



**VOLUSIA COUNTY – ORANGE CITY SEPTIC TANK
PHASE-OUT MASTER PLANNING AND REUSE SYSTEM
EXPANSION**

Volusia County and Orange City | July 2018

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PHASE-OUT MASTER PLANNING AND REUSE SYSTEM
EXPANSION**

Prepared for

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DeLand, Florida 32724

and

City of Orange City
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Orange City, Florida 32763

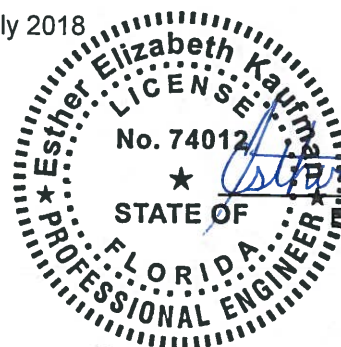
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Certificate of Engineering Authorization #1841

Jones Edmunds Project No.: 22015-015-01

July 2018



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7/30/18

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Attachment 1	Population and Flow Estimations and Projections Technical Memorandum
Attachment 2	Capital Improvement Projects Cost Estimates

ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AADF	Annual Average Daily Flow
BEBR	University of Florida Bureau of Economic and Business Research
BMAP	Basin Management Action Plan
CIP	Capital Improvement Plan
CRA	Community Redevelopment Area
ERC	Equivalent Residential Connection
ERU	Equivalent Residential Unit
FDEP	Florida Department of Environmental Protection
FDOH	Florida Department of Health
FM	Force Main
fps	Feet per second
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GPM	Gallons per Minute
LF	Linear Feet
LS	Lift Station
MFL	Minimum Flows and Levels
mg/L	Milligrams per Liter
MGD	Million Gallons per Day
MP	Master Plan
MPR	Master Plan Report
NSILT	Nitrogen Source Inventory and Loading Tool
OSTDS	Onsite Sewage Treatment & Disposal Systems
PHF	Peak Hourly Flows
PUD	Planned Unit Development
RCW	Reclaimed Water
SCADA	Supervisory Control and Data Acquisition
SJRWMD	St. Johns River Water Management District
SRWRF	Southwest Regional Wastewater Reclamation Facility
STPO	Septic Tank Phase-Out
TMDL	Total Maximum Daily Load
UFA	Upper Florida Aquifer
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

OVERVIEW

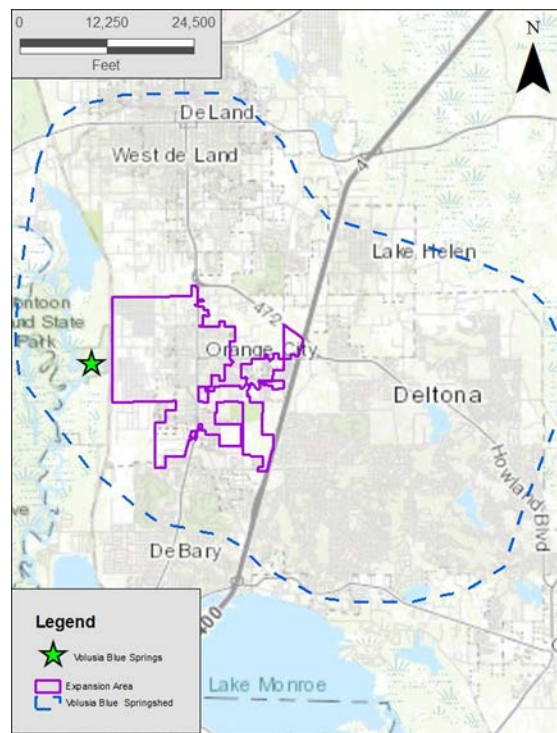
Orange City's and Volusia County's rich historical and aesthetic features have been key to attracting businesses and residents to the area. However, population increases have and continue to impact the area's water quality. Creating an affordable, reliable, and efficient wastewater collection and treatment system is key to sustainable population growth, economic development, and the health of the City's and County's natural resources and landscape.

The Master Plan Report (MPR) is a local and regional collaborative effort to improve and protect the region's water quality in an affordable, sustainable, efficient, and reliable manner. The MPR outlines the options and recommendations for removing septic tanks from the City and the unincorporated areas of the County (adjacent to the City) and expanding the public access reuse system.

BACKGROUND AND PURPOSE

Blue Spring is in Florida, 1 mile west of the City and wholly within Volusia County. This spring has the distinction of being the largest spring on the St. Johns River. Maintaining and protecting the spring are high priorities for both the County and the City. The St. Johns River Water Management District (SJRWMD) has an adopted minimum flow regime for the spring and the Florida Department of Environmental Protection (FDEP) has adopted Total Maximum Daily Load (TMDL) constraints to bring this first magnitude spring back to health from its current impaired state.

The County and the City have residential communities and commercial entities within the springshed area with a population of approximately 22,000 people. Most of these communities do not have central sewer-collection systems but use septic tanks to treat and dispose of wastewater. To avoid additional damage to the spring created by septic tanks, the County and the City are evaluating options for removing septic tanks and providing centralized sewer collection with treatment at the Southwest Regional Wastewater Reclamation Facility (SRWRF).



The water quality in Blue Spring, Blue Spring Run, and the Upper Floridan Aquifer has a significant impact on the community. The spring provides recreation for residents and visitors and provides a critical habitat for the threatened West Indian manatee and endemic snail species.

This MP is an effort to improve and protect this crucial natural resource, which impacts ecosystems, fisheries, marine and wildlife habitats, wetlands, the tourism industry, home values, and overall quality of life.

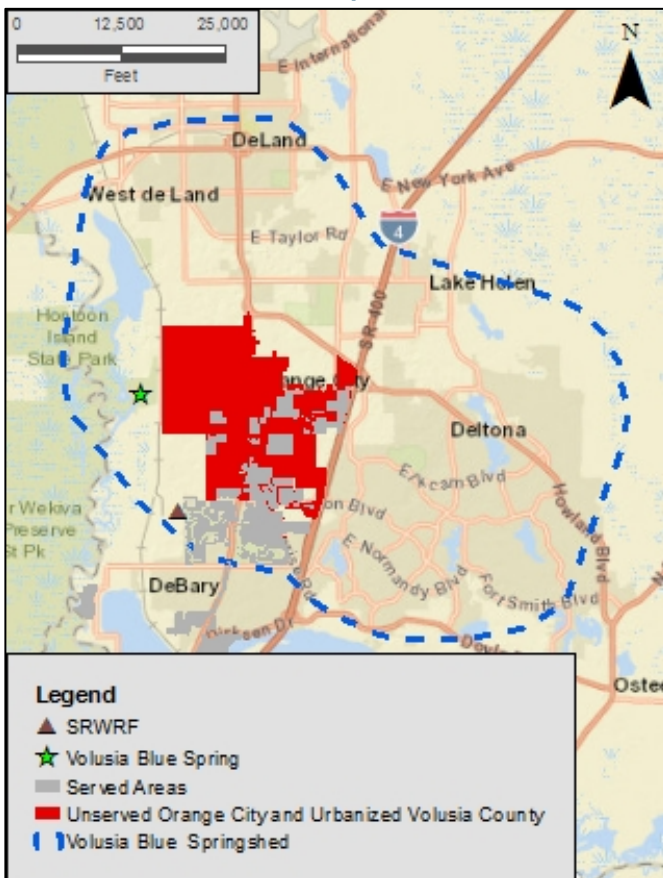
METHODOLOGY

Volusia County and Orange City have joined together to phase out septic tanks where economically viable in the portion of the Blue Spring springshed that includes all of the City and urbanized portions of the unincorporated County adjacent to the City (see Figure ES-1).

This Septic Tank Phase-Out (STPO) Master Plan (MP) aims to be an environmentally advantageous and economically sustainable MP that includes improvements to existing facilities where needed. To achieve this, the Master Planning Team performed the following tasks:

- Developed current population and wastewater flow estimations.
- Evaluated existing wastewater generation currently served by the SRWRF.
- Assessed existing transmission force mains and lift station tributaries to the SRWRF.
- Determined sewershed basin expansion areas.
- Developed wastewater flow estimations and growth projections for the existing sewershed basins and for the expansion area sewershed basins.
- Assessed each expansion sewershed for nitrogen loading attributable to septic tanks.
- Created a hydraulic model of the force main system tributary to the SRWRF.
- Modeled the expansion area impacts to the existing infrastructure.
- Planned further extensions of the reclaimed water (RCW) force main system to serve expansion areas.

ES-1 Location Map



The team identified expansion projects and developed the 10-Year Capital Improvement Plan (CIP) using the assessments listed in the tasks above combined with institutional knowledge from the City Planning Department, the City Public Works Department, and the County's Water and Utility Services Group.

MASTER PLAN CAPITAL IMPROVEMENT PLAN

The MP identifies the capital improvement projects for collections systems, transmission systems, wastewater treatment, and RCW systems for the first 10 years.

After completing the 10-Year CIP, annual septic system effluent nitrogen loadings will decrease by approximately 18,000 pounds.

The projects include constructing four collection systems within the Community Redevelopment Area (CRA), nine transmission mains and lift stations, four RCW extensions, SCADA improvements at all existing City-owned lift stations, and an Infiltration and Inflow Study. A review of the existing water reclamation facility (WRF) indicated that the existing infrastructure would sufficiently serve the existing and future areas in the 10-Year CIP. Figure ES-2 presents the 10-year expansion project areas (redevelopment and new planned developments), transmission extensions and lift stations, and RCW main extensions. Table ES-1 presents the opinion of probable construction costs.

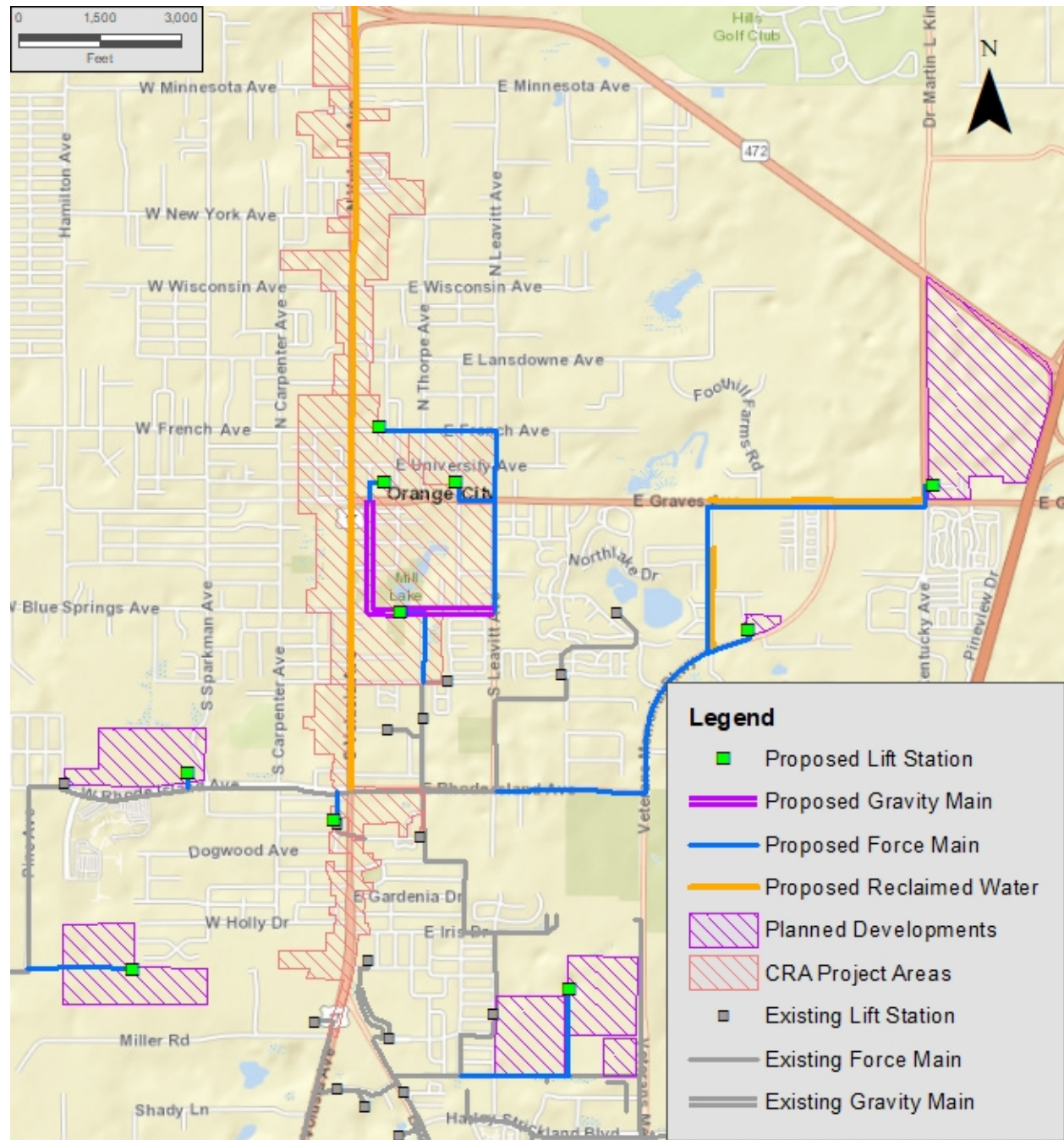


Table ES-1 10-Year Capital Improvement Plan Opinion of Probable Construction Costs

CIP	Construction Cost
SCADA and LS improvements at existing Orange City Lift Stations	\$900,000
Infiltration and Inflow Study and Infrastructure Improvements	\$5,365,000
South Holly to Rhode Island – Transmission System Extension	\$1,664,000
Central 17/92 and South Holly CRA – Collection Systems	\$5,460,000
17/92 Middle Extension – RCW Extension	\$1,352,000
E. University CRA – Transmission System Extension	\$271,000
E. University Avenue – Collection Systems	\$1,076,000
E. French Avenue and S. Leavitt Avenue – Transmission System Extension	\$1,570,000
North 17/92 CRA - Collection Systems	\$2,579,000
17/92 Upper Extension –RCW Extension	\$1,724,000
Mimosa Avenue to Rhode Island Avenue – Transmission System Extension	\$367,000
South 17/92 CRA – Collection Systems	\$2,195,000
17/92 Lower Extension – RCW Extension	\$505,000
I-4 and Graves Multifamily Development – Transmission System Extension ¹	\$0
East Graves and Monastery – RCW Extension	\$1,422,000
Veteran's Memorial Parkway Assisted Living Facility – Transmission System Extension ¹	\$0
Three Developments in Orangedale (Veteran's Memorial Parkway) – Transmission System Extension ¹	\$0
Development W. Rhode Island/Sparkman Avenue – Transmission System Extension ¹	\$0
Development Westside Parkway and Twin Lakes Train – Transmission System Extension ¹	\$0
Development Westside Parkway and Twin Lakes Train – Transmission System Extension ¹	\$0
Miscellaneous Equipment	\$237,000
Total Capital Needed	\$26,689,000

1. Private Developer responsible for construction.

1 INTRODUCTION

1.1 PURPOSE

A regional effort is underway to improve and protect the water quality in the Blue Spring springshed in southwest Volusia County by reducing land-based non-point-source pollution. As a part of this effort, the Division of Environmental Assessment and Restoration Water Quality Restoration Program is finalizing a draft Basin Management Action Plan (BMAP) with participation from the Volusia Blue Spring Stakeholders. The plan aims to enhance community life by ensuring and sustaining the quality of natural water resources to protect and provide a safe water supply, a recreational haven, and an environmental resource.

Blue Spring and Blue Spring Run are designated as an Outstanding Florida Waterbody. In December 2006 in response to long-term flow declines, the SJRWMD established minimum flows and levels (MFLs) for Blue Spring. The MFLs reduce groundwater withdrawals up to 10 percent in average spring flows.

St. Johns River Water Management District (SJRWMD) has projected that flows from Blue Spring will fall below the applicable minimum mean flows by 2019 (SJRWMD, 2013). The spring flow reductions are caused by excessive groundwater pumping for agricultural, industrial, and urban water uses.

In 2009, Blue Spring and Blue Spring Run were included in Florida's list of impaired waters and elevated nitrate in the water was determined to cause excessive algal growth. In July 2014, Florida Department of Environmental Protection (FDEP) concluded that Blue Spring was impaired due to elevated nitrogen concentrations, resulting primarily from Onsite Sewage Treatment and Disposal Systems (OSTDS). According to FDEP, the spring will require a 45 percent cut in nitrogen loading to become unimpaired. The BMAP for Blue Spring is likely to be adopted by FDEP in early 2018.

Human-caused impairments can be reversed and spring flows can be restored to protective rates by reducing groundwater pumping and by reduced nitrogen loading rates in the form of fertilizer and domestic wastewater. The recommendations contained in this Septic Tank Phase-Out (STPO) and Reuse Implementation Master Plan (MP) can be part of the solution by implementing advanced nitrogen removal with central sewer and reducing water consumption by using reuse water instead of potable water.

In expectation of the BMAP and in accordance with both the County's and the City's objectives, Jones Edmunds & Associates, Inc., was contracted to prepare a STPO and Reuse Water MP for the City of Orange City and for the neighboring unincorporated urbanized areas of Volusia County.

1.2 LOCALITY BACKGROUND

Blue Spring is on the west edge of the DeLand Ridge within the 2,644-acre Volusia Blue Spring State Park. The park and the spring provide recreation for residents and visitors and a critical habitat for the threatened West Indian manatee and endemic snail species.

Blue Spring discharges 102 million gallons per day (MGD) from a vent approximately 20 feet below ground elevation and has a system of caves 125 feet deep. The primary water source into Blue Spring is the Upper Floridan Aquifer (UFA), which is a highly transmissive limestone aquifer.

Water throughout the entire springshed moves between the surficial aquifer system and the UFA, but is slowed by an intermediate confining unit. The confining layer is perforated by sinkholes that allow surface waters to be transferred into the aquifer at a rapid rate.

Blue Spring discharge water is a mixture of groundwater that is recharge into the aquifer anywhere from several days to several decades ago.

In 2009, FDEP determined that Blue Spring had elevated nutrient concentrations that impaired the body of water, and in 2014 the agency limited the Total Maximum Daily Load (TMDL) threshold of nitrate-N to 0.35 milligram per liter (mg/L). The elevated nitrate concentrations in Blue Spring are the result of the land uses in the springshed.

The land use in the springshed has changed significantly from 1970 to the present day. The population of the area has grown from 3,700 to 22,000 people, which is a more than a 500 percent growth over the last half century. Figure 1-1 presents population data collected by the US Census Bureau for Orange City and the surrounding unincorporated Volusia County (US Census Tract 908) from 1970 to 2010 with an estimation of growth to 2020 using the medium growth rate for Volusia County population projections (BEBR, 2016). Figure 1-2 shows the spatial land use distribution in 1970 and 2010.

Figure 1-1 Population Growth from 1970 to 2020

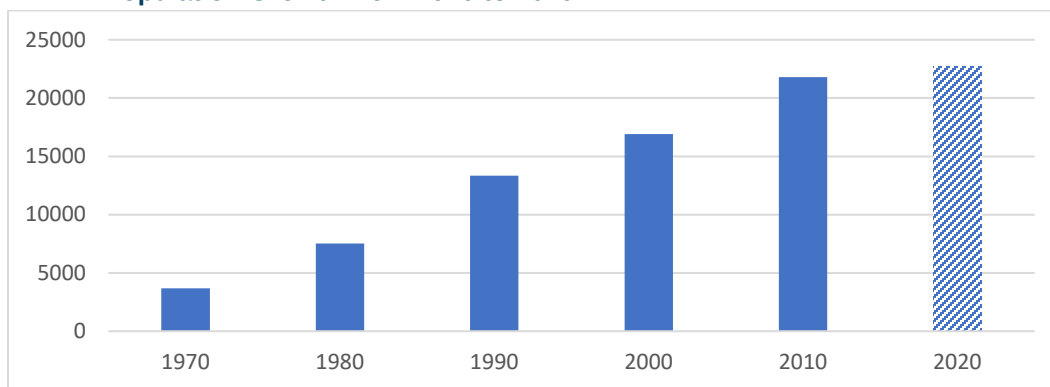
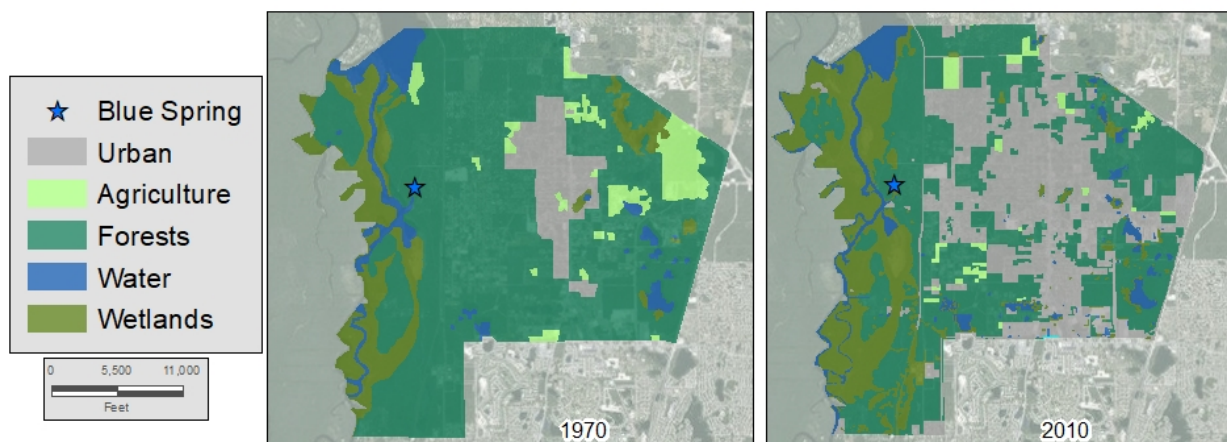
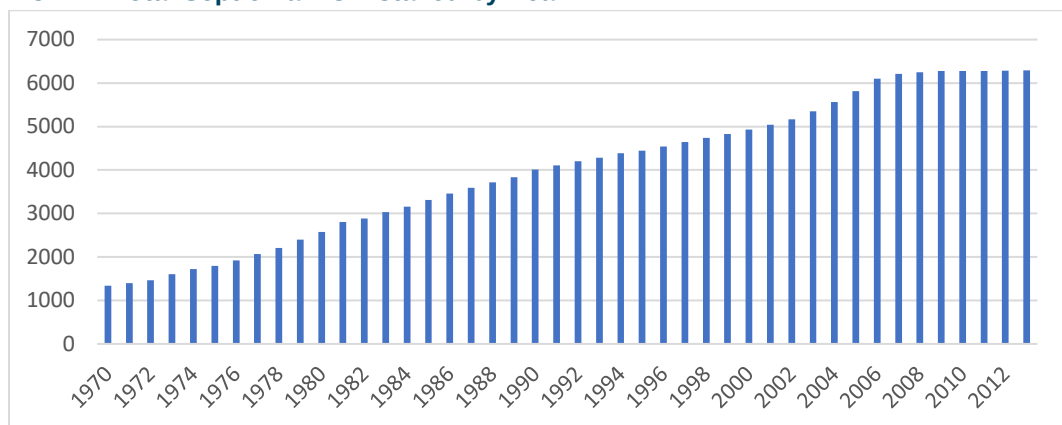


Figure 1-2 Land Use 1970 and 2010



Currently, 54 percent of all nitrates in Blue Spring is attributable to septic systems (NSILT reference). According to the Florida Department of Health (FDOH) OSTDS Inventory geographic information system (GIS) data, there are 6,300 septic tanks serving US Census Tract 908. Figure 1-3 presents the number of septic tanks installed by year.

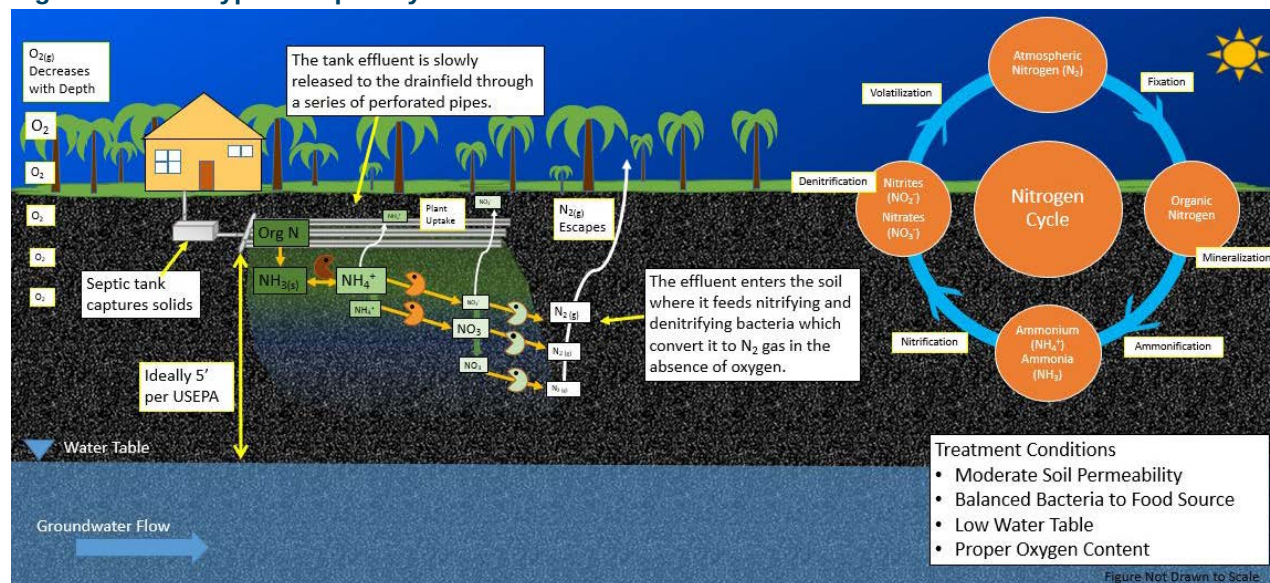
Figure 1-3 Total Septic Tanks Installed by Year



1.3 THE SCIENCE ON SEPTIC NUTRIENTS ENTERING GROUNDWATER

Septic systems operate through a multi-step process that includes a septic tank and drainfield. Figure 1-4 depicts how wastewater from the home is collected and conveyed to the septic system through drainpipes.

Figure 1-4 Typical Septic System and Drainfield with Ideal Treatment



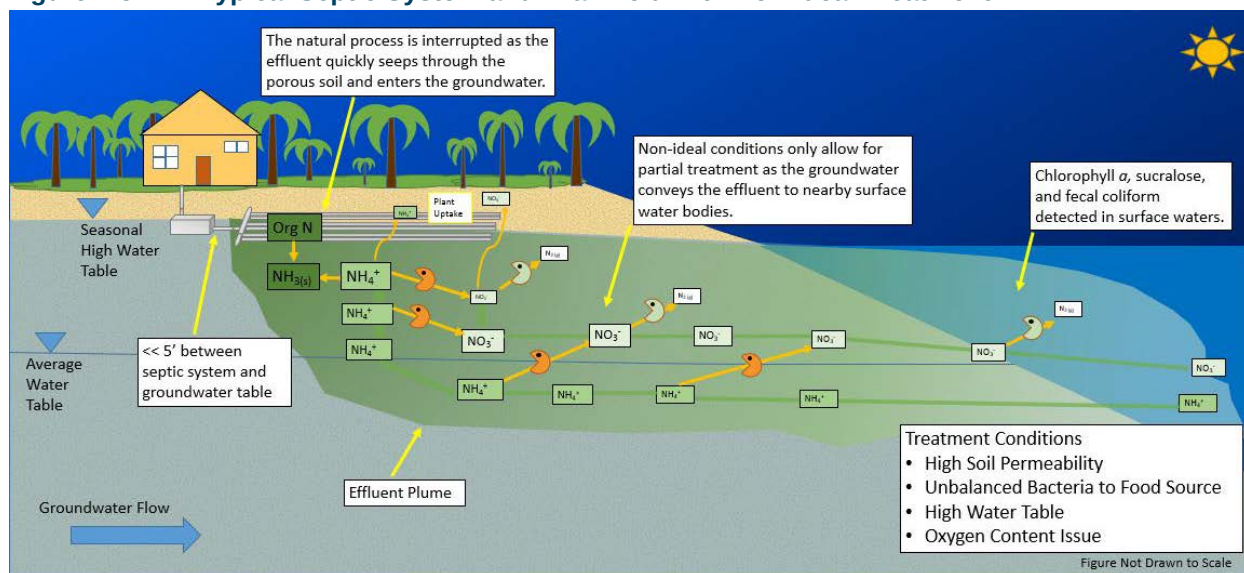
In the septic tank, solids settle out while the effluent flows through a series of perforated pipes that are embedded in a drainfield or leachfield. The effluent percolates into the drainfield and through a deep layer of soil, allowing additional treatment to occur before entering the groundwater.

All septic systems release the nutrients of nitrogen (primarily in the form of ammonia-nitrogen ($\text{NH}_4^+ - \text{N}$) and phosphorus to the groundwater from the leachfield. In a properly operating system, nitrifying bacteria in the upper portions of the leachfield/soil convert $\text{NH}_4^+ - \text{N}$ to nitrate-nitrogen ($\text{NO}_3^- - \text{N}$) in the presence of oxygen (O_2) in porous soils. As the effluent percolates deeper in the ground, another group of bacteria denitrifiers convert the $\text{NO}_3^- - \text{N}$ to nitrogen gas ($\text{N}_2 \text{ gas}$), which escapes to the atmosphere. The denitrification process occurs under conditions without oxygen present and with a carbon source.

The soil type and separation depth relative to the groundwater table play significant roles in the septic systems' treatment effectiveness. High porosity soils found in many regions of Florida are saturated due to high groundwater and are typically unsuitable for providing the necessary treatment time.

Figure 1-5 shows a septic system with non-ideal treatment.

Figure 1-5 Typical Septic System and Drainfield with Non-Ideal Treatment



High groundwater creates flooded soils, which reduce oxygen transfer and create low-oxygen levels leading to incomplete removal of nitrogen. In this situation, the conversion of ammonia to nitrate and nitrate to nitrogen gas are impeded leaving nitrate to persist in the groundwater and ultimately impact surrounding surface waters.

1.4 STPO REPORT OBJECTIVES

Developing and implementing the STPO MP is a joint effort of Volusia County Utility Department, Orange City Public Works and Planning Department, the City Commission, and the County Commission. This effort is the first step in taking this locality from septic to sewer. This Plan is intended to be revised every 5 years to give it the flexibility needed to serve the community and to make use of septic to sewer funding programs when available.

The Plan provides an affordable community solution that addresses the common goal of improving and restoring water quality in Blue Spring and enhancing the community's quality of life. The following STPO MP objectives support these BMAP goals:

- Summarize the need to reduce nutrient and bacteria discharges.
- Review and compile historical sewer system and water reclamation facility (WRF) flows and loads data.
- Model and predict system growth.
- Develop detailed consumer and wastewater flow estimates through buildout.
- Review existing wastewater collection and transmission systems.
- Review existing WRF and prepare infrastructure extension recommendations.
- Develop CIP recommendations based on existing infrastructure needs.

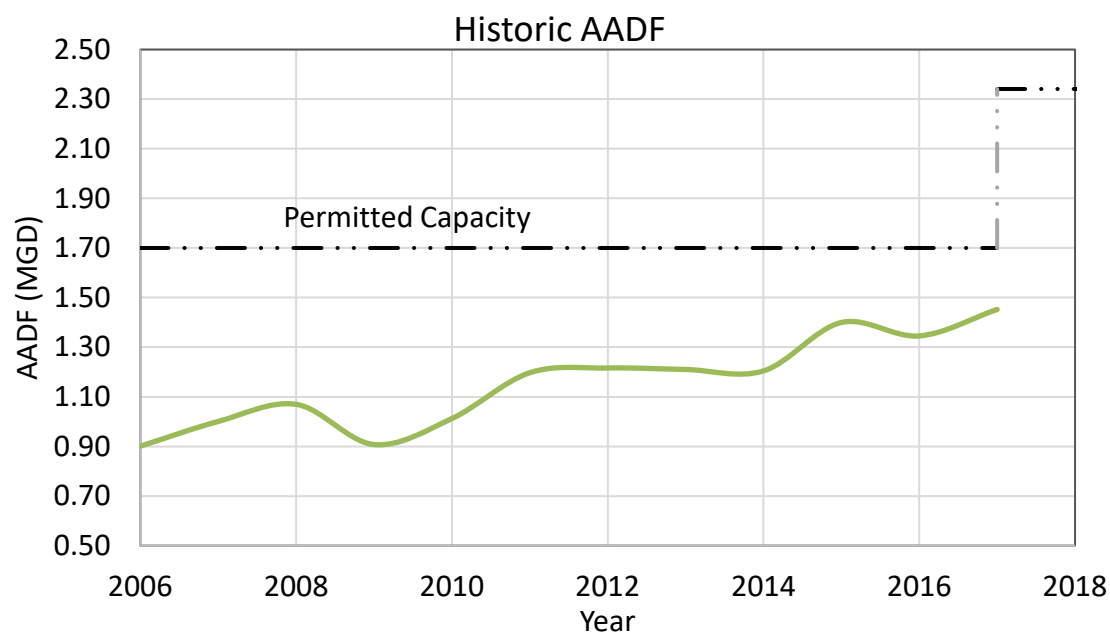
2 EXISTING FACILITIES

This Chapter presents a review of the pertinent infrastructure serving Orange City and portions of Volusia County. This Chapter includes a discussion of the existing collection and transmission facilities for Orange City and Volusia County, the Southwest Regional Water Reclamation Facility (SRWRF), and the reclaimed water (RCW) distribution system.

