

DRAFT

City of Deltona Deltona Lakes Water Reclamation Facility Facilities Plan

August 2023



1. Introduction	5
A. Background	5
B. Objectives	6
2. General Conditions	8
A. Deltona Water Demographics	8
B. Climate	8
C. Topography	8
D. Hydrology and Wetlands	10
E. Floodplains	10
F. Hydrogeology	13
G. Plant and Animal Communities	13
H. Archaeological and Historical Sites	13
I. Land Use	14
J. Soils	14
3. Existing Wastewater System	18
A. Wastewater Service Area and System	18
B. Historical Wastewater Flows	18
C. DLWRF Treatment System	20
4. DLWRF Condition Assessment	23
A. Influent Structure	24
B. Flow Equalization Tank	25
C. Clarifiers	25
D. Contact Tank	26
E. Stabilization Basins	26
F. Digesters	26
G. Oxidation Ditch Treatment Train	26
H. Effluent Filtration	26
I. Intermittent Pump Station	27
J. Sub-Standard Storage Tank	28
K. Other Site Condition Assessments	28
5. Existing Effluent Disposal System	29

A. System Description	29
B. Permitted Reclaimed Disposal Capacity	32
C. Historical Reclaimed Water Disposal	33
6. Wastewater Flow Projections	35
A. Population Growth	35
B. OSTDS or Septic Tanks	36
C. Citywide Wastewater Flow Projections	37
D. Wastewater Flow Projection for DLWRF	39
7. Alternatives Analysis	43
A. Alternative 1 – Rehab DLWRF to An Advanced Wastewater Treatment Facility	43
(1) DLWRF Upgrade to 1.0-MGD AWT Facility	44
(2) EWRF Upgrades	47
(3) Additional Effluent Disposal	48
B. Alternative 2 – Convert DLWRF to a Master Lift Station (MLS) Pumping to EWRF	49
C. Alternative 3 – Convert DLWRF to a Master Lift Station (MLS) Pumping 1.0-MGD Flow to VC SWRWRF	52
8. Cost Estimate and Present Worth Analysis	54
A. Planning Level Capital Cost Estimate	54
B. Planning Level Operation and Maintenance Cost Estimate	59
C. Summary of Planning Level Cost Estimate	61
9. Comparison of Alternatives	62
A. Non-Monetary Criteria	62
10. Summary and Recommendation	63
A. Summary	63
B. Recommendations	64

LIST OF TABLES

Table 2-1: SHPO Structures and Cemeteries within the Project Area	14
Table 2-2: City of Deltona Soil Types	14
Table 3-1: Historical Wastewater Flows and Parcels Sewered	19
Table 3-2: Wastewater Flow Splits between DLWRF and EWRF	19
Table 4-1: Summary of DLWRF Process Physical Conditions	23
Table 5-1: Permitted Reclaimed Water Disposal Capacity	32
Table 5-2: Historical Reclaimed Water Disposal	33
Table 6-1: Volusia County Population Growth Rates and Projection, and Deltona Population	

Projection	35
Table 6-2: Statistics of Parcels in PFA within Deltona Sewer Service Area	37
Table 6-3: Wastewater Flow Projection at Wastewater Level of Service of 96 gpcd	37
Table 6-4: Updated Wastewater Flow Projection	38
Table 6-5: Statistics of Parcels in PFA within Approximate DLWRF Service Area	41
Table 6-6: Year 2050 Wastewater Flow Projection for DLWRF	41
Table 8-1: Cost Estimate for Upgrading DLWRF to a 1.0-MGD AWT Facility (Alternative 1).....	54
Table 8-2: Cost Estimate for Converting DLWRF to a 2.5-MGD Master Lift Station and Pumping Flow to EWRF (Alternative 2)	56
Table 8-3: Cost Estimate for Converting DLWRF to a 2.5-MGD Master Lift Station and Pumping Flow to VC SWRWRF (Alternative 3)	58
Table 8-4: City of Deltona DLWRF and EWRF Recent O&M Costs.....	59
Table 8-5: Planning Level Annual Wastewater Treatment O&M Cost	60
Table 8-6: Summary of Planning Level Cost Estimate	61

LIST OF FIGURES

Figure 1-1: Deltona Wastewater System	7
Figure 2-1: Topography.....	9
Figure 2-2: Wetlands Map.....	11
Figure 2-3: Floodplain Map	12
Figure 2-4: Land Use Map	16
Figure 2-5: Soil Map	17
Figure 3-1: Existing DLWRF Layout	22
Figure 5-1: Deltona Reclaimed Water System	30
Figure 5-2: Deltona Effluent Disposal System	31
Figure 5-3: Daily Reclaimed Water to RIBs and Volusia County.....	34
Figure 6-1: Historical and Projected Deltona Population	36
Figure 6-2: Historical and Projected Deltona Wastewater Flow	39
Figure 6-3: DLWRF Approximate Service Area and Parcel Built Time	40
Figure 7-1: Alternative 1 – Timeline of Major Upgrades	44
Figure 7-2: Proposed Layout of DLWRF to Be Upgraded to an AWT Facility.....	46
Figure 7-3: Alternative 2 – Timeline of Major Upgrades	50
Figure 7-4: Proposed Force Main Routes.....	51
Figure 7-5: Alternative 3 – Timeline of Major Upgrades	53

Appendix A Wildlife Inventory

Executive Summary

1. Introduction

A. Background

The City of Deltona (City) and its subsidiary Deltona Water (DW) owns and operates Deltona Lakes Water Reclamation Facility (DLWRF), a.k.a. Fisher WRF. DLWRF, located at 401 Fisher Road. DLWRF began operating circa 1965 and has a permitted capacity of 1.4 million gallons per day (MGD) of annual average daily flow (AADF). The Florida Department of Environmental Protection (FDEP) operating permit number is FLA111724, which expires on September 19, 2026.

Due to facility aging and the FDEP's May 18, 2021 final order to implement the Volusia Blue Spring Basin Management Action Plan (BMAP), DLWRF must be either upgraded to treat to advanced wastewater treatment (AWT) standards or converted to a master lift station (MLS) conveying wastewater to the City's Eastern Water Reclamation Facility (EWRF) and/or the Volusia County's Southwest Regional Water Reclamation Facility (SWRWRF). DLWRF is at the end of its service life. Many of its facilities are in poor conditions, needing significant upgrades to be restored to good conditions. In addition, much of the DLWRF service area is within the priority focus area (PFA) inside the Volusia Blue Spring BMAP area, as shown in **Figure 1**. DLWRF is required to be upgraded to meet the nitrogen effluent limit of 3 milligrams per liter (mg/L) on an annual average basis before the next operating permit renewal by September 19, 2026 if it is to remain in service.

The PFA is a subarea within the BMAP boundary which represents the area in the basin where the aquifer is most vulnerable for nitrate from nitrogen and where there are the most connections between groundwater and Volusia Blue Spring. FDEP believes that nitrogen sources are more likely to influence groundwater quality under certain soil and underlying geologic material conditions. FDEP finalized nutrient total maximum daily loads (TMDLs) for Volusia Blue Spring and Volusia Blue Spring Run in 2018. The TMDLs established a monthly average nitrate target of 0.35 mg/L. To achieve this target, FDEP has established a 20-year total nitrogen reduction goal of 61,653 pounds (lb) per year. 4% of the total reduction will be from the wastewater treatment facilities within the Blue Spring BMAP area. FDEP requires the nitrogen effluent limit of 3 mg/L for the DLWRF. The FDEP May 18, 2021 final order mandates that nitrogen effluent limits do not exceed 3 mg/L on an annual average basis to all new and existing wastewater treatment facilities with an FDEP permitted discharge. The new effluent standards will take effect at the time of permit renewal. This mandate will require upgrading DLWRF to meet a 3 mg/L total nitrogen limit by next permit renewal before September 19, 2026 if it remains in service.

Effluent nitrogen levels are a major consideration for DLWRF. To rectify the exceedance of the total nitrogen as nitrate limit of 10 mg/L for any sample reported on Part D of the Groundwater Discharge Monitoring Report (DMR) for the 4th quarter of 2019 and the 3rd quarter of 2020, the FDEP's March 1, 2021 Consent Order mandates the DLWRF to be subject to the interim limit for total nitrogen as nitrate at 20 mg/L for any single sample through January 28, 2023.

The Blue Spring BMAP's Onsite Sewage Treatment and Disposal Systems (OSTDS) Mitigation Plan requires all existing OSTDS within the PFA on lots of less than 1 acre provide enhanced treatment of nitrogen or connect to sewers within 20 years after the Blue Spring BMAP adoption, which took place on May 18, 2021. Mead and Hunt estimated that there are a total of 8,149 less than 1.0 acre developed parcels with OSTDS within the Deltona sewer service area and Blue Spring Priority Focus Area. Of the

8,149 parcels, 3,007 lie in inside the approximate DLWRF service area. Connecting many of these parcels to sewers will significantly impact the capacity needs for the City.

B. Objectives

The main objective of this facilities plan is to develop a comprehensive and holistic approach for the proper management and treatment of wastewater generated in the City's wastewater service area, including the areas currently served by DLWRF and EWRF. The plan should provide sufficient information to help the City decide the future of DLWRF – converting it to an MLS or upgrading it to an AWT facility, and strategize the wastewater treatment planning and reclaimed water disposal.

The second objective of this facilities plan is to make this document a FDEP State Revolving Fund (SRF) Planning Document required in compliance with 62-503.700(2) F.A.C. as the City intends to pursue funding through the FDEP SRF loan program.

To achieve the above objectives, this report consists of the following sections:

- Executive Summary
- Section 1 - Introduction
- Section 2 – General Conditions
- Section 3 – Existing Wastewater System
- Section 4 – DLWRF Condition Assessment
- Section 5 – Existing Effluent Disposal System
- Section 6 – Wastewater Flow Projections
- Section 7 – Alternatives Analysis
- Section 8 – Cost Estimate and Present Worth Analysis
- Section 9 – Comparison of Alternatives
- Section 10 – Summary and Recommendations

