will become more regulated in the future. IX provides the most cost effective option, based on capital costs and operating costs within and beyond a 20-year life-span. Operating costs, however, are dependent on raw water PFC, TOC, and iron concentrations, since GAC regeneration frequency is greatly affected by these parameters.

Based on the research conducted on PFC's, pilot testing, and evaluation of the existing water treatment plant, the following recommendations are provided:

A. Based on no initial capital costs to connect to Martin County Utilities, and the cost to purchase water from Martin County, this option is the most cost effective short-term (3-year) solution, and addresses the immediate need to meet system demands. If the system demands do not exceed the current water plant treatment capacity, then there is no cost to the City.

B. IX is the best suited treatment method for this application as a short and long- term solution to the PFC contamination issue, based on costs, implementation and estimated flows of 525,000 gpd average daily flow. Considering the wide variations in PFC concentrations from well S-3, operational adjustments described herein can be implemented to help maintain a consistent PFC feed concentration to and exiting the IX treatment system.

C. Pilot testing demonstrated that iron and TOC can greatly affect treatment effectiveness and efficiency of GAC. Effectiveness is dictated by:
    - Total Organic Carbon (TOC)
    - Iron (Ferric & Ferrous)
    - Variable PFC levels

    Most installed systems that utilize GAC for PFC removal are low in TOC levels (< 3.0 - 5.0 mg/l), whereas TOC levels in the City's wells 1, 3, and 5 range from 6.0 to 10.0

mg/l, and the ACT pilot testing experienced greater than 10.0 mg/l. Elevated TOC levels in the raw water result in the PFC's competing for adsorption sites, rapidly diminishing the GAC's ability to absorb PFC's.

Although iron may be bound up with the TOC, any oxidation of the iron will tend to "blind" over the GAC sites, preventing any absorption of the other PFC contaminants from the raw water and short-circuiting of the GAC bed.

The PFOS levels in the raw water have varied wildy, from undetected (0.0058 ug/l) up to more than 2,100 ug/l. Coupled with elevated levels of TOC and iron, careful monitoring of the effluent must be implemented.

D. Reduce flows from well S-3 in order to control PFC levels to treatable levels, using well flows from S-1 and S-5 capacities. Operational adjustments can be implemented with the GAC system.

E. IX provides specific treatment and removal of PFC's, allowing hardness and alkalinity to pass through. This provides the ability to stabilize a future water treatment process which may utilize reverse osmosis (RO) treatment of an alternative water supply being the Floridan aquifer.

F. The IX system will provide pretreatment to the existing VOC towers, currently rated for 1,020 gpm to 1,400 gpm. Specific volatiles (VOC's) such as Vinyl Chloride are typically not absorbed by IX, and therefore the towers must still be used where other contaminants exist in the same raw water.

G. Nanofiltration is considered the best available technology, but is redundant to the existing conventional lime softening and filtration system. If the conventional treatment system is ever demolished in the future, then NF treatment would be the best suited treatment system.

H. Consideration of converting a NF membrane system designed for organics and PFC removal, could be later converted to brackish RO membrane treatment system, and may be considered in the long-term future alternative water supply evaluation.

I. From a regulatory perspective, although the PFC levels are not enforceable and do not carry a maximum contaminant level, the goal should still be to reduce PFC's to well below the health advisory levels (HAL), and possibly as low as current lab technology can detect. Based on extensive literature review, laboratory testing capabilities, on-going

research, and stricter water quality requirements in other states, it is recommended the City target treatment removal levels less than 10 ng/L up to 20 ng/L combined PFOS/PFOA.

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Plotted By:Block, Nick Sheet Set:Stuart PFC Layout:C-1 SITE PLAN March 16, 2017 12:15:48pm U:\Stuart\C-1 SITE PLAN.dwg

NORTH

GRAPHIC SCALE IN FEET
0 5 10 20

LIME SLUDGE PIT

WELL S-5

7' CHAIN LINK FENCE

12" CMP N.E. INV.9.41

CATCH BASIN TOP: 11.23 INV. 12" CMP 10.09

6" METAL PIPE N. INV. 13.77 S. INV. 13.84

15" PVC N. INV.8.20 S. INV.10.17

4" PVC

12" PVC INV. 7.99

6" PVC N.W. INV. 8.85 (UNABLE TO OBTAIN S.E. INVERT).