2.1 SRWRF

Volusia County owns and operates the SRWRF (FDEP Facility ID FLA011128). The SRWRF uses an activated sludge process to treat wastewater from residents, institutions, and businesses within the cities of DeBary, Orange City, and nearby unincorporated areas within the Blue Spring Basin. The facility was permitted and originally designed with a biological nutrient removal (BNR) treatment capacity of 1.7 MGD annual average daily flow (AADF). On October 19, 2015, FDEP approved an increase to the permit capacity pending an expansion to the BNR process of 2.70 MGD AADF. The current permitted capacity is 2.341 MGD AADF and is based on the reuse capacity of the WRF. Figure 2-1 depicts the historical wastewater flows entering the SRWRF. The treated effluent is conveyed to either rapid infiltration basins or the RCW distribution system.

Figure 2-1 **Historical Flows at SRWRF**

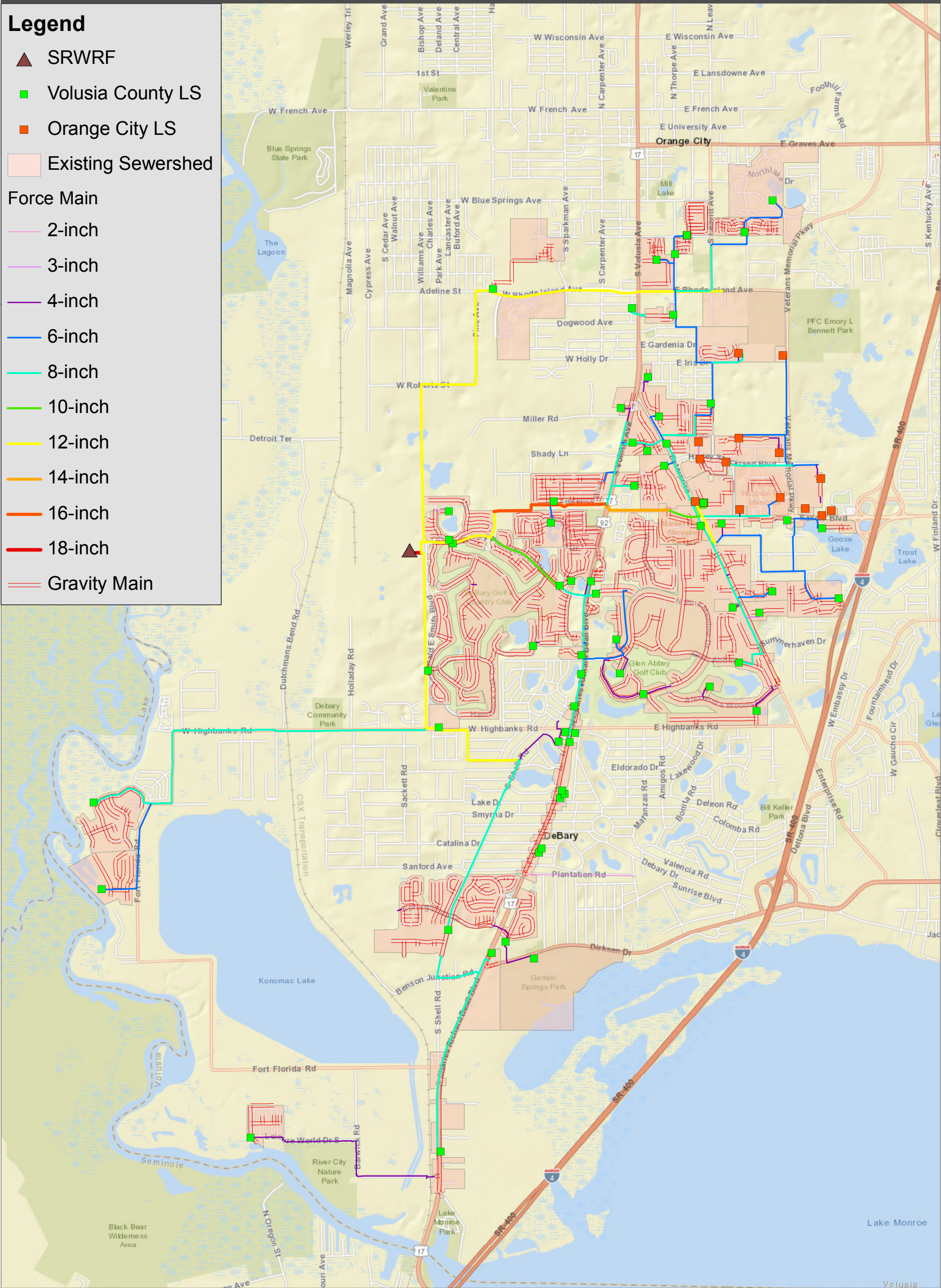


2.2 ORANGE CITY COLLECTION AND TRANSMISSION FACILITIES SUMMARY

Orange City provides wastewater service to approximately 1,300 customers through a network of collection and transmission systems. The wastewater collection and transmission systems convey wastewater from homes and businesses through approximately 14 miles of pipe to the SRWRF.

Pipe diameters range from 4 to 16 inches. The collection and transmission systems include over 7 miles of gravity mains and over 7 miles of force mains (FMs). Lift stations (LSs) and FMs are used to pump flows to another gravity collection system or to a master LS. The system includes over 70 LSs (67 in-service City-owned and more than six privately owned). Figure 2-2 presents the current collection and transmission system, LSs, and the SRWRF that serve the City.

Figure 2-2
Existing Collection and Transmission System
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



2.3 VOLUSIA COUNTY SRWRF COLLECTION AND TRANSMISSION FACILITIES SUMMARY

The Volusia County wastewater collection system conveys wastewater from 3,700 homes and businesses through 94 miles of pipe to SRWRF. The collection system is primarily comprised of gravity mains (over 62 miles). Pipes range from 6 to 18 inches in diameter. LSs and FMs (over 32 miles) are used to pump flows to another gravity collection system, to a master lift station, or directly to the SRWRF. Figure 2-2 presents the current collection and transmission systems, LSs, and the WRF that serve the County.

2.4 RCW DISTRIBUTION SYSTEM

The SRWRF RCW distribution system includes the following components:

- SRWRF RCW water LS (capacity 1,625 gallons per minute [GPM]).
- Over 20 miles of County-owned RCW FM.
- Over 2 miles of City-owned RCW FM.

The largest customers are Florida Power & Light and two golf courses in the area, which use a total of 0.75 MGD AADF. The total RCW distributed is 1.0 MGD AADF.

3 POPULATION, WASTEWATER FLOW, AND SEPTIC TANK-BASED NITROGEN LOADING

This Chapter presents a review of historical flow data, the prediction of area population and flow projections, and the modeling results of the septic tank nutrient discharges in the possible expansion areas.

Jones Edmunds used data available from the US Census Bureau, the Volusia County Property Appraiser, SJRWMD, and FDEP to develop detailed population estimates, wastewater flow estimates, and nitrogen discharges for present day and buildout scenarios.

Attachment 1 presents the details of the development of sewer service areas (sewersheds), population projections, and detailed wastewater flow projections within the existing and future SRWRF service areas. The estimates and projections are presented for each existing and future sewershed in terms of equivalent residential units (ERU), AADF, and peak hourly flows (PHFs).

To estimate the septic tank-produced nitrates, the FDEP Nitrogen Source Inventory and Loading Tool (NSILT) for septic tank source methodology was used. NSILT is a tool used to estimate nitrogen contributions into the UFA from all sources. The forthcoming BMAP for the Blue Spring springshed makes use of this tool to address water quality impairment, and the County and City have decided to use the same tool as a guide to prioritize septic to sewer conversions for the sewershed basins in the expansion areas.

3.1 CURRENT POPULATION, WASTEWATER FLOW, AND SEPTIC TANK-BASED NITROGEN-LOADING ESTIMATIONS

The total population currently served at the SRWRF was estimated to be 13,500, throughout the existing 38 sewersheds. The estimated population including all future sewersheds (expansion project areas) was determined to be 14,100.

To develop an understanding of current wastewater usage in the area, the team processed the reported WRF influent flow data. The current SRWRF AADF is 1.452 MGD and the flow from each equivalent residential connection (ERC) was calculated to be 135 gallons per day (GPD), which equates to 55 gallons per capita per day (GPCD).

To estimate existing wastewater flow generation in future project areas, Jones Edmunds used a value of 80 percent of the potable water use data, tax parcel data, and the large household size from the US Census data to find 164 GPD AADF per ERC. The additional flow currently generated in all future expansion areas equals 0.87 MGD.

Table 3-1 presents the estimates for ERCs, AADF, and PHF for existing populations in the SRWRF service area per sewershed.

Table 3-1 Existing ERCs, AADF, and PHF for Each Existing Sewershed Basin

Sewershed	ERCs	AADF (GPD)	PHF (GPM)	Sewershed	ERCs	AADF (GPD)	PHF (GPM)
SW11 ¹	29	3900	8	SW41 ⁵	413	55700	109
SW12 ¹	16	2200	4	SW48 ⁵	80	10800	21
SW13 ¹	219	29600	58	SW50 ⁵	11	1500	3
SW14 ¹	26	3500	7	SW51 ⁵	277	37400	73
SW42 ¹	33	4500	9	SW55 ⁵	187	25300	50
SW43 ¹	247	33300	65	SW73 ⁵	170	22900	45
SW44 ¹	40	5400	11	FM22001-00 ⁵	13	1700	3
SW45 ¹	53	7100	14	LS12001-00 ⁵	119	16000	31
SW46 ¹	59	8000	16	LS12003-00 ⁵	17	2300	5
SW54 ¹	17	2300	5	LS20001-00 ⁵	168	22700	45
LS16001-00 ¹	36	4900	10	LS20002-00 ⁵	74	10000	20
SW17 ²	136	18400	36	LS22001-00 ⁵	53	7200	14
SW20 ²	170	23000	45	LS22002-00 ⁵	121	16400	32
SW21 ²	21	2900	6	LS22003-00 ⁵	135	18200	36
SW22 ²	18	2400	5	LS22004-0 ⁵	21	2800	5
SW28 ²	143	19300	38	PLS16001-0 ⁵	39	5200	10
SW30 ²	46	6200	12	PLS20001-0 ⁵	0	0	0
SW31 ²	410	55300	108	PLS22002-0 ⁵	61	8300	16
SW77 ²	7	900	2	PLS22003-0 ⁵	0	0	0
SW78 ²	264	35700	70	PLS22004-0 ⁵	108	14600	29
SW79 ²	2	300	1	SW07	261	35200	69
SW80 ²	7	1000	2	SW09	265	35800	70
SW82 ²	10	1300	3	SW10	70	9500	19
SW83 ²	1	200	0	SW15	121	16300	237
SW66 ³	3	400	1	SW16	208	28100	55
SW08 ⁴	178	24000	47	SW18	714	96400	516
SW24 ⁴	1	200	0	SW19	385	52000	103
SW25 ⁴	599	80900	159	SW23	86	11600	279
SW26 ⁴	1	100	0	SW47	247	33400	66
SW27 ⁴	125	16900	33	SW56	428	57800	113
SW38 ⁴	3	400	1	SW57	953	128600	252
SW59 ⁴	61	8200	16	SW58	210	28300	56
SW32 ⁵	145	19600	38	SW60	313	42300	953
SW33 ⁵	633	85500	168	SW71	145	19600	38
SW34 ⁵	141	19000	37	SW81	8	1100	2
SW35 ⁵	62	8400	16	SW71	145	19600	38
SW39 ⁵	124	16700	33	SW81	8	1100	2
SW40 ⁵	88	11900	23	TOTAL	10,682	1,442,500	

Notes:

1. Flows to SW15. 2. Flows to SW18. 3. Flows to SW 19. 4. Flows to SW 23. 5. Flows to SW 60.

Table 3-2 presents the estimates for ERCs, AADF, and PHF for existing populations for the expansion project areas.

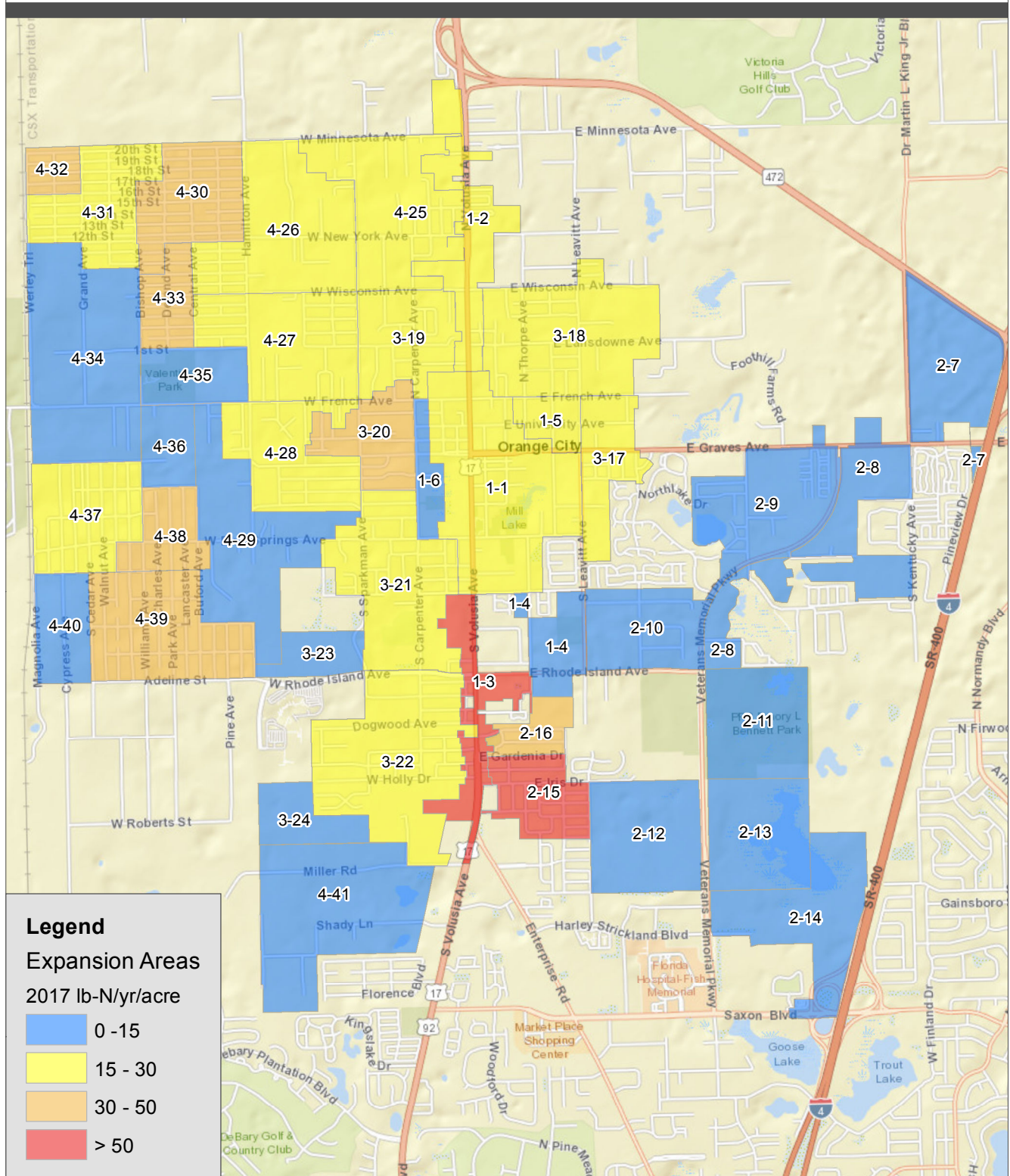
Table 3-2 Existing ERCs, AADF, and PHF for Each Project Area Sewershed Basin

Project Area ID	ERCs	AADF (GPD)	PHF (GPM)	Project Area ID	ERCs	AADF (GPD)	PHF (GPM)
P1A1	400	65600	147	P3A22	410	67200	150
P1A2	138	22600	51	P3A23	35	5700	13
P1A3	321	52600	118	P3A24	0	0	0
P1A4	9	1400	3	P4A25	232	38100	85
P1A5	48	7800	17	P4A26	212	34700	78
P1A6	29	4800	11	P4A27	255	41900	94
P2A7	13	2200	5	P4A28	173	28400	63
P2A8	7	1100	2	P4A29	71	11700	26
P2A9	4	600	1	P4A30	267	43800	98
P2A10	41	6800	15	P4A31	210	34400	77
P2A11	0	0	0	P4A32	59	9700	22
P2A12	2	400	1	P4A33	150	24600	55
P2A13	0	0	0	P4A34	48	7900	18
P2A14	0	0	0	P4A35	9	1500	3
P2A15	256	42000	94	P4A36	7	1100	2
P2A16	83	13600	30	P4A37	206	33800	76
P3A17	107	17600	39	P4A38	158	25900	58
P3A18	312	51100	114	P4A39	343	56300	126
P3A19	180	29600	66	P4A40	26	4300	10
P3A20	188	30800	69	P4A41	39	6400	14
P3A21	282	46300	104	TOTAL	5,330	874,300	

Figure 3-1 presents the NSILT estimate of nitrate contributions in pound of nitrogen per year per acre from the current OSTDS.

Figure 3-1

Current Septic Tank Based Nitrogen Loading Estimation Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



3.2 BUILDOUT POPULATION, WASTEWATER FLOW, AND SEPTIC TANK-BASED NITROGEN-LOADING PROJECTIONS

Estimates of ERCs and wastewater sanitary flows were developed for each sewershed/project area basin based on future land use guidelines. Attachment 1 details the methodology used to estimate the number of housing units and the non-residential building square footage. Additionally, Orange City water use records were analyzed to understand average water use by tax use codes.

Table 3-3 presents a listing of the estimates for ERCs, AADF, and PHF for buildout populations in the SRWRF service area.

Table 3-3 Buildout ERCs, AADF, and PHF for Each Existing Sewershed Basin

Sewershed	ERCs	AADF (GPD)	PHF (GPM)	Sewershed	ERCs	AADF (GPD)	PHF (GPM)
SW11 ¹	29	3900	8	SW41 ⁵	425	57300	111
SW12 ¹	23	3200	6	SW48 ⁵	83	11200	22
SW13 ¹	235	31800	62	SW50 ⁵	12	1600	3
SW14 ¹	27	3700	7	SW51 ⁵	286	38600	75
SW42 ¹	37	5000	10	SW55 ⁵	187	25300	49
SW43 ¹	248	33500	65	SW73 ⁵	197	26500	52
SW44 ¹	40	5400	11	FM22001-00 ⁵	13	1700	3
SW45 ¹	53	7100	14	LS12001-00 ⁵	119	16000	31
SW46 ¹	59	8000	16	LS12003-00 ⁵	19	2600	5
SW54 ¹	17	2300	4	LS20001-00 ⁵	168	22700	44
LS16001-00 ¹	37	5000	10	LS20002-00 ⁵	77	10400	20
SW17 ²	136	18400	36	LS22001-00 ⁵	53	7200	14
SW20 ²	176	23800	46	LS22002-00 ⁵	121	16400	32
SW21 ²	21	2900	6	LS22003-00 ⁵	135	18200	35
SW22 ²	18	2400	5	LS22004-0 ⁵	21	2800	5
SW28 ²	165	22300	43	PLS16001-0 ⁵	39	5200	10
SW30 ²	47	6300	12	PLS20001-0 ⁵	0	0	0
SW31 ²	411	55400	108	PLS22002-0 ⁵	71	9600	19
SW77 ²	7	900	2	PLS22003-0 ⁵	18	2400	5
SW78 ²	264	35700	69	PLS22004-0 ⁵	108	14600	28
SW79 ²	2	300	1	SW07	261	35200	68
SW80 ²	7	1000	2	SW09	265	35800	70
SW82 ²	12	1600	3	SW10	70	9500	18
SW83 ²	1	200	0	SW15	126	16900	245
SW66 ³	3	400	1	SW16	208	28100	55
SW08 ⁴	182	24500	48	SW18	715	96500	521
SW24 ⁴	3	500	1	SW19	385	52000	102
SW25 ⁴	624	84200	164	SW23	86	11600	351
SW26 ⁴	1	100	0	SW47	268	36200	70
SW27 ⁴	125	16900	33	SW56	477	64400	125
SW38 ⁴	220	29700	58	SW57	953	128600	250

Sewershed	ERCs	AADF (GPD)	PHF (GPM)	Sewershed	ERCs	AADF (GPD)	PHF (GPM)
SW59 ⁴	96	13000	25	SW58	286	38500	76
SW32 ⁵	145	19600	38	SW60	313	42300	1022
SW33 ⁵	721	97300	189	SW71	145	19600	38
SW34 ⁵	141	19000	37	SW81	28	3800	7
SW35 ⁵	61	8300	16	SW71	425	57300	111
SW39 ⁵	96	13000	25	SW81	83	11200	22
SW40 ⁵	136	18300	36	TOTAL	11,459	1,547,100	

Notes: 1. Flows to SW 15. 2. Flows to SW 18. 3. Flows to SW 19. 4. Flows to SW 23. 5. Flows to SW 60.

Table 3-4 presents the estimates for ERCs, AADF, and PHF for buildout populations for the expansion project areas.

Table 3-4 Buildout ERCs, AADF, and PHF for Each Project Area Sewershed Basin

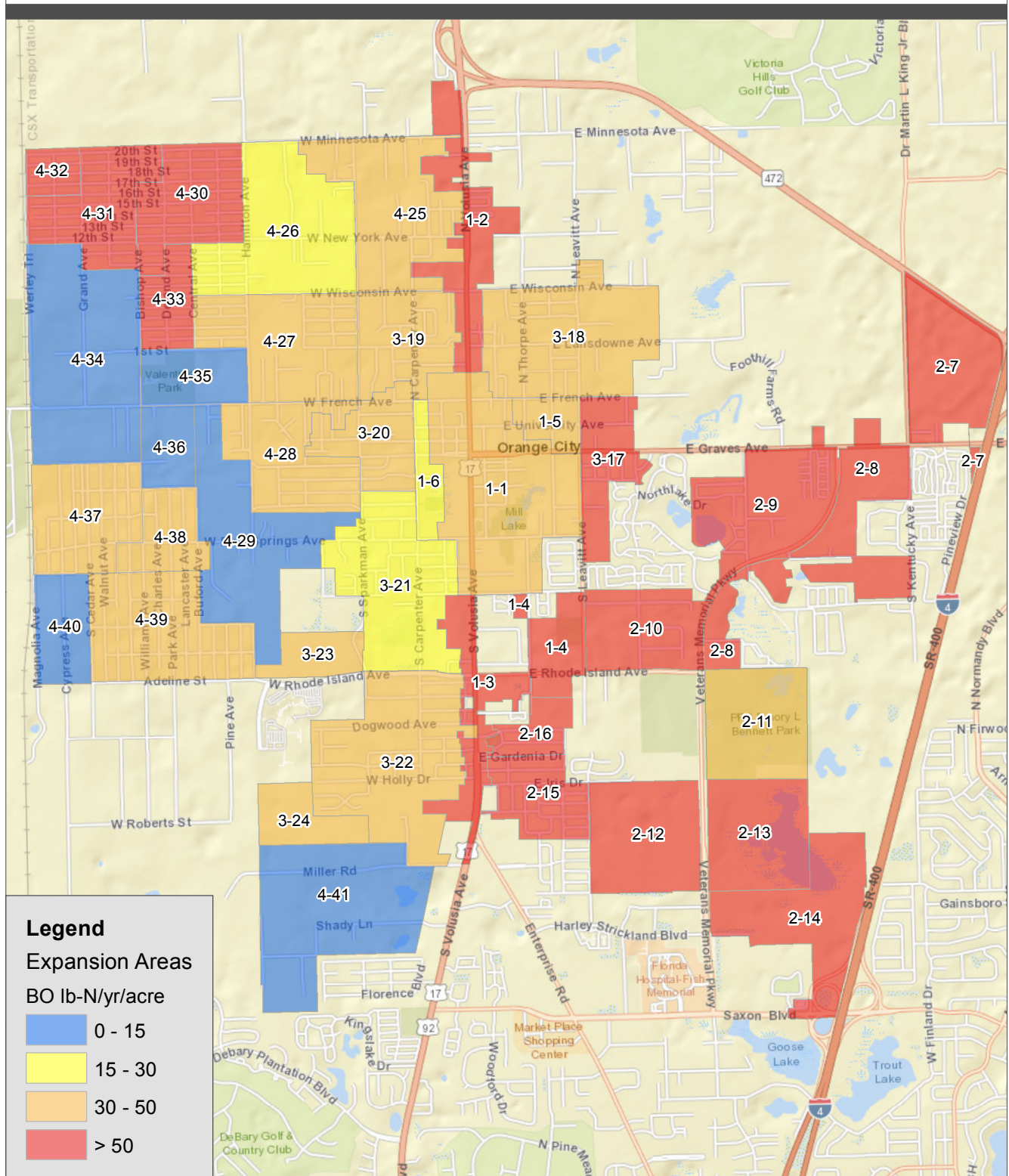
Project Area ID	ERCs	AADF (GPD)	PHF (GPM)	Project Area ID	ERCs	AADF (GPD)	PHF (GPM)
P1A1	1049	172100	324	P3A22	627	102900	194
P1A2	490	80300	151	P3A23	150	24600	46
P1A3	399	65400	123	P3A24	202	33,100	62
P1A4	295	48400	91	P4A25	423	69400	131
P1A5	103	16900	32	P4A26	289	47400	89
P1A6	99	16200	31	P4A27	407	66700	126
P2A7	1100	180400	340	P4A28	284	46600	88
P2A8	1099	180300	340	P4A29	86	14100	27
P2A9	737	120900	228	P4A30	442	72,500	137
P2A10	984	161400	304	P4A31	423	69,400	131
P2A11	509	83,500	157	P4A32	115	18,900	36
P2A12	1088	178500	336	P4A33	204	33,500	63
P2A13	981	160,900	303	P4A34	69	11,300	21
P2A14	1207	197,900	373	P4A35	10	1,600	3
P2A15	273	44,700	84	P4A36	9	1,500	3
P2A16	133	21,800	41	P4A37	412	67,600	127
P3A17	254	41700	79	P4A38	184	30,200	57
P3A18	609	99900	188	P4A39	531	87,100	164
P3A19	318	52100	98	P4A40	28	4,600	9
P3A20	235	38500	73	P4A41	70	11,500	22
P3A21	424	69600	131	TOTAL	17,351	2,845,900	

Figure 3-2 presents the buildout NSILT estimates of nitrate contributions in pounds of nitrogen per year per acre if the area was allowed to continue to install OSTDSs and no centralized sewer is put in place.

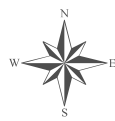
Figure 3-2

Build Out Septic Tank Based Nitrogen Loading Projections

Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



0 1,750 3,500
Feet
1:42,000



JonesEdmunds

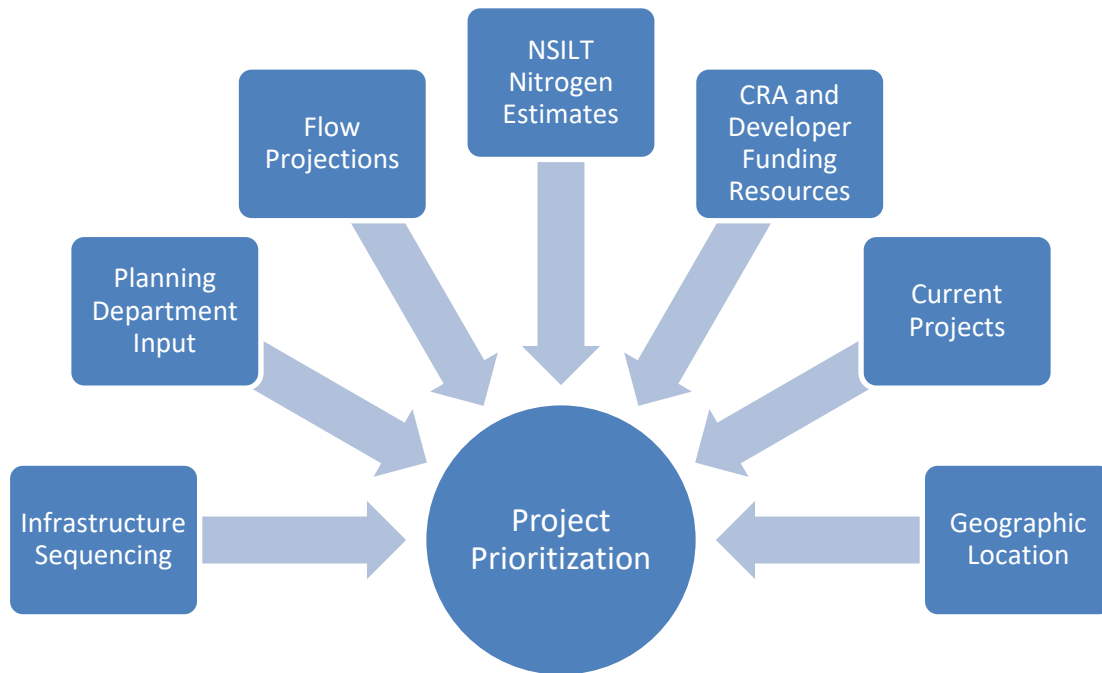
3.3 10-YEAR ERCs

Using the University of Florida Bureau of Economic and Business Research (BEBR) 2016 update on population growth in Volusia County, the team developed population projections for low-, medium-, and high-growth outlooks.

Based on the existing populations and the BEBR growth rates of 1.0, 4.5, and 7.6 percent over a 10-year planning period, the population of the area is predicted to increase by 555, 2,540, and 4,355 people, respectively. The medium growth was used to calculate 1,016 additional ERCs by 2027. The majority of the predicted growth is assumed to be gained within the new planned developments and redevelopment areas.

4 PROJECT PHASING PLAN

Once project areas were identified with the completion of environmental assessments, project areas were prioritized to develop a flexible and practical implementation sequence. The optimum economic sequencing was determined considering the inputs shown below.



The project prioritizations were used to identify and develop a 10-Year Improvement Plan. The specific infrastructure improvements including collection systems, transmission lines, and LSs for the project areas are discussed in detail in Chapter 5.

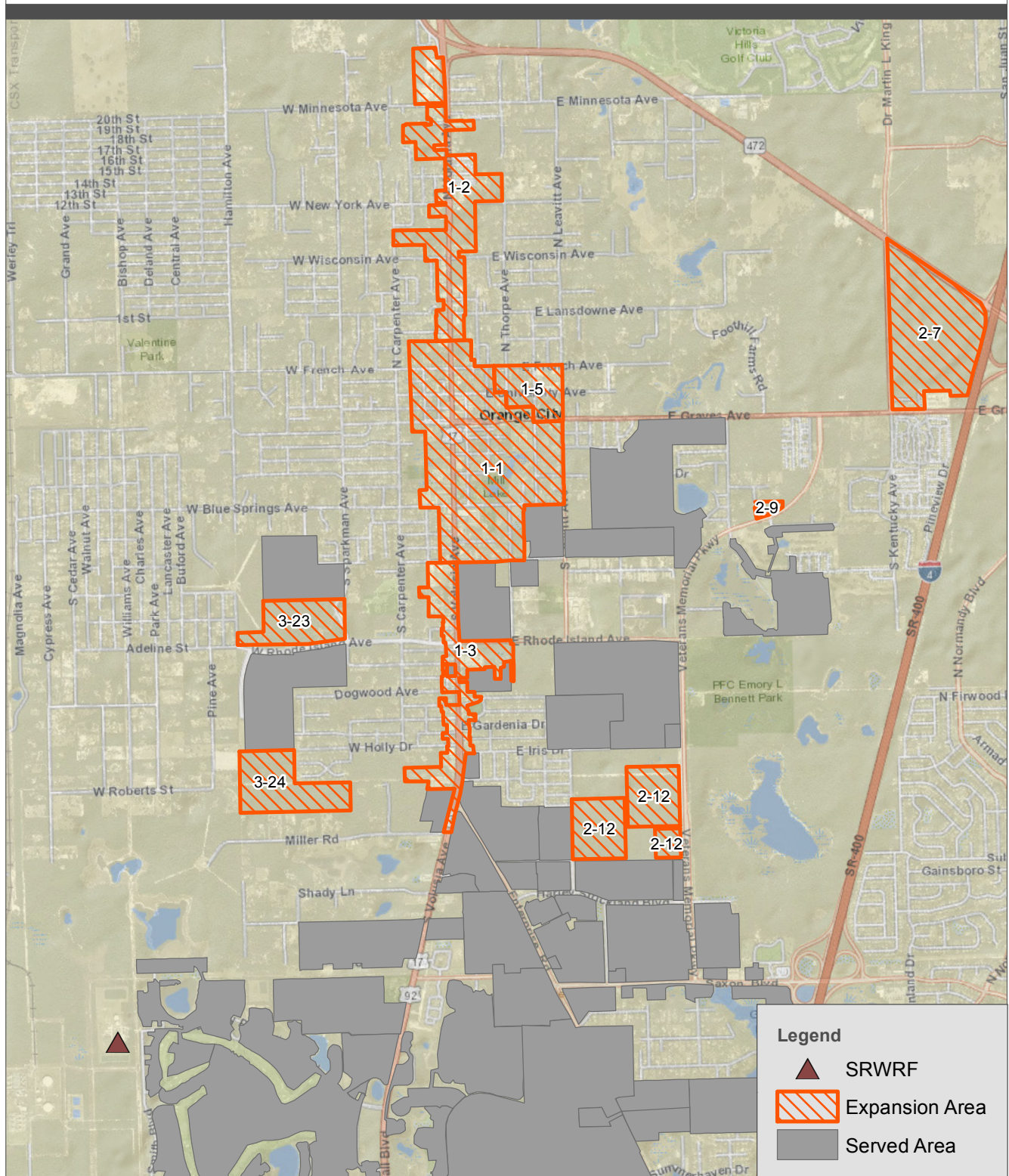
4.1 10-YEAR IMPROVEMENT PLAN

Figure 4-1 graphically depicts the 10-Year Improvement Plan by displaying the location of the project areas.