2. General Conditions

A. Deltona Water Demographics

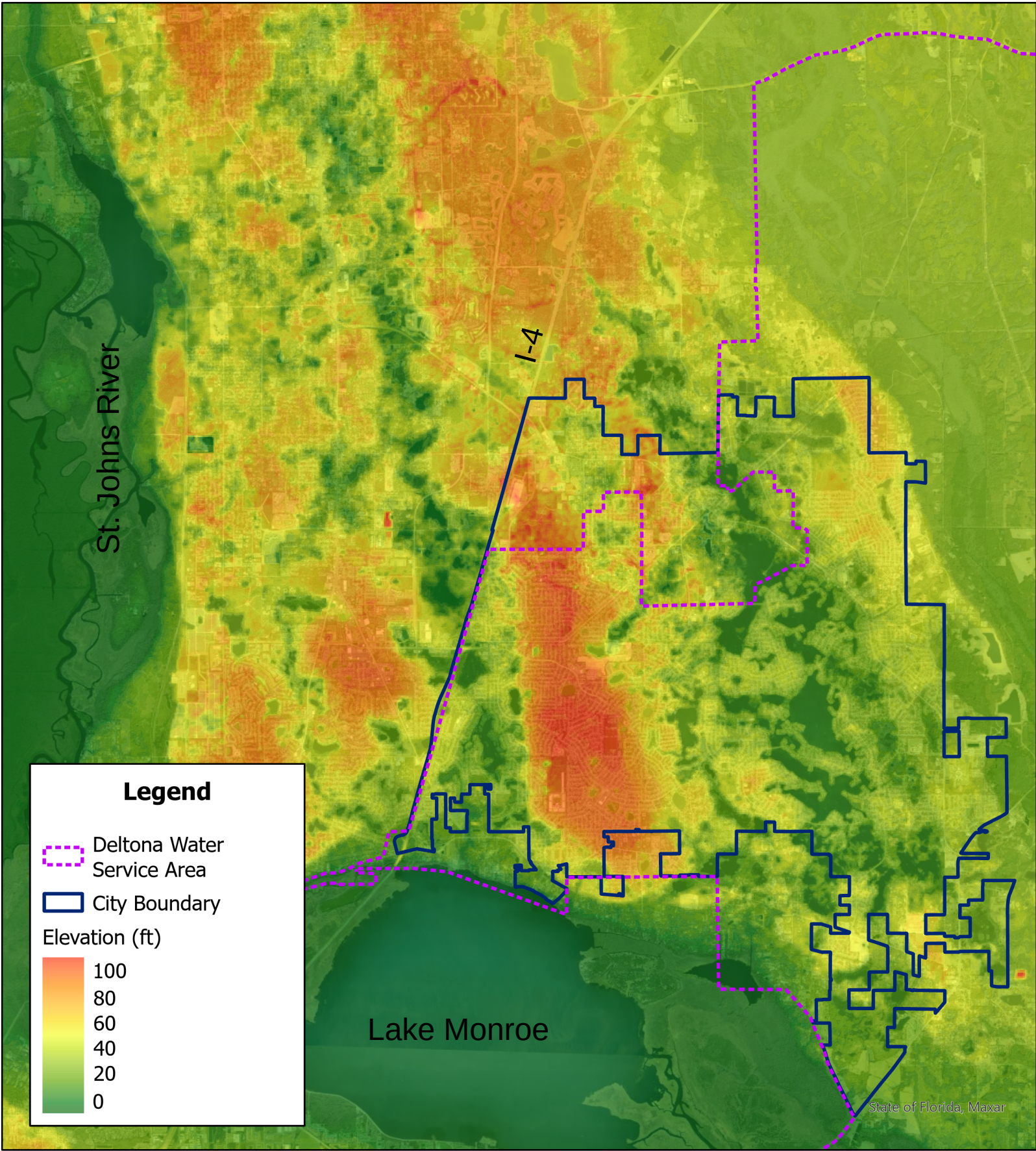
The City's wastewater service area covers approximately 145 square miles, including the incorporated limits of the City less the Deltona North service area (served by Volusia County's North Deltona Water Reclamation Facility), small areas of unincorporated Volusia County, and the Chapter 180 service area adopted by the City in 2005 and modified in 2010. Although the City does not currently provide wastewater service in the Chapter 180 service area, the City has "first right of refusal" to serve new developments per Florida Statutes. The service area for the DLWRF covers the western portion of the City and a few areas outside the City.

B. Climate

The climate of Deltona may be generally characterized as subtropical with high humidity and warm temperatures. The annual average maximum monthly temperature is approximately 82°F. During the hottest months, June through August, temperatures generally exceed 90°F. Winters are generally short and mild with the annual average minimum monthly temperatures of 60°F. The coldest month, January, has an average low temperature of 60°F (SERCC Online website - Historical Climate Summaries- NOAA station Deland 1 SSE, 082229). The mean average annual rainfall was 55.4 inches. The highest mean monthly rainfall occurred in July and the lowest monthly rainfall occurred in November.

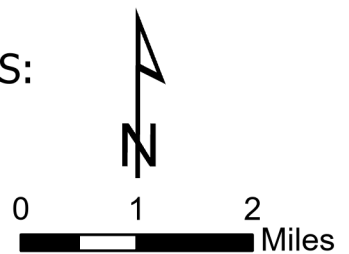
C. Topography

Deltona is primarily located within the Crescent City – Deland Ridge physiographic area. Land elevations within this area can range from a low of 25 feet near lakes on the east side of Deltona to over 110 feet in the west central portion of the Deltona. A small portion of Deltona (southern portion along Doyle Road near Lake Monroe) is within the St. Johns Offset where elevations are generally lower than within the Crescent City-Deland Ridge. The St. Johns Offset is the portion of the St. Johns River where the river turns west near Sanford south of Deltona before turning north again. Land elevations within the St. Johns Offset are typically 50 feet or less. **Figure 2-1** shows the City's topography.



**DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
TOPOGRAPHIC MAP**
City of Deltona
Volusia County, FL

Figure 2-1



D. Hydrology and Wetlands

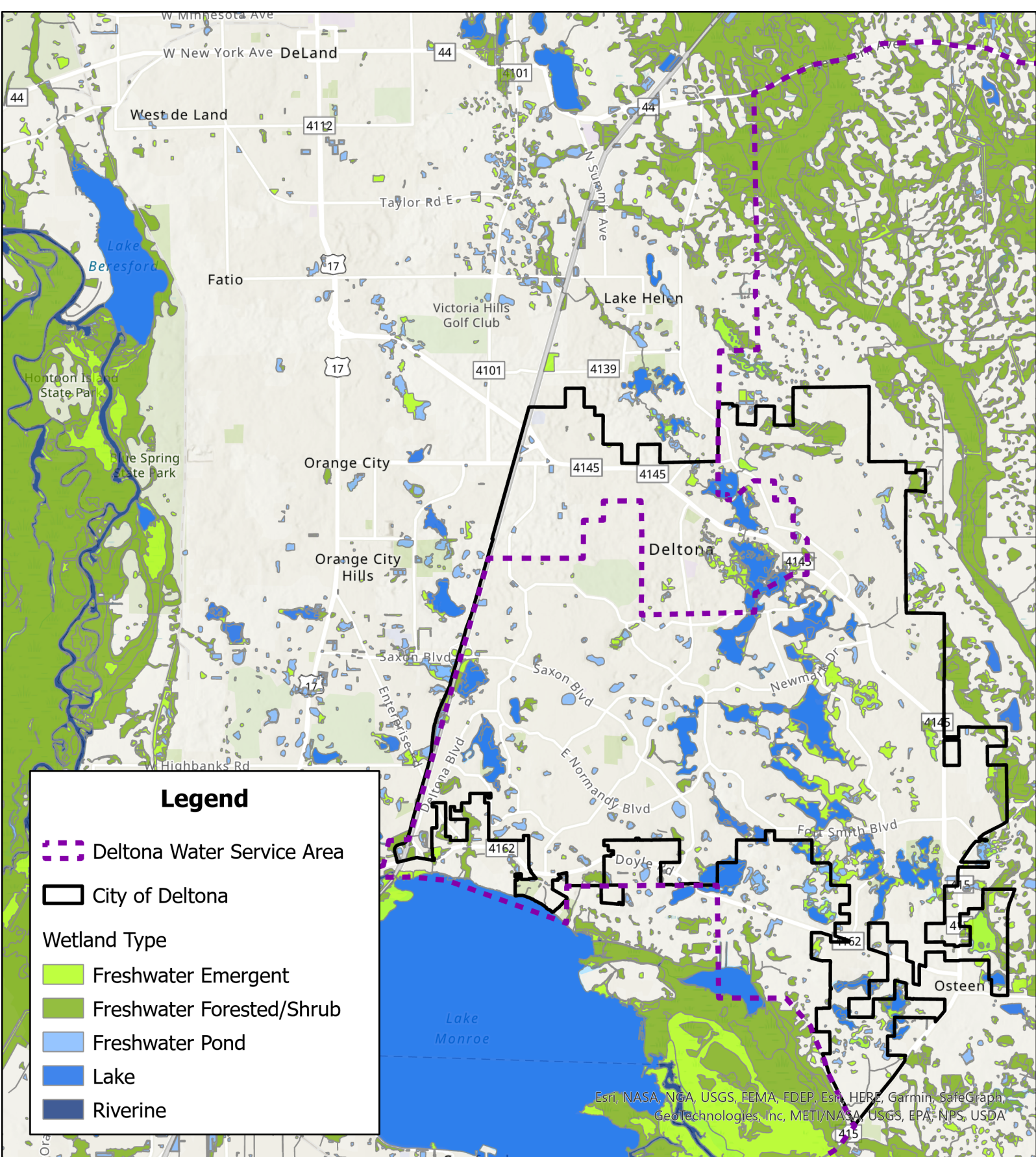
The hydrology in Deltona generally flows to east and south from the Deland Ridge towards the St Johns River or Lake Monroe. Deltona has numerous lakes that collect stormwater runoff and are interconnected by canals, culverts, and pump stations. Several of the lakes are land-locked and the only outlet of water is either through evapotranspiration or percolation. Because of the common karst geology of the area, many of the lakes or depressional areas are a result of sinkhole formations.

Figure 2-2 shows the five wetland types within the City, namely freshwater emergent, freshwater forested/shrub, freshwater pond, lake and riverine. Freshwater emergent and lakes are the two dominant types.

E. Floodplains

Figure 2-3 shows the Federal Emergency Management Agency (FEMA) National Flood Insurance Program maps of the City. The FEMA flood zones are divided into one of three categories: 0.2% Annual Flood Hazard zone, Zone A and Zone AE. Zone A and AE fall within the Special Flood Hazard Area (SFHA) while 0.2% Annual Flood Hazard zone is outside the SFHA. A description of these three flood zones is:

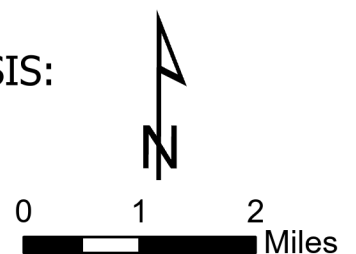
- Zone A is the flood insurance rate zone that corresponds to the 1-percent annual chance flood event determined by approximate methods of analysis.
 - Zone AE is the flood insurance rate zone that corresponds to the 1-percent annual chance flood event determined by detailed methods of analysis.
- 0.2% Annual Flood Hazard zone represents the areas outside the SFHA and higher than the elevation of 0.2 percent annual chance of flooding.