6" PVC N.W. INV. 8.05 (UNABLE TO OBTAIN S.E. INVERT)

CATCH BASIN TOP: 12.10 INV. 12" PVC: 10.00

4" METAL PIPE N. INV. 14.42 S. INV. 13.65

4" METAL PIPE E. INV. 13.63 W. INV. 13.74

20" CRW

14" RW

6" CRW

12" RW

10" METAL PIPE N. INV.16.31 S. INV.16.39

10" METAL PIPE N. INV.16.32 S. INV.16.31

10" METAL PIPE N. INV.16.24 S. INV.16.39

10" METAL PIPE N. INV.16.34 S. INV.16.26

PUMP PAD

CONC. PAD

CONC. A/C PAD

ELECTRICAL BLDG.

ELEC. VAULT

TOP OF BANK

SWALE

TOP OF BANK

13.00

13.60

CATCH BASIN TOP: 13.74

BLOWER PAD

GENERATOR PAD

FUEL TANK PAD

CLS

4" PVC (INSTALLED BY CITY)

V.O.C. TOWER

10" VERT. METAL PIPE

CATCH BASIN TOP: 12.59

2" PVC ACID FEED DRAIN

CLEANING SUPPLY BLDG. SLAB EL. 18.67

15" PVC N. INV. EL. 14.75 S. INV. EL. 14.66

12" CMP N. INV. EL. 14.45 S. INV. EL. 14.62

EMERG. WASH STA.

12" METAL PIPE W. INV. EL. 16.98 E. INV. EL. 16.86

12" METAL PIPE W. INV. EL. 18.04 E. INV. EL. 13.17

12" METAL PIPE W. INV. EL. 18.07 E. INV. EL. 18.08

12" METAL PIPE W. INV. EL. 18.09 E. INV. EL. 18.02

12" METAL PIPE W. INV. EL. 18.07 E. INV. EL. 17.95

CONC. PAD

CATCH BASIN TOP: 14.35

FIBERGLASS TOWERS ON CONC. PAD

CONC. BLOWER PAD

RAMP

CONCRETE PAD (PIPE STORAGE)

PRELIMINARY

No.	REVISIONS	DATE	BY

Kimley»Horn
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WWW.KIMLEY-HORN.COM CA 00000696

KHA PROJECT	144967008
DATE	AUG. 2016
SCALE	AS SHOWN
DESIGNED BY	NPB
DRAWN BY	SS
CHECKED BY	MDM

GAC FILTERS
PREPARED FOR
CITY OF STUART

STUART, FLORIDA

SITE PLAN

SHEET NUMBER
C-1

Calgon Carbon Corporation
Pittsburgh, PA

Technical Service Report No. 20160811

Accelerated Column Test (ACT) Study: Removal of Perfluorinated Compounds from Groundwater using Filtrasorb 400 12x40 Activated Carbon

Prepared For:

City of Stuart, FL

Author: _____
Marshall McGoff x6622

Co-Investigator: R. Klingbeil

Date: February 6, 2017

cc: F. Forrester
A. Simonic
R. Franco
K. Ryan
L. Zappa
S. Briczinski Stuart FL ACT Report SB201625

INTRODUCTION

Calgon Carbon Corporation's, hereinafter CCC, services were requested by the City of Stuart, FL to conduct an Accelerated Column Test (ACT). The ACT will evaluate the performance capacity of Filtrasorb 400 (F-400) 12x40 mesh granular activated carbon (GAC) for the removal of perfluorinated compounds (PFCs), total organic carbon (TOC), and color from potable groundwater.

PFCs are used in many industrial and commercial applications including non-stick cookware, fire-fighting foam, and stain resistant fabrics. They are problematic because of their persistence in the environment and their long half-life in humans. In general, PFCs are separated into main categories: perfluoroalkyl sulfonates (PFAS) and long-chain (greater than 8 carbons) perfluroalkyl carboxylates (PFAC). The two major PFCs of interest are perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) due to their predominance in industrial applications. In the United States, the EPA Health Advisory Exposure Limit for PFOS and PFOA is 70 ng/L (ppt) in treated water.

SUMMARY and CONCLUSIONS

The ACT was conducted using F-400 12x40 activated carbon to determine the bed life for reduction of PFCs as well as TOC and Color. The column test simulated a 10-foot diameter vessel containing 20,000 lbs of granular activated carbon operating at 500 gallons per minute. This system and operation conditions simulated a 9.3 minute EBCT based upon A.D. packing density, and 10.8 minute EBCT after backwashing. At completion, the ACT simulated 500 days of operation. The data tables for the column effluent as well as the feed can be found in Tables 1 and 2 respectively.