Figure 4-1

10 Years Expansion Plan

Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



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Table 4-1 includes the project area name, corresponding identifier, the occupied lots using septic systems, and the number of lots expected to connect during the 10-year improvement planning period. The Plan includes converting 926 septic systems to sewer in nine project areas with the addition of 1,016 new connections expected as growth within the redevelopment areas and new developments.

Table 4-1 10-Year Improvement Plan

Identifier	Name	Existing ERCs	10 Year ERCs ¹
P1A1 ²	South Holly Avenue	400	701
P1A2 ²	North 17/92 CRA	138	279
P1A3 ²	South 17/92 CRA	321	436
P1A5 ²	E. University Avenue	48	79
P2A7 ³	I-4 and Graves Multifamily Development	13	156
P2A9 ³	Veteran's Memorial Parkway Assisted Living Facility	4	25
P2A12 ³	Future development on south Veteran's Memorial Parkway (Parc Hill)	2	164
P3A23 ³	Future development at W. Rhode Island Drive and Sparkman Avenue	0	43
P3A24 ³	Planned unit development (PUD) at future Westside Parkway and Twin Lakes Train	0	59
Total		926	1,942

Notes:

1. ERC estimations concentrated in known redevelopment zones and private developments. Total estimations based on BEBR percent growth predictions for Volusia County and the current population for the SRWRF current and existing service areas.
2. Part of the CRA Brownfield designation.
3. Private Developer responsible for design and funding.

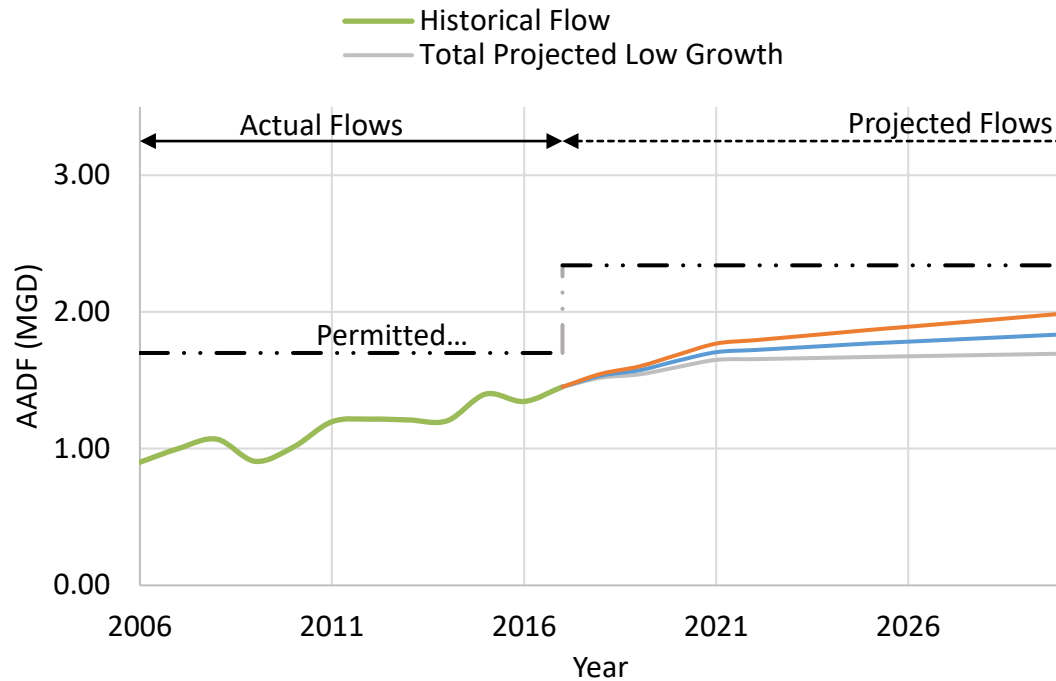
The prioritization of the non-developer funded project areas was determined based on construction difficulty, number of units served, grow and nitrogen contribution, Table 2 presents the prioritization of non-developer funded project areas.

Table 4-2 Project Area Prioritization

Identifier	Priority
P1A1	1
P1A2	3
P1A3	4
P1A5	2

Figure 4-2 shows the impact to the SRWRF flows with the permitted capacity.

Figure 4-2 Projected SWRWF Flows



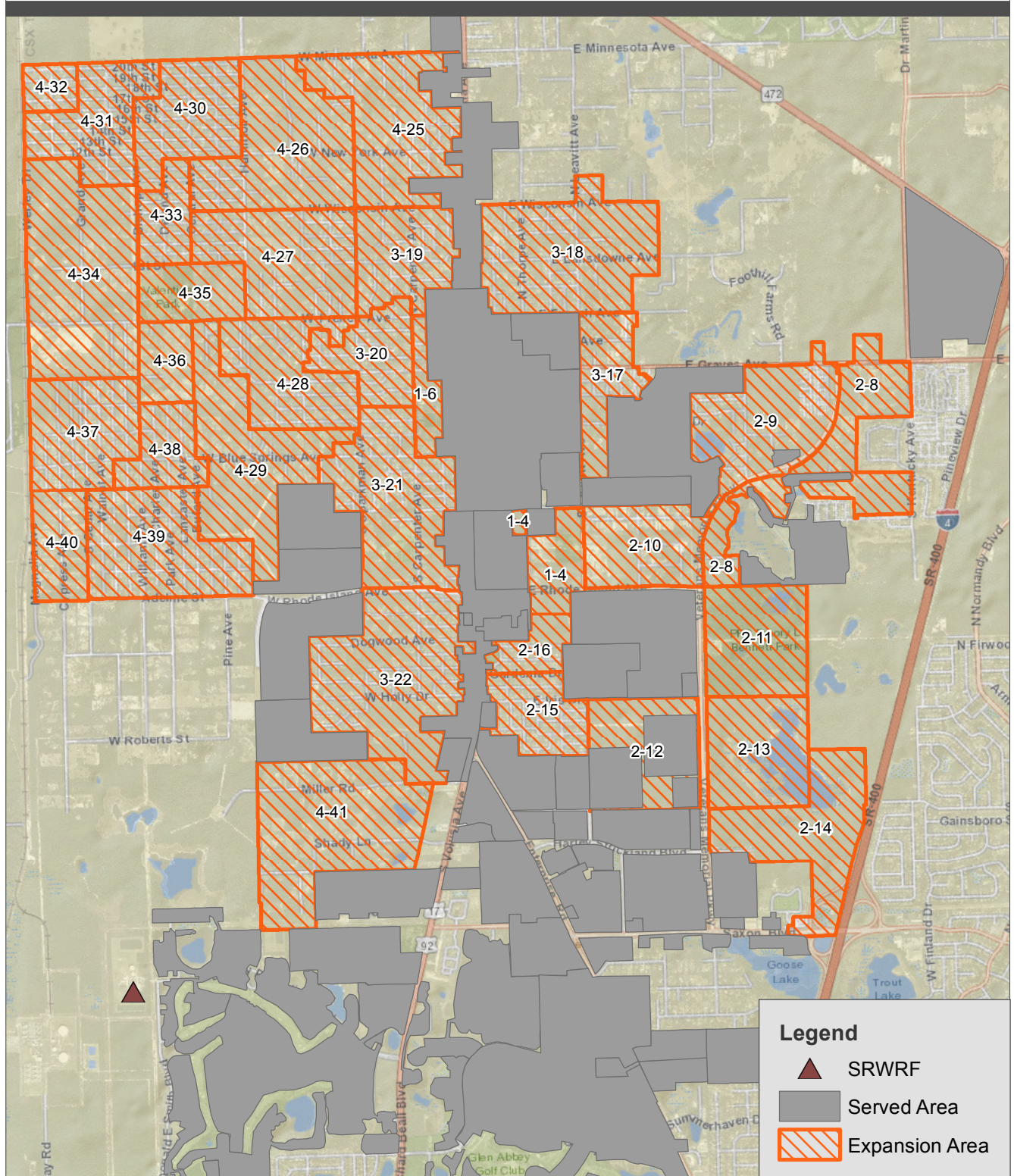
4.2 BUILDOUT IMPROVEMENT PLAN

The Buildout Improvement Plan shown in Figure 4-3 identifies the project areas that remain after completing the 10-Year Improvement Plan. Population and flow projections for these remaining areas are presented in Table 3-4.

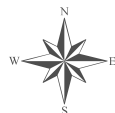
Figure 4-3

Build Out Expansion Plan

Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



0 1,750 3,500
Feet
1:42,000



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5 ANALYSIS OF WASTEWATER COLLECTION SYSTEM OPTIONS

Three collection system options were considered to determine an economical centralized collection system for the expansion service areas. The collection system evaluation included low-pressure, gravity collection, and combination low pressure-gravity collection. The following factors were used to evaluate the wastewater collection system alternatives:

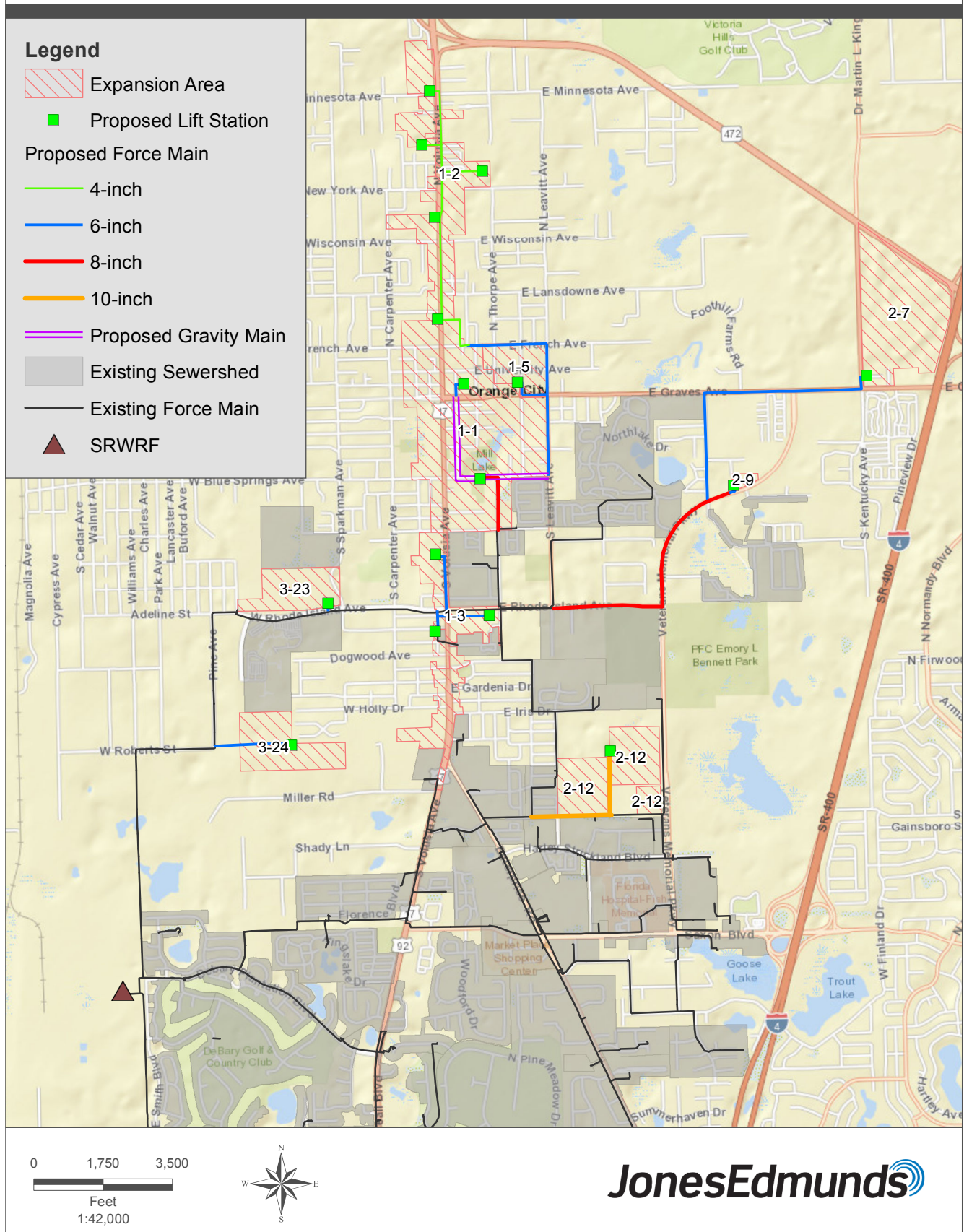
- Constructability.
- Reliability.
- Protection of the environment.
- Ease of maintenance.
- Capital costs.
- Operation and maintenance costs.

5.1 OPTION 1 – GRAVITY COLLECTION SYSTEM

Gravity collection systems are common and a traditional method to collect domestic wastewater for public utilities. The system involves gravity service laterals from each customer that connect to gravity sewer mains connected by manholes approximately every 400 feet or each bend. The gravity system then flows to localized LSs in the area. The network of LSs pump into FMs used to transport the collected wastewater to the WRF for treatment. Construction of a gravity system results in a greater disturbance to the developed land (e.g., roadway, sidewalks, and other utilities) relative to other sewer collection technologies; however, they are overall more reliable than other systems since the mechanical and electrical components are only at the LSs. Although capital costs can be significant, the customer's service lateral is their responsibility to maintain on their property up to the right-of-way (ROW), which over time can reduce the maintenance costs for this type of collection system. Figure 5-1 presents the transmission systems required for serving the 10-Year Improvement Plan with a gravity collection system.

Figure 5-1

**Option 1 - Gravity Collection System Transmission Improvements
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion**



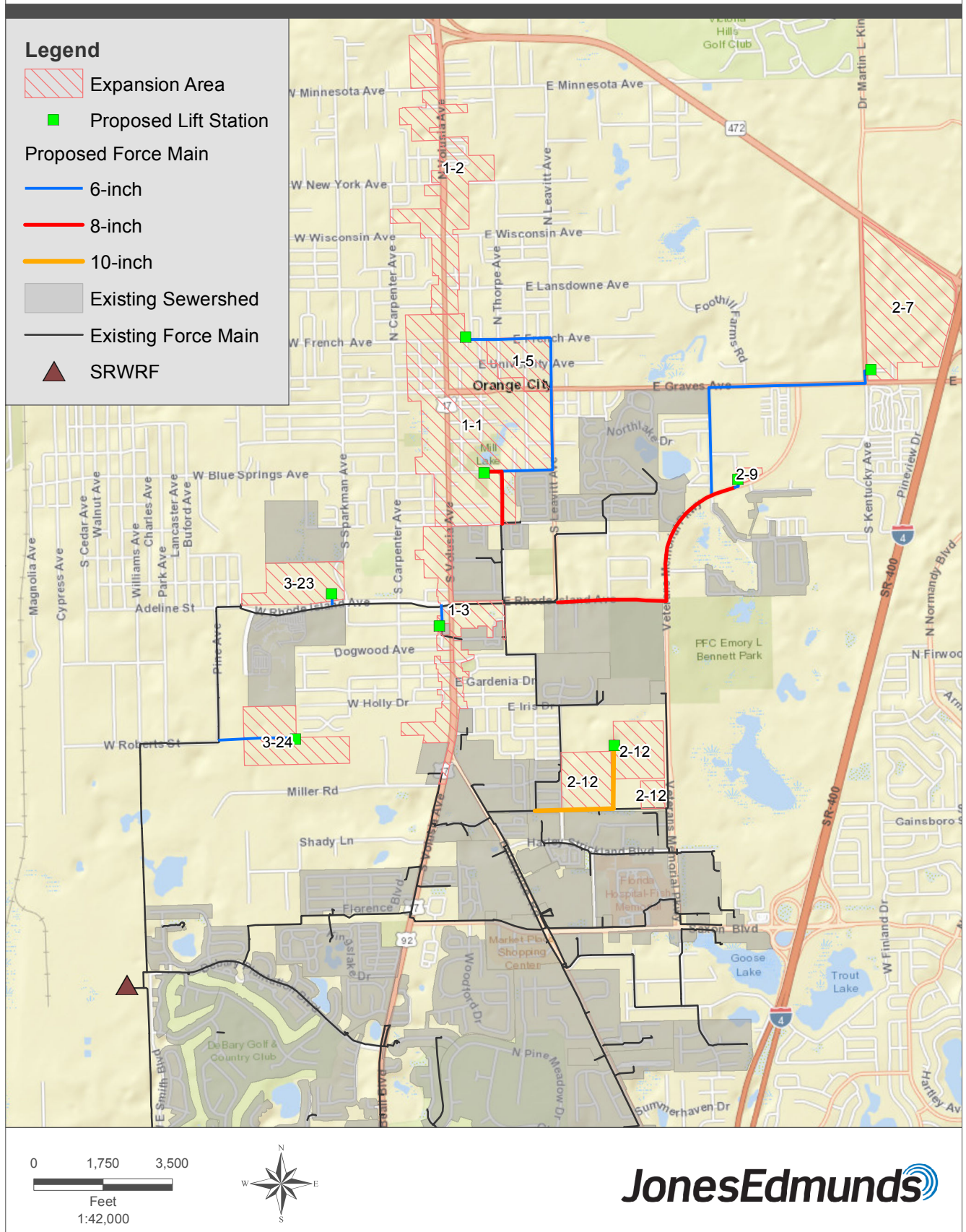
5.2 OPTION 2 – LOW-PRESSURE COLLECTION SYSTEM

Low-pressure systems use small in-ground tanks with automatic pumps and control devices at each service connection to convey the liquid in the tank to a low-pressure collection system. Wastewater from the residence flows to the grinder pump tank via gravity service lines. The waste is ground into a slurry and then pumped into the collection system by a small (typically 2-inch minimum) pressurized pipe. The use of a smaller pipe is beneficial since it is less costly and causes less disturbance on developed lands during installation. The low-pressure system then conveys the liquid to a LS where it is transported to the WRF through transmission FMs. Homeowners are required to maintain the septic effluent pump and provide an easement dedicated to the utility or City to allow access onto the property to maintain the system.

Generally, the assumption is that low-pressure systems can provide cost savings by retrofitting existing septic tanks. However, the majority of the existing septic systems are beyond useful life, have insufficient capacity, or cannot be modified. A new collection tank with the effluent pump would need to be installed for each customer, which would include connecting to the customer's power supply and is, therefore, not a reliable source for reducing costs except in cases where constructability of a gravity collection system is a major concern. Figure 5-2 presents the transmission systems needed for serving the 10-Year Improvement Plan with low-pressure collection and transmission systems.

Figure 5-2

**Option 2 - Low Pressure Collections System Transmission Improvements
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion**

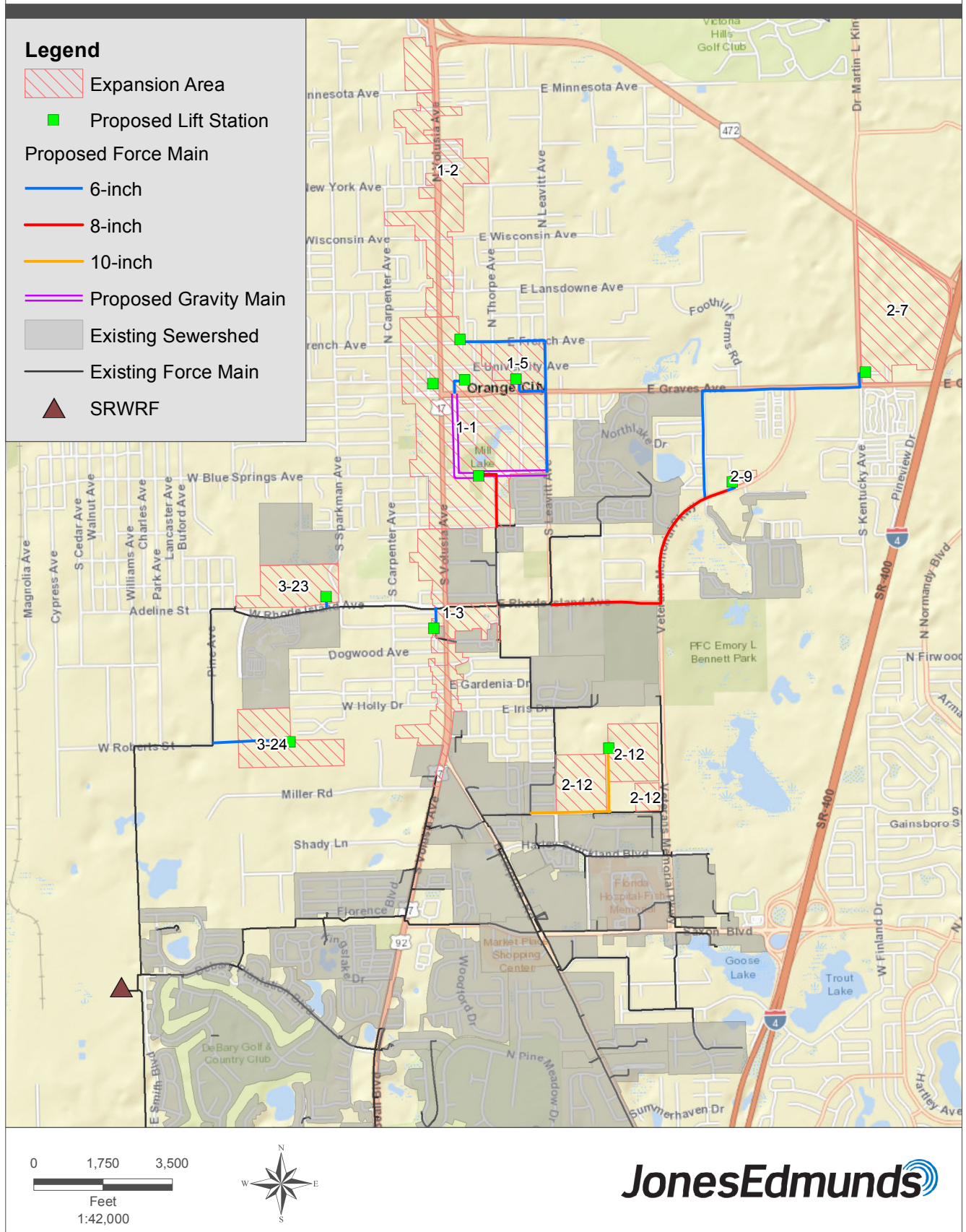


5.3 OPTION 3 – COMBINATION COLLECTION SYSTEM

The combined gravity and low-pressure collection system uses gravity laterals and mains to collect and transfer wastewater flows wherever feasible and uses low-pressure systems where gravity collection is not feasible in already congested ROWs and/or unfavorable topography. Low-pressure systems are connected to gravity infrastructure (manholes or gravity mains) within the ROWs, and flows are transferred to an intermediary LS for transmission to the WRF through FMs. Figure 5-3 presents the transmission systems needed for serving the 10-Year Improvement Plan with combined collection system technologies.

Figure 5-3

**Option 3 - Combination Collections System Transmission Improvements
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion**



6 HYDRAULIC MODEL AND SUMMARY OF NEEDED TRANSMISSION IMPROVEMENTS

This Chapter presents the assumptions, development, calibration, and results of the hydraulic wastewater modeling effort conducted as part of the Master Plan. The proposed 10-Year Improvement Plan includes installing a combined sewer collection system for collecting and conveying wastewater to the WRF (Option 3 as discussed in Chapter 5). Hydraulic modeling was used to simulate the existing conditions, ongoing improvements, and determine the future improvements required to implement the 10-Year Improvement Plan.

Figure 6-1 shows that the 10-Year Improvement Plan would require replacing 926 existing septic systems, constructing a new low-pressure and gravity collection system, and installing new FMs and LSs. In addition, a number of RCW improvements are also discussed in this Chapter.

6.1 HYDRAULIC MODEL

Hydraulic wastewater models are typically composed of a detailed model network that includes LSs, FMs, and gravity mains to simulate flow conveyance throughout the collection and transmission system. These types of models can be used for various purposes depending on the level of correlation to actual network supervisory control and data acquisition (SCADA) data.

Utility owners regularly use hydraulic models of the wastewater transmission systems to identify areas where additional capacity is needed to convey projected long-term flows to the WRFs. Model simulations were conducted using 2016 wastewater flows to identify areas requiring improvements for the current system. Modeling simulations were also conducted using flow conditions for the 10-Year Improvement Plan to determine additional infrastructure requirements for the wastewater collection and conveyance systems over the planning period.

6.1.1 MODEL DEVELOPMENT

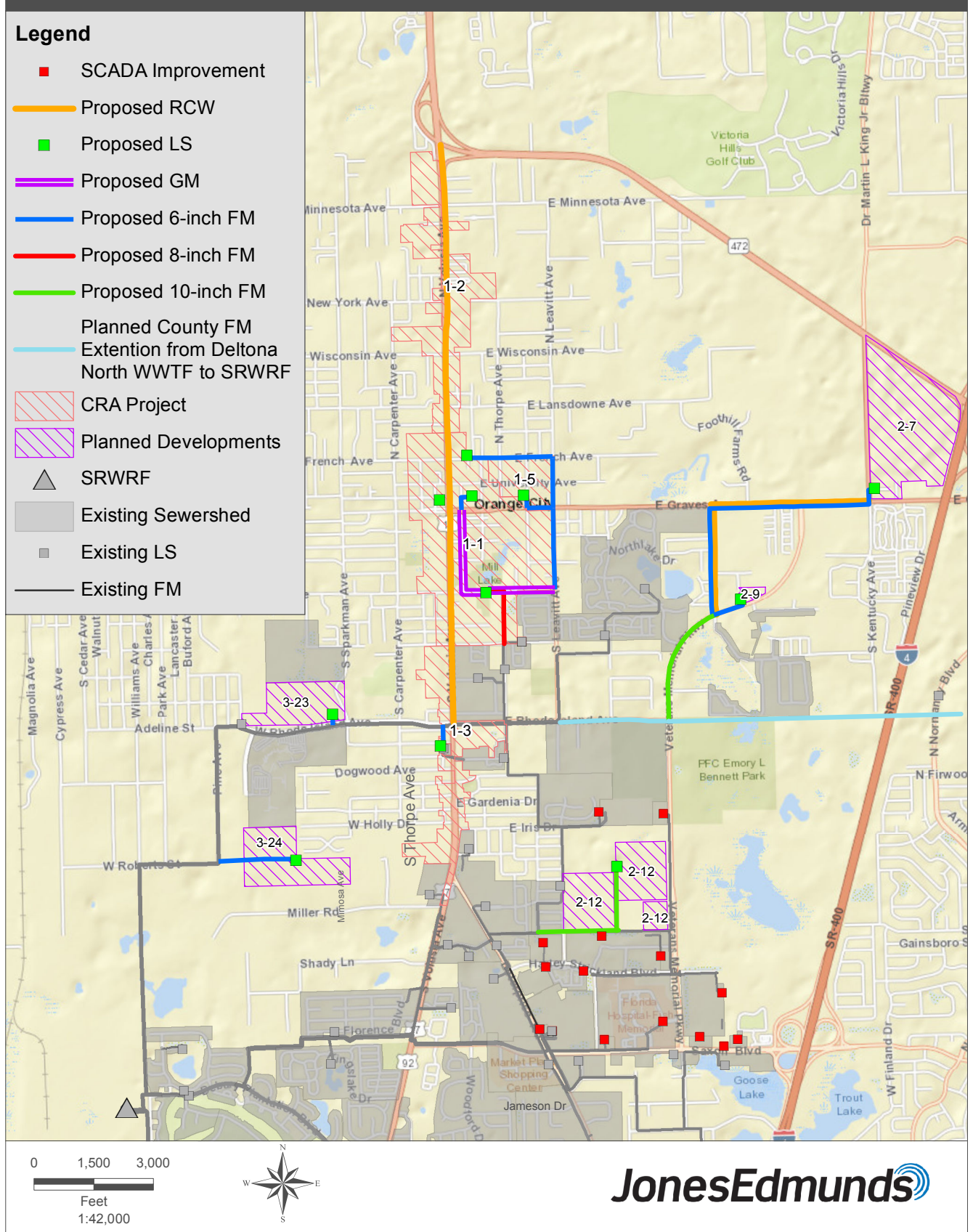
As part of the Master Plan effort, a hydraulic model of the SRWRF FM transmission system was created. A workshop was held with Volusia County staff to review the model development and needed updates to the GIS transmission system data, which were conveyed to County GIS staff. To verify the model representation, a calibration process was executed.

6.1.2 CALIBRATION

The model was calibrated using SCADA data to improve the level of correlation between model predictions and actual system flows. The FM model of the SRWRF transmission system LSs and the SRWRF were validated based on LS pump runtime, tax parcel-based flow estimations, and discharge monitoring reports. The model met the desired level of correlation to sufficiently predict SRWRF flows from sanitary system flows. Volusia County should re-calibrate the wastewater models to account for system improvements and current flows before using model predictions for future design recommendations. An up-to-date calibrated model will allow the County to use the models for additional operational improvements and will allow streamlined master planning efforts in the future.

Figure 6-1

10 Years Sewer and RCW Transmission Improvements Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



6.1.3 HYDRAULIC MODELING ASSUMPTIONS AND EVALUATION CRITERIA

6.1.3.1 Average and Maximum Daily Flows

Modeling simulations used an annual average level of service value of 164 gpd per residential connection to account for variations in customer water use and to provide adequate transmission capacity throughout the service areas. The actual AADF for the service area was determined to be 135 gpd per residential connection based on County data. The peaking factor for the SRWRF was determined to be 1.3 and was used for modeling the maximum daily extended-period flow simulations that included PHFs.

6.1.3.2 Evaluation Criteria

The wastewater hydraulic models were used to evaluate the existing wastewater system performance under the current and 10-year scenarios. The evaluation criteria for establishing wastewater collection system performance included system capacity and wastewater velocity:

- System capacity was determined adequate if a stand-by pump was not needed to transmit the flow under a particular scenario.
- FM velocities were considered sufficient if the sustained velocities were within the FM operating guidelines of 2 and 8 feet per second (fps).

If the evaluation criteria were not met, system improvements were identified and listed for each flow scenario.

6.2 EXISTING HYDRAULIC MODELING RESULTS AND EXISTING IMPROVEMENTS

The modeling analysis showed that the existing transmission system requires only pumping capacity increases for one LS and that the FM network is adequately meeting the area's needs to convey current flows. We recommend the following improvement be implemented by the County:

- Increase the pumping capacity at LS SW 7.

6.3 10-YEAR PLAN FOR WASTEWATER AND RCW TRANSMISSION SYSTEM IMPROVEMENTS

6.3.1 WASTEWATER SYSTEM IMPROVEMENTS

The 10-Year Improvement Plan includes four project areas and connecting five planned developments.

Modeling results for the 10-Year Improvement Plan predicted no LS capacity exceedances within the 10-year sanitary flows and no FMs with sustained velocities above 8 fps. Therefore, no additional improvements would need to be completed before implementing the projects identified in the 10-Year Improvement Plan.

Figure 6-1 presents an overview of the 10-Year Improvement Plan for which each wastewater transmission project is described in detail below:

- Project Area P1A1 requires the following additional transmission facilities:
 - A LS at or near the intersection of E. Blue Springs Avenue and S. Thorpe Avenue.
 - 3,300 linear feet (LF) of 8-inch and 10-inch FM along E Blue Springs Avenue and S Thorpe Avenue and ending at Rhode Island Avenue.
 - Repurpose a stormwater pump station into a wastewater LS east of N. Holly Avenue about 300 feet south of University Avenue.

- 600 LF of 6-inch FM starting along N. Holly Avenue, to E. Groves Avenue
- 2,500 LF of 10-inch GM starting at E Graves Avenue and S Holly Avenue and ending at LS P1A1S.
- 1,700 LF of 10-inch GM on E. Blue Springs Avenue and ending at LS P1A1S.
- Project Area P1A2 requires the following additional transmission facilities:
 - A LS at or near the intersection of E. French Avenue and Collins Court.
 - 5,000 LF of 6-inch FM from the LS to on S. Leavitt Avenue, and ending at E. Graves Avenue.
- Project Area P1A3 requires the following additional transmission facilities:
 - A LS at or near the intersection of Birch Avenue and Mimosa Avenue.
 - 600 LF of 6-inch FM starting at Birch Avenue, continuing north along Mimosa Avenue, and ending at W. Rhode Island Avenue.
- Project Area P1A5 requires the following additional transmission facilities:
 - A LS at or near N. Orange Avenue about 300 feet south of University Avenue.
 - 500 LF of 6-inch FM starting at the LS along N. Orange Avenue and ending at E. Graves Avenue.
- Planned development in Project Area P2A7 requires the following additional transmission facilities:
 - A LS at or near the intersection of Sunnyside Avenue and N. Kentucky Avenue.
 - 7,200 LF of 6-inch FM on E. Graves Avenue from N. Kentucky Avenue, to Monastery Road and south on Monastery Road to Veteran's Memorial Parkway
 - 5,800 LF of 8-inch FM starting along Veterans Memorial Parkway, continuing along E. Rhode Island Avenue, and ending at S. Leavitt Avenue.
- Planned development in Project Area P2A9 requires the following additional transmission facilities:
 - A LS at or near the intersection of Oakland Court and Veteran's Memorial Parkway.
 - 300 LF of 6-inch FM starting at the LS and ending at Veterans Memorial Parkway.
- Planned development in Project Area P2A12 requires the following additional transmission facilities:
 - A LS at a to-be-determined location northwest of the intersection Veteran's Memorial and Jameson Drive.
 - 3,500 LF of 6-inch FM south from the LS, continuing west along Jameson Drive, and ending at Hillside Avenue.
- Planned development in Project Area P3A23 requires the following additional transmission facilities:
 - A LS at or near the intersection of W. Rhode Island Avenue and S. Sparkman Avenue.
 - 300 LF of 6-inch FM starting at the LS and ending at W. Rhode Island Avenue.
- Planned development in Project Area P3A24 requires the following additional transmission facilities:
 - A LS south of Twin Lakes Trail.
 - 2,000 LF of 6-inch FM starting at Twin Lakes Trail and ending at Pine Avenue.