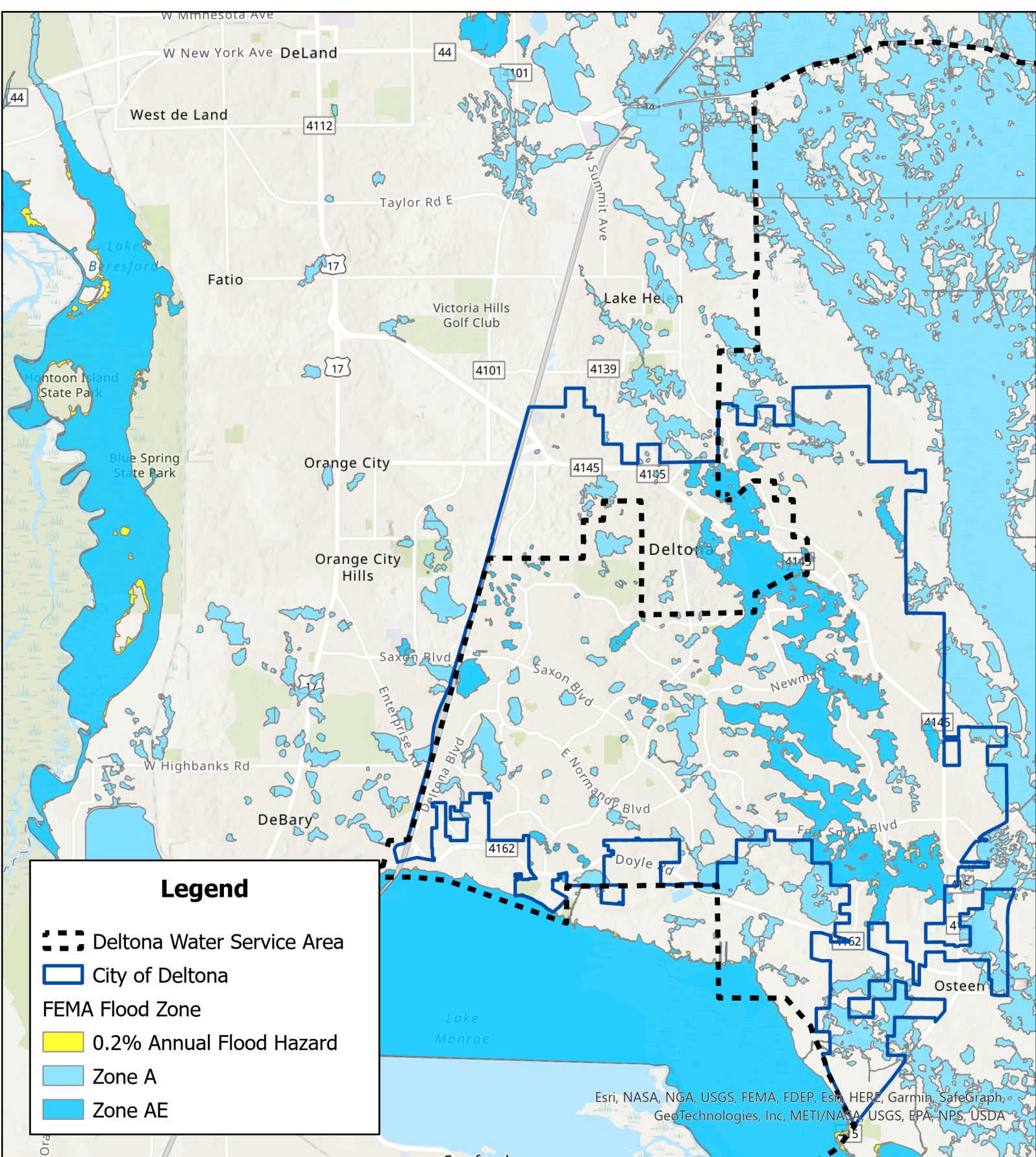


DELTONA LAKES/FISHER WRF PLANNING ANALYSIS: WETLAND MAP

City of Deltona
Volusia County, FL

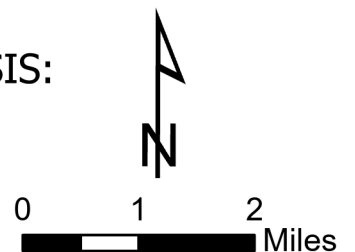
Figure 2-2





DELTONA LAKES/FISHER WRF PLANNING ANALYSIS: WASTEWATER SYSTEM MAP City of Deltona Volusia County, FL

Figure 2-3



F. Hydrogeology

The groundwater system in the Deltona general area consists of the surficial aquifer, the Upper Floridan Aquifer (UFA), and the Lower Floridan Aquifer (LFA). In general, the surficial aquifer is relatively thin. The groundwater table tends to follow the contours of the land occurring at or near the ground surface in low lying areas and several feet below ground surface in regions with higher elevations. In low lying areas near Lake Monroe, the aquifer is usually less than twenty feet thick. However, it can be greater than sixty feet thick in areas with higher ground surface elevations. The superficial aquifer produces relatively low yielding wells when compared to the UFA.

The top of the UFA is between -20 feet and -60 feet in the Deltona area. Transmissivity of the UFA ranges from around 6,000 square feet per day to 250,000 square feet per day. In Deltona, the transmissivity is lower around 6,000 to 20,000 square feet per day. There is limited information on the hydraulic conductivity of the LFA due to relatively few hydraulic conductivity tests on the aquifer. This is because the depth, quantity, and quality of the aquifer make it uneconomical as a potable water source. The top of the LFA occurs around -700 feet and is approximately 1400 feet thick in the Deltona area.

In most areas of Deltona, the UFA is recharged by water from the surficial aquifer. However, discharge to the surficial aquifer from the UFA can occur in low lying areas. The recharge is affected by rainfall as surficial aquifer ground water levels fluctuate with rainfall.

G. Plant and Animal Communities

A list of federally endangered, threatened, and other species of concern for Volusia County as available from the US Fish and Wildlife Service (USFWS) is provided in **Appendix A**, State and Federal Florida Natural Areas Inventory (FNAI) Species in the City of Deltona and Surrounding Areas are shown. A site-specific study/evaluation would be performed for the preferred alternative to determine specific species present at the site(s).

H. Archaeological and Historical Sites

A search of the National Park Service (NPS) Heritage Documentation Programs (via the US Library of Congress) showed no historical sites in the project areas. The NPS Heritage Documentation Programs includes records maintained in the Historic American Buildings Survey (HABS), Historic American Engineering Record (HAER), Historic American Landscapes Survey (HALS), and the Cultural Resources Geographic Information Systems (CRGIS). At the state level, a search of the State Historic Preservation Officer (SHPO) records showed structures within the project areas. The SHPO is the Director of Florida's Division of Historical Resources serving as liaison with the NPS. The locations of structures and cemeteries identified as historical or archaeological sites are shown in **Table 2-1**.

TABLE 2-1: SHPO STRUCTURES AND CEMETERIES WITHIN THE PROJECT AREA

Site Name	Address	Year Built	Use
Cobb House	1040 Braddock Road	c1910	Private Residence
St. Paul's AME Church	1580 Enterprise Road	c1930	House of Worship
1560 Timber Trail	1560 Timber Trail	c1925	Private Residence
Northrup House	910 DeBary Avenue	c1915	Private Residence
Historic Structure I	2575 Enterprise Osteen Road	1922	Private Residence
Garfield Settlement Cemetery		1881	Abandoned Cemetery

I. Land Use

Figure 2-4 shows City's land uses, Developed, Low Intensity being the predominant one followed by Open Water.

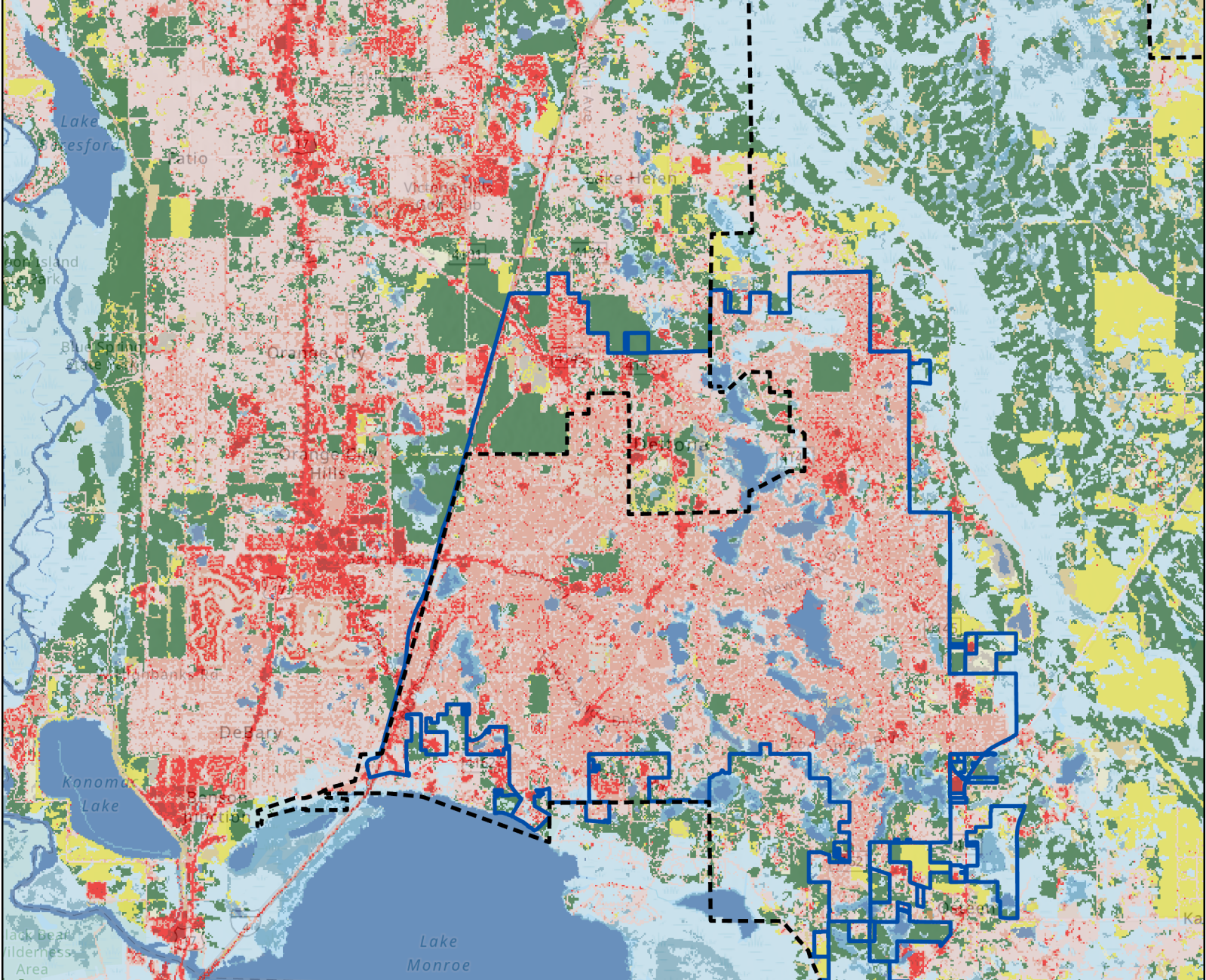
J. Soils

Figure 2-5 shows City's soil map. The soils are classified by Natural Resources Soil Conservation. The breakdowns are shown in **Table 2-2**. More than one third of the soils in the City are Paola fine sand, 0 to 8 percent slopes, followed by Astatula fine sand, 0 to 8 percent slopes. Both of them are very deep, excessively drained soils.

TABLE 2-2: CITY OF DELTONA SOIL TYPES

Soil Classification	Acres	Percent
Paola fine sand, 0 to 8 percent slopes	9,114.7	34.80%
Astatula fine sand, 0 to 8 percent slopes	3,332.5	12.70%
Water	2,802.8	10.70%
Orsino fine sand, 0 to 5 percent slopes	1,856.0	7.10%
Daytona sand, 0 to 5 percent slopes	1,157.1	4.40%
Quartzipsamments, gently sloping	952.4	3.60%
Apopka fine sand, 0 to 5 percent slopes	926.2	3.50%
Paola-Urban land complex, 0 to 8 percent slopes	844.5	3.20%
Tavares fine sand, 0 to 5 percent slopes	773.7	3.00%
Myakka-Myakka, wet, fine sands, 0 to 2 percent slopes	616.6	2.40%
St. Lucie fine sand, 0 to 5 percent slopes	608.6	2.30%
Immokalee sand	483.7	1.80%
Myakka fine sand, frequently ponded, 0 to 1 percent slopes	418.9	1.60%
Paola fine sand, 8 to 17 percent slopes	368.0	1.40%
Satellite sand, 0 to 2 percent slopes	279.1	1.10%
Cassia fine sand, 0 to 2 percent slopes	265.1	1.00%
Samsula muck, frequently ponded, 0 to 1 percent slopes	197.6	0.80%
Hontoon muck, frequently ponded, 0 to 1 percent slopes	151.3	0.60%

Soil Classification	Acres	Percent
Placid fine sand, frequently ponded, 0 to 1 percent slopes	148.5	0.60%
Basinger fine sand, frequently ponded, 0 to 1 percent slopes	135.6	0.50%
Electra fine sand, 0 to 5 percent slopes	103.4	0.40%
Myakka-St. Johns complex	66.2	0.30%
Satellite-Urban land complex	88.6	0.30%
Smyrna-Smyrna, wet, fine sand, 0 to 2 percent slopes	84.5	0.30%
St. Johns fine sand	82.3	0.30%
Astatula fine sand, 8 to 17 percent slopes	49.2	0.20%
Myakka-Urban land complex	53.7	0.20%
Pits	52.9	0.20%
Pomona-St. Johns complex	59.1	0.20%
Farmton fine sand	38.7	0.10%
Pomona fine sand, depressional, 0 to 2 percent slopes	14.2	0.10%
Wauchula fine sand	30.7	0.10%
Wauchula fine sand, depressional	33.5	0.10%
Source: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx		