Figure 1 shows the plotted breakthrough curves for PFOS and PFOA versus simulated days of operation. Figure 2 shows the plotted breakthrough curves for TOC and Color versus simulated days of operation. The following conclusions can be drawn from the data generated in this ACT:

- For PFC Removal:
    - The feed contained average PFC concentrations of 86 and 13 ppt for PFOS and PFOA, respectively, for a combined average of 99 ppt.
    - The column effluent achieved initial breakthrough above the minimum detection limit after 60 simulated days of operation. The combined effluent concentrations for PFOS and PFOA reached higher than 70 ppt after nearly 180 simulated days of operation, equating to a carbon use rate of 0.16 lbs GAC per 1000 gallons treated. See Figure 1 for

plotted breakthrough curves for PFOS and PFOA versus simulated days of operation.

- For TOC/Color Removal:
    - The feed contained an average TOC concentration of 9.6 mg/L (ppm) and an average apparent color of 23.
    - The column effluent achieved initial breakthrough above detection limit for TOC after ~11 simulated days of operation, which equates to a carbon use rate of 2.66 lbs / 1000 gallons treated.
    - TOC achieved 50% breakthrough after ~20 simulated days, which equates to a carbon use rate of 1.45 lbs / 1000 gallons treated. The initial breakthrough for color was observed at the same time and reached 50% of feed at ~73 simulated days of operation. See Figure 2 for plotted breakthrough curves of both TOC and Color versus simulated days of operation.

EXPERIMENTAL

ACT Design

The ACT design simulated a 10-foot diameter vessel containing 20,000 lbs of F-400 granular activated carbon, operating at 500 GPM, and providing 9.3 minutes EBCT based on A.D. packing density and 10.8 minute EBCT after backwashing.

A description of the Accelerated Column Test is in Appendix B.

ACT Carbon Preparation

A current production sample of F-400 was systematically re-sized to 100x325 mesh for use in the ACT. The test carbon was oven dried at 105°C for 16 hours then allowed to cool in a desiccator until placed in a column.

After installation in the test column, and prior to the introduction of the feed water, the carbon was pre-wetted with Milli-Q water for approximately 16 hours.

See Appendix A for the Activated Carbon Sales Specification Sheet.

ACT Feed Preparation

CCC received two 55-gallon drums from Stuart, FL on August 31, 2016. The drum was stored in a walk-in cooler maintained between 2-8°C until the study began.

ACT Sampling

PFC effluent samples were collected 1x daily, TOC effluent samples 2x daily, Color effluent samples 1x daily, and inlet samples less frequently and periodically. TOC fractions were collected into sealed 40-mL VOA vials and PFC/color samples were collected into 500-mL trace-clean amber glass bottles, via automated sample collectors.

PFC samples were transferred into 250 ml high-density polyethylene (HDPE) bottles with Trizma® preservative. Select samples were placed on ice and shipped (overnight) in a cooler lined with ice to the Eurofins laboratory in Monrovia, CA with a COC identifying the samples.

The flow rate of the ACT was closely monitored throughout the study. Composite samples of the ACT effluent, minus discrete samples for TOC and PFC analysis, were collected and measured on a daily basis. From this data, an average flow rate was calculated.

Analytical

TOC samples were analyzed in CCC's analytical laboratory according to the described method:

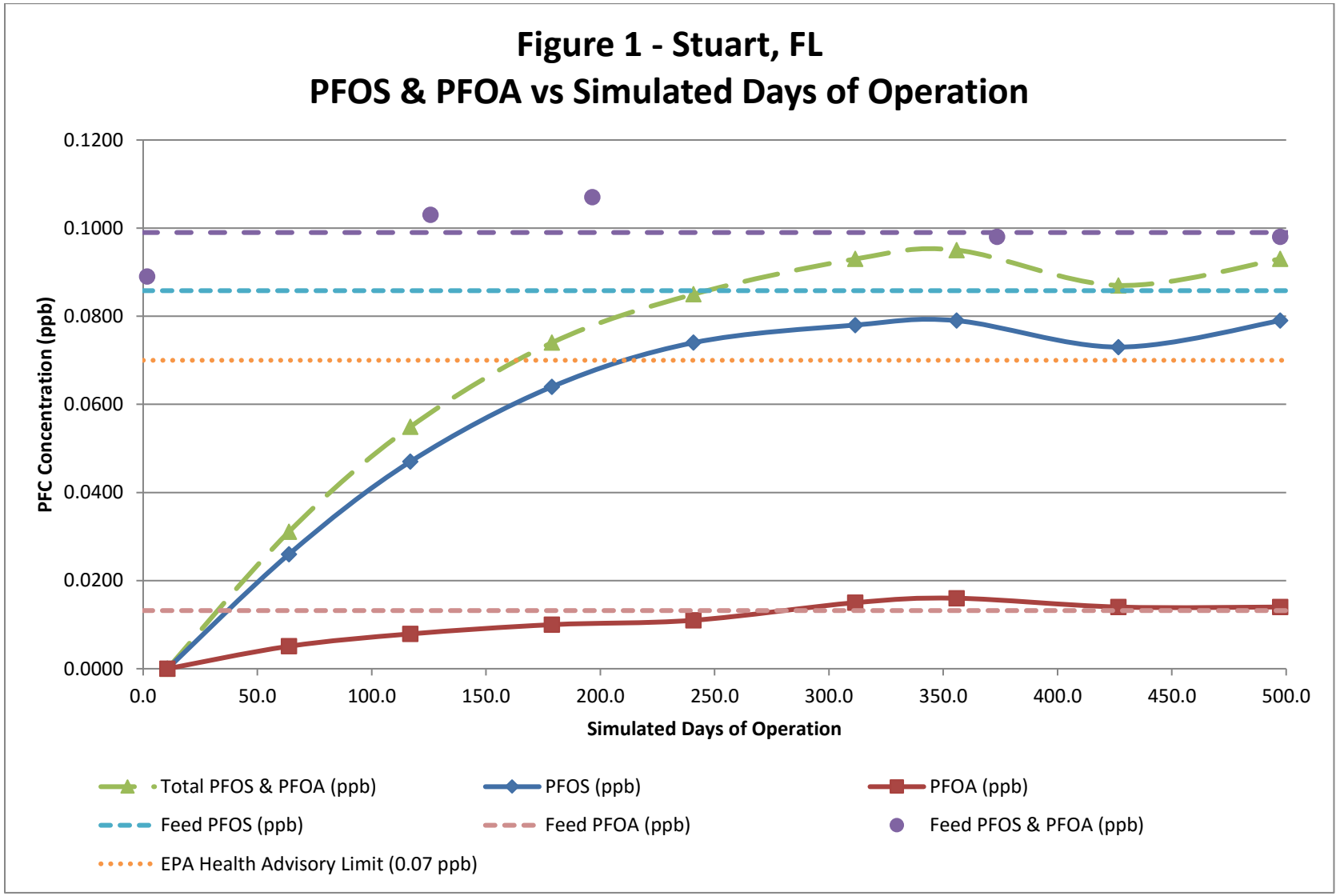
> Standard Methods [SM 5310B] Total Organic Carbon, High Temperature Combustion Method

250-mL samples were sent to Eurofins for PFC testing according to the following method:

> EPA 537 - Perfluorinated Alkyl Acids

500-mL samples were sent to TestAmerica Pittsburgh for Apparent Color testing according to the following method:

> Standard Methods [SM 2120B] Color, Colorimetric


Figure 1 - Stuart, FL
PFOS & PFOA vs Simulated Days of Operation
PFC Concentration (ppb)
0.1200
0.1000
0.0800
0.0600
0.0400
0.0200
0.0000
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
Simulated Days of Operation
Total PFOS & PFOA (ppb)
PFOS (ppb)
PFOA (ppb)
Feed PFOS (ppb)
Feed PFOA (ppb)
Feed PFOS & PFOA (ppb)
EPA Health Advisory Limit (0.07 ppb)