In addition to the transmission system improvements, the hydraulic modeling indicates that infiltration and inflow (I/I) exists in the overall system. I/I is expected in older systems due to physical conditions including infrastructure age, material type, and soil type. An I/I study should be undertaken to determine the most effective locations to focus effort to eliminate sources of I/I.

6.3.2 WASTEWATER TREATMENT IMPROVEMENTS

No additional improvements are required under the 10-Year Improvement Plan.

6.3.3 RECLAIMED WATER SYSTEM IMPROVEMENTS

The 10-Year Improvement Plan includes four projects that will be coordinated with the corresponding expansion area to minimize disruption due to construction and cost.

Figure 6-1 presents an overview of the 10-Year Improvement Plan of which each RCW extension project is described in detail below:

- Project Area P1A1 requires the following additional transmission facilities:
 - 6,100 LF of 8-inch RCW main extension from E. French Avenue to E. Ohio Avenue on N. Volusia Avenue.
- Project Area P1A2 requires the following additional transmission facilities:
 - 7,800 LF of 8-inch RCW main extension from E. French Avenue to State Road 472 on N. Volusia Avenue.
- Project Area P1A3 requires the following additional transmission facilities:
 - 2,200 LF of 8-inch RCW main extension from Rhode Island to E. Ohio Ave on N. Volusia Avenue.
- Planned development in Project Area P2A7 requires the following additional transmission facilities:
 - 4,200 LF of 8-inch RCW main extension on E. Graves Avenue from S. Kentucky Avenue to Monastery Road.
 - 2,700 LF of 8-inch RCW main extension on Monastery Road from E. Graves Avenue to Veterans Memorial Parkway.

In addition to the above RCW main extensions, SJRWMD and West Volusia Water Suppliers are co-funding a preliminary design study to determine whether the B&H Excavation Site, a borrow pit located near Volusia Blue Spring, can be used for aquifer recharge and to determine what type of water (including surface water, treated stormwater, and/or advanced treated reclaimed) can be used for recharge. If advanced treated reclaimed water can be used for aquifer recharge, one possibility would be to interconnect the City of Deland's reclaimed water transmission system near the intersection of State Road 472 and US 17/92 to the Orange City 10-year RCW main on US 17/92 (N. Volusia Avenue). An additional westward RCW main on French Avenue may be needed to reach the borrow pit.

6.4 BUILDOUT CRITICAL SYSTEM IMPROVEMENTS

Modeling results indicate that the following improvements will be necessary to convey the projected flows for all project areas under the Buildout Improvement Plan:

- 31 LSs to serve project areas.
- 86,000 LF of FM.

Figure 6-2 presents an overview of the transmission facilities and project areas for the Buildout Improvement Plan.

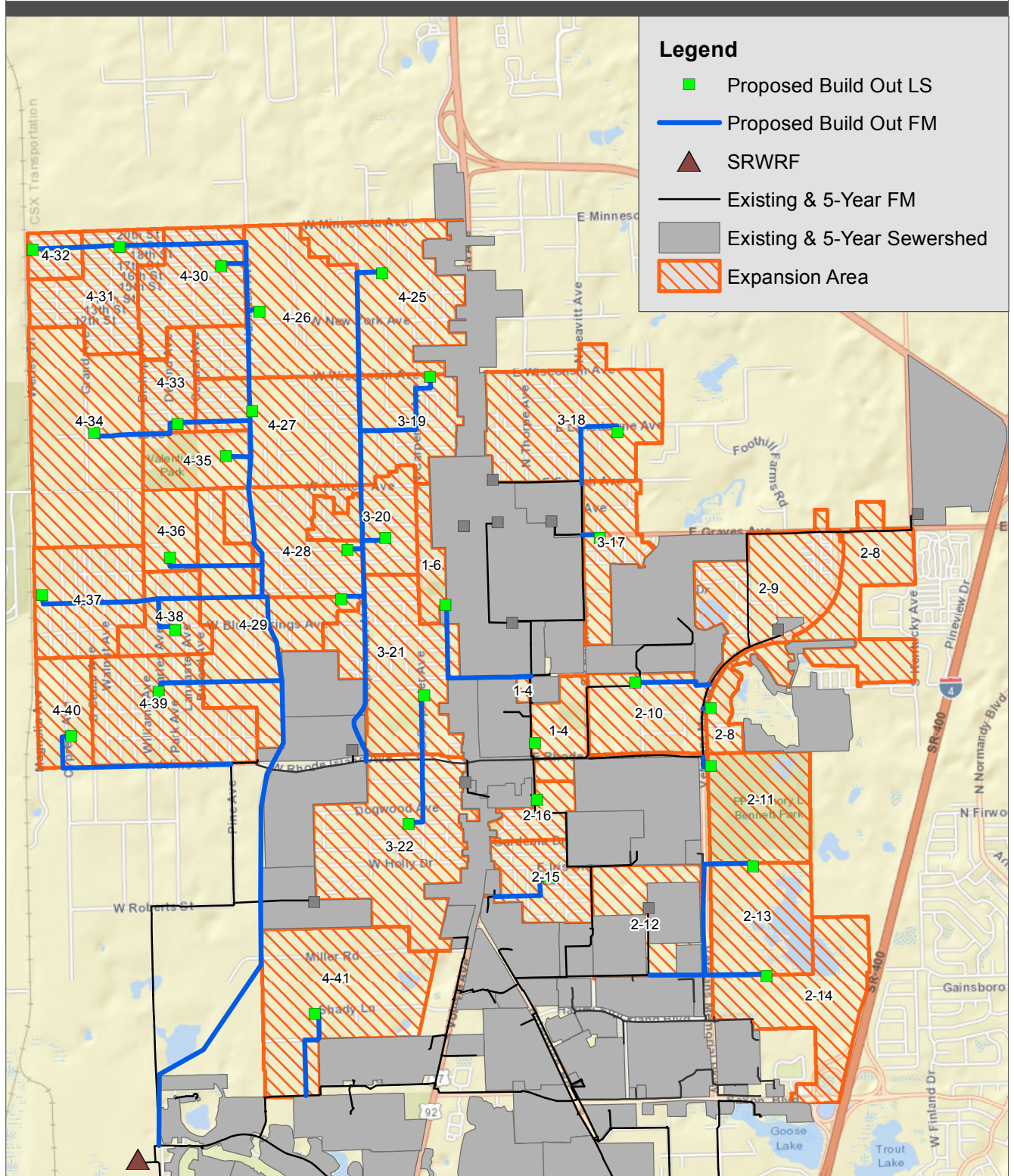
Routing was chosen based on the latest City Planning Department information. Florida Department of Transportation plans to extend Westside Parkway; this plan is currently known as the Western Beltway. If

this plan is implemented, this would allow portions of the urbanized unincorporated County closest to Blue Spring to be sewerred on a much shortened timeline.

Figure 6-2

Build Out Sewer Transmission Improvements

Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



7 SERVICE AREA ADJUSTMENTS AND LAND/EASEMENT ACQUISITION NEEDS

7.1 SERVICE AREA ADJUSTMENTS

Orange City and Volusia County desire a realignment of their respective service areas to improve efficiency of O&M, improve clarity to utilities applicants (including residents, businesses, and developers), and to provide planning certainty for Orange City Public Works and for the Volusia County Utilities Department.

The transfer of wastewater service area will include a transfer of infrastructure which includes physical assets, as-built drawings, and maintenance information.

7.2 LAND AND EASEMENT ACQUISITION NEEDS

Figures 7-1 to 7-4 present vacant parcels that may be acquired for needed facility improvements.

Figure 7-1 P1A1 Identified Parcels for Acquisition

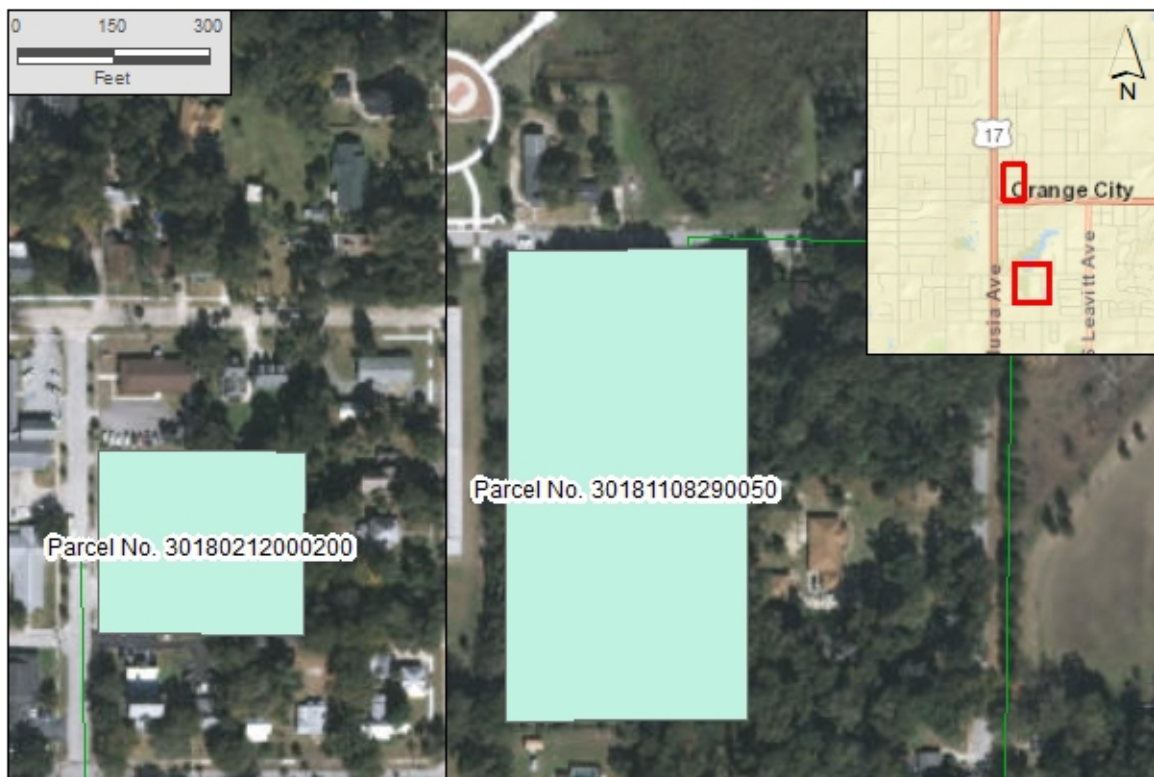


Figure 7-2 P1A2 Identified Parcel for Acquisition

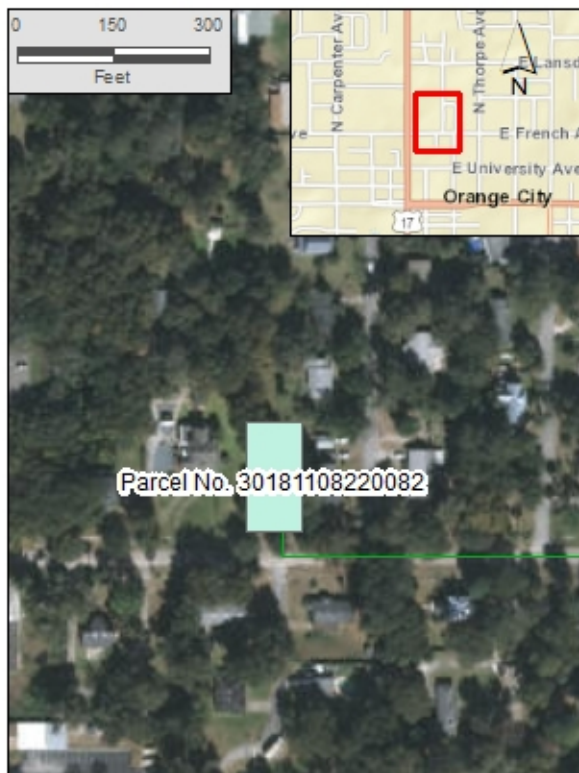


Figure 7-3 P1A3 Easement and Identified Parcel for Acquisition



Figure 7-4 P1A5 Identified Parcel for Acquisition

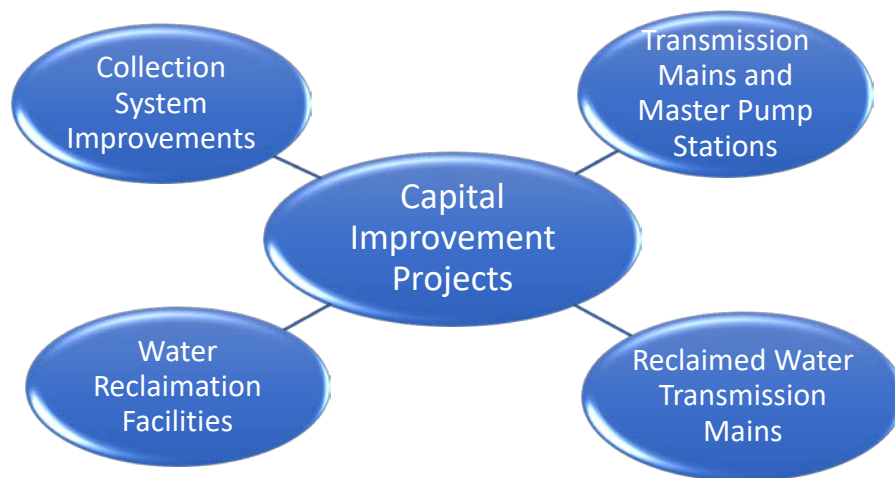


Only one easement is expected for the Redevelopment Project P1A3. Easements for the planned development Project Areas (P2A7, P2A9, P2A12, P3A23, and P3A24) are governed by typical developer agreements with the City, and all easements will be acquired through the developer agreements.

8 ROUGH ORDER OF MAGNITUDE ESTIMATE OF PROBABLE CIP COSTS

This Chapter summarizes the wastewater CIPs identified and discussed in Chapter 6. The estimates of probable construction costs were estimated in 2018 for each project and presented herein. Costs such as state revolving fund origination fees, capitalized interest, and inflation are not included. The expected schedule and optimum sequencing for implementing the CIPs are presented in terms of a 10-year funding plan.

8.1 CAPITAL IMPROVEMENT PROJECT COMPONENTS



8.1.1 COLLECTION SYSTEM IMPROVEMENTS

The collection system improvements include the projects related to the conversion of septic systems to centralized sewer as identified in the 10-Year Improvement Plan. Development and prioritization of the improvement plan were discussed in Chapter 4. The costs were determined on a per-connection basis using unit costs for a low-pressure or gravity collection system. Each cost included:

- General.
- On-lot connections.
- Off-lot connections.
- Collection piping.
- LSs.
- Restoration.
- Mobilization and general conditions (8 percent).
- Contingency (20 percent).
- Professional services (20 percent).

8.1.2 TRANSMISSION MAINS AND MASTER LSS

Transmission main improvements refer to the piping that connects project areas identified in the improvement plans to the County's existing wastewater infrastructure. The location, implementation cost, and implementation year for each transmission main CIP are presented in Section 6.2. The schedule, size, and route of the recommended transmission mains were based on modeling results and the vicinity to the existing wastewater system as discussed in Chapter 6. The costs of these transmission mains included unit costs for:

- Pipe materials.
- Transmission main installation.
- Valves and fittings.
- Restoration.
- Contingency (30 percent).
- Professional services (20 percent).

8.1.3 WATER RECLAMATION FACILITIES

No improvements are needed at the SWRWRF in the 10-Year Improvement Plan.

8.1.4 RECLAIMED WATER TRANSMISSION MAINS

Reclaimed water transmission mains refer to the piping used to convey reclaimed water from the WRF to the residents and businesses throughout the County. RCW transmission mains were identified by the City and costs for each project were estimated based on the criteria for wastewater transmission mains as discussed in Section 8.1.2.

8.2 IMPROVEMENT PLANS

The CIP provided in Table 8-1 presents the required amounts needed to fund the project areas outlined in each 10-Year Improvement Plan before planning and construction for the project can commence. Total project costs presented do not include inflation, administrative fees, or capitalized interest.

Jones Edmunds developed opinions of probable cost include restoration, a 30 percent construction contingency, and an additional 20 percent for professional services.

Detailed cost breakdowns are presented in Attachment 2.

8.2.1 10-YEAR IMPROVEMENT PLAN

Table 8-1 10-Year Capital Improvement Projects Funding Plan (\$ in Thousands)

CIP Type	Description	Project Area	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
SCADA & LS Rehabilitation	Add SCADA and Improve Existing LSs ¹	Existing LS	\$248	\$230	\$175	\$131	\$116					
Infiltration and Inflow	Study and Infrastructure Improvements ¹	Existing LS	\$305	\$635	\$275	\$2,075	\$2,075					
Transmission Facility	South Holly to Rhode Island	P1A1, P1A2, P1A5	\$832	\$832								
Collection System	Central 17/92 CRA	P1A1	\$1,821	\$1,821	\$1,820							
RCW Facility	17/92 Middle Extension	P1A1		\$676	\$676							
Transmission Facility	E. University CRA	P1A5				\$271						
Collection System	E. University Avenue	P1A5				\$538	\$538					
Transmission Facility	E. French and S. Leavitt	P1A2						\$785	\$785			
Collection System	North 17/92 CRA	P1P2						\$1,290	\$1,289			
RCW Facility	17/92 Upper Extension	P1A2						\$575	\$575	\$574		
Transmission Facility	Mimosa to Rhode Island	P1A3								\$367		
Collection System	South 17/92 CRA	P1P3								\$732	\$732	\$731
RCW Facility	17/92 Lower Extension	P1A3										\$505
Transmission Facility	I-4 and E. Graves Development	P2A7										

CIP Type	Description	Project Area	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
RCW Facility	E. Graves and Monastery	P2A7, P2A9									\$711	\$711
Transmission Facility	Veteran's Memorial Parkway ALF	P2A9										
Transmission Facility	Three developments Veteran's Memorial	P2A12										
Transmission Facility	Development at W. Rhode Island and Sparkman	P3A23										
Transmission Facility	Development at Westside Parkway and Twin Lakes	P3A24										
Miscellaneous Equipment	Computers, Vehicles, Generators, and Other Equipment	Existing WW System	\$221	\$5	\$1	\$6	\$4					
Total Capital Needed			\$3,427	\$4,199	\$2,947	\$3,021	\$2,733	\$2,650	\$2,649	\$1,673	\$1,443	\$1,947

1. Includes planned wastewater infrastructure improvements refer to City CIP budget dated April 22, 2018

9 REFERENCES

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Attachment 1

Population and Flow Estimations and Projections Technical Memorandum

Orange City Septic Tank Phase-Out Master Planning and Reuse System Expansion

TO: Scott Mays, PE; Michael Ulrich (Volusia County Utilities);
Raul Palenzuela, PE; Migdalia Hernandez; Becky Mendez, AICP
(City of Orange City)

FROM: Esther Kaufman, PE; John Horvath, PE

DATE: July 30, 2018

SUBJECT: Population and Flow Projections
Volusia County Project No. PC2150
Jones Edmunds Project No. 22015-015-01

1 INTRODUCTION

Blue Spring is near Orange City, Volusia County, Florida, and is the largest spring on the St. Johns River. Maintaining and protecting the spring are high priorities for the County and the City. The spring has an adopted minimum flow regime and an adopted Total Maximum Daily Load (TMDL) that are constraints for water supply and wastewater treatment facilities within the springshed area. The County and the City have residential communities and commercial entities within the springshed area. Most of these communities do not have central sewer-collection systems but use septic tanks to treat and dispose of wastewater. To avoid potential environmental impacts to the spring created by septic tanks, the County and the City are engaged in a master plan for removing septic tanks within the Blue Spring springshed and providing centralized sewer collection with treatment at the Southwest Regional Water Reclamation Facility (SRWRF).

This technical memorandum supports the master planning effort by providing documentation on the development of sewer service areas (sewersheds), population projections, and wastewater flow projections within the existing and future SRWRF service areas. The technical memorandum summarizes the equivalent residential units (ERC), average annual daily flows (AADF), and peak hourly flows (PHF) for each existing and future sewersheds. Additionally, the flow projections for the overall area are presented to enable the County to assess timing of capacity improvements at the SRWRF.

2 METHODOLOGY AND ASSUMPTIONS

2.1 SERVICE AREA DELINEATION AND PHASING

The delineation rationale for serving parcels with centralized treatment at the SRWRF include the following:

- Serve all urban areas within or just west of the Orange City limits (and nearest to Blue Spring), excluding properties already served by a centralized wastewater collection and treatment system.
- Prioritize areas most likely to develop/redevelop in the near future including:
 - Orange City Community Redevelopment Area (CRA), which is defined as a specific area along and adjacent to US Highway 17/92 (Volusia Avenue) within the City of Orange City in Volusia County, Florida.
 - Properties adjacent to Veterans Memorial Parkway including areas adjacent to East Graves Avenue from I-4 to Veterans Memorial Parkway.

2.2 FUTURE SEWERSHED DEVELOPMENT

Sewersheds for the entire master planning service area (described in Section 2.1) were developed with the following criteria:

- Elevation data – used to allow for the design for gravity collection when possible and cost effective.
- Major man-made and naturally occurring boundaries (e.g., water bodies and large roadways) – used as natural delineations.
- Approved developments – used as separate delineations to allow for developer homogeneity.
- Prioritization (listed in Section 2.1) – used as delineations to allow for sewer construction during redevelopment.

Master plan sewersheds may be revised during preliminary design, which could include combining sewersheds where appropriate. Figure 1 presents the master plan future sewersheds.

2.3 DEVELOPMENT OF EXISTING SRWRF SERVICE AREAS – SEWERSHEDS, FLOWS, AND ERCs

Jones Edmunds reviewed the existing sanitary sewer geodata database (GDB) to delineate each existing lift station sewershed that is tributary to the SRWRF. Figure 2 presents the delineated sewersheds in Orange City and unincorporated Volusia County that flow to the SRWRF.

2.3.1 2017 FLOW AND ERC ESTIMATION FOR EXISTING SEWERSHEDS

Jones Edmunds processed reported SRWRF influent flows from discharge monitoring reports (DMRs) for April 1, 2016 to March 31, 2017, to develop an understanding of the variability of the SRWRF influent flows.

We developed an initial estimate of wastewater sanitary flows for each delineated sewershed using information available in property appraiser data for each parcel and typical wastewater generation by land use type.

Jones Edmunds developed an initial estimate of maximum day flows (MDF) based on the following:

- Wastewater estimates as described in Florida Administrative Code Chapter 64E-6.008 Table 1.
- Wastewater estimates as described in *2002 US EPA Onsite Wastewater Treatment Systems Manual*.
- Florida Department of Revenue Use Code (DORUC) for parcels within the sewersheds presented in Figure 2.
- Other County parcel data including non-residential building indoor area and multi-family number of units.
- Average household size from 2010 US Census data.

The wastewater estimates were converted to AADF using an MDF-to-AADF factor of 1.3 as found in the DMRs for the SRWRF. The AADF estimates were then further refined by calibrating a hydraulic model of the force main transmission system to actual DMR influent data for the SRWRF and pump run time data for each lift station.

Each single-family residential parcel is equivalent to 1 ERC, and the associated flow was calculated using the total influent flow to the SRWRF AADF minus estimated commercial flows with census data.

The total population served was estimated to be 13,500, and the flow from each ERC was calculated to be 135 gallons per day (GPD), which equates to 55 gallons per day per capita (GPDC) .

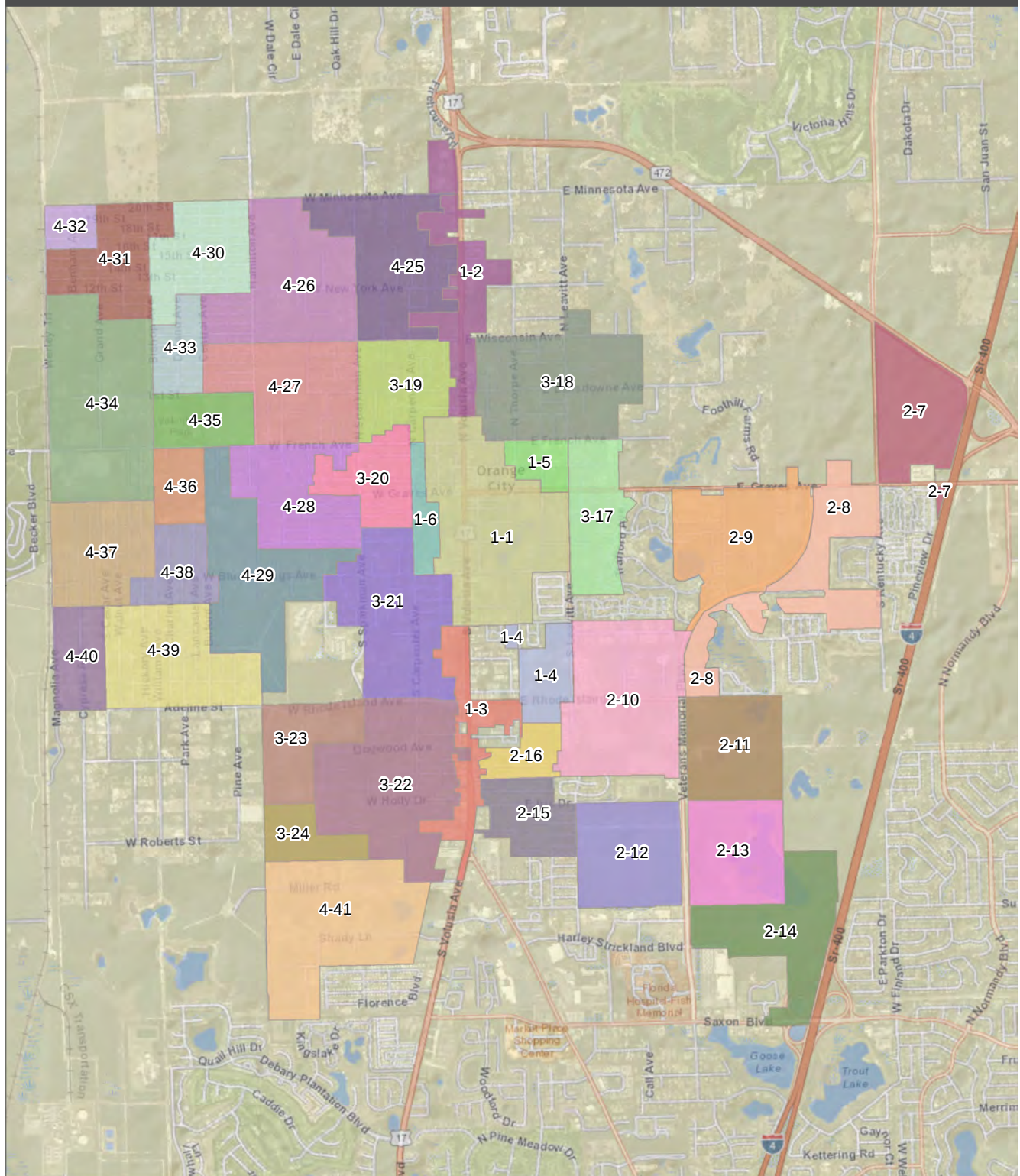
This evaluation is directly in line with the *2002 US EPA Onsite Wastewater Treatment Systems Manual* for residential flows.

Appendix A summarizes each lift station flow during an annual average day and a peak hour as well as the ERCs. PHF was calculated based on population for the SRWRF service area based on the Ten-States Standards. The peak hour factor for a population of 13,500 is 2.82.

Figure 1

Master Plan Future Sewersheds

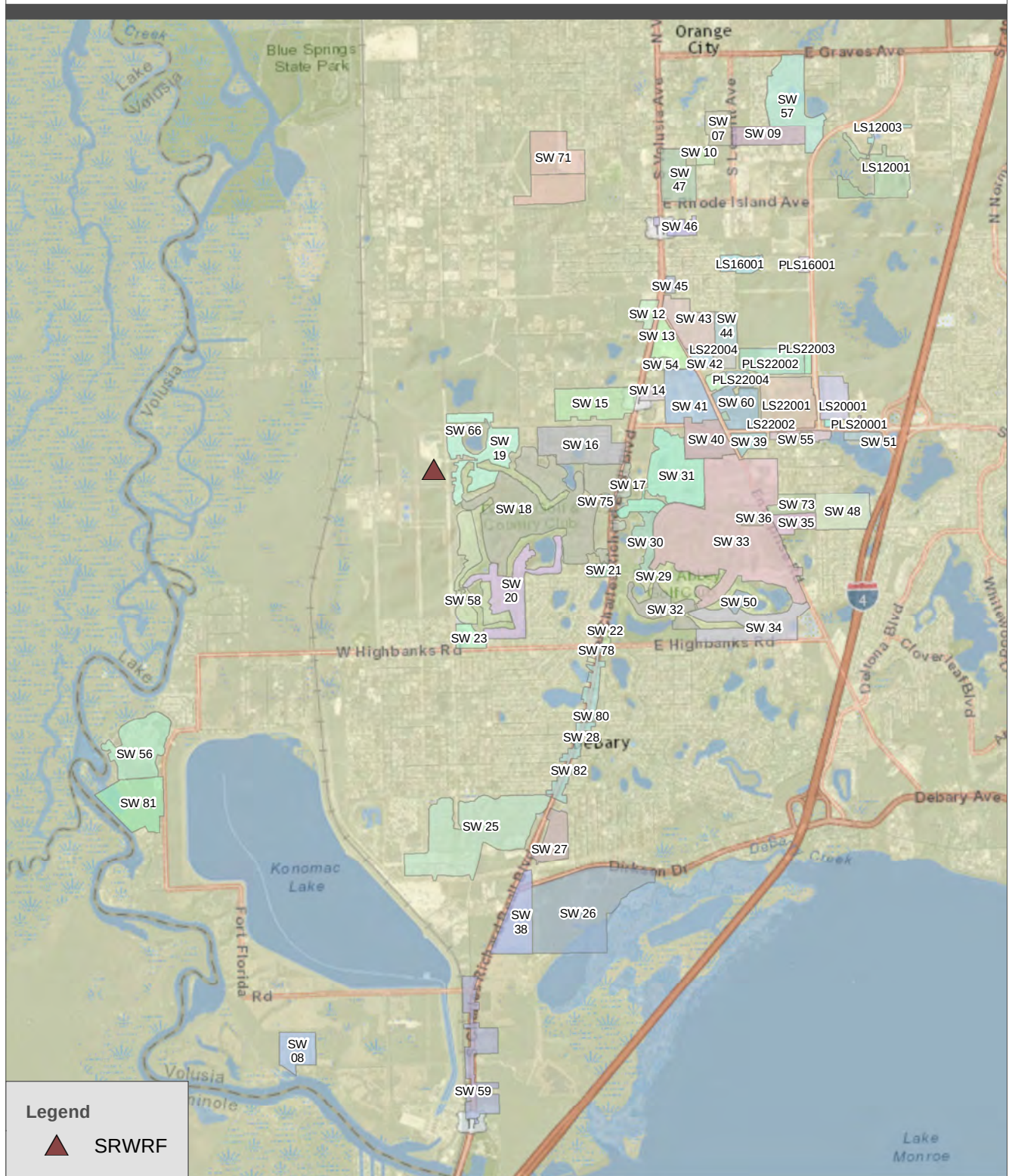
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



JonesEdmunds

Figure 2

Existing Sewersheds in Orange City and Volusia County
Orange City Septic Tank Phase Out Master Planning and Reuse System Expansion



2.3.2 BUILD-OUT FLOW AND ERC ESTIMATIONS FOR EXISTING SEWERSHEDS

To estimate build-out flow for vacant residential parcel, each parcel is assumed equivalent to 1 ERC.

To estimate build-out flows for each existing sewershed commercial flows, the following data were gathered for each Department of Revenue Use Code (DORUC):

- A summation of vacant non-residential and other various acreage usage codes including DORUC:
 - 010 (Vacant Commercial)
 - 040 (Vacant Industrial)
 - 070 (Vacant Institutional)
 - 050 – 060, 099 (Cropland, Timberland, Grazing Land, Non-Agricultural Acreage, etc.)
- A count of the vacant residential parcels.

Table 1 presents the vacant/acreage DORUC sums described above by existing sewershed.

Table 1 Existing Force Main Model Lift Station Vacant Parcel Sums

Sewershed	Count/Acreage Summation by DORUC				
	000 Count	010 Acres	040 Acres	070 Acres	050 through 069, and 099 (Acres)
SW 07	0	0	0	0	0
SW 09	0	0	0	0	0
SW 10	0	0	0	0	0
SW 15	5	7.0	0	0	0
SW 16	0	0	0	0	0
SW 18	9	5.8	0	0	0
SW 19	0	0	0	0	0
SW 23	2	9.9	5.5	0	56.0
SW 47	2	0	4.8	0	0
SW 56	49	0	0	0	0
SW 57	0	0	0	0	0
SW 58	76	0	0	0	0
SW 60	19	53.8	0	0	0
SW 71	0	0	0	0	0
SW 81	13	0	0	0	0

The assumptions necessary to derive flow for the non-residential parcel acreage are as follows:

- Gross acres minus 40 percent for right-of-way (ROW), stormwater, and open space.
- 25-percent floor-to-area ratio (FAR) on 60 percent of the gross acres.
- 80 gallons of wastewater produced per day for each 1,000 square foot of indoor floor space.
- Non-residential ERCs calculated based on 1 ERC equivalent to 1,688 square feet.