Legend

Deltona Water Service Area

City of Deltona

Land Use Classification

Unclassified

Open Water

Developed, Open Space

Developed, Low Intensity

Developed, Medium Intensity

Developed, High Intensity

Barren Land

Deciduous Forest

Evergreen Forest

Mixed Forest

Shrub/Scrub

Herbaceous

Hay/Pasture

Cultivated Crops

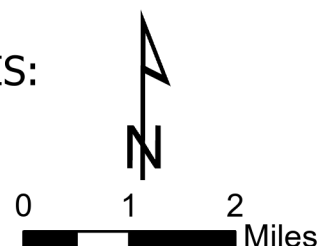
Woody Wetlands

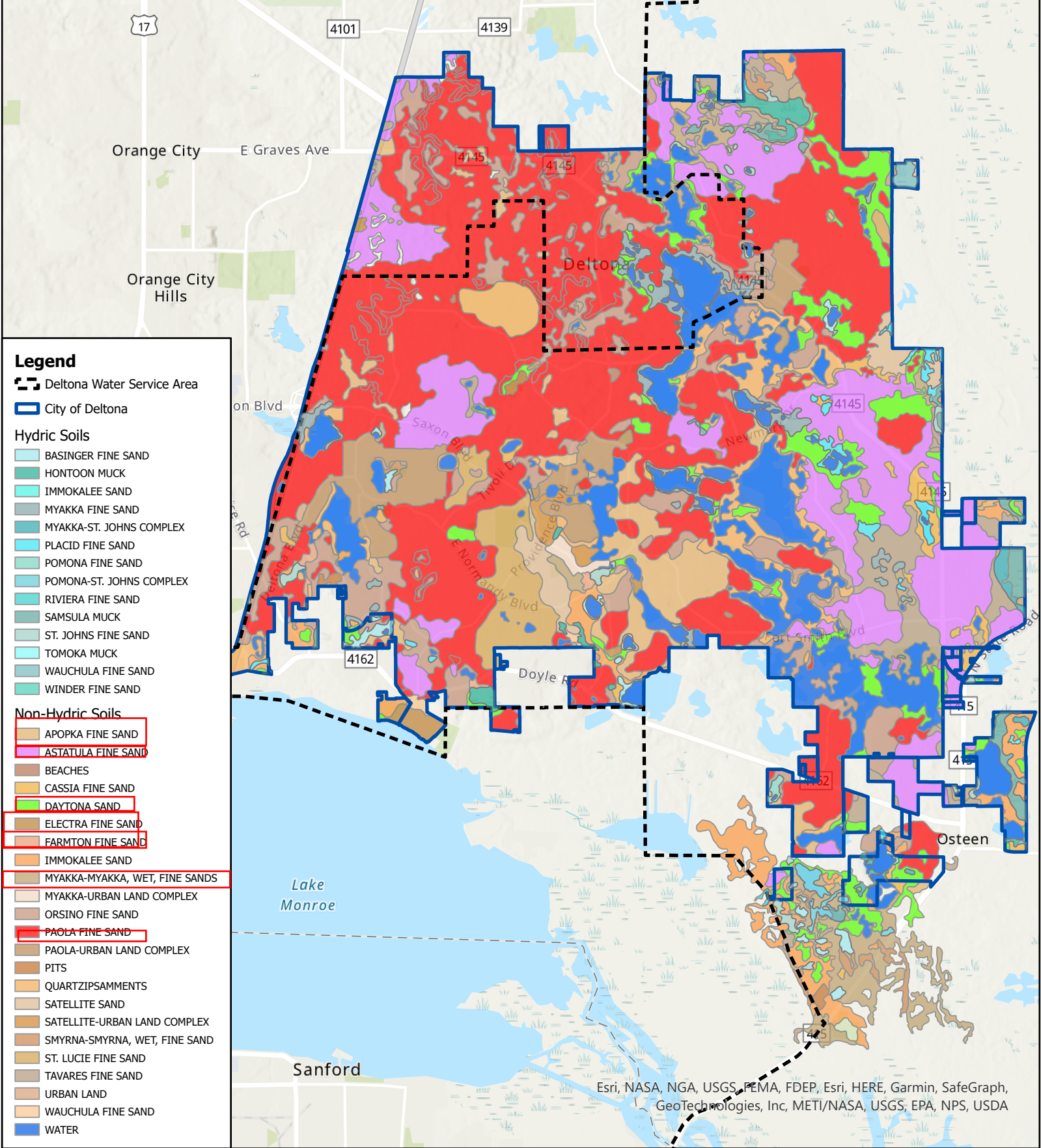
Emergent Herbaceous Wetlands



DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
LAND USE
 City of Deltona
 Volusia County, FL

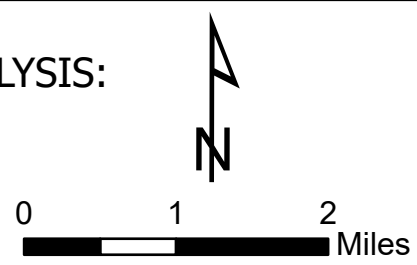
Figure 2-4





DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
SOILS
City of Deltona
Volusia County, FL

Figure 2-5



3. Existing Wastewater System

A. Wastewater Service Area and System

DW currently provides water services to approximately 33,000 customers and wastewater services to approximately 6,000 customers. Most of the residents in the City utilize OSTDS, commonly known as septic systems or septic tanks for wastewater disposal. **Figure 1-1** shows the DW water service area, the existing sewer system and the locations of the two existing water reclamation facilities – DLWRF and EWRF.

DW owns and operates two (2) wastewater treatment plants: DLWRF and EWRF. DLWR has a permitted capacity of 1.4 MGD while EWRF has a permitted capacity of 1.0 MGD AADF. In 2022, a total of 0.51 MGD to DLWRF while 0.48 MGD AADF to EWRF. Among the 6,000 wastewater customers, residential customers are nearly 95% while commercial customers make up the remaining 5%. About 91% of the wastewater customers reside inside of the city limits while the remaining 9% reside outside of the city limits. Residents served outside the City are on Stone Island, in unincorporated Volusia County. The wastewater from the area north of the DW water service area and south of the City's limit is served by Volusia County's Deltona North WRF.

Based on the data provided by the City in May 2023, DW owns and operates nearly 38.5 miles of sewer force mains, 62.1 miles of gravity sewers, 51 lift stations and two WRFs.

B. Historical Wastewater Flows

Annual flow data summarized from the Discharge Monitoring Reports (DMRs) from 2007 to 2022 are shown in **Table 3-1**. The total number of parcels and average flow per parcel are also provided. The average flow per parcel ranges from 132 to 192 gallons per day (GPD). The highest, 192 GPD, occurred in 2022, might be due to Hurricane Ian and Hurricane Nichole, which caused excessive infiltration and inflow to the gravity sewers; or due to lower estimated number of parcels; or both. The average per capita flow varies from 46 to 67 gallons per capita per day (GPCD) between 2007 and 2022. The highest, 67 GPCD was recorded in 2022. The variation could be mainly due to precipitation differences.

The flow splits between DLWRF and EWRF are shown in **Table 3-2**. The maximum AADF to DLWRF was 0.68 MGD in 2019 and the AADF decreased gradually to 0.51 MGD in 2022. The decrease may be attributable to more flow diverted to EWRF and the City's active infiltration and inflow reduction program.

TABLE 3-1: HISTORICAL WASTEWATER FLOWS AND PARCELS SEWERED

Year	Total Annual Average Wastewater Flow (MGD)	City Parcel Count	Outside City Parcel Count	Total Parcels Served	Average Flow per Parcel (GPD)	Average Flow per Capita (GPCD) ^(c)
2007	0.82	5496 ^(a)	-	5496 ^(a)	149	52
2008	0.93	5464 ^(a)	-	5464 ^(a)	170	59
2009	0.89	5416 ^(a)	-	5416 ^(a)	164	57
2010	0.82	5366 ^(a)	-	5366 ^(a)	153	53
2011	0.79	5370 ^(a)	-	5370 ^(a)	147	51
2012	0.77	5372 ^(a)	-	5372 ^(a)	143	50
2013	0.77	5408 ^(a)	16 ^(a)	5424 ^(a)	142	49
2014	0.73	4992 ^(a)	520 ^(a)	5512 ^(a)	132	46
2015	0.82	5083 ^(a)	523 ^(a)	5606 ^(a)	146	51
2016	0.89	5164 ^(a)	527 ^(a)	5691 ^(a)	156	54
2017	0.97	5207 ^(a)	527 ^(a)	5734 ^(a)	169	59
2018	1.08			6000 ^(b)	180	63
2019	1.04			6000 ^(b)	173	60
2020	1.10			6000 ^(b)	183	64
2021	0.98			6000 ^(b)	163	57
2022	1.15			6000 ^(b)	192	67
Data Sources: (a) Water, Wastewater, and Reclaimed Water Master Plan Update, WSP, November 27, 2019 (b) Assumed. (c) Average household size is 2.87 persons per https://www.census.gov/quickfacts/fact/table/deltonacityflorida/PST045222 .						

TABLE 3-2: WASTEWATER FLOW SPLITS BETWEEN DLWRF AND EWRF

Year	Annual Average Flow to DLWRF (MGD)	Annual Average Flow to EWRF (MGD)
2017	0.67	0.32
2018	0.62	0.36
2019	0.68	0.41
2020	0.63	0.40
2021	0.59	0.51
2022	0.51	0.48

C. DLWRF Treatment System

DLWRF has two separate treatment trains: a 0.9 MGD contact stabilization train and a 0.5 MGD oxidation ditch train. The contact stabilization treatment train consists of aeration and secondary clarification, while the oxidation ditch treatment train consists of aeration and clarification using an intra-channel clarifier, commonly known as a BOAT clarifier. Following treatment, the reclaimed water from both the treatment trains is combined and used for on-site non-potable use, or sent to public access reuse irrigation customers or sent to rapid infiltration basins (RIBs) for aquifer recharge or wet weather disposal. **Figure 3-1** illustrates the existing layout of DLWRF.

The dual channel pretreatment structure is equipped with a mechanical bar screen in the primary channel and a manual bar screen in the bypass channel. The discharge from the pretreatment structure gravity flows to a splitter box, diverting flow to either an equalization (EQ) tank or directly to the oxidation ditch treatment train. A flow control device on the EQ tank regulates the volume of flow to the contact stabilization treatment train. A floating mixer aerates the EQ tank to keep solids in suspension and prevent malodorous conditions. Flow attenuation is provided for the 0.9 MGD contact stabilization treatment train via the EQ tank and a constant flow rate of 0.25 MGD is supplied to the oxidation ditch, thus for the purposes of this report, the capacity of each unit downstream of the pretreatment structure will be evaluated at average daily flow (ADF).

Extended aeration treatment is provided by the 0.5 MGD ADF oxidation ditch treatment train, which consists of one oxidation ditch and one intra-channel (BOAT) clarifier. Two brush aerators within the oxidation ditch aerate the mixed liquor and maintain flow velocity with the mixed liquor entering the rear of the BOAT clarifier for settling. Return Activated Sludge (RAS) is internally recycled within the oxidation ditch while Waste Activated Sludge (WAS) is pumped to Digester No. 1. The clarified effluent gravity flows to the Intermediate Pump Station where it is combined with alum and pumped to the effluent filters. Scum collected from the perimeter of the clarifier is collected at the On-Site Pump Station and routed to the pretreatment structure for re-processing.

The 0.9 MGD ADF contact stabilization train consists of one contact tank, two stabilization tanks, and three clarifiers. Screened wastewater blends in the contact tank with the Return Activated Sludge (RAS) from Stabilization Tank No. 2. The contact tank and both stabilization tanks are equipped with diffused aeration systems (the stabilization tanks also have floating mechanical aerators) to maintain solids in suspension and satisfactory dissolved oxygen (DO) levels.

The discharge from the contact tank is split among the three clarifier units. Clarifiers No. 1 and 2 are peripheral feed units while Clarifier No. 3 is a center feed unit. Sludge collected from each clarifier is pumped by the RAS/WAS pumps either to Stabilization Tank No. 1 for return or to Digester No. 1 for wasting. The clarified effluent gravity flows to the Intermediate Pump Station where it is combined with alum and pumped to the effluent filters. Scum from the surface of the clarifiers is collected in the Scum Pit and pumped either to Digester 2 or to the EQ tank.