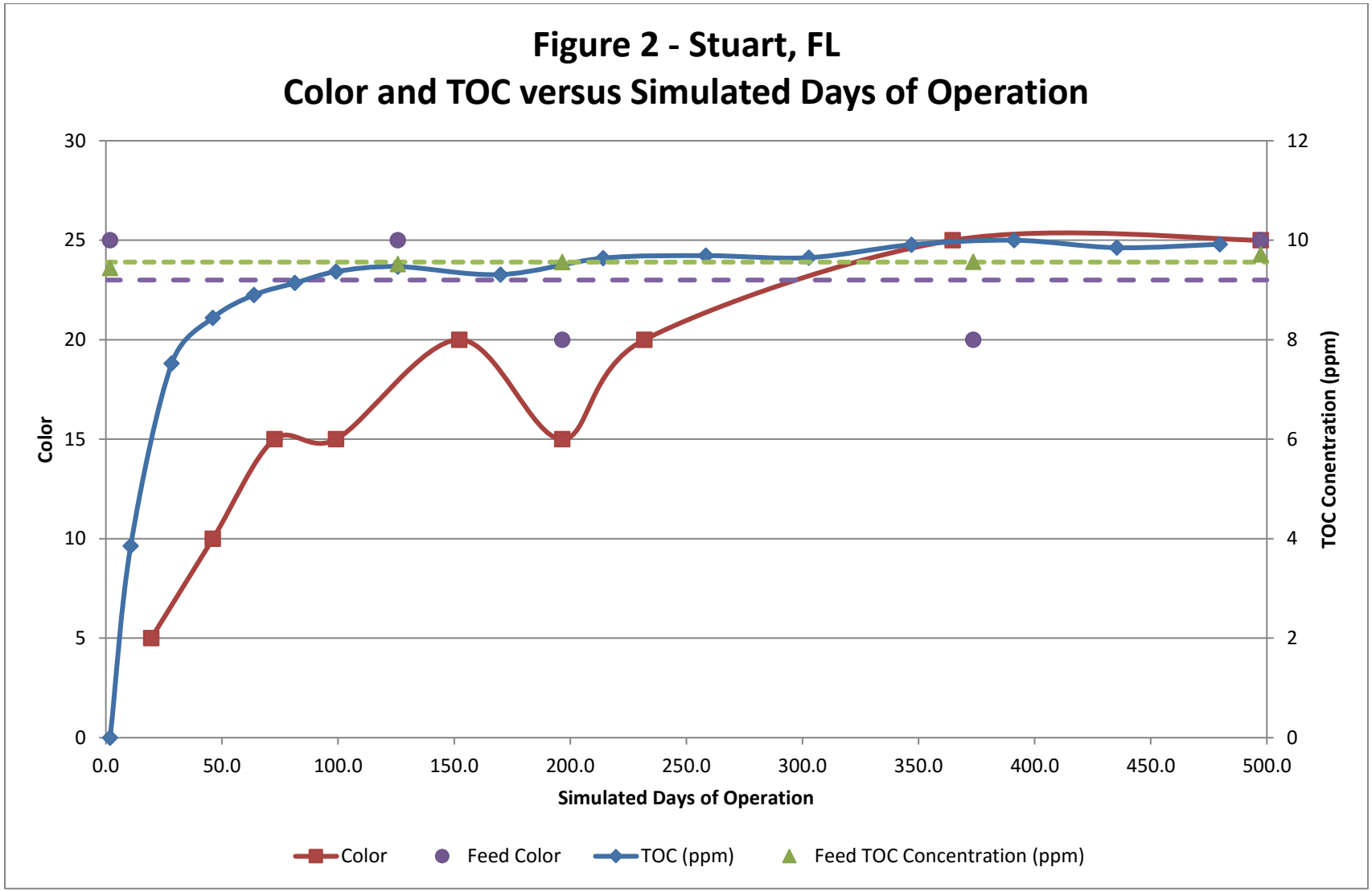

Figure 2 - Stuart, FL
Color and TOC versus Simulated Days of Operation
Color
TOC Conentration (ppm)
Simulated Days of Operation
0
5
10
15
20
25
30
0
2
4
6
8
10
12
0.0
50.0
100.0
150.0
200.0
250.0
300.0
350.0
400.0
450.0
500.0
Color
Feed Color
TOC (ppm)
Feed TOC Concentration (ppm)

Table 1: Column Effluent Data

Date/Time	Simulated Days of Operation	TOC (ppm)	PFOS (ppb)	PFOA (ppb)
9/6/16 11:00	1.8	0		
9/6/16 23:00	10.7		0	0
9/6/16 23:00	10.7	3.855		
9/7/16 23:00	28.4	7.525		
9/8/16 23:00	46.1	8.44		
9/9/16 23:00	63.8		0.026	0.0051
9/9/16 23:00	63.8	8.9		
9/10/16 23:00	81.5	9.14		
9/11/16 23:00	99.2	9.37		
9/12/16 23:00	116.9		0.047	0.0079
9/13/16 11:00	125.7	9.47		
9/15/16 23:00	170.0	9.31		
9/16/16 11:00	178.8		0.064	0.01
9/18/16 11:00	214.2	9.64		
9/19/16 23:00	240.8		0.074	0.011
9/20/16 23:00	258.5	9.69		
9/23/16 11:00	302.7	9.65		
9/23/16 23:00	311.6		0.078	0.015
9/25/16 23:00	347.0	9.91		
9/26/16 11:00	355.8		0.079	0.016
9/28/16 11:00	391.2	10		
9/30/16 11:00	426.6		0.073	0.014
9/30/16 23:00	435.5	9.85		
10/3/16 11:00	479.7	9.92		
10/4/16 11:00	497.4		0.079	0.014