2.4 DEVELOPING MASTER PLAN SEWERSHED FLOWS AND ERCs

2.4.1 2017 FLOW AND ERC ESTIMATION FOR MASTER PLAN SEWERSHEDS

To estimate existing wastewater flow generation and ERCs, Jones Edmunds used potable water use data where available. We estimated wastewater flows from parcel potable water data from Orange City at a rate of 80 percent of the potable water usage records. Where water use data were unavailable, we used the following data to estimate current wastewater generation:

- Census data on average household size (2.65 people per unit).
- 62 GPDC as calculated from the potable water data.
- Residential parcel data counts for each expansion sewershed.

The flow per ERC is 164 GPD AADF. Appendix B presents the current ERC flow estimates for each Master Plan sewershed.

2.4.2 BUILD-OUT FLOW AND ERC ESTIMATION FOR MASTER PLAN SEWERSHEDS

To estimate build-out ERCs and flows, each sewershed's future land use (FLU) acreage were calculated by FLU type. Table 2 presents the assumptions on the percentage of development mix, the ERC per acre, and FAR used for each type of FLU.

Table 2 FLU Development Mix, ERC per Acre and FAR Assumptions

FLU Designation	Percent of Development Mix ¹	ERC/Acre and FAR ² Assumptions
	SFR/MF/Non-Residential	
Commercial	0 / 10 / 90	NA / 12 ERC / 0.25 FAR
Mixed Use	20 / 20 / 60	5 ERC / 18 ERC / 0.5 FAR
Office Transitional	75 / 0 / 25	4 ERC / NA / 0.25 FAR
Public/Government	0 / 0 / 100	NA / NA / 0.25 FAR
Residential High	25 / 75 / 0	8 ERC / 12 ERC / NA
Residential Medium	25 / 75 / 0	4 ERC / 8 ERC / NA
Residential Low	75 / 25 / 0	4 ERC / 8 ERC / NA

Notes:

¹ The development mix is based on City planning interpretation of the zoning matrix.

² FAR based on commercial FLU.

Additional assumptions needed to complete flow estimations include:

- Each ERC generates 164 GPD.
- Gross acres minus 40 percent for ROW, stormwater, and open space.
- Non-residential ERCs calculated based on one ERC equivalent to 2,050 square feet.

Appendix C presents details on FLU acreage and the resulting estimates of wastewater generation for each sewershed.

3 SRWRF FLOW PROJECTIONS

Jones Edmunds processed the population projection data from the 2017 Bureau of Economic and Business Research (BEBR) projections for Volusia County to develop overall system flow projections on a 5-year incremental basis.

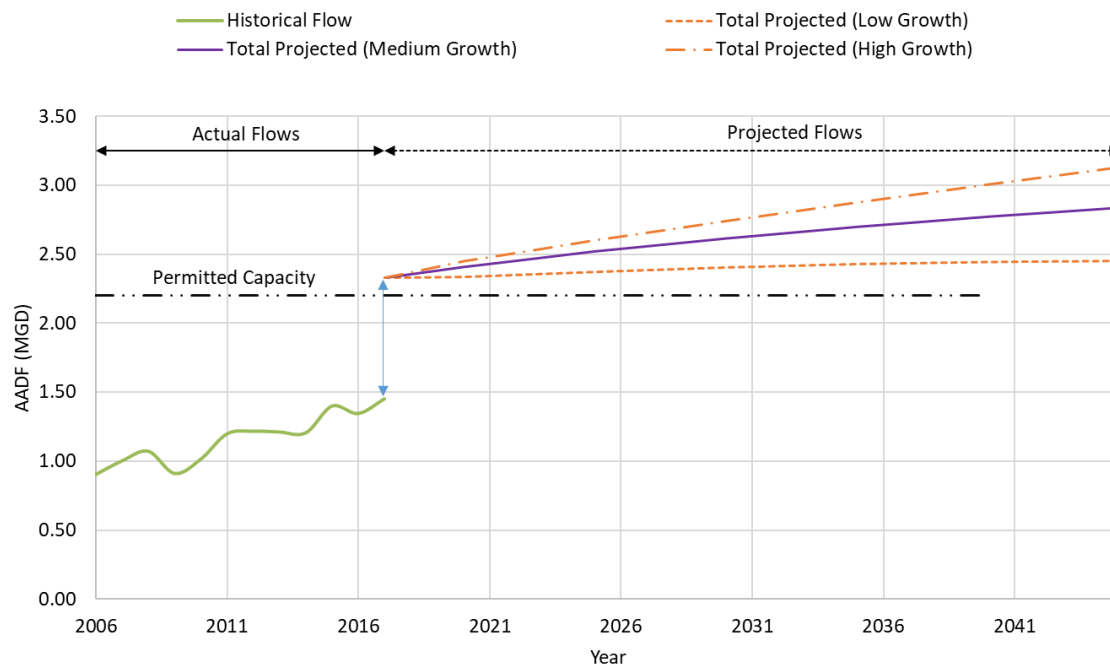
Table 3 presents the projected growth rate from 2010 through 2045.

Table 3 BEBR Volusia County Population Growth Percentages

BEBR Volusia County Projection Series	2016–2020	2021–2025	2026–2030	2031–2035	2036–2040
Low Growth	0.37%	1.62%	1.42%	1.07%	0.67%
Medium Growth	4.42%	4.63%	3.66%	3.17%	2.71%
High Growth	8.17%	6.93%	6.18%	5.79%	5.41%

Figure 3 compares the SRWRF permit limits with the current influent flows projected by year with the three BEBR projection series rates with additional flows from the future master plan service area flows. The gap between the historical flows and the projected flows represents the total flow from the existing businesses and residents within the Master Plan sewersheds.

Figure 3 SRWRF Historical and Projected AADFs



Appendix A

**Existing Sewershed EDU and Wastewater
Flows for 2017 and Build Out**

Existing Sewershed EDU and Wastewater Flows for 2017 and Build Out

Sewershed	Current (2017)			Build Out		
	EDU	AADF (GPD)	PHF (GPM)	EDU	AADF (GPD)	PHF (GPM)
SW11 ¹	29	3900	8	29	3900	8
SW12 ¹	16	2200	4	23	3200	6
SW13 ¹	219	29600	58	235	31800	62
SW14 ¹	26	3500	7	27	3700	7
SW42 ¹	33	4500	9	37	5000	10
SW43 ¹	247	33300	65	248	33500	65
SW44 ¹	40	5400	11	40	5400	11
SW45 ¹	53	7100	14	53	7100	14
SW46 ¹	59	8000	16	59	8000	16
SW54 ¹	17	2300	5	17	2300	4
LS16001-00 ¹	36	4900	10	37	5000	10
SW17 ²	136	18400	36	136	18400	36
SW20 ²	170	23000	45	176	23800	46
SW21 ²	21	2900	6	21	2900	6
SW22 ²	18	2400	5	18	2400	5
SW28 ²	143	19300	38	165	22300	43
SW30 ²	46	6200	12	47	6300	12
SW31 ²	410	55300	108	411	55400	108
SW77 ²	7	900	2	7	900	2
SW78 ²	264	35700	70	264	35700	69
SW79 ²	2	300	1	2	300	1
SW80 ²	7	1000	2	7	1000	2
SW82 ²	10	1300	3	12	1600	3
SW83 ²	1	200	0	1	200	0
SW66 ³	3	400	1	3	400	1
SW08 ⁴	178	24000	47	182	24500	48
SW24 ⁴	1	200	0	3	500	1
SW25 ⁴	599	80900	159	624	84200	164
SW26 ⁴	1	100	0	1	100	0
SW27 ⁴	125	16900	33	125	16900	33
SW38 ⁴	3	400	1	220	29700	58
SW59 ⁴	61	8200	16	96	13000	25
SW32 ⁵	145	19600	38	145	19600	38
SW33 ⁵	633	85500	168	721	97300	189
SW34 ⁵	141	19000	37	141	19000	37
SW35 ⁵	27	3700	7	61	8300	16
SW35 ⁵	62	8400	16	96	13000	25
SW39 ⁵	124	16700	33	136	18300	36
SW40 ⁵	88	11900	23	95	12900	25
SW41 ⁵	413	55700	109	425	57300	111
SW48 ⁵	80	10800	21	83	11200	22
SW50 ⁵	11	1500	3	12	1600	3
SW51 ⁵	277	37400	73	286	38600	75
SW55 ⁵	187	25300	50	187	25300	49
SW73 ⁵	170	22900	45	197	26500	52

Sewershed	Current (2017)			Build Out		
	EDU	AADF (GPD)	PHF (GPM)	EDU	AADF (GPD)	PHF (GPM)
FM22001-00 ⁵	13	1700	3	13	1700	3
LS12001-00 ⁵	119	16000	31	119	16000	31
LS12003-00 ⁵	17	2300	5	19	2600	5
LS20001-00 ⁵	168	22700	45	168	22700	44
LS20002-00 ⁵	74	10000	20	77	10400	20
LS22001-00 ⁵	53	7200	14	53	7200	14
LS22002-00 ⁵	121	16400	32	121	16400	32
LS22003-00 ⁵	135	18200	36	135	18200	35
LS22004-0 ⁵	21	2800	5	21	2800	5
PLS16001-0 ⁵	39	5200	10	39	5200	10
PLS20001-0 ⁵	0	0	0	0	0	0
PLS22002-0 ⁵	61	8300	16	71	9600	19
PLS22003-0 ⁵	0	0	0	18	2400	5
PLS22004-0 ⁵	108	14600	29	108	14600	28
SW07	261	35200	69	261	35200	68
SW09	265	35800	70	265	35800	70
SW10	70	9500	19	70	9500	18
SW15	121	16300	237	126	16900	245
SW16	208	28100	55	208	28100	55
SW18	714	96400	516	715	96500	521
SW19	385	52000	103	385	52000	102
SW23	86	11600	279	86	11600	351
SW47	247	33400	66	268	36200	70
SW56	428	57800	113	477	64400	125
SW57	953	128600	252	953	128600	250
SW58	210	28300	56	286	38500	76
SW60	313	42300	953	313	42300	1022
SW71	145	19600	38	145	19600	38
SW81	8	1100	2	28	3800	7

1. Flows to SW15
2. Flows to SW18
3. Flows to SW19
4. Flows to SW23
5. Flows to SW60

Appendix B

**Future Sewershed EDU and Wastewater
Flows for 2017 and Build Out**

Future Sewershed EDU and Wastewater Flows for 2017 and Build Out

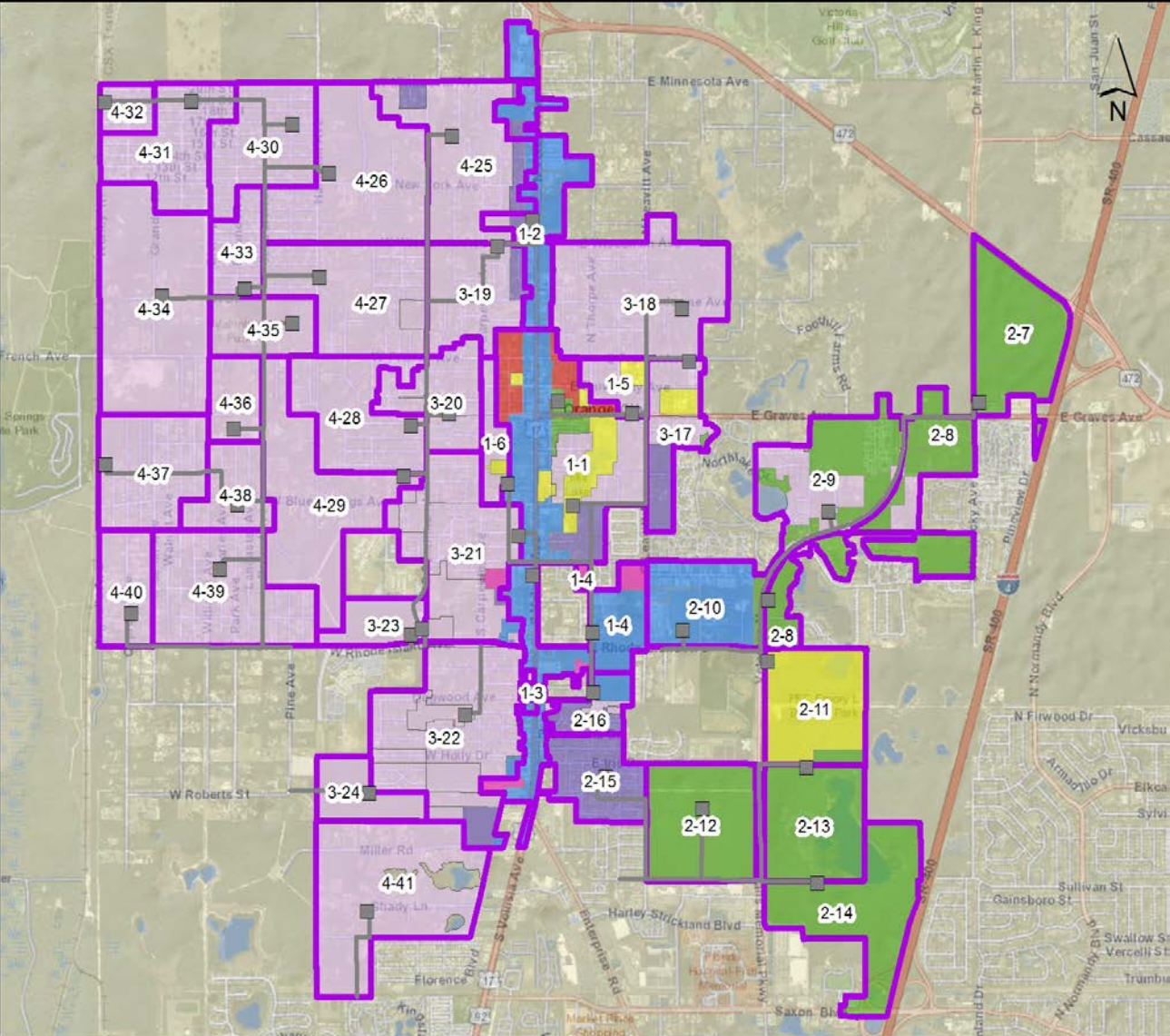
Sewershed	Current (2017)			Build Out		
	EDU	AADF (GPD)	PHF (GPM)	EDU	AADF (GPD)	PHF (GPM)
P1A1	244	65600	162	657	172100	342
P1A2	86	22600	57	306	80300	159
P1A3	199	52600	132	250	65400	130
P1A4	5	1400	4	185	48400	96
P1A5	28	7800	19	65	16900	34
P1A6	17	4800	11	62	16200	32
P2A7	8	2200	6	647	169400	336
P2A8	1	1100	1	688	180300	358
P2A9	1	600	1	461	120900	240
P2A10	24	6800	16	616	161400	321
P2A11	0	0	0	319	83,500	166
P2A12	0	400	0	673	176400	350
P2A13	0	0	0	614	160,900	320
P2A14	0	0	0	755	197,900	393
P2A15	0	42000	0	141	36,900	73
P2A16	0	13600	0	83	21,800	43
P3A17	64	17600	43	261	68400	136
P3A18	176	51100	117	381	99900	198
P3A19	110	29600	73	199	52100	103
P3A20	111	30800	74	147	38500	76
P3A21	169	46300	112	266	69600	138
P3A22	0	67200	0	164	42900	85
P3A23	22	5700	14	163	42600	85
P3A24	0	0	0	98	25,600	51
P4A25	134	38100	89	420	110100	219
P4A26	42	34700	28	313	82100	163
P4A27	89	41900	59	441	115600	230
P4A28	89	28400	59	308	80700	160
P4A29	10	11700	6	65	17000	34
P4A30	0	43800	0	479	125,500	249
P4A31	0	34400	0	458	120,100	238
P4A32	0	9700	0	125	32,700	65
P4A33	0	24600	0	221	57,900	115
P4A34	0	7900	0	75	19,600	39
P4A35	0	1500	0	6	1,600	3
P4A36	0	1100	0	10	2,600	5
P4A37	0	33800	0	447	117,000	232
P4A38	0	25900	0	200	52,300	104
P4A39	0	56300	0	576	150,800	299
P4A40	0	4300	0	31	8,000	16
P4A41	0	6400	0	76	19,900	40

Appendix C

**Expansion Area Project Information
Sheets**

EXPANSION AREA PROJECT INFORMATION SHEET

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

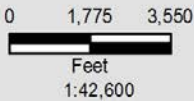
- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Expansion Area: **Phase 1 Area 1**

This map displays the Grandview City area, with various colored zones and street names. The zones are color-coded: red, blue, yellow, green, purple, and pink. The map includes a north arrow in the top right corner. The streets shown include W. Lincoln Ave., W. May St., W. Blue St., W. Howard Ave., W. Central Ave., W. Grimes Ave., W. Blue Spring, W. Virginia Ave., W. Ohio Ave., W. 1st Ave., W. 2nd Ave., W. 3rd Ave., W. 4th Ave., W. 5th Ave., W. 6th Ave., W. 7th Ave., W. 8th Ave., W. 9th Ave., W. 10th Ave, W. 11th Ave, W. 12th Ave, W. 13th Ave, W. 14th Ave, W. 15th Ave, W. 16th Ave, W. 17th Ave, W. 18th Ave, W. 19th Ave, W. 20th Ave, W. 21st Ave, W. 22nd Ave, W. 23rd Ave, W. 24th Ave, W. 25th Ave, W. 26th Ave, W. 27th Ave, W. 28th Ave, W. 29th Ave, W. 30th Ave, W. 31st Ave, W. 32nd Ave, W. 33rd Ave, W. 34th Ave, W. 35th Ave, W. 36th Ave, W. 37th Ave, W. 38th Ave, W. 39th Ave, W. 40th Ave, W. 41st Ave, W. 42nd Ave, W. 43rd Ave, W. 44th Ave, W. 45th Ave, W. 46th Ave, W. 47th Ave, W. 48th Ave, W. 49th Ave, W. 50th Ave, W. 51st Ave, W. 52nd Ave, W. 53rd Ave, W. 54th Ave, W. 55th Ave, W. 56th Ave, W. 57th Ave, W. 58th Ave, W. 59th Ave, W. 60th Ave, W. 61st Ave, W. 62nd Ave, W. 63rd Ave, W. 64th Ave, W. 65th Ave, W. 66th Ave, W. 67th Ave, W. 68th Ave, W. 69th Ave, W. 70th Ave, W. 71st Ave, W. 72nd Ave, W. 73rd Ave, W. 74th Ave, W. 75th Ave, W. 76th Ave, 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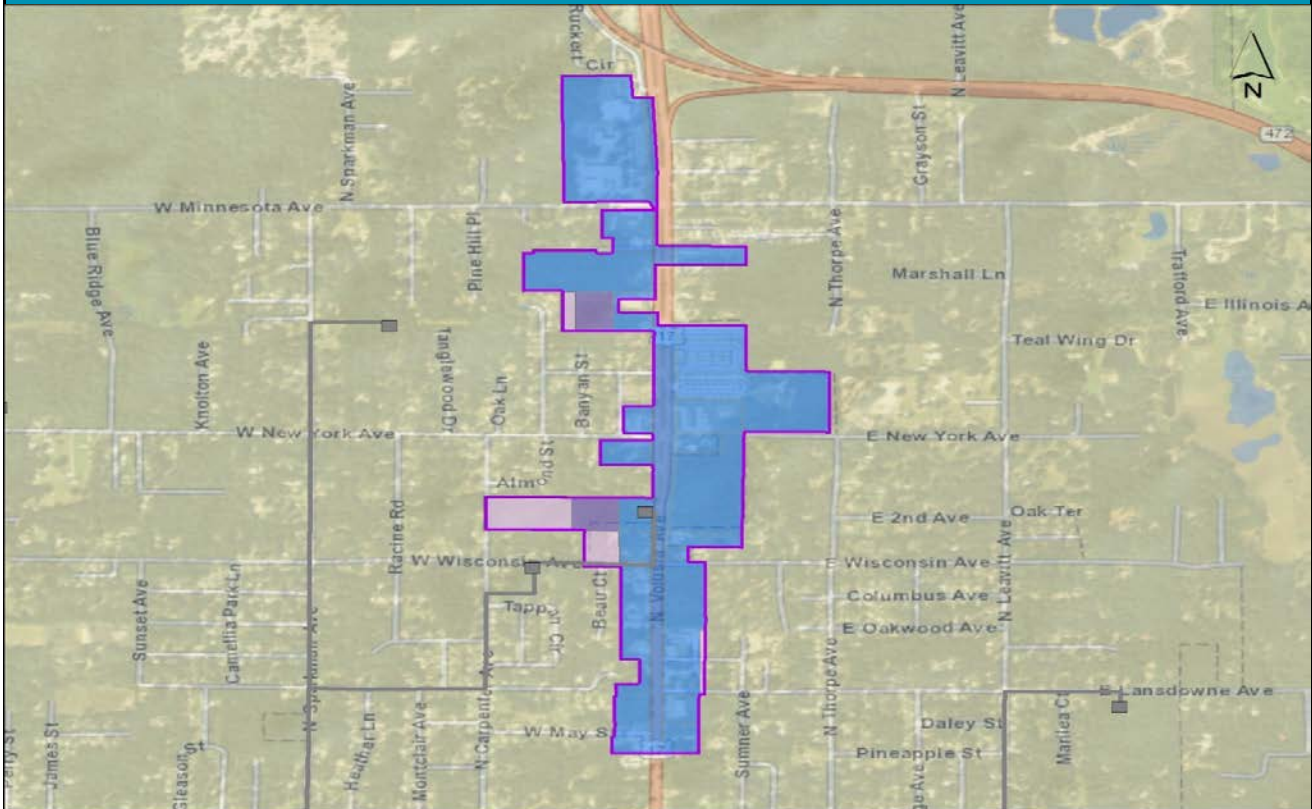


Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	105	63	0	76	617,700	61,900
Mix Use	16.3	9.8	10	35	127,900	17,600
Office Transitional	51.6	31	93	0	84,300	22,000
Public/Government	47	28.3	0	0	307,900	24,600
Residential High	0.5	0.3	1	3	0	600
Residential Medium	29.4	17.7	18	106	0	20,300
Residential Low	63.6	38.2	115	38	0	25,100
Total	313.4	188.3	237	258	1,137,800	172,100

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area: Phase 1 Area 2

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



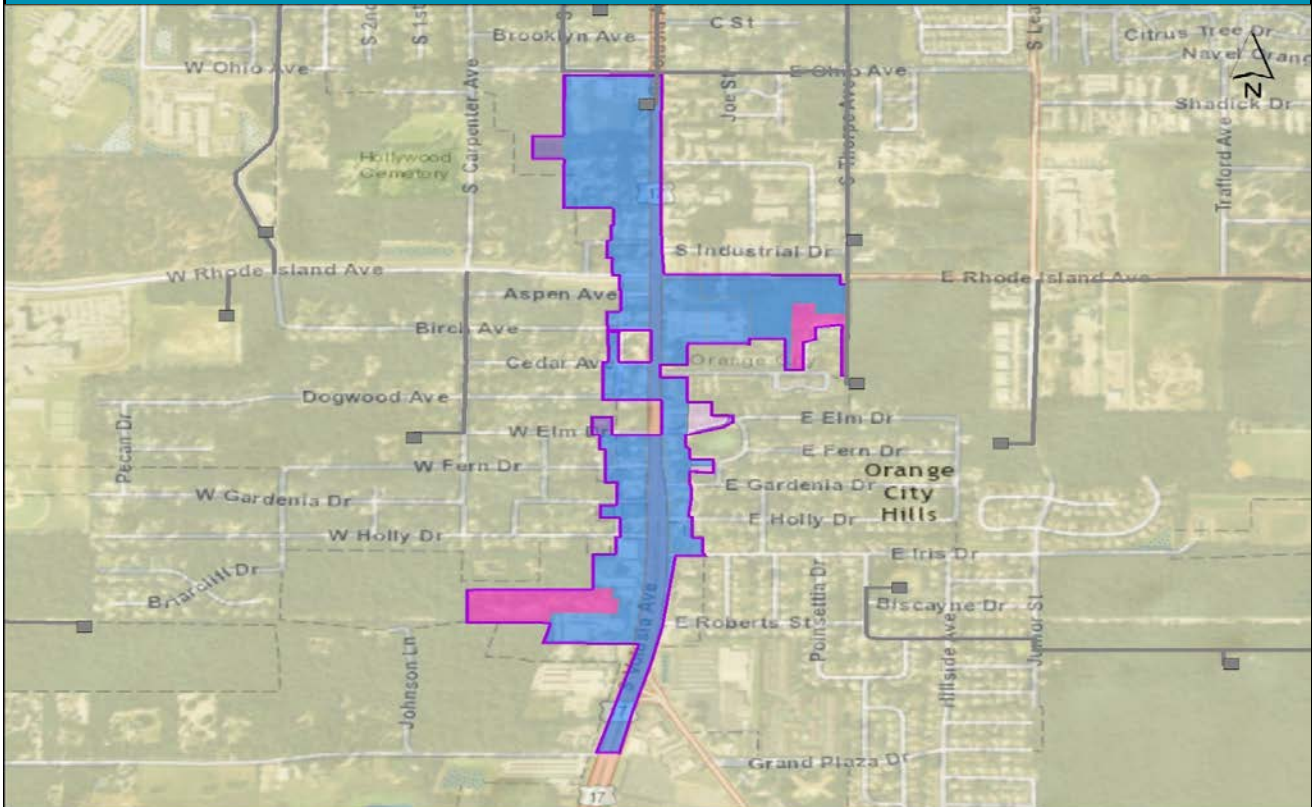
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	127.5	76.5	0	92	750,000	75,100
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	6	3.6	9	11	0	3,200
Residential Low	10	6	9	3	0	2,000
Total	143.5	86.1	18	106	750,000	80,300

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 1 Area 3

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



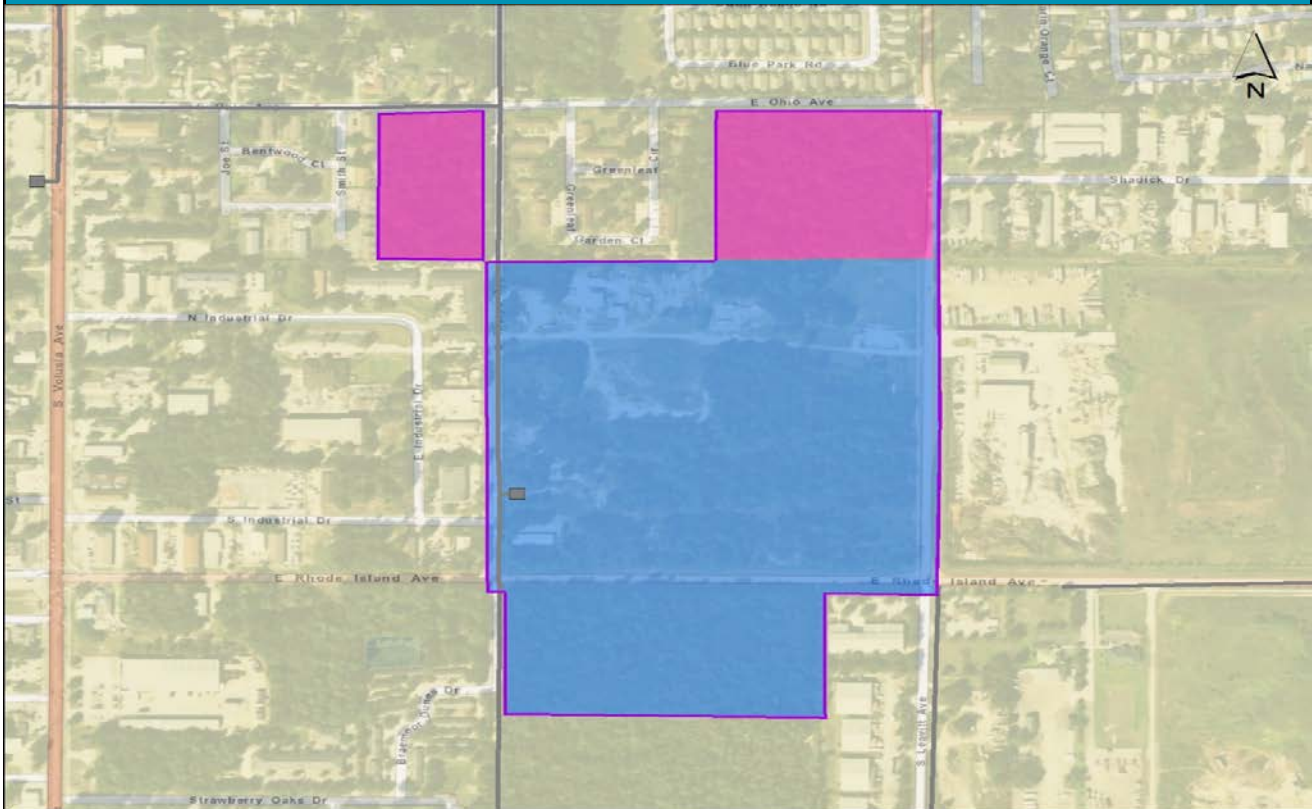
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	88.8	53.3	0	64	522,400	52,300
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	10.3	6.2	12	55	0	11,100
Residential Medium	1.9	1.1	2	6	0	1,300
Residential Low	1.7	1	3	1	0	700
Total	102.7	61.6	17	126	522,400	65,400

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 1 Area 4

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



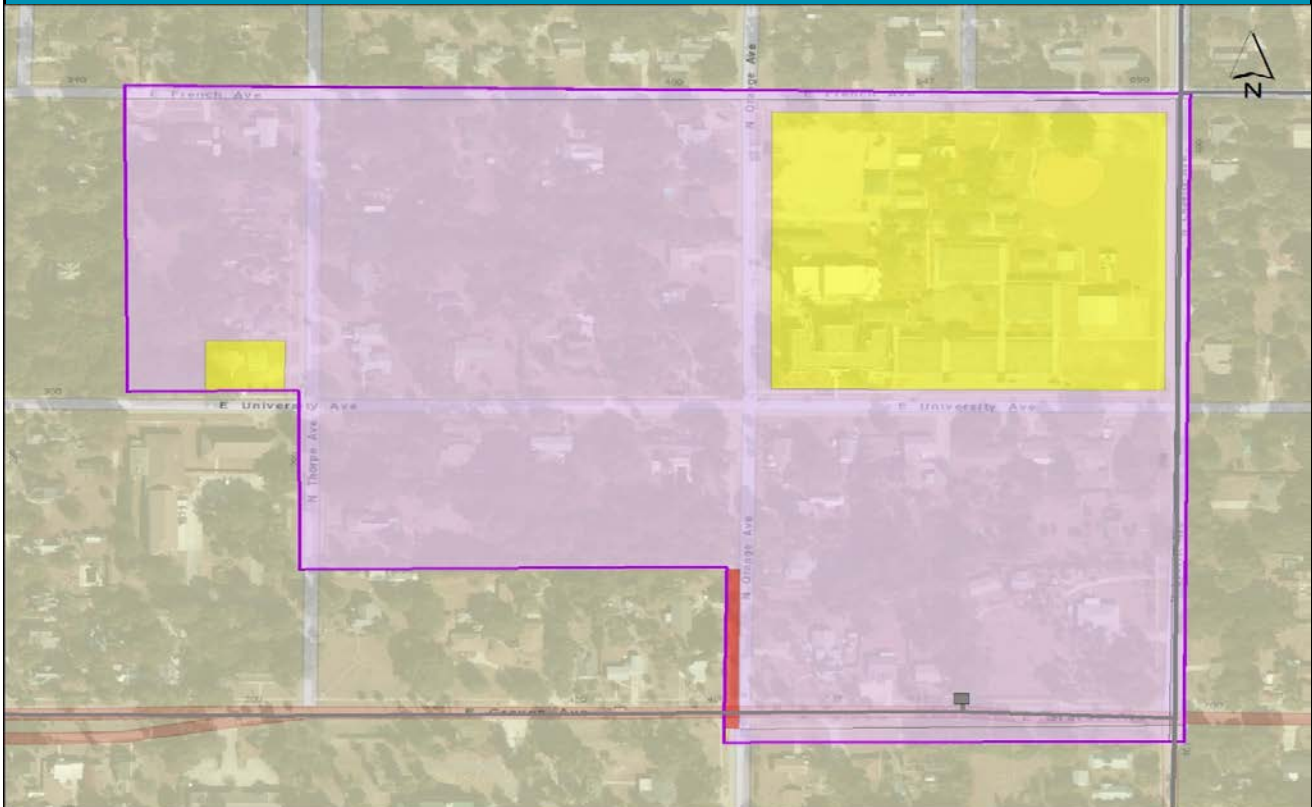
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpm)
			Single Family	Multi Family		
Commercial	56.2	33.7	0	40	330,400	33,000
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	14.2	8.5	17	77	0	15,400
Residential Medium	0	0	0	0	0	0
Residential Low	0	0	0	0	0	0
Total	70.4	42.2	17	117	330,400	48,400

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 1 Area 5

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0.2	0.1	0	0	400	0
Public/Government	8	5	0	0	54,000	4,300
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	32.5	19.5	58	19	0	12,600
Total	40.7	24.6	58	19	54,400	16,900

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 7

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use ¹	156.8	94.1	0	500	1,229,600	180,400
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	0	0	0	0	0	0
Total	156.8	94.1	0	500	1,229,600	180,400