The clarified effluent from both treatment trains gravity flows to the Intermediate Pump Station, where they are combined with alum, and pumped to the effluent filters. Effluent filtration consists of two sets of traveling bridge filters arranged in parallel. The filtered effluent from each unit is discharged in a common clear well, which is the source water for the automatic filter backwash cycles. Used backwash water

gravity flows to the On-Site Pump Station where is it pumped to the head of the plant.

The two (2) parallel chlorine contact basins receive flow via gravity from the effluent filtration clear well. Sodium hypochlorite solution is added at the head of either contact basin. Each basin includes four longitudinal baffles to create a serpentine flow pattern while maintaining laminar flow. The disinfected effluent gravity flows to the on-site Percolation / Holding Pond.

DLWRF has sufficient detention time to adequately reduce fecal coliform in the treatment plant effluent in accordance with high-level disinfection standards. At the discharge end of the chlorine contact basins, the pH and chlorine residual of the treated effluent is continuously monitored. A turbidity meter in the common filter clear well continuously monitors the Total Suspended Solids (TSS). A meter in the common filter clear well continuously monitors the Total Suspended Solids (TSS). These data are electronically recorded by the SCADA system. In the event that the effluent does not meet the water quality standards, water is automatically diverted to the Substandard Storage Tank. Water in the Substandard Storage Tank is pumped to the EQ tank and processed by the contact stabilization treatment train.

The disinfected effluent which meets the water quality standards gravity flows from the Chlorine Contact Basins to the onsite 1.9 MG Percolation / Holding Pond. From the holding pond, the treated effluent can be pumped to the reclaimed water distribution system or used on-site as irrigation, wash-down, or plant process water.

Two reclaimed water land application systems are permitted by the FDEP for the DLWRF. System R-001 consists of a 0.90 MGD AADF slow-rate public access system serving a golf course with an additional 0.50 MGD in residential subdivisions and other minor users (including the treatment plant). System R-001 also includes 0.050 MGD AADF of infiltration capacity supplied by the On-Site Holding / Percolation Pond. There is no surface water outfall or injection well discharge facility permitted. A previously permitted outfall has been off-line and unused for approximately 15 years and does not appear in the current operating permit.

The existing permitted reuse capacity exceeds the permitted treatment capacity. Reuse system R-002 is used in times of low irrigation demand from users associated with reuse system R-001.

Waste Activated Sludge (WAS) from both treatment trains is pumped to Digester No. 1 for aerobic digestion, then combined with a polymer coagulant and pumped to the Dewatering Screw Press to be thickened to a solids content of approximately 17%. The dewatered sludge is loaded into a 'roll off' dumpster for hauling and disposal. The digesters are aerated with a diffused aeration system. Supernatant from the Digesters and the Dewatering Screw Press are conveyed to the On-Site Pump Station. Residuals produced at this facility are unclassified and thus are hauled to a permitted residuals management facility (RMF) for further treatment and/or to a Class I or II solid waste landfill for disposal. DW currently contracts Shelley's Environmental Systems, Inc. for this task.

4. DLWRF Condition Assessment

On June 21, 2023, Mead & Hunt conducted a condition assessment of DLWRF. The physical conditions of each process are summarized in **Table 4-1**. In general, most processes are in poor conditions. The conditions of the treatment process are described further below.

TABLE 4-1: SUMMARY OF DLWRF PROCESS PHYSICAL CONDITIONS

Process	Component	Physical Condition
Influent Structure	Mechanical Bar Screen	Good
	Manual Bar Screen	Poor
	Splitter Box	Poor
	Electrical	Poor
	Instrumentation	Fair
	Treatment Efficiency	Good
Flow Equalization Tank	Structure	Poor
	Electrical	Poor
	Instrumentation	Poor
	Treatment Efficiency	Poor
Clarifier 1	Structures	Fair
	Clarifier Drive	Fair
	Electrical	Fair
	Capacity	Poor
	Treatment Efficiency	Fair
Clarifier 2	Structures	Fair
	Clarifier Drive	Poor
	Electrical	Fair
	Capacity	Fair
	Treatment Efficiency	Fair
Clarifier 3	Structures	Poor
	Clarifier Drive	Poor
	Electrical	Fair
	Capacity	Fair
	Treatment Efficiency	Fair
Contact Tank	Structure	Poor
	Capacity	Poor
	Diffusers	Poor
	Blowers	Poor
	Treatment Efficiency	Poor
Stabilization Tank 1	Structure	Poor
	Capacity	Poor
	Treatment Efficiency	Poor
Stabilization Tank 2	Structure	Fair
	Capacity	Poor
	Treatment Efficiency	Poor
Digester 1	Structure	Fair
	Diffusers	Poor
	Blowers	Poor
	Capacity	Good
	Treatment Efficiency	Fair
Digester 2	Structure	Poor
	Diffusers	Poor

Process	Component	Physical Condition
	Blowers	Poor
	Capacity	Good
	Treatment Efficiency	Poor
Intra-Channel Boat Clarifier	Structure	Good
	Capacity	Good
	Brush Aerators	Poor
	Treatment Efficiency	Fair
Oxidation Ditch	Structure	Fair
	Capacity	Good
	Treatment Efficiency	Fair
Effluent Filters	Structure	Fair
	Capacity	Fair
	Media	Poor
	Treatment Efficiency	Poor
Chlorine Contact Basins	Structure	Good
	Capacity	Fair
	Treatment Efficiency	Fair
Percolation Holding Pond	Structure	Good
	Capacity	Good
	Treatment Efficiency	Good
Intermediate Pump Station	Structure	Poor
	Electrical	Fair
	Capacity	Good
High Service Pump Station	Structure	Fair
	Electrical	Good
	Capacity	Good

A. Influent Structure

Sluice gates on the influent structure are not operating properly and do not move properly. Operators have to rake the screen manually. They expressed a need for a second mechanical bar screen. Concrete on the structure is deteriorating and has experienced discoloration. The coating on the concrete has faded. The autosampler is not operating properly. Recently, some backfeeding has occurred on the electrical panel of the influent structure. The actuator valve is not operating properly. Currently, the influent structure does not have a grit removal system. The City pays for grit removal. The operators have expressed a need for an onsite grit removal system.



SCREEN MANUALLY RAKED



INFLUENT STRUCTURE

B. Flow Equalization Tank

The 335,000-gallon equalization tank is in failing condition. There are holes on the outer structure of the tank. There is rust and corrosion on the metal parts of the tank. The equalization pumps are relatively new and in good condition. The control panel is in good condition. Operators have expressed a need for an entirely new equalization basin.



C. Clarifiers

The clarifiers have experienced deterioration and structural issues. There are bad cracks and leaking on the outside of the concrete structures. However, the treatment efficiency is acceptable. The mechanism drive on Clarifier 3 is in poor operating condition. Clarifier 3 has leaking cold joints and its valves are operating poorly. Clarifiers 1 and 2 are served by 2 Return Activated Sludge (RAS) Pumps, and clarifier 1 requires a new RAS Pump.



RUST AND CORROSION ON CLARIFIER 2

D. Contact Tank

The Contact Tank is having issues with diffusers and mixer aeration. This tank is nearing the end of its useful life. The contact stabilization switch gear is relatively new, but the exterior is showing superficial rust.

E. Stabilization Basins

The exterior structure of the stabilization tanks is fair with some cracks in concrete. The influent valve operating poorly. The flow splitter is nearing the end of its useful life. The blowers are operating well but are nearing the end of their useful life. Diffusers and aerators are not operating efficiently. Re-aeration tanks 1 and 2 are in need of diffusers. The floating mixer aerator is about 20 years old and is nearing the end of its useful life.

F. Digesters

Digester 1 is experiencing issues with diffuser efficiency. About 50% of the diffusers are in poor operating condition. New stainless-steel piping to the blowers is needed. The diffusers and blowers in Digester 2 are in poor operating condition.

G. Oxidation Ditch Treatment Train

The BOAT clarifier provides fair treatment efficiency. The operating staff has reported that disturbances cause effluent levels to be undesirable for up to three weeks after the disturbance has occurred. The southwest aerator is in poor condition and needs replacement. The shaft, motor, and drive are in fair condition.



AERATOR SHAFT,
MOTOR AND DRIVE

H. Effluent Filtration

The effluent filtration tank has experienced issues with media. The media is not sealed properly and there are leaks. The plastic in the filter underdrain needs replacement because media is lost due to improper sealing. The filter effluent gates are in poor condition and need to be replaced.



FILTERS

I. Intermittent Pump Station

The interior structure of the intermediate pump station is damaged. There is pitting and cracking on the structure. The Alum storage is in poor condition and needs replacement. The alum storage currently does not have a cover. The operators expressed a need for a cover on the Alum storage tank. The filter and bypass actuators are in poor condition and need replacement. The pump station requires concrete repairs and recoating.



*DAMAGE OF CONCRETE IN INTERIOR OF
INTERMEDIATE PUMP STATION*



INTERMEDIATE PUMP STATION

J. Sub-Standard Storage Tank

The three vertical turbines on the substandard tank pumps are in poor condition and should be rebuilt. Five valves need to be replaced. Automatic reject valves need to be replaced.

K. Other Site Condition Assessments

Overall, the electrical building is operating well. The lab building is in good condition. However, there are some aesthetic issues with the lab. The counter tiles are loose in some areas. The floor tiles are worn in some areas. The chlorine tank cover is in poor structural condition and should be replaced. There is severe rust and corrosion at the base of the beams over the chlorine tank cover.

The lighting on the site needs upgrades. Generator building doors are in poor condition and should be replaced. The generator itself is in good operating condition. The fuel tank is in good condition, but the tank feet are rusting from water in the open containment. New fuel is needed. The switchgear is operating well and the main MCC is operating well. The on-site lift station has a single pump. For redundancy purposes, a second pump for this lift station is preferred.

A test-sample shed with Siemens testing equipment is located East of the filters and chlorine contact basins. This building and its equipment are in good condition.