Table 2: Feed Data

Date/Time	Feed TOC Concentration (ppm)	Feed PFOS (ppb)	Feed PFOA (ppb)
9/6/16 8:30	9.561	0.0858	0.0132
9/6/16 11:00	9.445	0.079	0.01
9/13/16 11:00	9.52	0.091	0.012
9/17/16 11:00	9.56	0.094	0.013
9/27/16 11:00	9.565	0.082	0.016
10/4/16 11:00	9.715	0.083	0.015

Appendix A
Sales Specification Sheet for F-400

CalgonCarbon

SALES SPECIFICATION SHEET

FILTRASORB 400

Granular Activated Carbon

Test	Specification		Calgon Carbon Test Method
	Min	Max	
IODINE NUMBER, mg/g	1000	-	TM-4,ASTM D4607
MOISTURE (AS PACKAGED), wt%	-	2	TM-1,ASTM D2867
ABRASION NUMBER	75	-	TM-9,AWWA B604
EFFECTIVE SIZE, mm	0.55	0.75	TM-47,ASTM D2862
UNIFORMITY COEFFICIENT	-	1.9	TM-47,ASTM D2862
12 US MESH [1.70 mm], wt%	-	5	TM-8,ASTM D2862
< 40 US MESH [0.425 mm] (PAN), wt%	-	4	TM-8,ASTM D2862

Typical Properties:

This product complies with ANSI/AWWA B604 (2005) – Granular Activated Carbon.

This product complies with the requirements for activated carbon as defined by the Food Chemicals Codex (FCC) (8th Edition) published by the U.S. Pharmacopeia.

This product is produced under supervision of the Islamic Food and Nutrition Council of America (IFANCA).

This product is prepared under the supervision of the Kashruth Division of the Orthodox Union and is Kosher.

Only products bearing the NSF Mark are Certified to NSF/ANSI 61 - Drinking Water System Components - Health Effects standard. Certified Products will bear the NSF Mark on packing or documentation shipped with the product.

Calgon Carbon Corporation's activated carbon products are continuously being improved and changes may have taken place since this publication went to press. (2030-08/29/2013)

Appendix B

ACCELERATED COLUMN TEST PROTOCOL

The Accelerated Column Test (ACT) procedure uses a miniature carbon-filled column to rapidly simulate the adsorption breakthrough curve that would be obtained by treating an aqueous stream in a large adsorption system. This technique, developed by Calgon Carbon Research and Development, has been shown to accurately simulate the carbon treatment of a wide range of waters and wastewaters under various conditions.

The principle advantage of the ACT procedure compared to the one-inch diameter column adsorption test is its increased speed. Typically, an ACT can be completed in 1/20th to 1/10th of the time required for a one-inch diameter study. The basic description of the ACT system is defined in the article, "High Pressure Technique for Rapid Screening of Activated Carbons for Use in Potable Water." [1]

Scale factors for sizing the full-scale adsorbers from the ACT data are developed by a proprietary method based on the chemistry of adsorption on activated carbon. To predict the volume breakthrough curve for the full-scale adsorber, the ACT results must be multiplied by the volume scale factor determined for each carbon type. The time breakthrough curve for the full-scale adsorber can be calculated by either of two methods. First, one can divide the predicted volumes calculated above by the flow rate of the full-scale system. Second, one can multiple the run time by the scale factor determined for each carbon type.

[1] Rosene, M.R., R. T. Deithorn, J. R. Lutchko, and N.J. Wagner, "High Pressure Technique for Rapid Screening of Activated Carbon for Use in Potable Water," Activated Carbon Adsorption of Organics from the Aqueous Phase, Vol. 1. I. H. Suffet and M. J. McGuire, editors, Ann Arbor Science, Ann Arbor, MI Chapter 15 (1980)

City of Stuart Water Treatment Plant

Per-fluorinated Compound (PFC) Treatment System

Basis of Design

1/24/2018

Pretreatment:	Bag Filters (10 micron)
PFC Treatment	
Capacity:	**75% Full Scale** (WTP = 6 MGD MDF) 4.0 MGD (2,800 gpm)
Number of Vessels:	4 w/ 1 O/S
Vessel Diameter:	12 ft
Vessel Area:	113 sq ft
Orientation:	Lead/Lag (series)
Loading:	12.4 gpm/sqft 700 - 1,400 gpm/vessel
Vessel SW Depth:	9 ft (8.0 – 10.0 ft)
dP across vessel:	1.5 – 2 psi/ft bed 5.25 – 10 psi
Empty Bed Contact Time (EBCT) resin:	2.4 – 3.0 minutes
Resin Depth:	4 ft – 5 ft
Resin Volume:	452 cft/vessel 565 cft/vessel (max) 1,808 - 2,260 cft TOTAL
Topping/Guard Depth:	0 - 1 ft
Topping/Guard Volume:	113 cft/vessel 452 cft TOTAL
Resin Types:	Purolite - PFA694E DOW - Dowex PSR2 Calgon - CalRes 2301, CalRes 2304
Topping Type:	Ion Exchange Resin Granular Activated Carbon (GAC)