¹ Include flows from new development

Expansion Area: **Phase 1 Area 6**



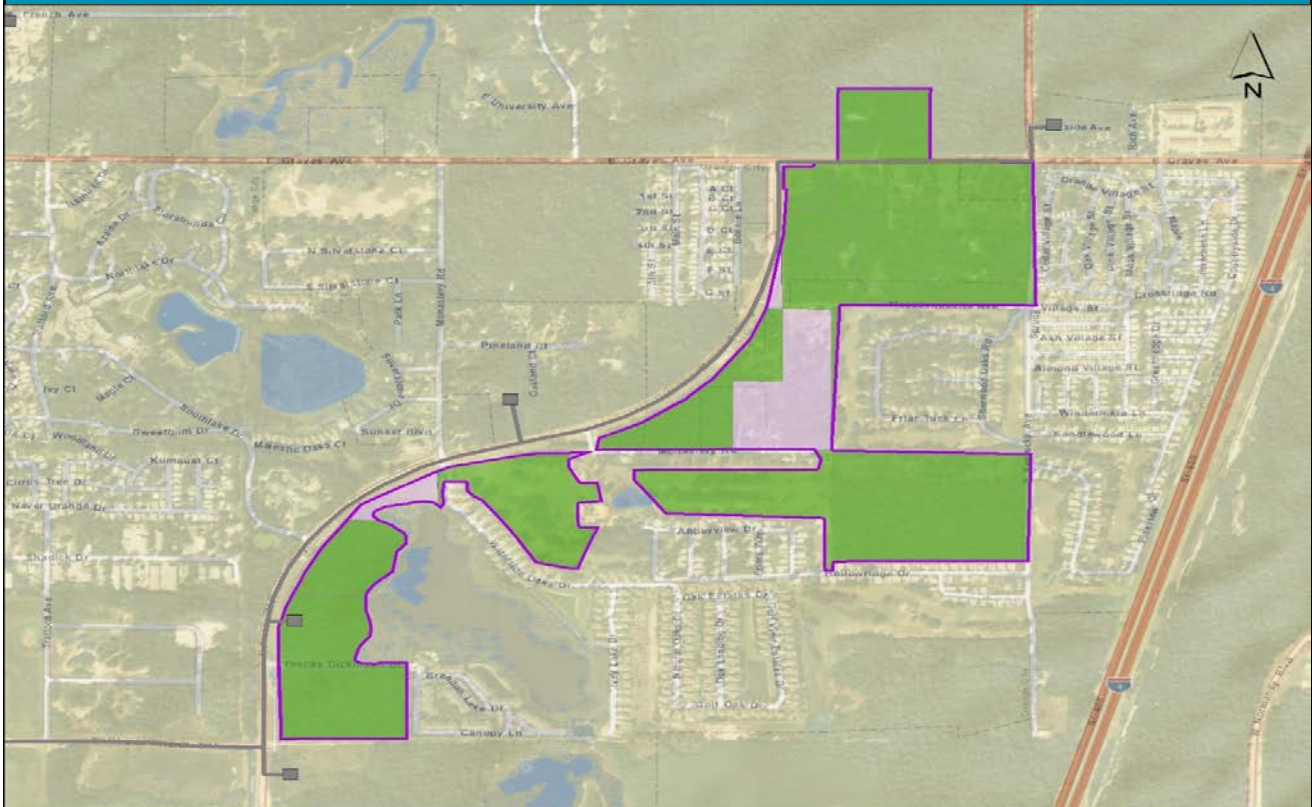
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0.7	0.4	0	1	4,300	500
Mix Use	0	0	0	0	0	0
Office Transitional	0.1	0.1	0	0	100	0
Public/Government	4	2.1	0	0	22,900	1,800
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	35.4	21.2	64	21	0	13,900
Total	40.2	23.8	64	22	27,300	16,200

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 8

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

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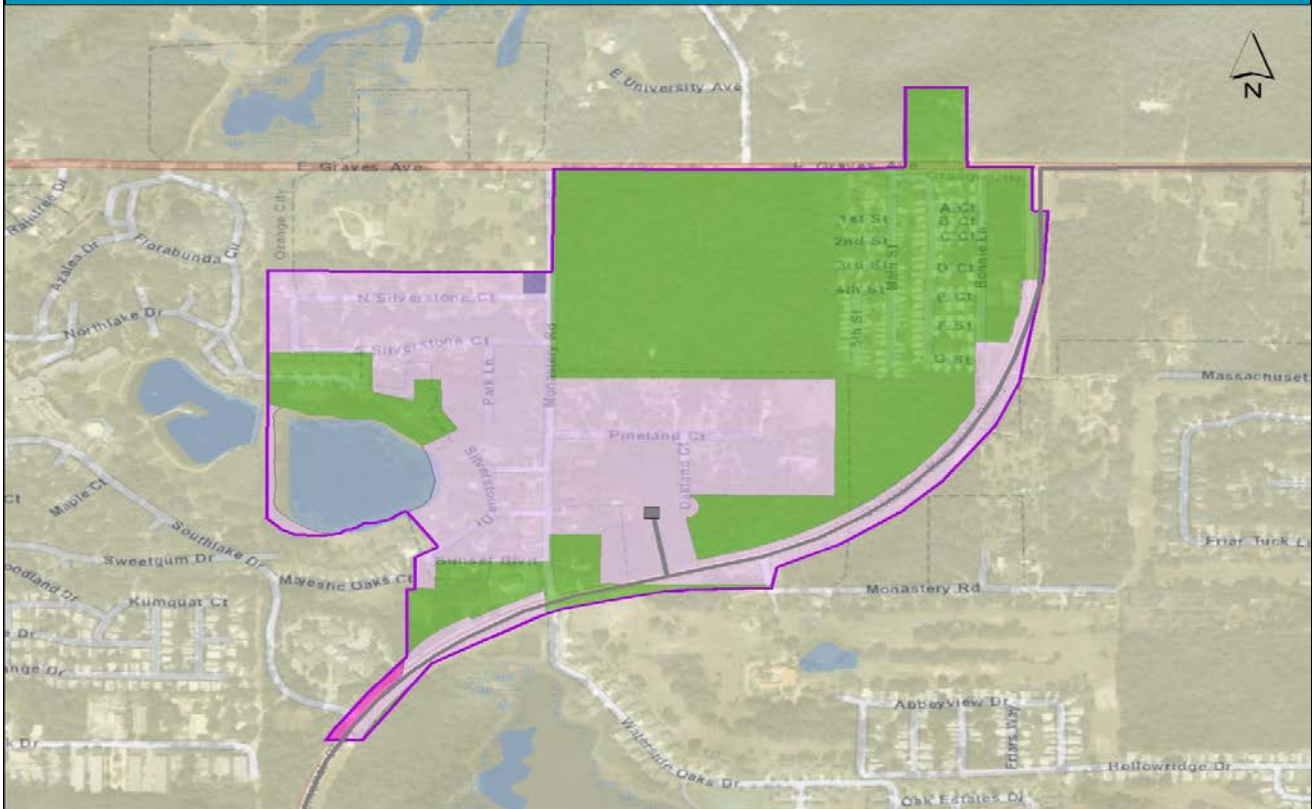
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	166.8	100.1	100	360	1,307,500	180,000
Office Transitional	0	0	0	0	0	0
Public/Government	0	0.1	0	0	500	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	18.1	10.9	2	0	0	300
Total	184.9	111.1	102	360	1,308,000	180,300

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 9

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



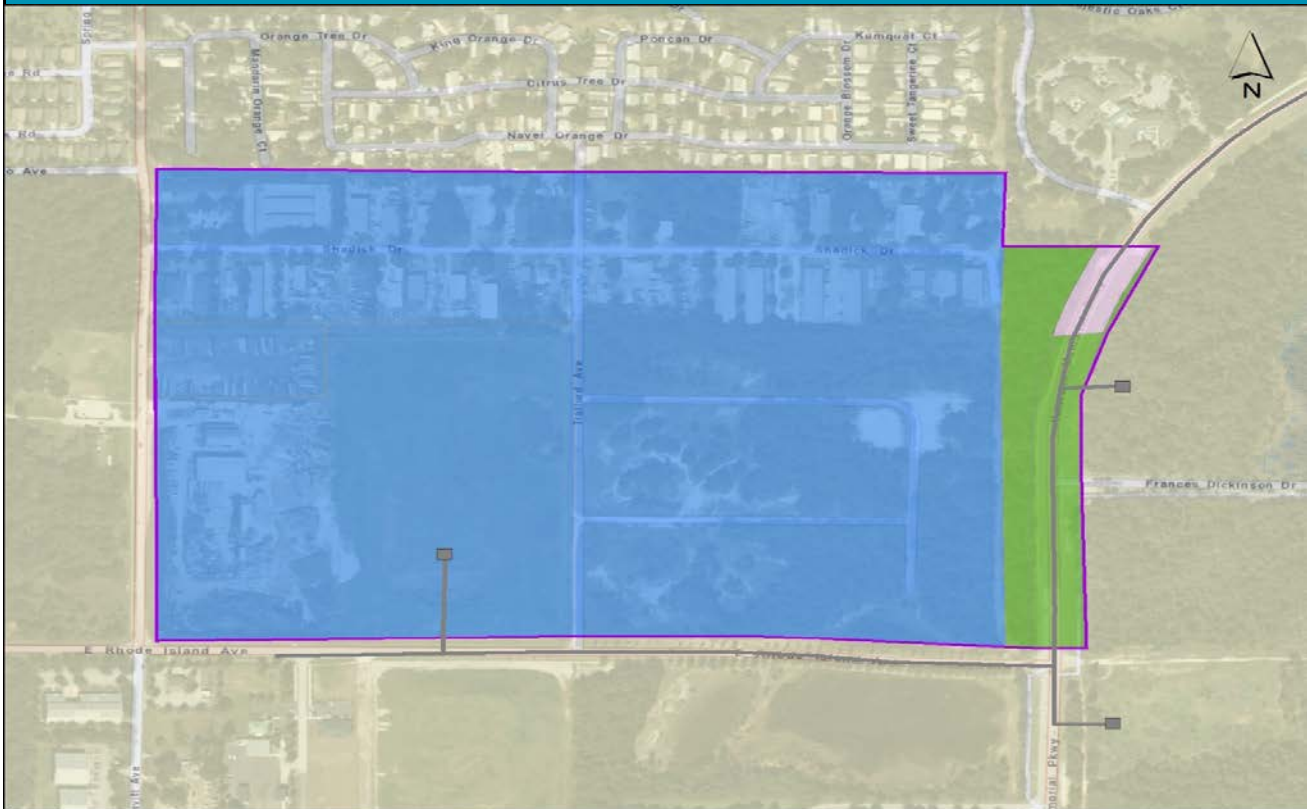
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	98.8	59.3	59	213	774,500	106,600
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0.9	0.5	4	0	0	700
Residential Medium	17.6	10.5	11	63	0	12,100
Residential Low	76.9	46.2	9	0	0	1,500
Total	194.2	116.5	83	276	774,500	120,900

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 10

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area



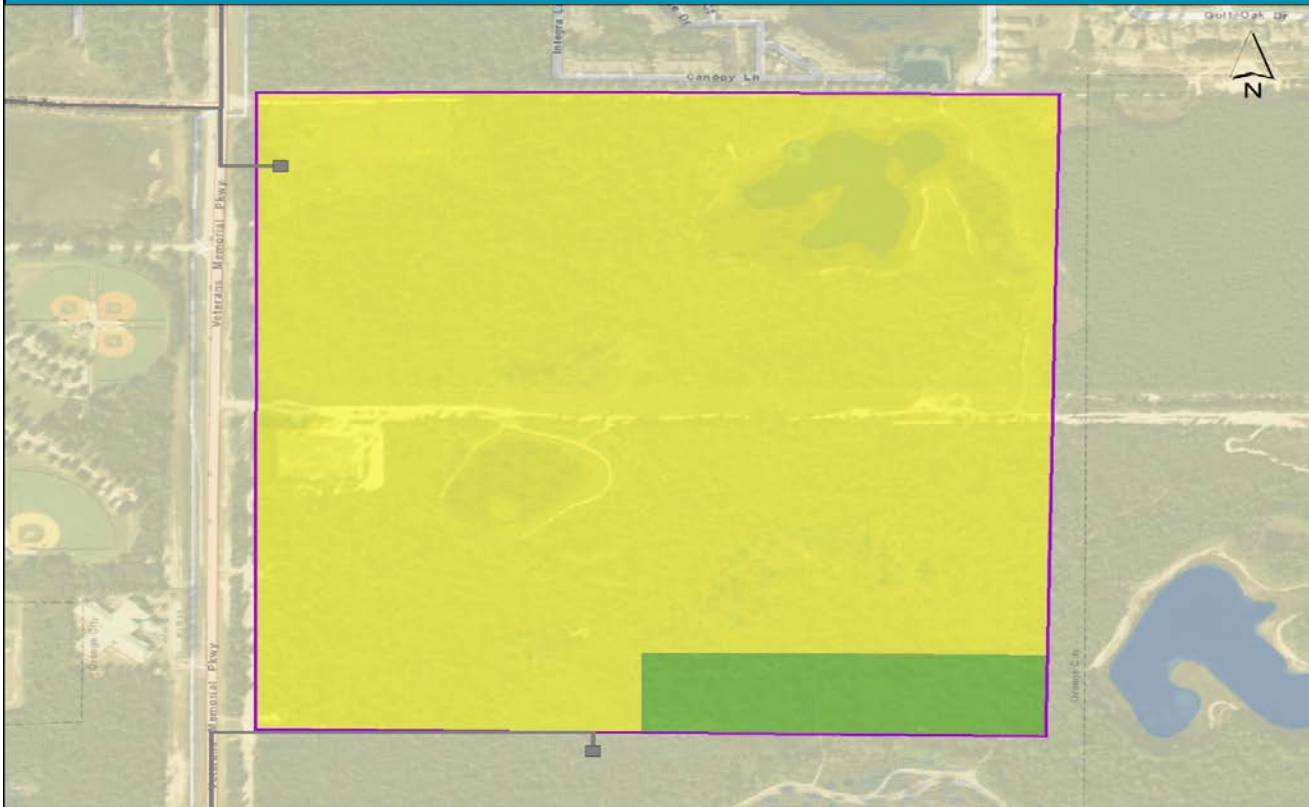
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	168.3	101	0	121	989,900	99,000
Mix Use	9.8	5.9	6	21	76,700	10,600
Office Transitional	0	0	0	0	0	0
Public/Government	57	34.3	0	0	373,100	29,800
Residential High	0	0	0	0	0	0
Residential Medium	31.9	19.1	19	115	0	22,000
Residential Low	1.4	0.8	0	0	0	0
Total	268.4	161.1	25	257	1,439,700	161,400

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 11

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



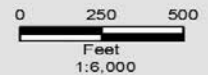
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	9.7	5.8	6	21	75,900	10,500
Office Transitional	0	0	0	0	0	0
Public/Government	140	83.8	0	0	912,000	73,000
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	0.3	0.2	0	0	0	0
Total	150	89.8	6	21	987,900	83,500

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 12

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use ¹	163.3	98	0	464	1,280,500	178,500
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0.1	0.1	0	0	0	0
Residential Low	0	0	0	0	0	0
Total	163.4	98.1	0	464	1,280,500	178,500

¹ Include flows from new development

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 13

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



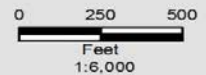
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



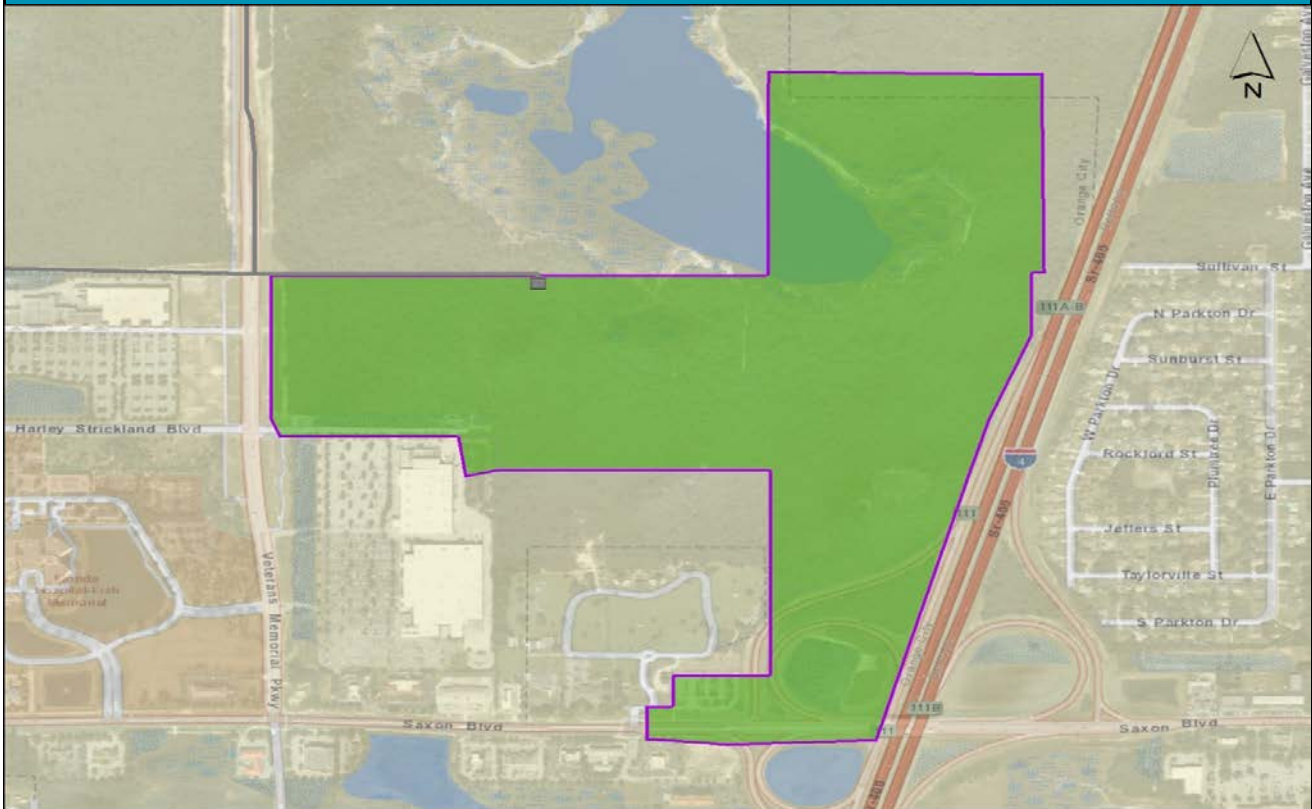
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	149.1	89.5	89	322	1,168,900	160,900
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	0	0	0	0	0	0
Total	149.1	89.5	89	322	1,168,900	160,900

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 14

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



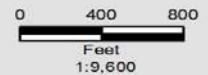
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



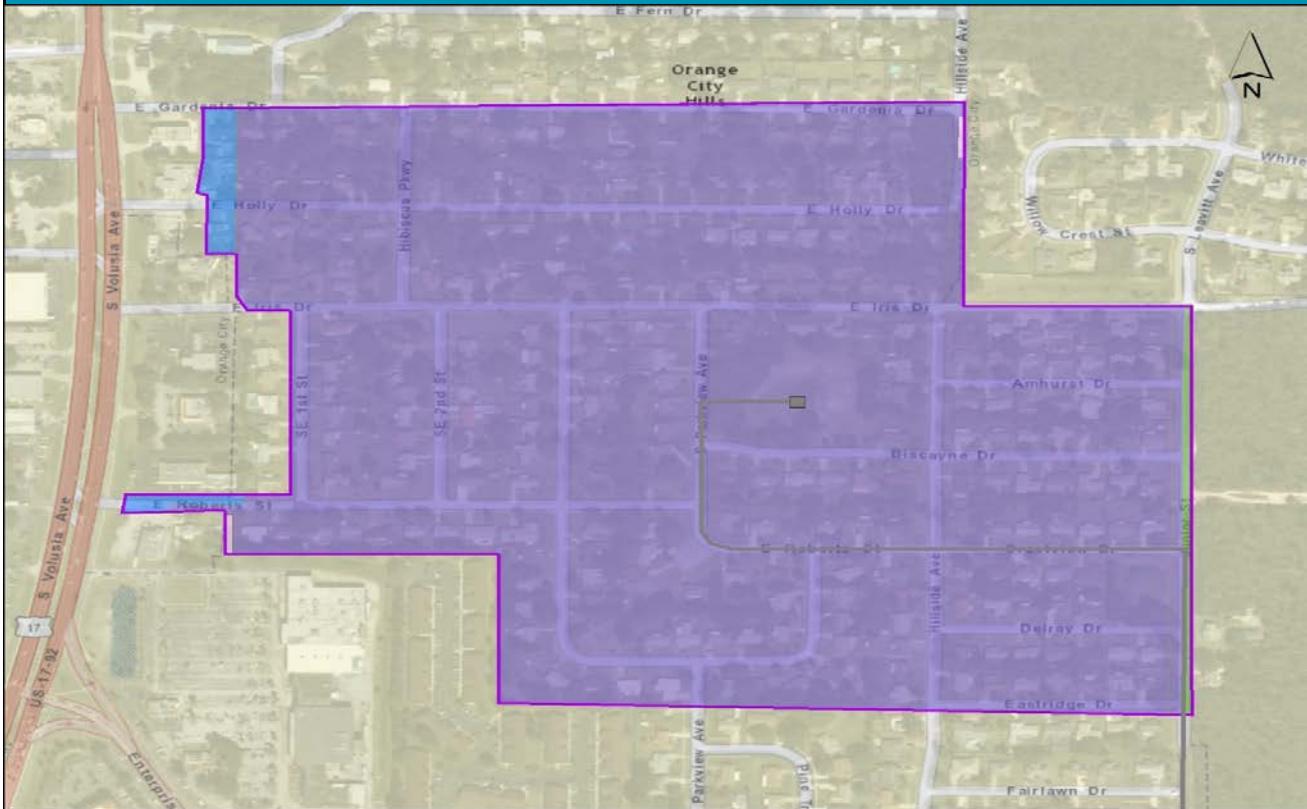
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	100	0
Mix Use	183.2	109.9	110	396	1,436,600	197,900
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	0	0	0	0	0	0
Total	183.2	109.9	110	396	1,436,700	197,900

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 15

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



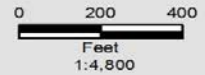
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	1.3	0.8	0	1	7,500	800
Mix Use	0.8	0.5	0	2	6,300	800
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium ¹	89.7	53.8	263	1	0	43,100
Residential Low	0.1	0.1	0	0	0	0
Total	91.9	55.2	263	4	13,800	44,700

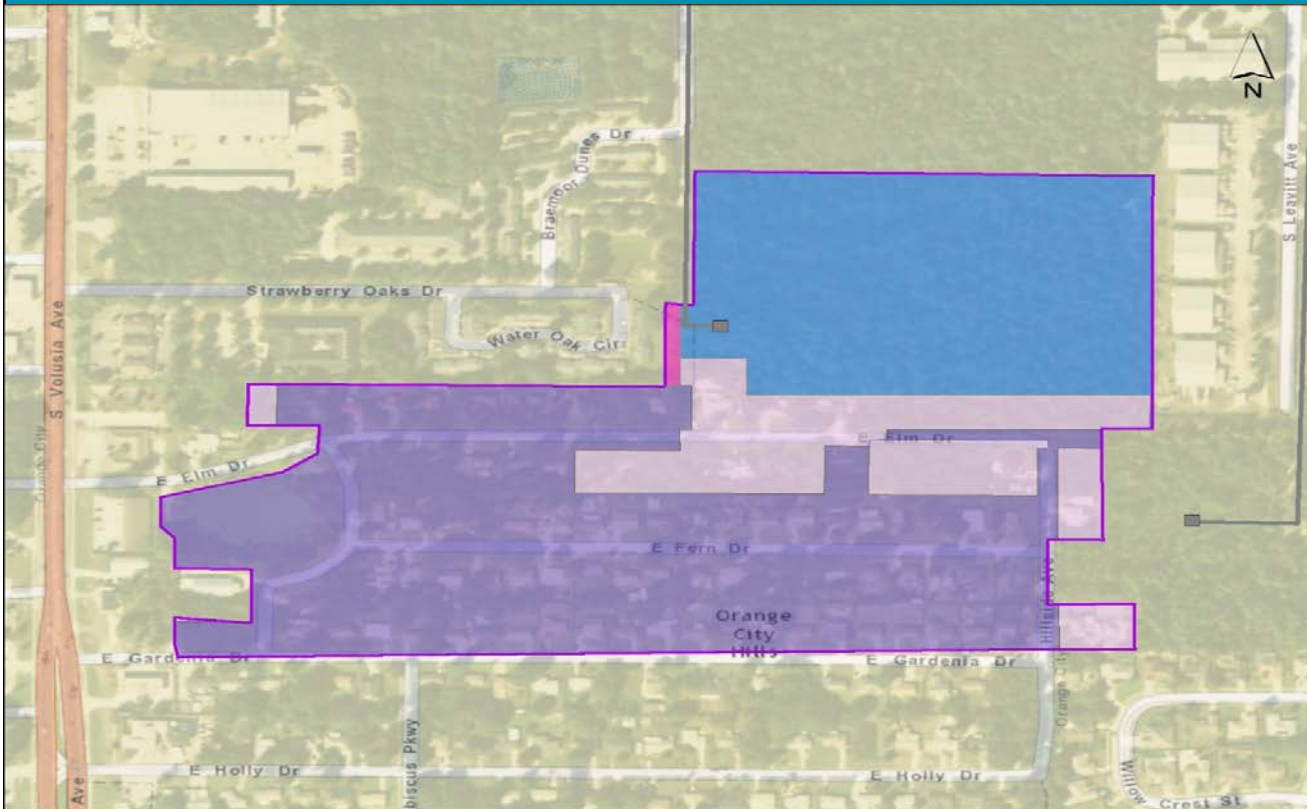
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 2 Area 16

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



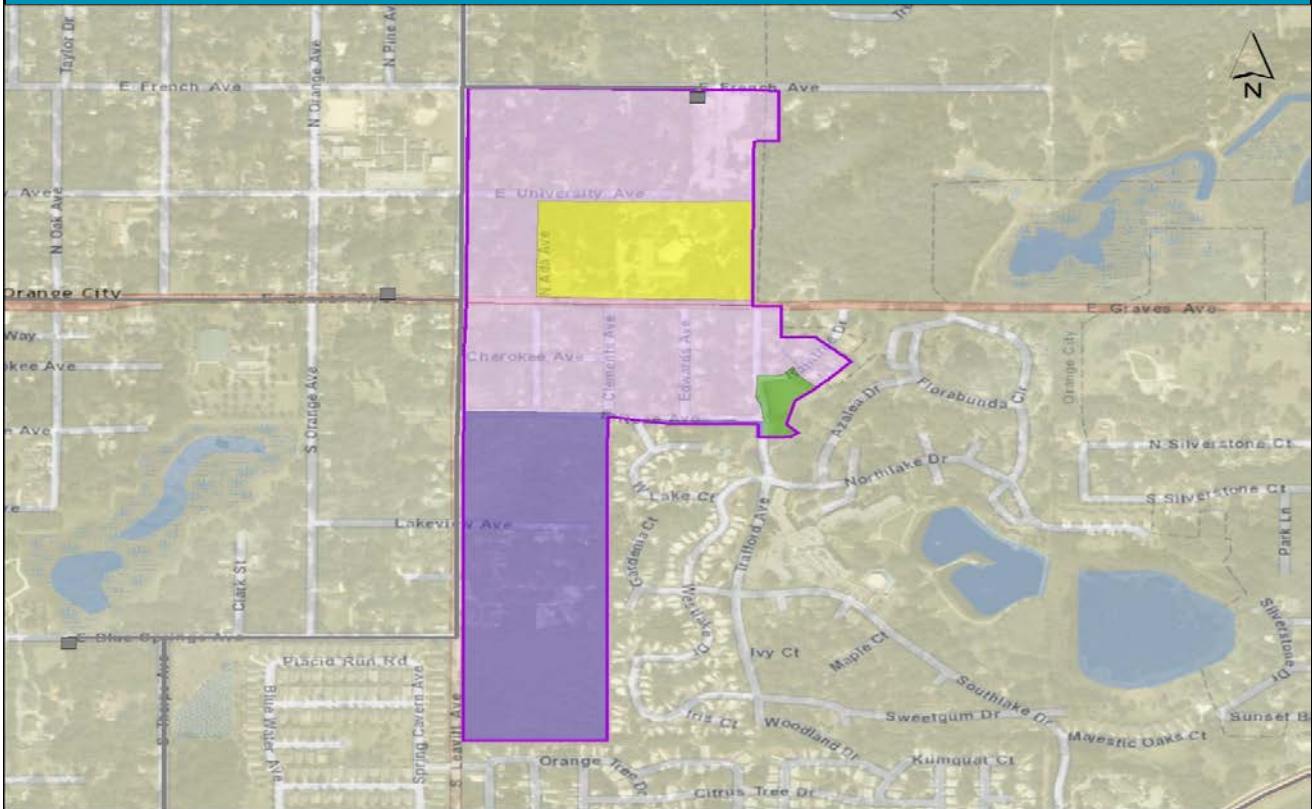
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	14.5	8.7	0	10	85,500	8,500
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0.2	0.1	0	1	0	200
Residential Medium	26.2	15.7	61	2	0	10,300
Residential Low	7.4	4.4	13	4	0	2,800
Total	48.3	28.9	74	17	85,500	21,800

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 17

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	1.6	1	1	3	12,700	1,700
Office Transitional	0	0	0	0	0	0
Public/Government	13	7.9	0	0	85,800	6,900
Residential High	0	0	0	0	0	0
Residential Medium ¹	58.5	35.1	12	71	0	13,600
Residential Low	49.6	29.7	89	30	0	19,500
Total	122.7	73.7	102	104	98,500	41,700

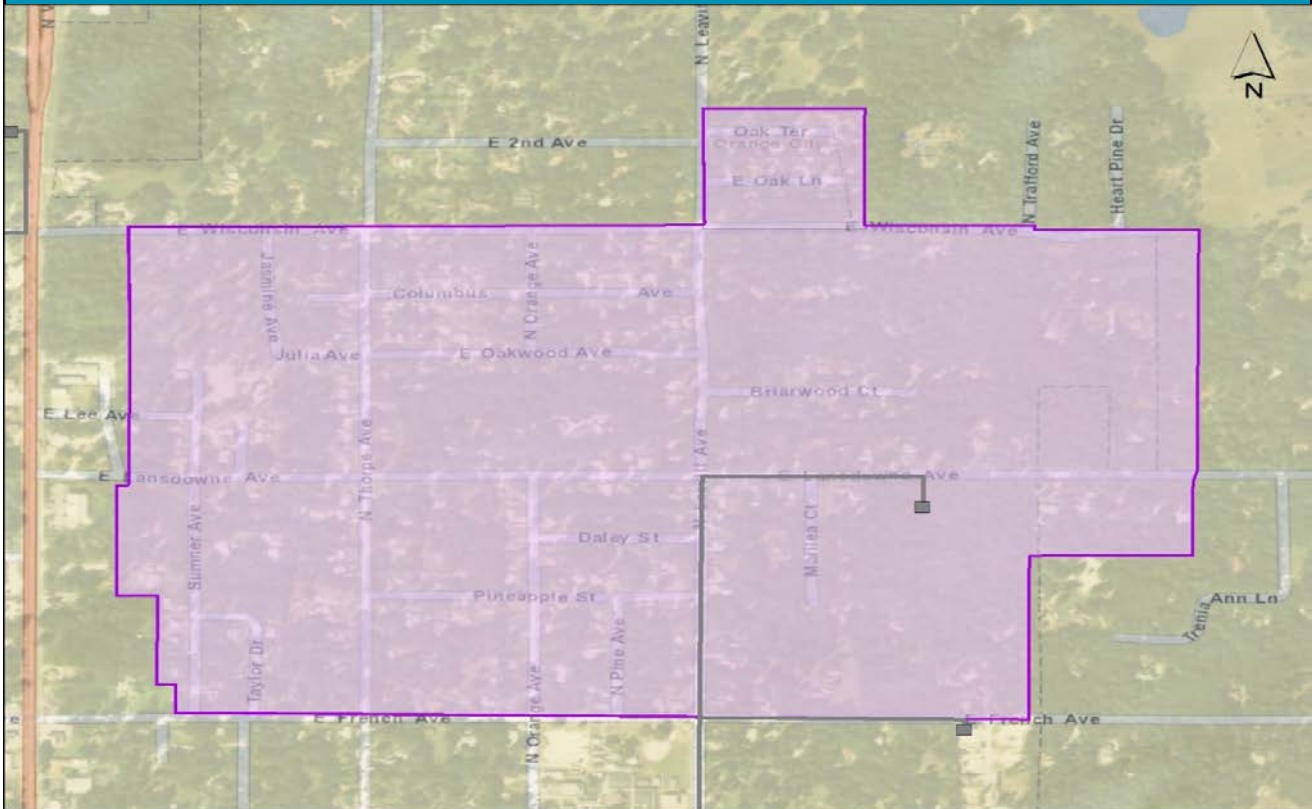
¹ Include Flows from New Developments

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 18

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



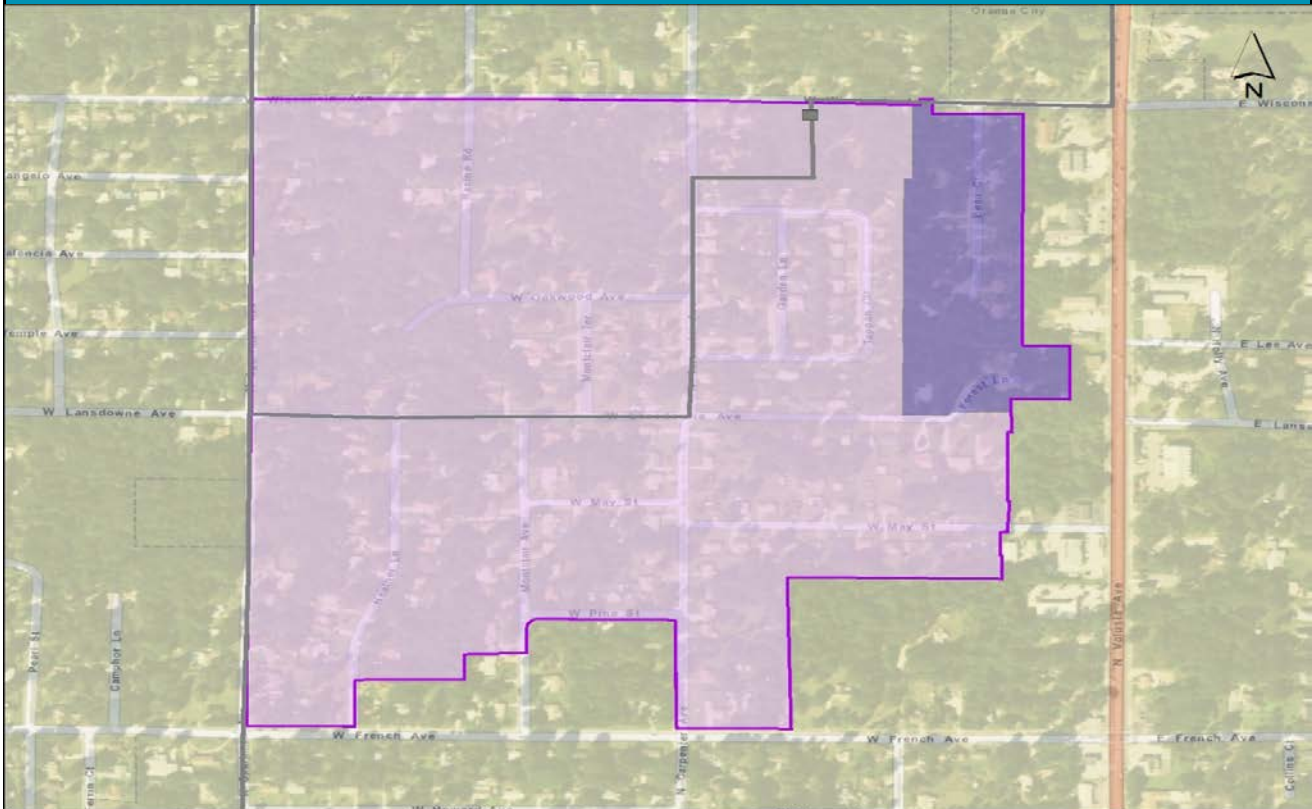
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	253.9	152.4	457	152	0	99,900
Total	253.9	152.4	457	152	0	99,900