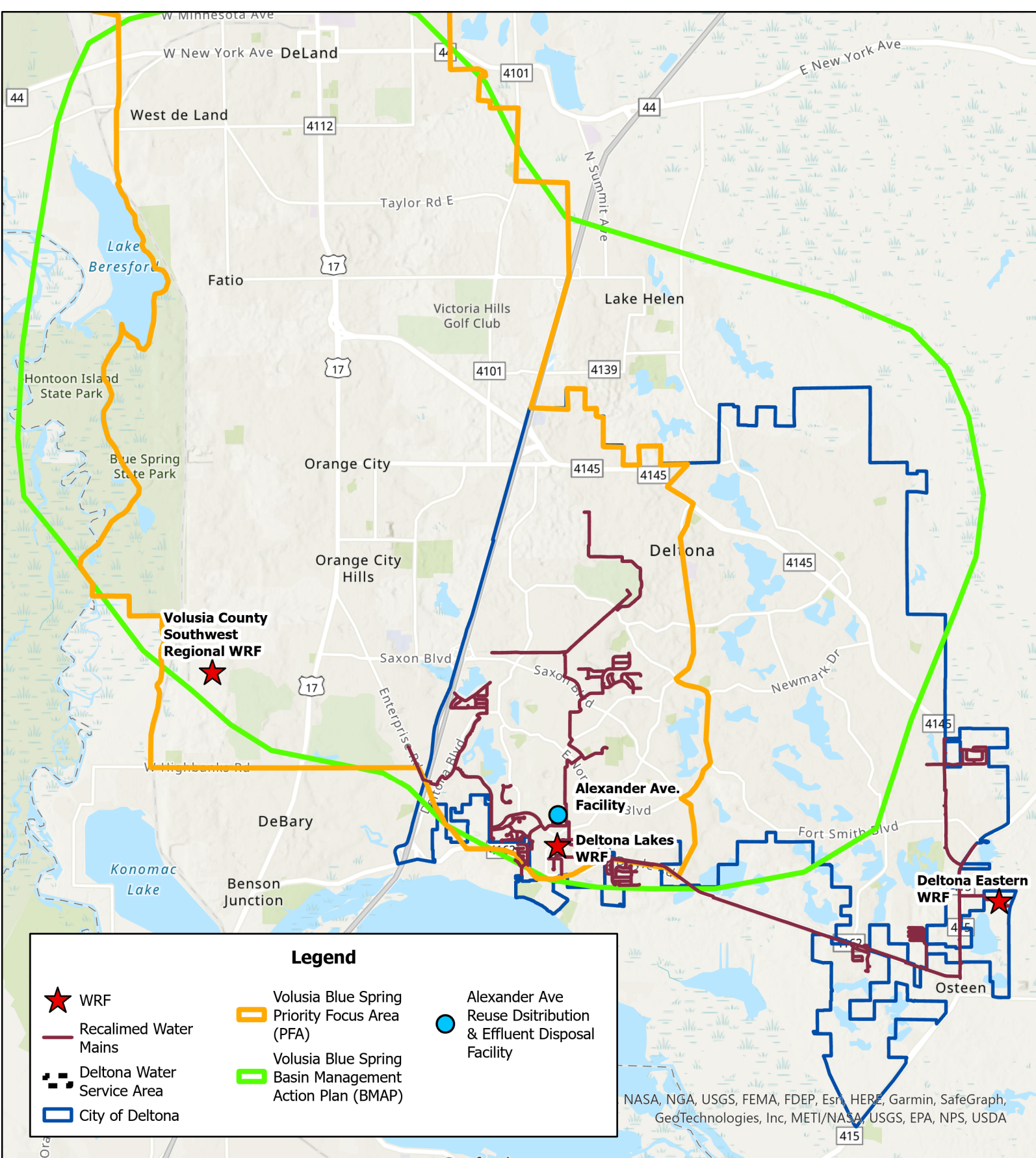
5. Existing Effluent Disposal System

A. System Description

Effluent disposal is one of the major criteria to be considered for deciding the future of DLWRF as the City is facing effluent disposal challenges due to a small reuse customer base. DW's reclaimed water infrastructure currently includes approximately 45.9 miles of reclaimed water transmission and distribution pipeline that connect DW's two WRFs, and the Alexander Avenue Water Resources Facility to its public access reuse (PAR) customers and the RIB site at the Alexander Avenue Water Resources Facility, as shown in **Figure 5-1**. There are two reclaimed water interconnections with Volusia County, allowing transfer of reclaimed water to the County for groundwater recharge and wet weather disposal.

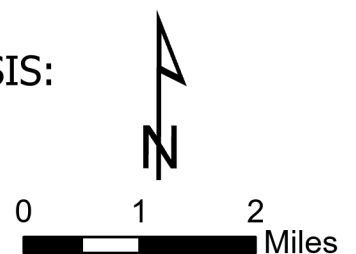
The City's effluent disposal system is schematically depicted in **Figure 5-2**. DLWRF has a 1.9 million gallons (MG) onsite holding/percolation pond prior to distribution. The reclaimed water pond is unlined, allowing water to percolate into the ground. Water loss through percolation from the reclaimed water pond is permitted by the FDEP for 0.05 MGD AADF. EWRF has an onsite 5.0 MG ground storage tank (GST) storing PAR quality reclaimed water prior to distribution. The Alexander Ave. Facility features three GSTs, two 1.0-MG GSTs for post-treatment effluent from DLWRF, EWRF and the Alexander Ave Facility, and one 3.0-MG GST to store raw water. Starting in April 2016, excess reclaimed water from DLWRF and EWRF is pumped to the two 1.0-MG GSTs at the Alexander Ave. Facility. The Alexander Ave Facility has a reclaimed water distribution Master Pump Station. The distribution Master Pump Station has three horizontal split case pumps: two 2,100-gpm pumps and one 700-gpm pump to convey water to the distribution system. The total pumping capacity of the master pump station at the facility is 4,900 gallons per minute (GPM) or 7.05 MGD AADF. With the largest pump out-of-service, the firm capacity of the master effluent pump station is 2,800 GPM or 4.03 MGD to meet the PAR demand.

Reuse water storage at the Alexander Ave Facility is applied to golf courses, nursery and residential irrigation. The surplus is applied to the RIBs at the facility. The RIB site at the Alexander Ave Facility is currently the only DW-owned aquifer recharge and excess wet weather disposal facility. The RIBs have **ten basins** with a permitted total wetted area of 14.78 acres. The RIBs are permitted for a discharge of 1.0 MGD AADF. During emergency peak flow conditions, excess reclaimed water can be sent to the Volusia County's Deltona North RIBs through an interconnection with the County.



**DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
REUSE SYSTEM MAP**
City of Deltona
Volusia County, FL

Figure 5-1



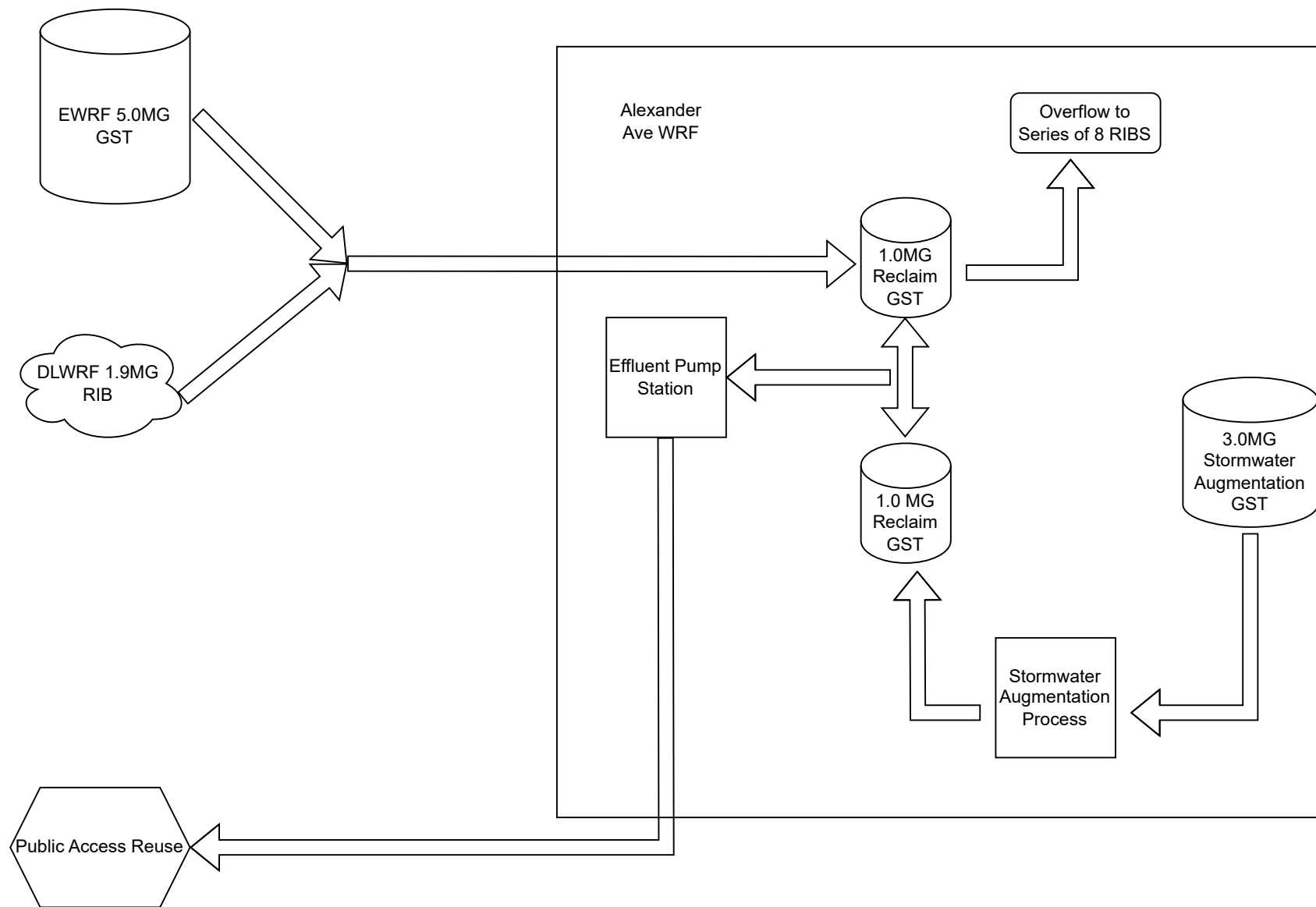


Figure 5-2 Schematic of Deltona Effluent Disposal System Provided by City

B. Permitted Reclaimed Disposal Capacity

The permitted reclaimed water disposal capacity for DLWRF is 1.405 MGD while it is 1.892 MGD for EWRF through Land Application R-001 and Land Application R-002 as shown in **Table 5-1**. The reclaimed water produced at DLWRF can be disposed of 0.050 MGD onsite and 1.4 MGD for RIB application at the Alexander Avenue site. 0.892 MGD of reclaimed water produced at EWRF is permitted for irrigations at Pell's Nurser, D-Ranch, Deltona Hills Golf Course and on site at the treatment plant; and 1.0 MGD for RIB application at the Alexander Ave Facility.

It seems that the combined permitted reclaimed water disposal capacity for DLWRF and EWRF is 3.297 MGD. But the actual capacity might be less than 1.897 MGD for the reasons discussed herein. First of all, the RIB application at the Alexander Ave site is included for both DLWRF and EWRF, hence it is double counted. Second, the actual capacity of the RIB site may be significantly less than its design capacity. This is discussed further below. It should be noted that the 1.4 MGD RIB-001 for DLWRF should be 1.0 MGD.

TABLE 5-1: PERMITTED RECLAIMED WATER DISPOSAL CAPACITY

Disposal Site Number	User Name	User Type	Capacity (MGD)	Acreage
DLWRF (Permit Number FLA11172)				
Land Application R-001 – Permitted Capacity 1.4 MGD AADF				
PAA-002	Residential and on-site irrigation	Residential Developments and On-site	0.050	
Land Application R-002 – Permitted Capacity 1.4 MGD AADF				
RIB-001	Alexander Avenue Site	Other Landscape Irrigation	1.4	
Sub Total – 1.405 MGD				
EWRF (Permit Number FLA709883)				
Land Application R-001 – Permitted Capacity 1.5 MGD AADF				
PAA-001	Pell's Nurser	Retail Nurseries, Ferneries, and Sod Farms	0.150	20
PAA-002	D-Ranch	Residential Developments	0.192	66
PAA-003	Deltona Hills Golf Course	Golf Course	0.400	20
PAA-004	On-Site Irrigation	Other Landscape Irrigation	0.150	226
Land Application R-002 – Permitted Capacity 1.0 MGD AADF				
RIB-001	Alexander Avenue Site Ten (10) Rapid Infiltration Basins	Other Landscape Irrigation	1.0	41
Sub Total – 1.892 MGD				