Desired Treatment Capacity (to non-detect)

Design	**80,000 BV (Bed Volumes)**
Maximum projected	**150,000 BV (Bed Volumes)**

12' DIAMETER VESSEL – FITTING SCHEDULE

FITTING	SIZE	LOCATION
Raw Inlet	10"	Top Middle
Treated Outlet	10"	Bottom (multi or common)
Sample Ports (3)	1"	Side wall, multiple hgts
Access Manway	20"	side
Media Fill manway (Elliptical)	14"x 20"	Top, off-center
Media inlet (fluidized)	4"	Top, center
Media outlet (fluidized)	4"	Bottom (combined w/ drain)
Washdown	2"	Top
Air/Vacuum release	2"	Top
Drain	4"	Bottom (combined w/drain)

BOOSTER PUMP OPERATING CONDITIONS

Suction Pressure:	+4 to +9 psi
Piping losses:	5 – 8 psi
Vessel/Resin HL:	9 – 21 psi
Bag Filter HL:	2.5 – 5 psi

Existing Conditions Downstream of Proposed Treatment System:

VOC Tower inlet Elevation:	27 ft above slab (lowered VOC tower with top section removed)
VOC Tower spray nozzles:	3 – 8.5 psi (7 nozzles @ 200 gpm each)
TOTAL TDH:	**34 – 63 / 110 ft (w/nozzles)**
Pump Design:	**100 ft TDH**

Modifications needed to booster pumps to accommodate increase in head loss through vessels, piping, etc.

Existing Pumps:

Quantity:	4
Capacity:	1,400 gpm @ 45 ft TDH
Speed:	1,150 rpm
Motor size:	25 HP
Two on VFD, Two constant speed	

Proposed Modifications:

Quantity:	Replace two (2) existing constant speed pumps
Capacity:	2,800 gpm @ 85 ft TDH
Speed:	1,800 RPM
Motor size:	75 HP
Electrical:	Two on 75 hp Variable Frequency Drives (VFDs) Existing 25 HP VFD driven pumps to remain

Largest pump O/S must still provide adequate capacity to both systems.

Water Quality:

Table of Detected Constituents in the City of Stuart Raw Water - Wellfield						
	Detected range	units	HAL/MCL	units	Design Raw Water (ug/L)	Target Reduction (ng/L)
Methyl-tert-butyl-ether	*1.8*	*ug/L*	***U***	*ug/L*	*1.8*	-
1,1-Dichloroethane	*0.23*	*ug/L*	***U***	*ug/L*	*0.23*	-
Chloromethane	*0.38-0.51*	*ug/L*	***U***	ug/L	0.51	-
Tetrachloroethylene (PERC)	*0.65*	*ug/L*	***0.003***	*ug/L*	*0.65*	-
1,2-Dichlorobenzene	*0.25*	*ug/L*	***600***	*ug/L*	*0.25*	-
Benzene	*1.3*	*ug/L*	***0.001***	*ug/L*	*1.3*	-
Vinyl Chloride	*0.8-12.5*	*ug/L*	***1***	*ug/L*	*1.3*	-
cis-1,2-Dichloroethylene	*0.3-42.4*	*ug/L*	***70***	*ug/L*	*40*	-
trans-1,2-Dichloroethylene	*1.1*	*ug/L*	***0.1***	*ug/L*	*1.1*	-
Chlorobenzene	*0.34*	*ug/L*	***100***	*ug/L*	-	-
Perfluorooctanesulfonic acid (PFOS)	**0.051-0.470**	ug/L	**0.07**	ug/L	**0.5**	**ND (2.5)**
Perfluorooctanoic acid (PFOA)	**0.014-0.052**	ug/L	**0.07**	ug/L	**0.1**	**ND (.25)**
Perfluorononanoic acid (PFNA)	0.011-0.014	ug/L			**0.014**	-
Perfluoroheptanoic acid (PFHpA)	0.0035-0.027	ug/L			**0.027**	-
Perfluorohexanesulfonic acid (PFHxS)	0.011-0.26	ug/L			**0.26**	-
Perfluorobutanesulfonic acid (PFBS)	0-0.041	ug/L			**0.041**	-
Perfluoro-1-hexanesulfonic acid	0.015-0.47	ug/L			**0.47**	-
Perfluoro-1-octanesulfonic acid	0.046-0.38	ug/L			**0.38**	-
Hydrogen Sulfide (Total)	0.1 - 0.8	mg/L			0.6	-
Sulfate	10 - 25	mg/L	250		15	-
Chloride	25 -60	mg/L	250		50	-
Nitrate	<8	mg/L	10		5	-
Alkalininty (as $CaCO_3$)	210 - 310				280	-
TOC	3.7 - 10.4	mg/L			8.0	-
Iron	0.04 - 0.65	mg/L	0.3	mg/L	0.5	-
Color	15 - 40	CU	15	CU	30	-
pH	7.0 - 7.6				7.4	-
Calcium Hardness (as $CaCO_3$)	280 - 350				300	-
TDS	320 - 410	mg/L	500	mg/L	410	-
VOC's						11/7/2017