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 19

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



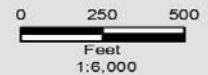
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



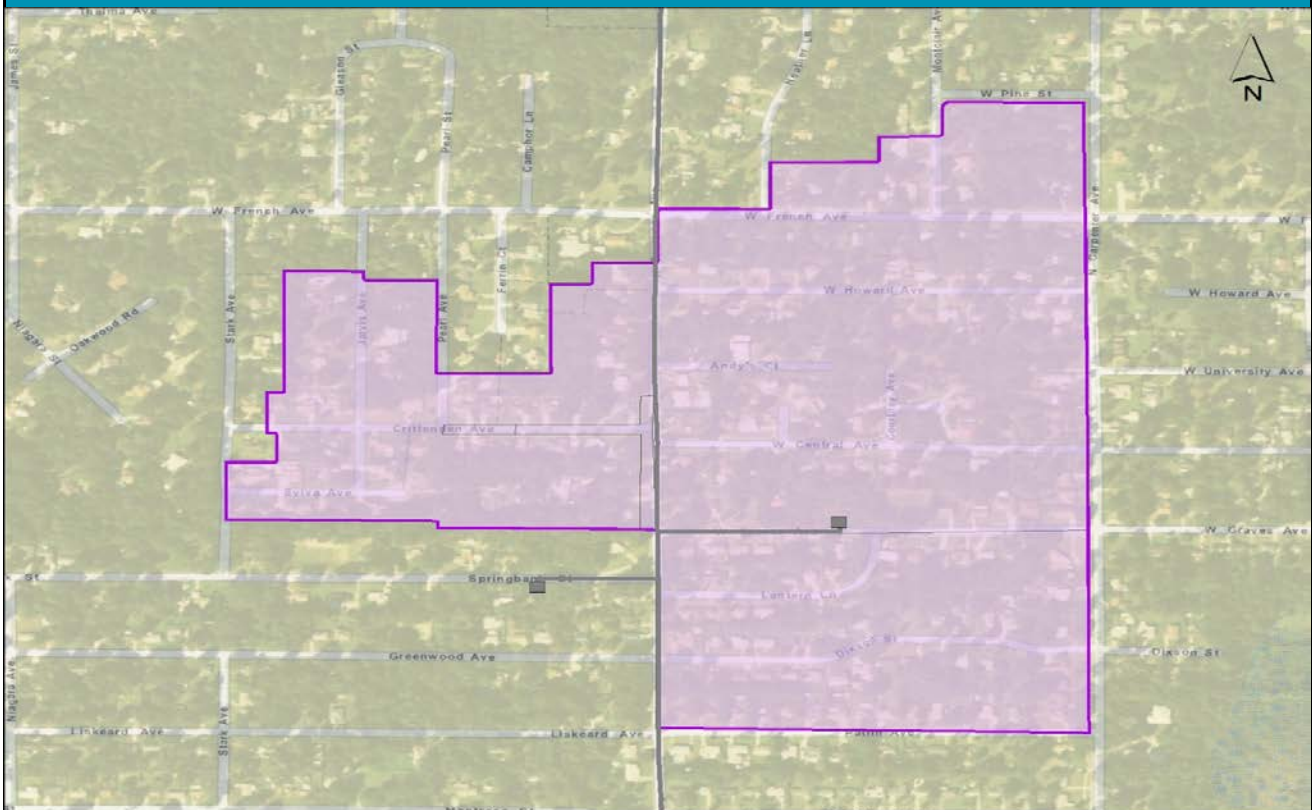
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	100	0
Mix Use	0	0	0	0	0	0
Office Transitional	0.1	0	0	0	100	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	11.2	6.7	7	40	0	7,700
Residential Low	112.7	67.6	203	68	0	44,400
Total	124	74.3	210	108	200	52,100

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 20

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



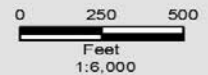
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



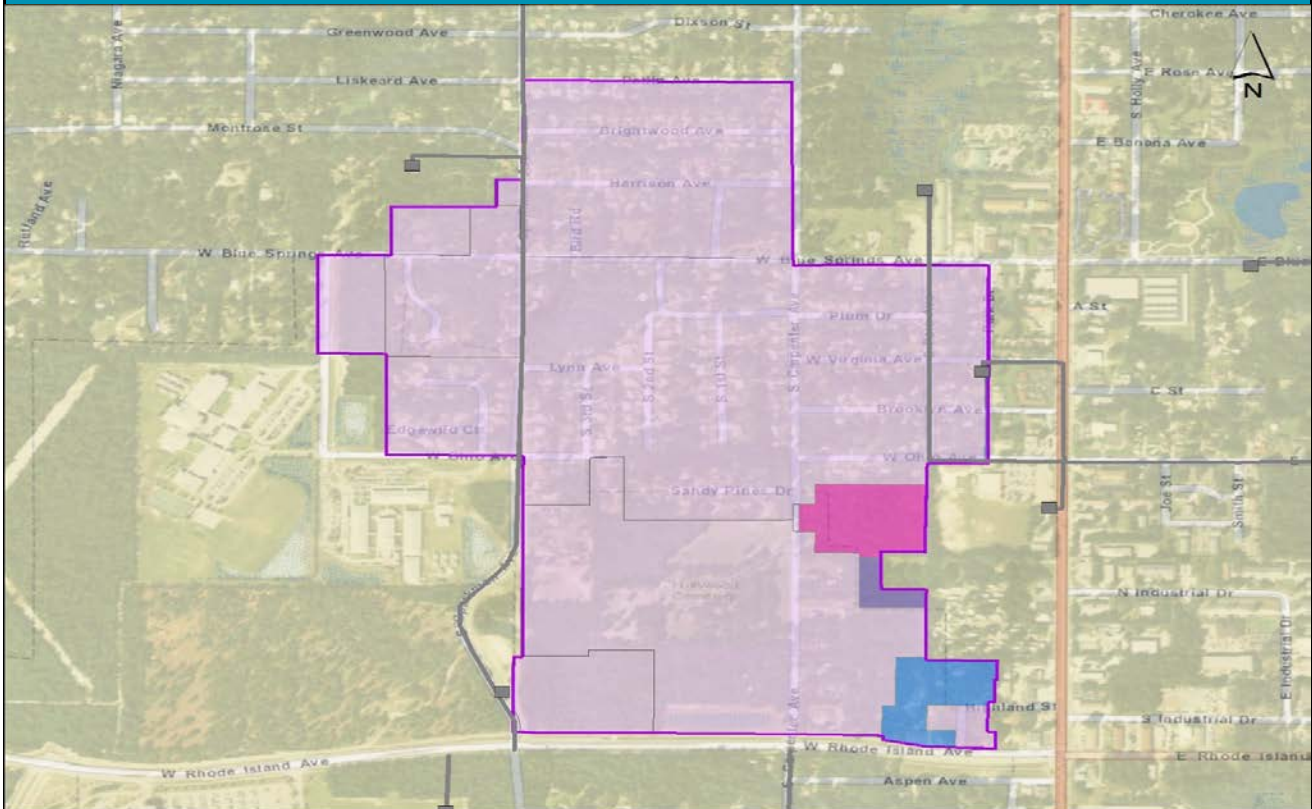
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	99.1	59.4	176	59	0	38,500
Total	99.1	59.4	176	59	0	38,500

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 21

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



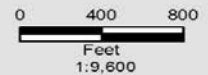
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	5.9	3.5	0	4	34,500	3,400
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	100	0
Residential High	6.2	3.7	7	33	0	6,700
Residential Medium	1.5	0.9	1	5	0	1,000
Residential Low	211	126.6	270	87	0	58,500
Total	224.6	134.7	278	129	34,600	69,600

Expansion Area: **Phase 3 Area 22**



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	8.8	5.3	0	6	51,900	5,100
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	17	10.2	10	61	0	11,600
Residential Low ¹	262.1	157.2	391	34	0	86,200
Total	287.9	172.7	401	101	51,900	102,900

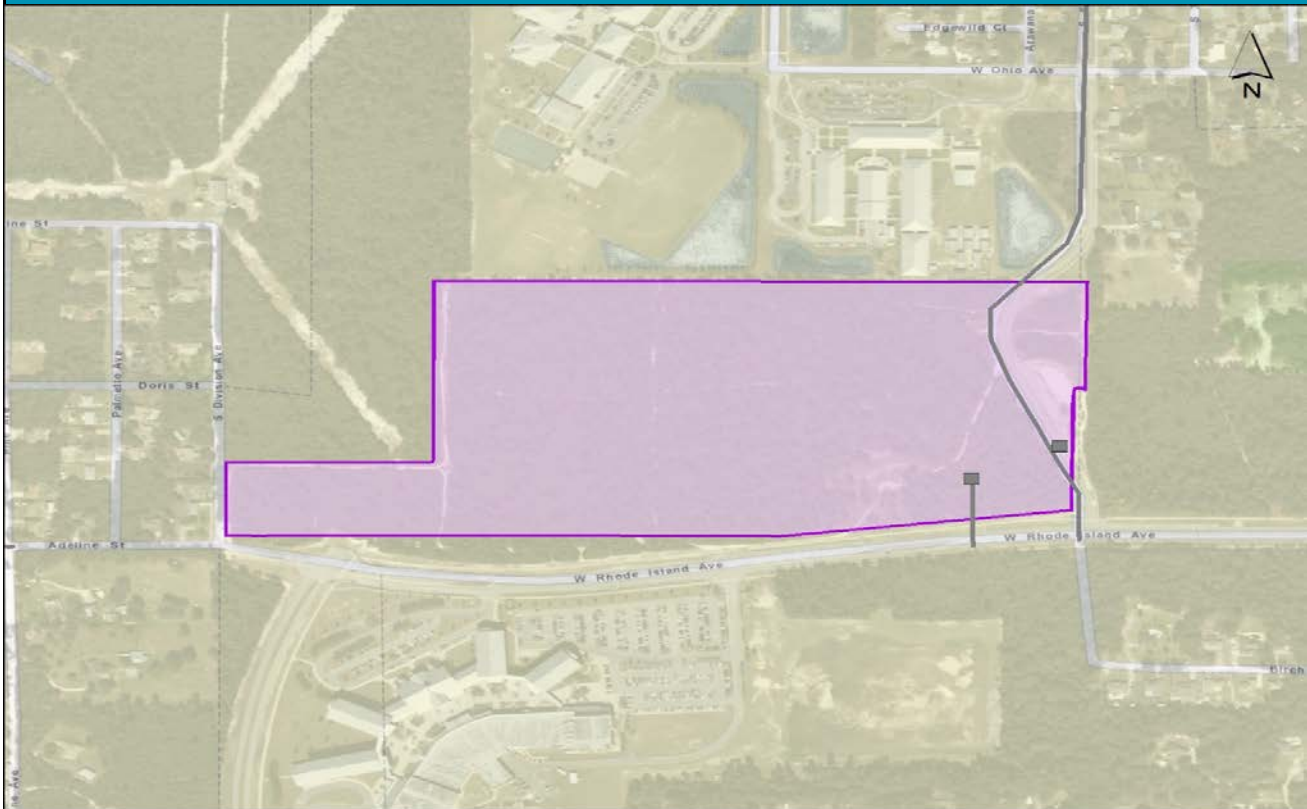
1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 23

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	108.5	65.1	150	0	0	24,600
Total	108.5	65.1	150	0	0	24,600

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 3 Area 24

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

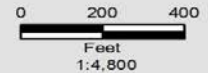
- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	65.3	39.2	202	0	0	33,100
Total	65.3	39.2	202	0	0	33,100

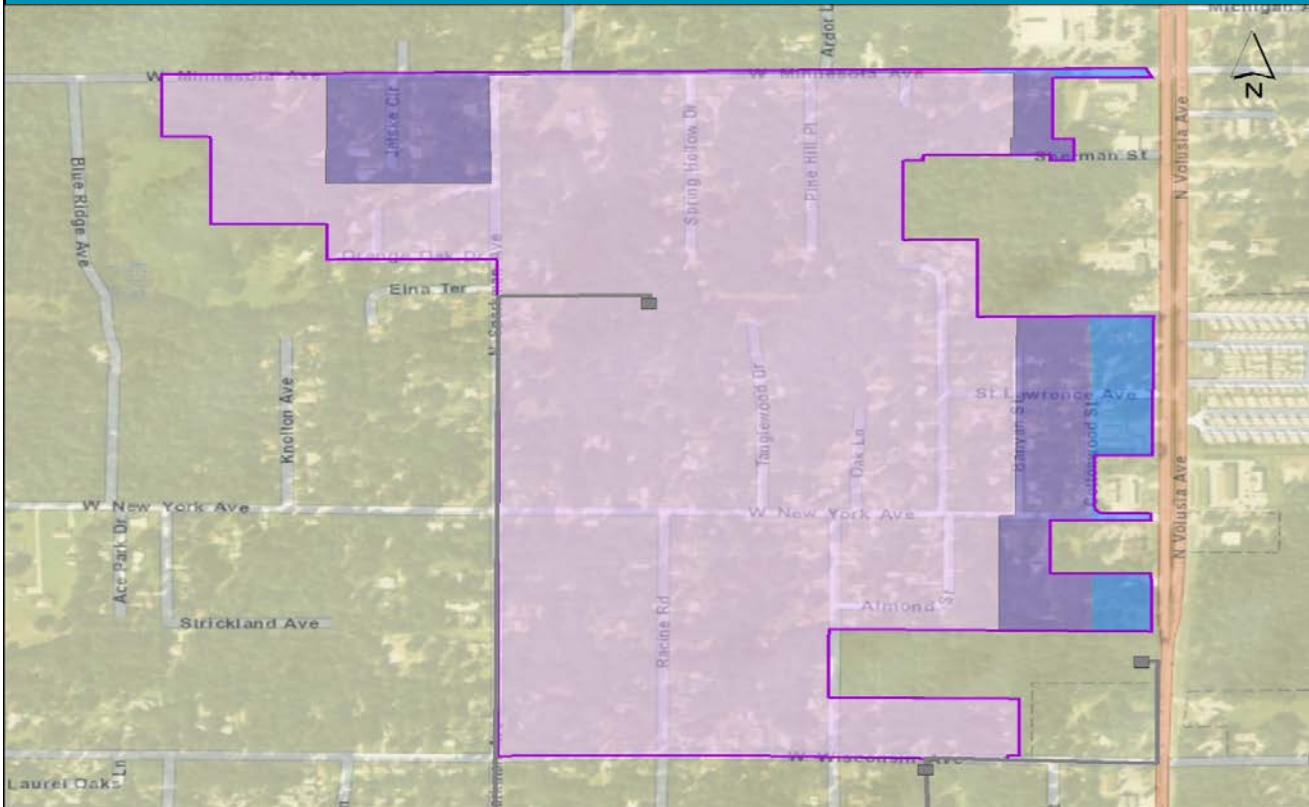
¹ Include flows from new development

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 25

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	7.4	4.5	0	5	43,700	4,300
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0.2	0.1	1	0	0	200
Residential Medium	23.6	14.2	57	0	0	9,300
Residential Low ¹	178.9	107.4	291	48	0	55,600
Total	210.1	126.2	349	53	43,700	69,400

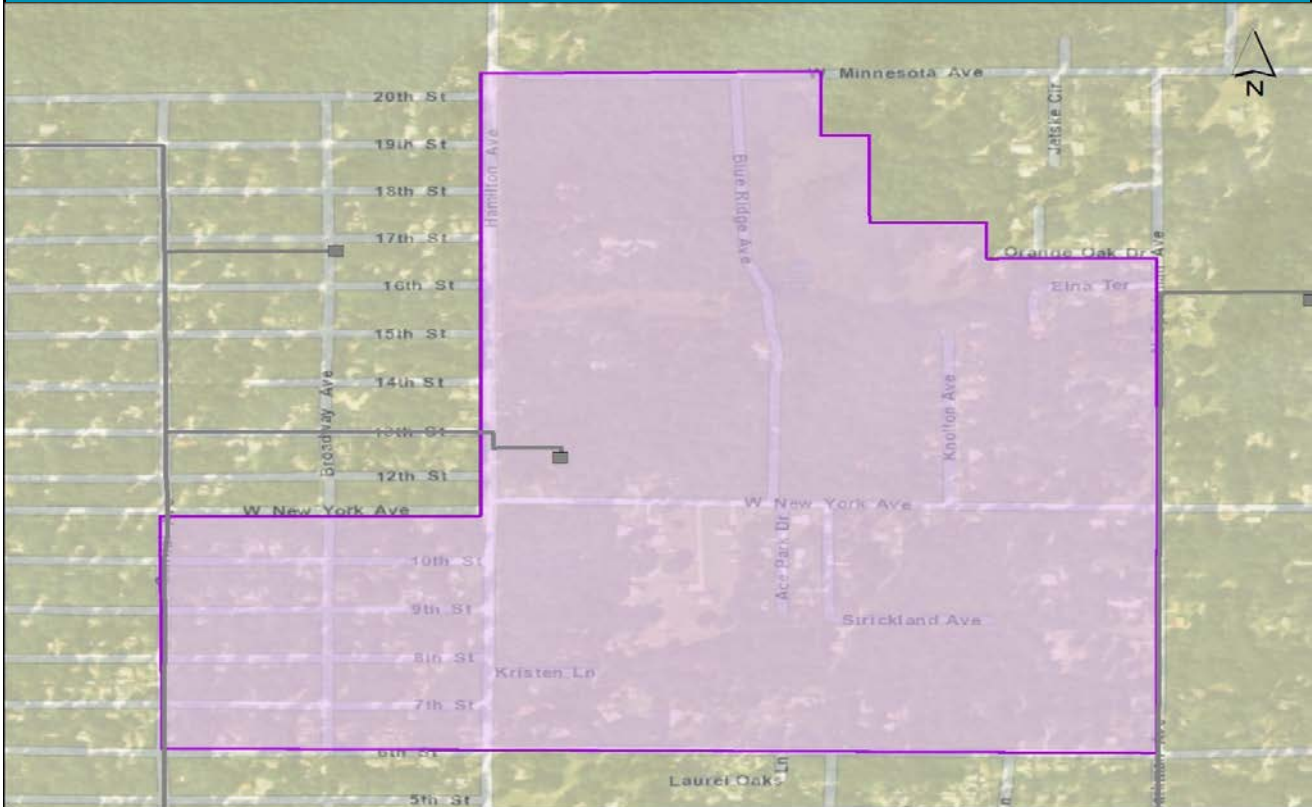
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 26

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 325 650
Feet
1:7,800

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	238.6	143.2	289	0	0	47,400
Total	238.6	143.2	289	0	0	47,400

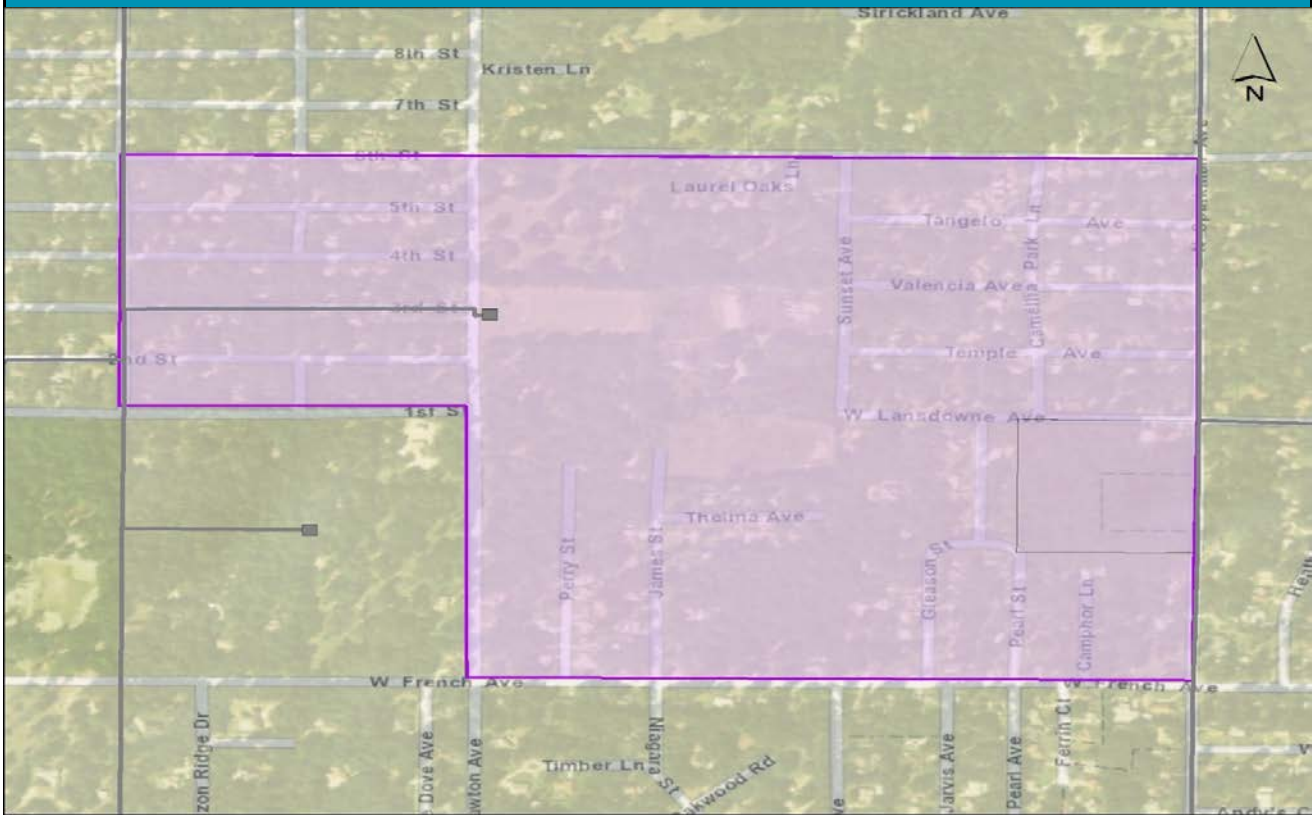
1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 27

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 300 600
Feet
1:7,200

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	197.5	118.5	403	4	0	66,700
Total	197.5	118.5	403	4	0	66,700

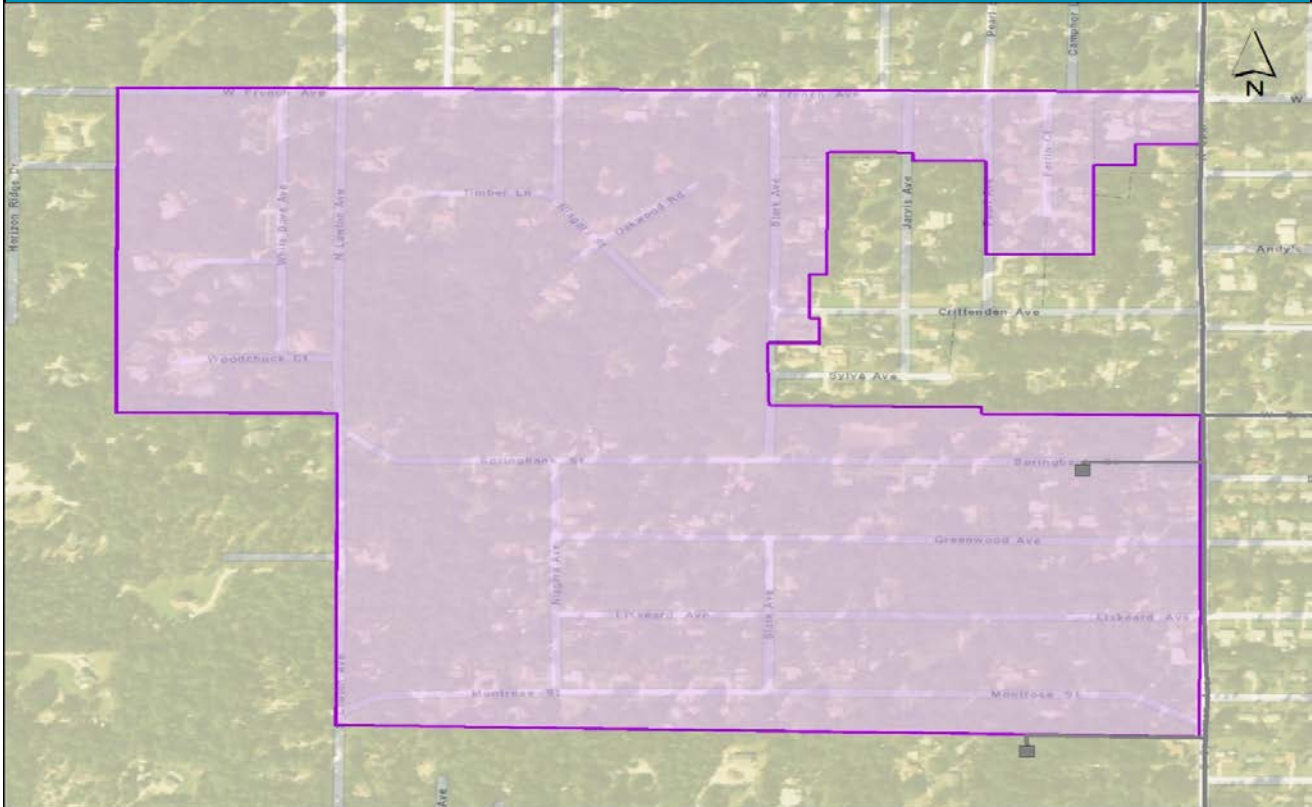
1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 28

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	157.4	94.4	284	0	0	46,600
Total	157.4	94.4	284	0	0	46,600

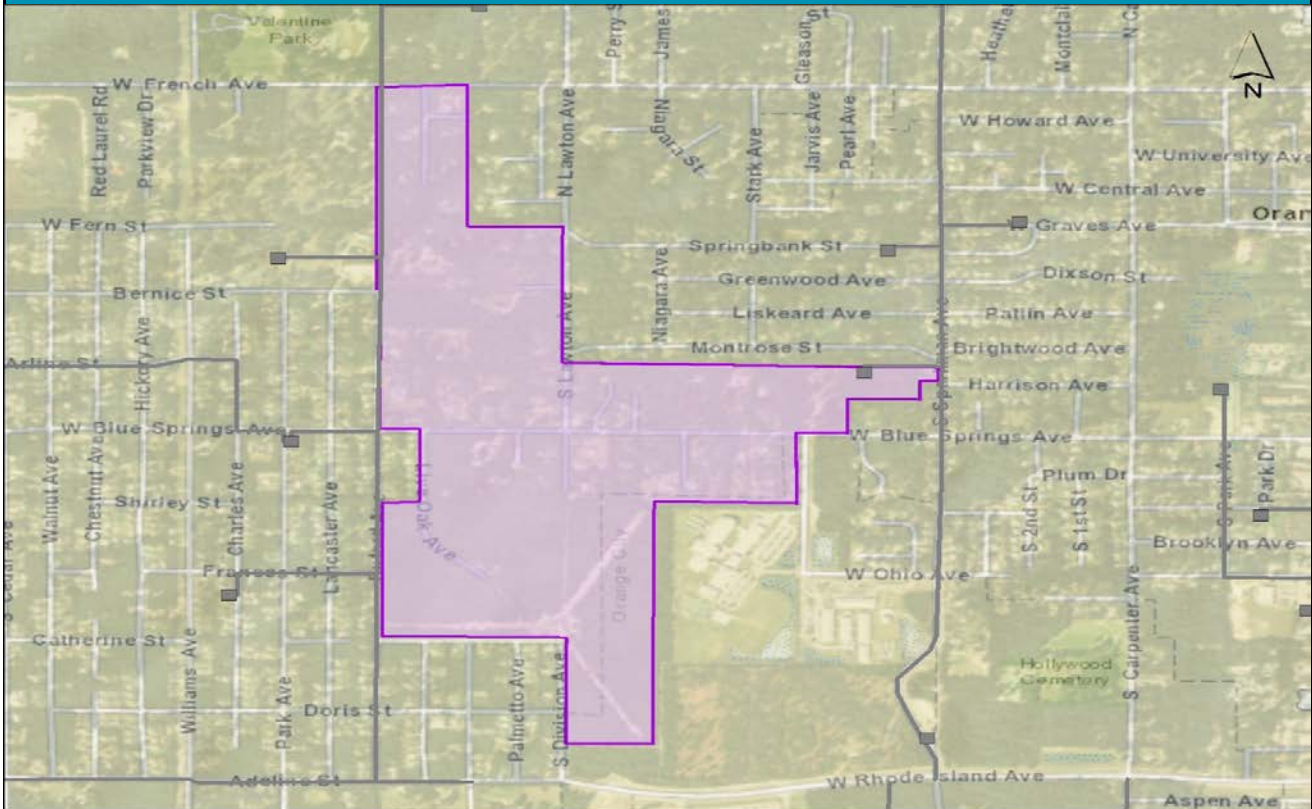
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 29

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area

0 575 1,150
Feet
1:13,800

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	227.5	136.5	86	0	0	14,100
Total	227.5	136.5	86	0	0	14,100

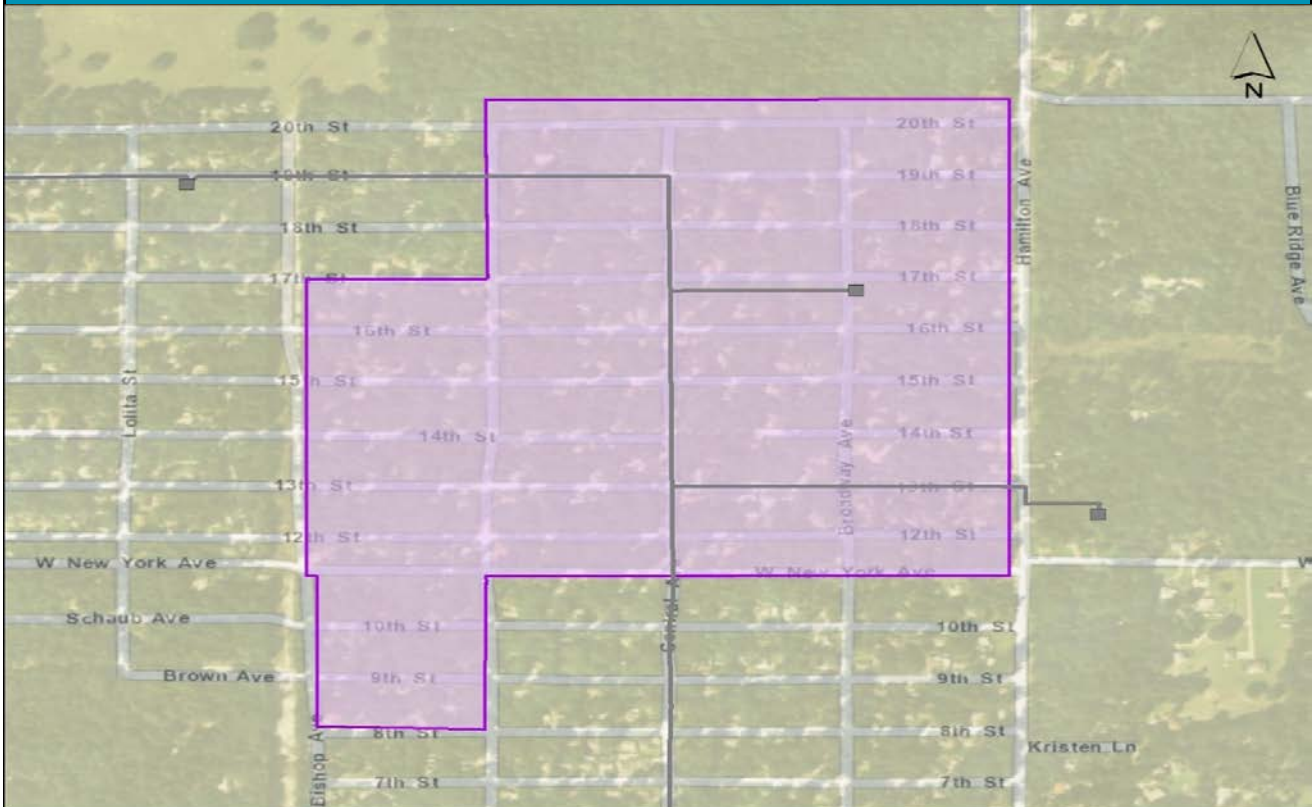
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 30