C. Historical Reclaimed Water Disposal

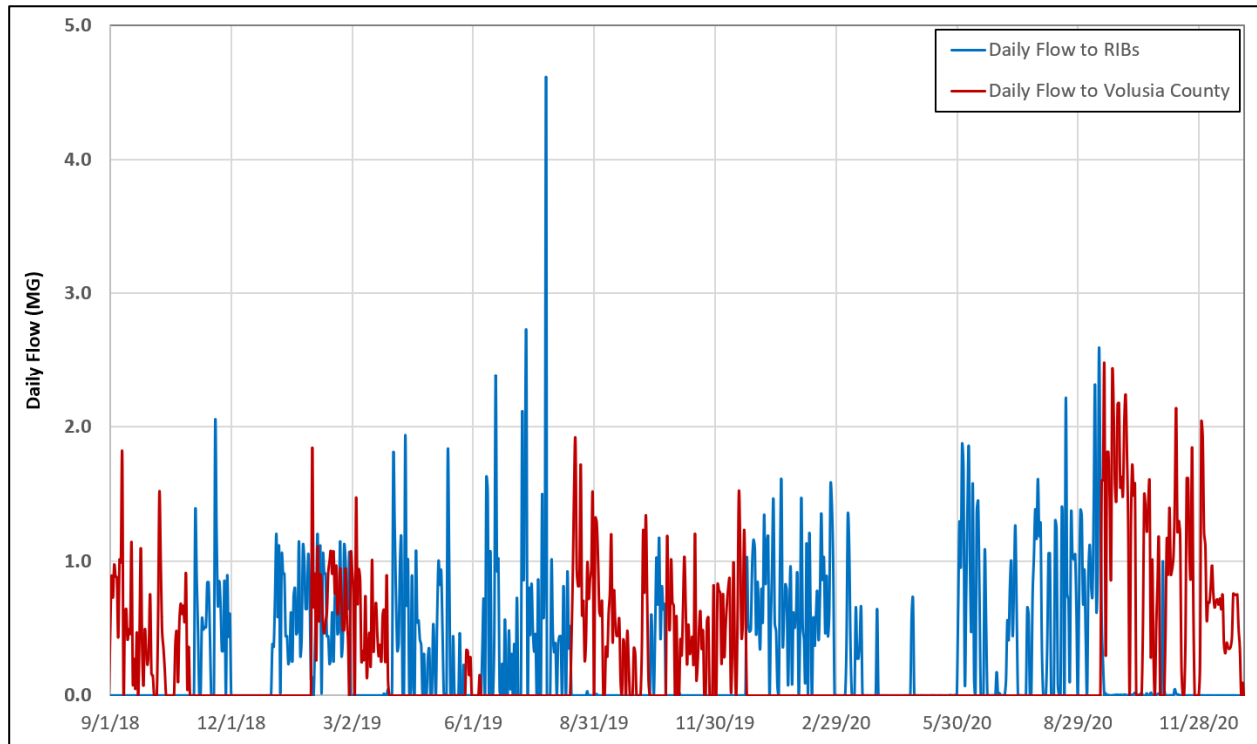
Table 5-2 shows the historical reclaimed water disposed of through public access reuse, RIB application at the Alexander Ave Site and Volusia County interconnections. Both the public access reuse and RIB application were much lower than the permitted capacities. Significant amount of reclaimed water was sent to Volusia County in 2019 and 2022. The actual existing capacity of public access reuse and RIB application might be much less than 1.0 MGD. If this were verified, it would pose a significant challenge for the City to manage its excess reclaimed water.

TABLE 5-2: HISTORICAL RECLAIMED WATER DISPOSAL

Year	Public Access Reuse (MGD)	RIBs at Alexander Ave Site (MGD)	Volusia County (MGD)	Total (MGD)
2017	0.41	0.70	0.00	1.11
2018	0.40	0.51	0.08	0.99
2019	0.38	0.26	0.29	0.92
2020	0.26	0.30	0.27	0.83
2021	0.33	0.33	0.01	0.66
2022	0.61	0.27	0.09	0.96

Per Rule 62-610.523(4) F.A.C., RIBs are designed to operate in a loading/resting cycle to allow restoration of percolation rates at the end of the resting cycle. RIBs at the Alexander Avenue site were designed for a 7-day loading period at an application rate of 3.0 inches per day followed by a 14-day resting cycle. However, DW staff indicated that the RIBs generally take longer than 14 days to recover per the WSP's 2019 Master Plan report. Based on the operational data of the RIBs since 2016, the actual percolation capacity of the RIBs appears to be less than its permitted 1.0 MGD AADF capacity. In 2017 the annual average flow to the RIBs was 0.70 MGD, it decreased to 0.51 MGD in 2018 and further decreased to around 0.30 MGD in the following years. It is recommended the City verify the actual RIB capacity. **Figure 5-3** shows the daily reclaimed water to the RIBs and Volusia County from September 1, 2018 to December 31, 2020.

FIGURE 5-3: DAILY RECLAIMED WATER TO RIBS AND VOLUSIA COUNTY



6. Wastewater Flow Projections

Wastewater flow increase will mainly result from population increase and OSTDS or septic to sewer conversion. The final Volusia Blue Spring BMAP expects local governments and utilities to develop master treatment feasibility analyses to identify areas to be sewerred or to have enhanced nitrogen reducing OSTDS within 20 years of BMAP adoption. The BMAP requires upon completion of the master wastewater treatment feasibility analyses, Florida Department of Health (FDOH) rulemaking, and funding program for homeowners included in the OSTDS remediation plan, but no later than 5 years after BMAP adoption, modification or repair permits issued by FDOH for all existing OSTDS within the PFA on lots of less than 1 acre to have enhanced treatment of nitrogen, unless sewer connections will be available based on a BMAP-listed project. All OSTDS subject to the policy must include enhanced treatment of nitrogen no later than 20 years after BMAP adoption. In addition, a utility is required to provide written notice to OSTDS owners of the availability of sewer lines for connection, no later than 1 year prior to the date the utility's sewerage system will become available, which triggers an obligation for OSTDS owners to comply with the requirements of Section 381.00655, F.S.

A. Population Growth

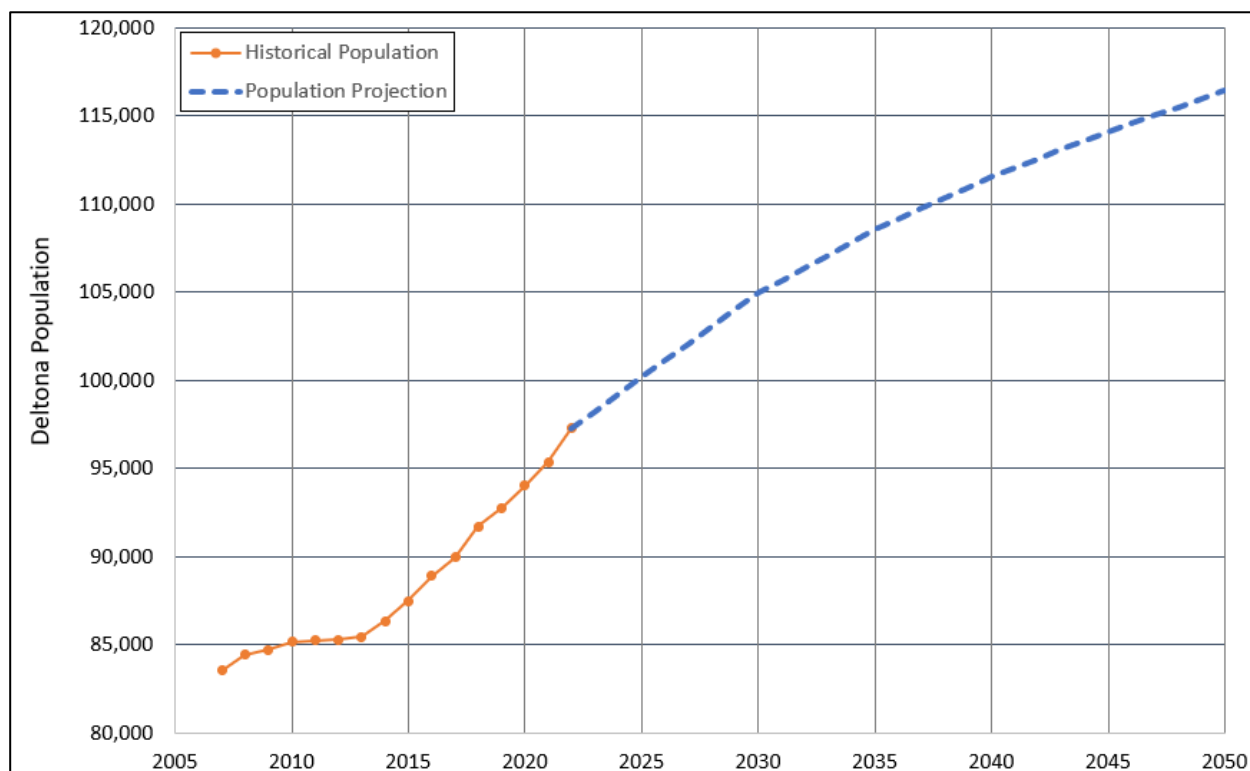
Deltona is the largest City in Volusia County. Its population growth rate is supposed to track that of the County. The County's population growth rates between 2021 and 2050, forecast by the Florida Office of Economic and Demographic Research (EDR), are shown in **Table 6-1**. EDR is a research arm of the Legislature principally concerned with forecasting economic and social trends that affect policy making, revenues, and appropriations. EDR provides objective information to committee staffs and members of the legislature in support of the policy making process. **Table 6-1** also shows the Volusia County population, Deltona population and Deltona population increase until year 2050.

The historical and projected Deltona population is plotted in **Figure 6-1**. The increase rate is expected to decrease gradually.

TABLE 6-1: VOLUSIA COUNTY POPULATION GROWTH RATES AND PROJECTION, AND DELTONA POPULATION PROJECTION

Year	2021	2025	2030	2035	2040	2045	2050
Annual Growth Rate ^(a)		1.00%	0.93%	0.68%	0.54%	0.46%	0.40%
Volusia Population	563,358	592,117	620,057	641,542	659,082	674,241	687,937
Deltona Population	95,386 ^(b)	100,214	104,962	108,579	111,543	114,132	116,433
Deltona Population Increase		4,828	4,748	3,617	2,964	2,589	2,301
Data Sources:							
(a) http://edr.state.fl.us/content/population-demographics/data/MediumProjections_2021.pdf							
(b) https://www.florida-demographics.com/deltona-demographics							

FIGURE 6-1: HISTORICAL AND PROJECTED DELTONA POPULATION



B. OSTDS or Septic Tanks

According to <https://stories.usatodaynetwork.com/septic-tank-crisis/deltona-sewer-dilemma/>, there are approximately 23,000 OSTDS or septic tanks in Deltona. It may cost approximately \$30,000 per lot (parcel) to connect to sewers; it may cost \$690 million to convert all septic tanks to sewers, which may be beyond the City and the property owners' affordability.

As shown in **Figure 1-1**, a large part of the City lies in the Blue Spring PFA. The Blue Spring BMAP's Onsite Sewage Treatment and Disposal Systems (OSTDS) Mitigation Plan requires all existing OSTDS within the PFA on lots of less than 1 acre provide enhanced treatment of nitrogen or connect to sewers within 20 years after the Blue Spring BMAP adoption, which took place on May 18, 2021. **Table 6-2** summarizes the sewer and septic tank information of the parcels in the PFA within the City sewer service area (excluding Deltona North WRF service area). Of a total of 16,890 parcels or lots, 15,670 have been developed and 1,220 remain vacant. Of the 15,670 developed parcels, 3,239 are sewered while 12,431 are not sewered. Among the 12,431 developed and unsewered parcels, 8,149 have a area less than 1 acre, connecting all of them to sewers could cost \$244 million.

The number of parcels built in each decade is also included in **Table 6-2**. Most of the parcels were developed between 1960 and 2009, nearly a third in 1980-1989.

TABLE 6-2: STATISTICS OF PARCELS IN PFA WITHIN DELTONA SEWER SERVICE AREA

Decade Built ^(a)	Total Number of Parcels	Total Number of Parcels in Currently Sewered Areas	Total Number Parcels < 1.0 Acre in Unsewered Area
1930 - 1939	1		
1940 - 1949	2		
1960 - 1969	2,446	2,181	182
1970 - 1979	2,582	253	1,537
1980 - 1989	5,444	55	2,596
1990 - 1999	2,170	113	1,807
2000 - 2009	2,475	410	1,716
2010 - 2019	392	214	171
2020 - 2029	158	13	140
Vacant	1,220	145	615
Grand Total	16,890 (15,670 Developed)	3,384 (3,239 Developed)	8,764 (8,149 Developed)
Data Source: (a) Based on GIS layer "Parcels Dissolved by Decade of Actual Year Built in Florida – 2022" downloaded from https://fgdl.org/meta/YB_DECADES.xml . The originator of this layer is University of Florida GeoPlan Center.			