Remarks:

- The resin should not be backwashed once installed initially as it alters chromatographic profile across the resin bed and can result in early breakthrough of PFA's and shorter service life
- Prefiltration is necessary to prevent buildup of suspended solids on the resin and blinding over of the resin. 10 – 50 micron (µm) bag filters recommended.
- Lead/Lag operation recommended to maintain effluent PFC levels below non-detect. Once breakthrough on lead, resin regenerated OR removed and disposed of and lag put into lead service.
- Acrylic based resins shed TOC better when considering regeneration with brine and removal of NOM
- Provide salt regeneration system (portable with tank) that can regen when PFC's breakthrough to see if TOC reduction can all further PFC removal. Not all resins allow this.
- Since PFC treatment system only rated for 4 mgd, up to 2 MGD of bypass to the VOC towers (current operation) should be provided through either a dedicated pump, or control bypass valve.

Appendix H Certification of Public Health Risk and Well Sampling Results

CERTIFICATION OF A PUBLIC HEALTH RISK WHERE THERE ARE NO ESTABLISHED DEP STANDARDS

Check the appropriate description: ☐ Acute Public Health Risk ☒ Chronic Public Health Risk

Please characterize the public health risk by providing the following information:

(a) Specific location of the health risk (attach a sketch or map).

City of Stuart Surficial Aquifer Wells as noted on the Ecology and Environmental, Inc., PFOA/PFOS Groundwater Concentrations Map Current EPA Health Advisory Level is 70 parts per trillion. The City's May 2, 2018 Point of Entry concentration was 43.

(b) Extent of the hazard (for example, number of affected wells and the number of people affected).

As noted in the Ecology and Environmental, Inc., PFOA/PFOS Groundwater Concentration Map, a majority of the City's raw water supply wells have detections of PFOA/PFOS. The City's water service area serves more than 17,000 residents.

(c) Chemical Abstract (CAS) number(s) for contaminant(s) and concentration(s) identified as well as the date(s) of sampling.

PFOA – CAS 335-67-1 PFOS – CAS 1763-23-1

Summary of laboratory lab results taken by Pace Analytical dated May 2, 2018.

(d) Explanation of how the project will eliminate the health risk.

The proposed pre-treatment system is designed to treat up to 4 million gallons per day and to reduce PFOA/PFOS concentration levels to less than 10 parts per trillion.

(e) As the State Public Health Officer, I hereby certify that a public health risk exists and that the information presented herein is accurate to the best of my knowledge.

Karlette J Peck — (signature)

5/15/18 — (date)

Karlette J. Peck MPH, PA — (print name)

Health Officer — (print title)

Florida Department of Health, Martin County — (agency)

3441 SE Willoughby Boulevard	Stuart	Martin	34994
(street address)	(city)	(county)	(zip code)

Telephone 772 221 4000 Email Karlette.peck@flhealth.gov

City of Stuart PFOA PFOS Sampling Events

Sample Results

Results in ppt: combined Action level 70 combined

Well #	PACE LAB 3/23/2018	PACE LAB 3/28/2018	PACE LAB 4/6/2018	PACE LAB 4/13/2018	PACE LAB 4/19/2018	PACE LAB 4/27/2018	PACE LAB 5/2/2018	PACE LAB
POE	49	52	51	55	48	42	43	
1				109			94	
2	36						33	
3				845		225	154	
4	85			96			80	
5				393		316	368	
6				120			108	
7	64			61			60	
8							40	
9							50	
10							28	
11							21	
12							19	
13							41	
14							72	
15							59	
22							41	
23							52	
24			80				145	
26							39	
27							10	
28							20	
29							41	
30							41	

N/A - Not applicable
ND - Not detected