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	139	83.4	442	0	0	72,500
Total	139	83.4	442	0	0	72,500

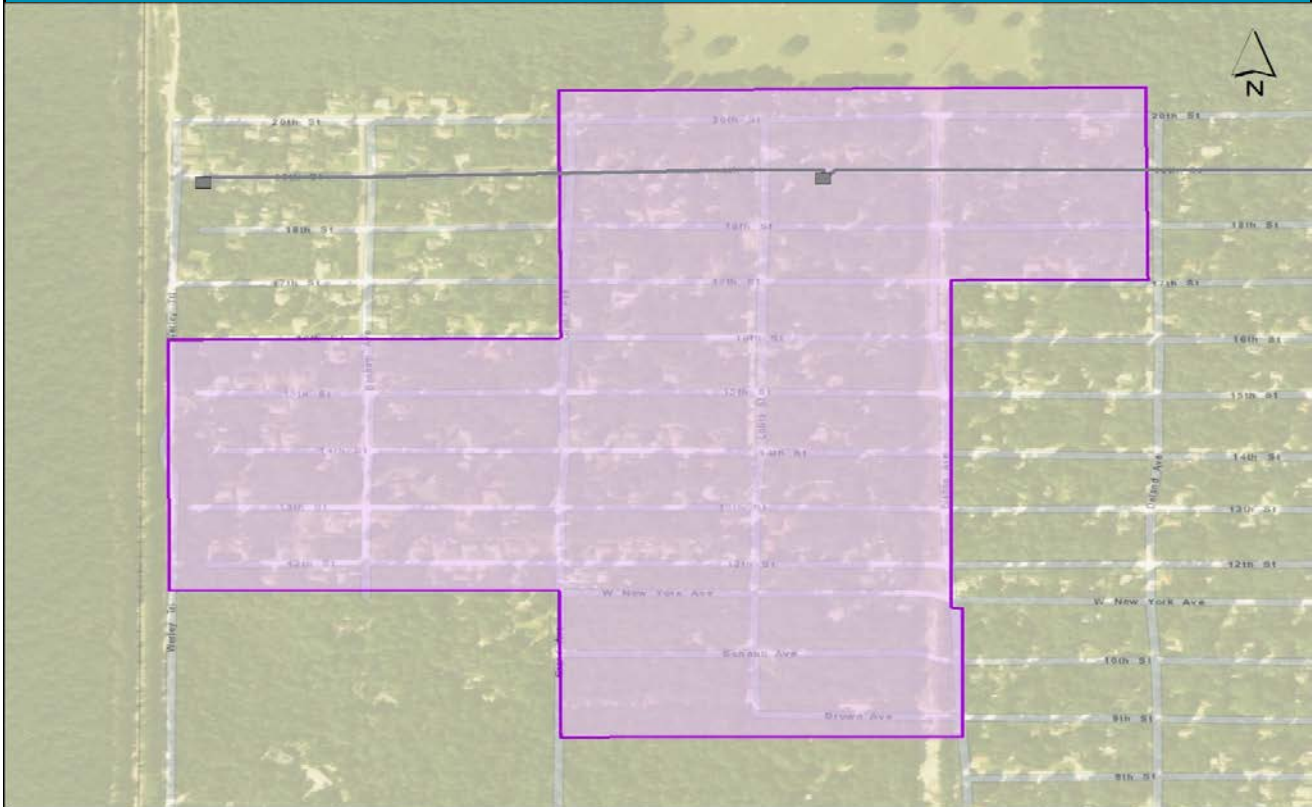
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 31

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 275 550
Feet
1:6,600

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	138.9	83.3	419	4	0	69,400
Total	138.9	83.3	419	4	0	69,400

1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 32

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



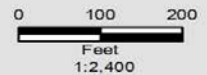
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



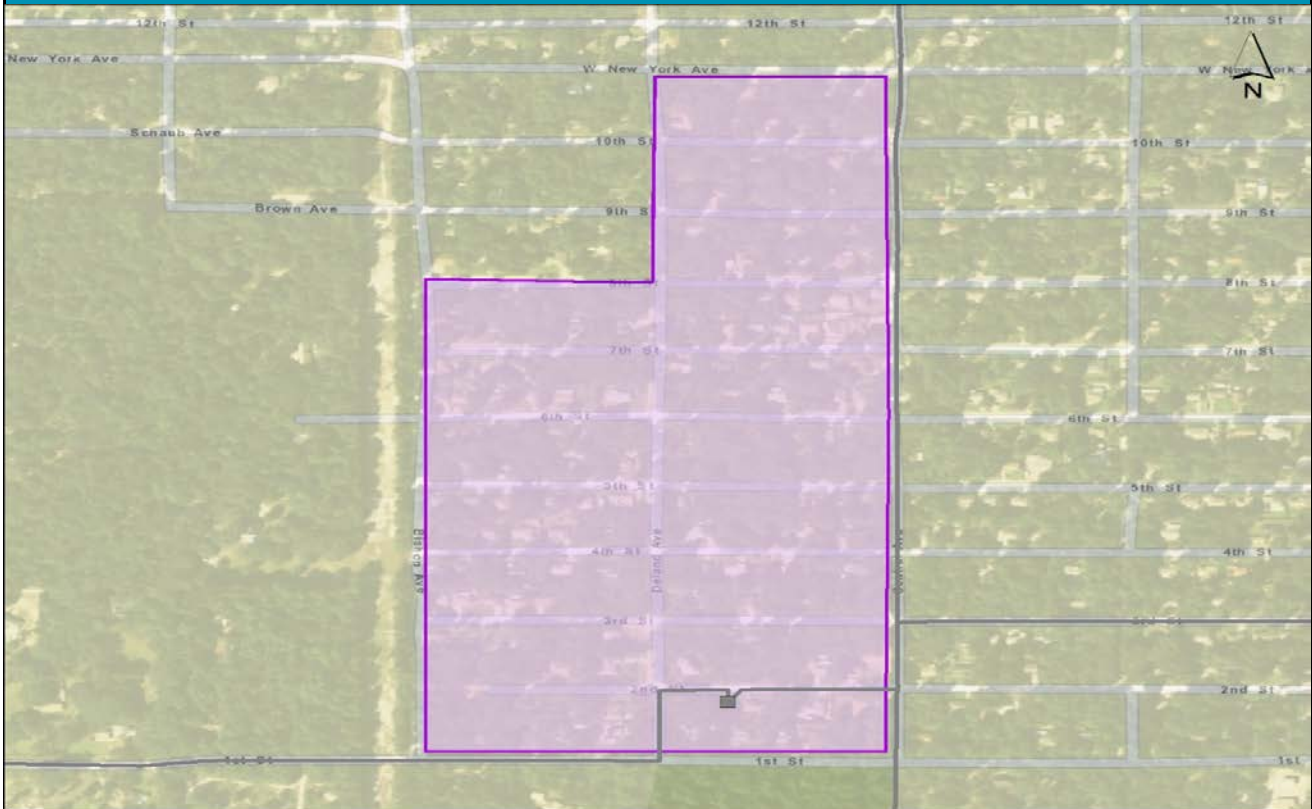
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	34	20.4	115	0	0	18,900
Total	34	20.4	115	0	0	18,900

¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area: Phase 4 Area 33

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional
- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 225 450
Feet
1:5,400

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	63.2	37.9	204	0	0	33,500
Total	63.2	37.9	204	0	0	33,500

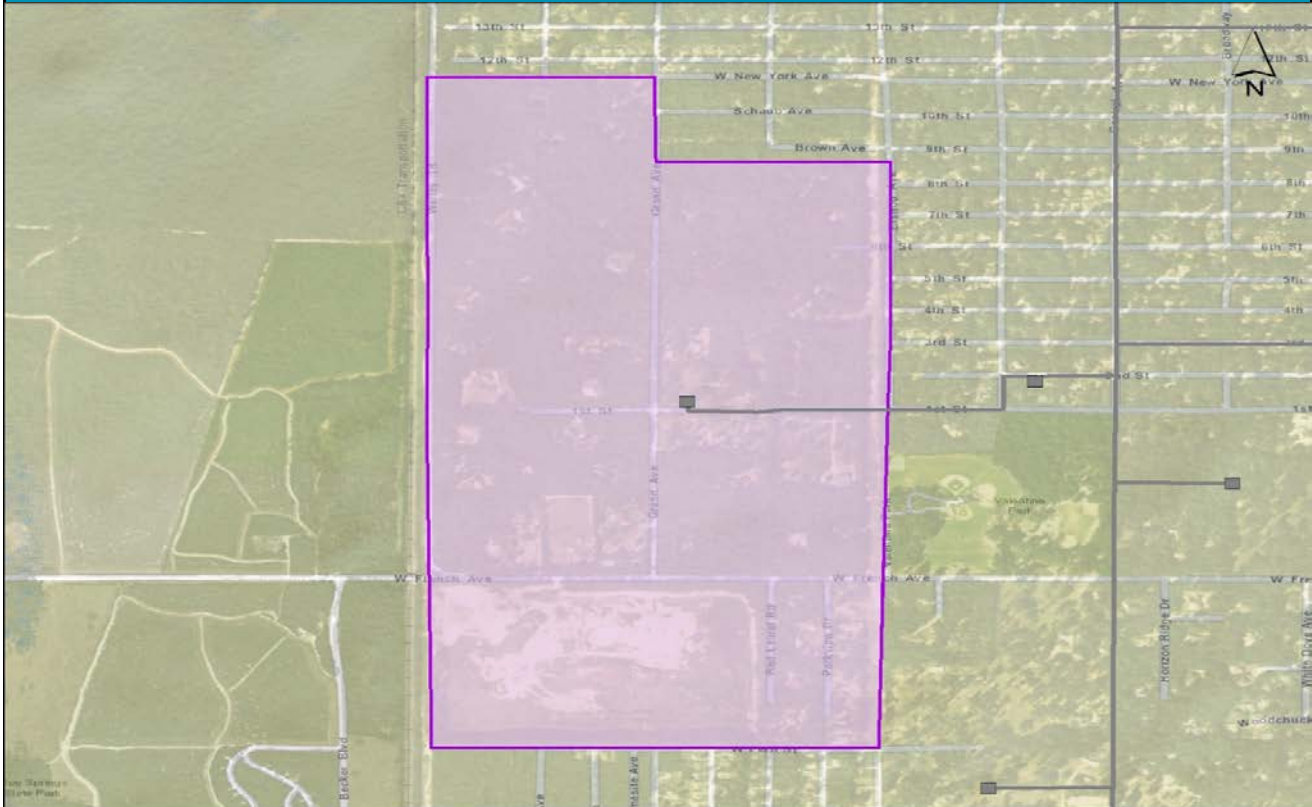
1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 34

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Public/Governmental & Institutional

- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 475 950
Feet
1:11,400

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	304.9	182.9	69	0	0	11,300
Total	304.9	182.9	69	0	0	11,300

1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 35

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low	80.5	48.3	10	0	0	1,600
Total	80.5	48.3	10	0	0	1,600

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area: Phase 4 Area 36

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	58.2	34.9	9	0	0	1,500
Total	58.2	34.9	9	0	0	1,500

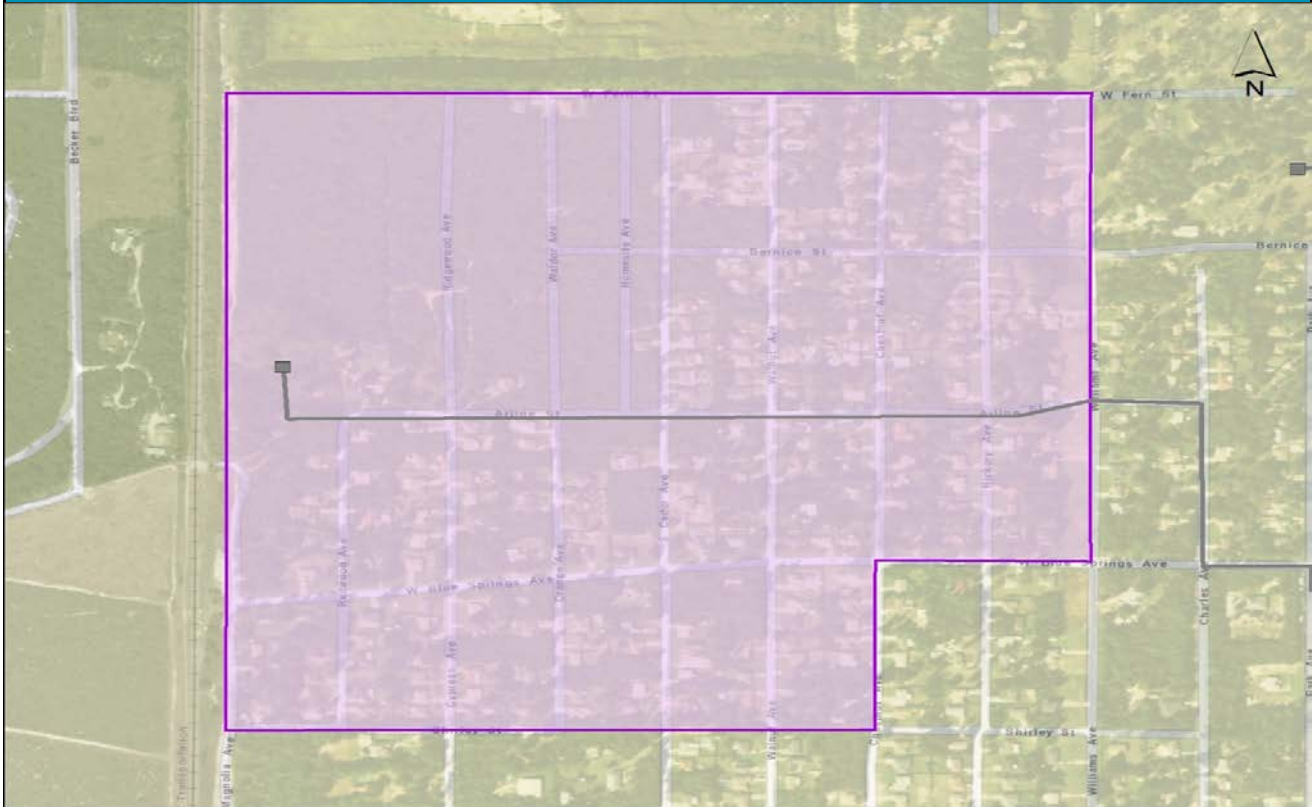
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 37

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area

0 250 500
Feet
1:6,000

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	150.4	90.2	412	0	0	67,600
Total	150.4	90.2	412	0	0	67,600

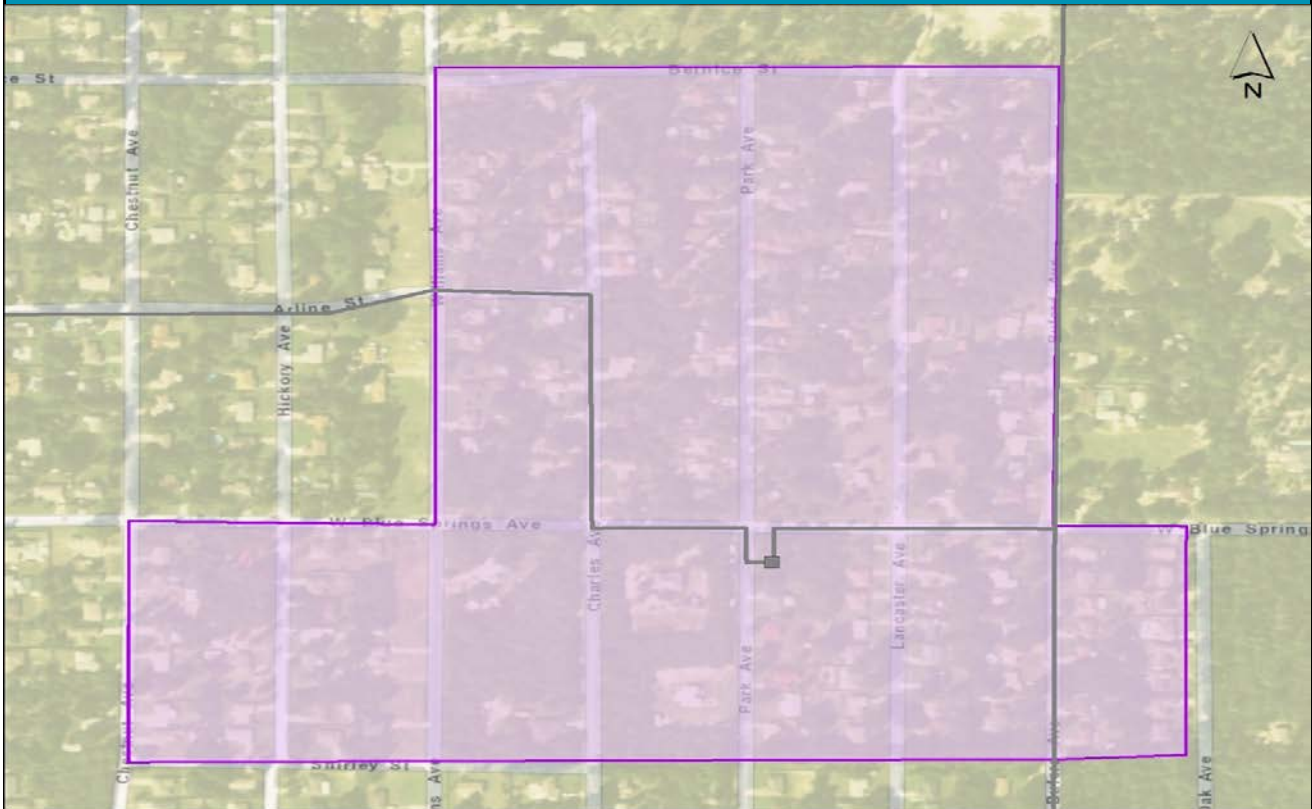
1 Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 38

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area



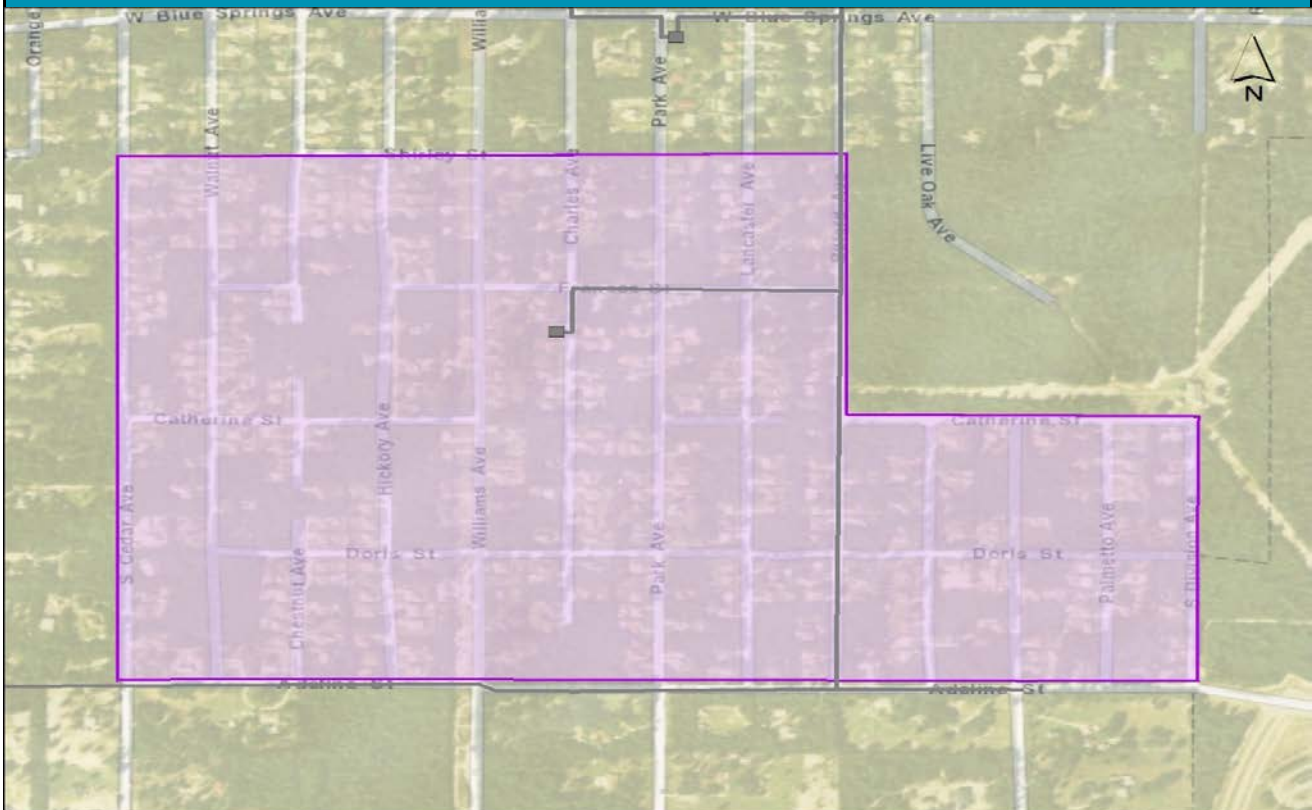
Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	76.8	46.1	184	0	0	30,200
Total	76.8	46.1	184	0	0	30,200

¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area: 4-18 Phase 4 Area 39

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



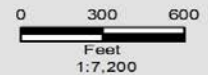
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	201	120.6	531	0	0	87,100
Total	201	120.6	531	0	0	87,100

¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area: Phase 4 Area 40

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



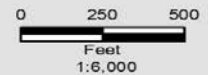
Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

Proposed WW Facilities

- Lift Station
- Force Main
- Expansion Area



Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	79.5	47.7	28	0	0	4,600
Total	79.5	47.7	28	0	0	4,600

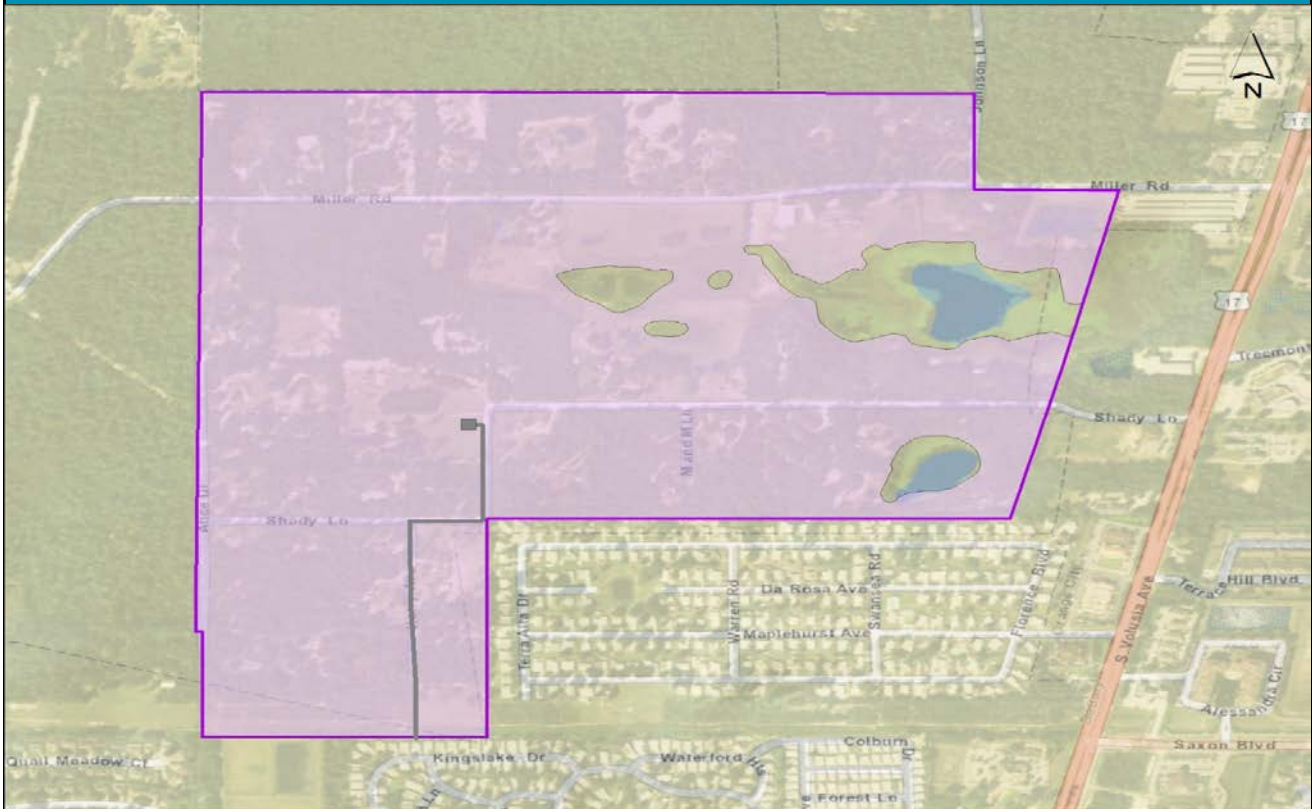
¹ Number of SFR Parcels used instead of acreage calculations

EXPANSION AREA PROJECT INFORMATION SHEET

Expansion Area:

Phase 4 Area 41

DESCRIPTION: This project includes removal of septic system from service area and construction of a centralized sewer system. A new lift station will be constructed in the location specified in the figure.



Future Land Use

- Commercial, Industrial
- Mix Use
- Office Transitional

Proposed WW Facilities

- Public/Governmental & Institutional
- Residential High, Urban High (VC)
- Residential Medium, Urban Medium (VC)
- Residential Low, Urban Low (VC)

- Lift Station
- Force Main
- Expansion Area

0 375 750
Feet
1:9,000

Future Land Use	Gross Area (acres)	Net Area (acres)	Dwelling Units		Non-Residential Building Area (sqft)	Average Annual Daily Flow (gpd)
			Single Family	Multi Family		
Commercial	0	0	0	0	0	0
Mix Use	0	0	0	0	0	0
Office Transitional	0	0	0	0	0	0
Public/Government	0	0	0	0	0	0
Residential High	0	0	0	0	0	0
Residential Medium	0	0	0	0	0	0
Residential Low ¹	260.1	156.1	70	0	0	11,500
Total	260.1	156.1	70	0	0	11,500

1 Number of SFR Parcels used instead of acreage calculations

Attachment 2

Capital Improvement Projects Cost Estimates

Improvement Project - P1A1-T	Cost Opinion
Install LS-P1A1S at E Blue Springs Avenue and S Thorpe Avenue.	\$ 100,000
Install 3,300 LF of 8-inch & 10-inch FM along E Blue Springs Avenue and S Thorpe Avenue and ending at Rhode Island Avenue.	\$ 361,000
Convert the stormwater LS into LS-P1A1N east of N Holly Avenue and south of E University Avenue.	\$ 50,000
Install 600 LF of 6-inch FM starting along N Holly Avenue south to E Graves Avenue.	\$ 69,000
Install 1,700 LF of 10-inch GM starting at S Leavitt Avenue road west along E Blue Springs Avenue and ending at LS-P1A1S.	\$ 319,000
Install 2,500 LF of 10-inch GM starting at E Graves Avenue and S Holly Avenue and ending at LS P1A1S.	\$ 217,000
Construction Cost Subtotal	\$ 1,116,000
Construction Contingency (30%)	\$ 270,000
Construction Cost Sub Total	\$ 1,386,000
Professional Services (20%)	\$ 277,000
Total Cost	\$ 1,663,000

Improvement Project - P1A1-C	Cost Opinion
Install 15,100 LF of 3-inch FM throughout the service area ¹	\$ 1,670,000
Install 3,300 LF of 4-inch FM from throughout the service area ¹	\$ 353,000
Install 16,700 LF of GMs throughout the service area	\$ 1,922,000
Construction Cost Subtotal	\$ 3,945,000
Construction Contingency (30%)	\$ 607,000
Construction Cost Sub Total	\$ 4,552,000
Professional Services (20%)	\$ 910,000
Total Cost	\$ 5,462,000

1. Assumes 50% HDD, and 50% open cut.

Improvement Project - P1A1-RCW	Cost Opinion
Install 6,100 LF of 8-inch RCW main from E French Avenue to E Ohio Avenue along N Volusia Avenue	\$ 867,000
Construction Contingency (30%)	\$ 260,000
Construction Cost Sub Total	\$ 1,127,000
Professional Services (20%)	\$ 225,000
Total Cost	\$ 1,352,000

Improvement Project - P1A2-T	Cost Opinion
Install LS-P1A2 at E French Avenue and Summer Avenue	\$ 75,000
Install 5,000 LF of 6-inch FM on E French Avenue and Summer Avenue to a GM at Blue Springs Avenue and N Leavitt Avenue	\$ 494,000
Construction Cost Subtotal	\$ 569,000
Construction Contingency (30%)	\$ 171,000
Construction Cost Sub Total	\$ 1,308,000
Professional Services (20%)	\$ 262,000
Total Cost	\$ 1,570,000

Improvement Project - P1A2-C	Cost Opinion
Install 8,800 LF of 3-inch FM from 472 to New York Avenue along N Volusia Avenue ¹	\$ 931,000
Install 1,900 LF of 4-inch FM from New York Avenue to Lansdowne Avenue along N Volusia Avenue ¹	\$ 218,000
Install 2,000 LF of 6-inch FM from Lansdowne Avenue and N Volusia Avenue to LS P1A2 ¹	\$ 258,000
Construction Cost Subtotal	\$ 1,407,000
Construction Contingency (30%)	\$ 499,000
Construction Cost Sub Total	\$ 2,164,000
Professional Services (20%)	\$ 433,000
Total Cost	\$ 2,597,000

1. Assumes 50% HDD, and 50% open cut

Improvement Project - P1A2-RCW	Cost Opinion
Install 7,800 LF of 8-inch RCW main extension from E French Avenue to SR 472 along N Volusia Avenue.	\$ 1,105,000
Construction Contingency (30%)	\$ 332,000
Construction Cost Sub Total	\$ 1,437,000
Professional Services (20%)	\$ 287,000
Total Cost	\$ 1,724,000

Improvement Project - P1A3-T	Cost Opinion
Install LS-P1A3 at Birch Avenue and Mimosa Avenue.	\$ 75,000
Install 600 LF of 6-inch FM starting at Birch Avenue north along Mimosa Avenue, and ending at W. Rhode Island Avenue.	\$ 58,000
Construction Cost Subtotal	\$ 133,000
Construction Contingency (30%)	\$ 40,000
Construction Cost Sub Total	\$ 306,000
Professional Services (20%)	\$ 61,000
Total Cost	\$ 367,000

Improvement Project - P1A3-C	Cost Opinion
Install 6,800 LF of 3-inch FM along S Volusia Avenue ¹	\$ 721,000
Install 600 LF of 4-inch FM along S Volusia Avenue ¹	\$ 74,000
Construction Cost Subtotal	\$ 795,000
Construction Contingency (30%)	\$ 239,000
Construction Cost Sub Total	\$ 1,829,000
Professional Services (20%)	\$ 366,000
Total Cost	\$ 2,195,000

1. Assumes 50% HDD, and 50% open cut

Improvement Project - P1A3-RCW	Cost Opinion
Install 2,200 LF of 12-inch RCW main extension from Rhode Island to E Ohio Ave along N Volusia Avenue.	\$ 324,000
Construction Contingency (30%)	\$ 97,000
Construction Cost Sub Total	\$ 421,000
Professional Services (20%)	\$ 84,000
Total Cost	\$ 505,000

Improvement Project - P1A5-T	Cost Opinion
Install LS-P1A5 at or near N. Orange Avenue about 300 feet south of University Avenue.	\$ 50,000
Install 500 LF of 6-inch force main starting at the LS along N. Orange Avenue and ending at E. Graves Avenue.	\$ 48,000
Construction Cost Subtotal	\$ 98,000
Construction Contingency (30%)	\$ 29,000
Construction Cost Sub Total	\$ 226,000
Professional Services (20%)	\$ 45,000
Total Cost	\$ 271,000

Improvement Project - P1A5-C	Cost Opinion
Install 6,000 LF of 8-inch GM throughout the project area	\$ 690,000
Construction Contingency (30%)	\$ 207,000
Construction Cost Sub Total	\$ 897,000
Professional Services (20%)	\$ 179,000
Total Cost	\$ 1,076,000

Improvement Project - P2A7-RCW	Cost Opinion
Install 6,400 LF of 8-inch RCW main extension along E Graves Avenue and Monastery Road	\$ 912,000
Construction Contingency (30%)	\$ 274,000
Construction Cost Sub Total	\$ 1,185,000
Professional Services (20%)	\$ 237,000
Total Cost	\$ 1,422,000