C. Citywide Wastewater Flow Projections

Table 6-3 provides the wastewater population and flow projections based on the 2019 WSP Master Plan report. A wastewater level of service of 96 gallons per capita per day (gpcd) was used to calculate the wastewater flows. As discussed below, this 2019 master plan projection was believed to be much overestimated.

TABLE 6-3: WASTEWATER FLOW PROJECTION AT WASTEWATER LEVEL OF SERVICE OF 96 GPCD

Year	Total Population Served by the City's Wastewater System	Wastewater Level of Service (gpcd)	Projected Total Wastewater Flow (MGD)
2024	21,023	96	2.02
2029	24,192	96	2.32
2039	45,136	96	4.33
2049	65,492	96	6.29
Build-out	88,137	96	8.46
Data Sources: Water, Wastewater, and Reclaimed Water Master Plan Update, WSP, November 27, 2019			

Mead & Hunt updated the City's wastewater flow projections, which are shown in **Table 6-4**. To estimate the future wastewater conservatively (on the high side), the following were assumed:

- All population growth will take place in the City's sewer service area, no growth in the Delton North WRF service area.
- 80% of the population growth will be provided with sewer connections.
- 100 parcels currently on septic tanks will be connected to sewers yearly.
- Average household size is 2.87 persons per

<https://www.census.gov/quickfacts/fact/table/deltonacityflorida/PST045222>.

- A unit wastewater flow rate of 67 gallons per capita per day (gpcd), based on the 2022 flow. This flow rate is the highest between 2007 and 2022, possibly due to Hurricane Ian and Hurricane Nichole.

TABLE 6-4: UPDATED WASTEWATER FLOW PROJECTION

Year	Volusia County Population Growth Rate (a)	Deltona Population	Deltona Population Growth	80% Population Growth to Be in Sewered Areas (c)	Number of OSTDs to Be Converted to Sewers (d)	Wastewater Flow (MGD AADF) (e)
2021		95,386 (b)				
2022	1.0%	97,267	1,881	1,505		1.15 (f)
2023	1.0%	98,240	973	778	100	1.22
2024	1.0%	99,222	982	786	100	1.29
2025	1.0%	100,214	992	794	100	1.37
2026	0.93%	101,146	932	746	100	1.43
2027	0.93%	102,087	941	753	100	1.50
2028	0.93%	103,036	949	760	100	1.57
2029	0.93%	103,995	958	767	100	1.65
2030	0.93%	104,962	967	774	100	1.72
2031	0.68%	105,675	714	571	100	1.77
2032	0.68%	106,394	719	575	100	1.83
2033	0.68%	107,118	723	579	100	1.89
2034	0.68%	107,846	728	583	100	1.95
2035	0.68%	108,579	733	587	100	2.01
2036	0.54%	109,166	586	469	100	2.06
2037	0.54%	109,755	589	472	100	2.11
2038	0.54%	110,348	593	474	100	2.16
2039	0.54%	110,944	596	477	100	2.21
2040	0.54%	111,543	599	479	100	2.26
2041	0.46%	112,056	513	410	100	2.31
2042	0.46%	112,571	515	412	100	2.35
2043	0.46%	113,089	518	414	100	2.40
2044	0.46%	113,609	520	416	100	2.45
2045	0.46%	114,132	523	418	100	2.50
2046	0.40%	114,588	457	365	100	2.54
2047	0.40%	115,047	458	367	100	2.58
2048	0.40%	115,507	460	368	100	2.63
2049	0.40%	115,969	462	370	100	2.67
2050	0.40%	116,433	464	371	100	2.72

Data Sources:

(a) http://edr.state.fl.us/content/population-demographics/data/MediumProjections_2021.pdf

(b) <https://www.florida-demographics.com/deltona-demographics>

(c) Assumed.

(d) Assumed.

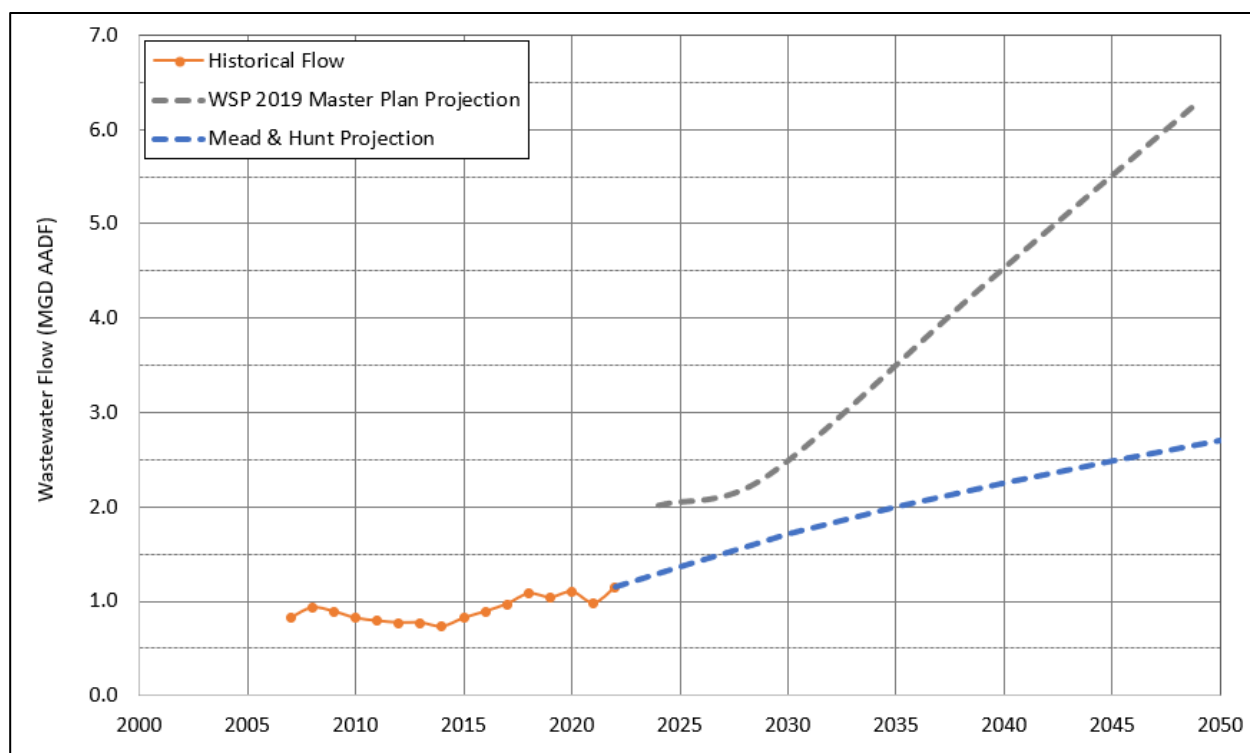
(e) Using an average household size of 2.87 persons per house and 67 gallons of wastewater per capita per day.

(f) Table 3-1 of this report.

The historical and projected Deltona wastewater flows are plotted in **Figure 6-2**. The WSP 2019 Master Plan projections are also shown for comparison. The updated projected 2050 wastewater flow is 2.72 MGD AADF. Mead and Hunt believes the updated projections are reasonable, and perhaps even slightly on the high side due to the conservative assumptions used, unless the population growth trend changes drastically and/or the City adopts an aggressive development plan to attract residents and businesses.

It should be noted only 2,800 septic tanks, about one third of the lots less than 1 acre (total 8,149 developed lots) can be connected to sewers from 2023 to 2050 at a rate of 100 a year. At today's price, connecting to sewers would cost \$84 million.

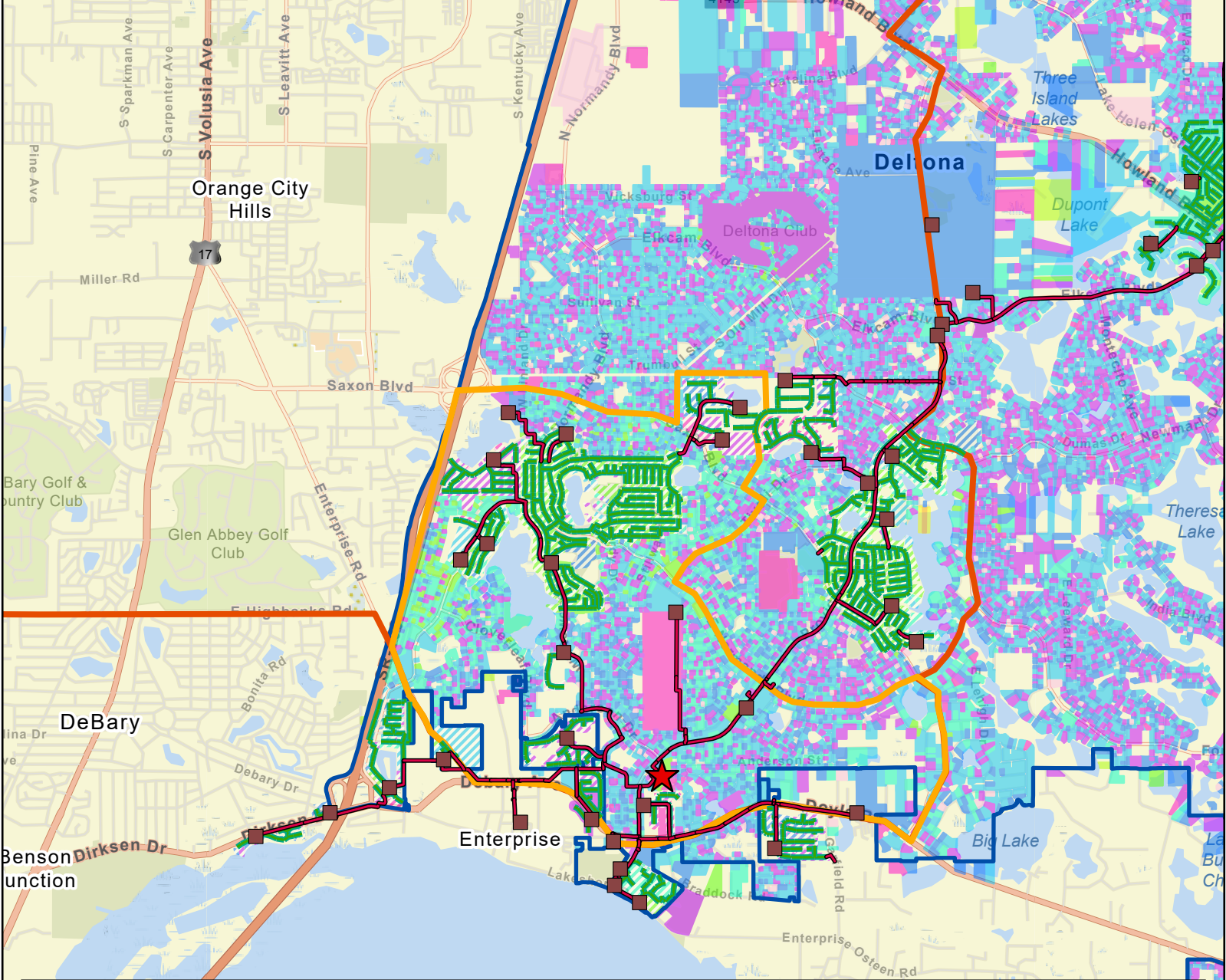
FIGURE 6-2: HISTORICAL AND PROJECTED DELTONA WASTEWATER FLOW



D. Wastewater Flow Projection for DLWRF

The approximate DLWRF service area is shown in **Figure 6-3**, much of it lies inside the Blue Spring PFA. **Table 6-5** summarizes the sewer and septic tank information of the parcels in the DLWRF approximate service area. There are 7,478 parcels in total; 6,953 of them have been built and only 534 of them remain vacant. 2,039 developed parcels are sewered, the remaining 4,905 are on septic tanks. Among the 4,905 on septic tanks, 3,007 of them are less than 1 acre. They are required to be provided with enhanced treatment of nitrogen or be connected to sewers within 20 years after the BS BMAP adoption. The year 2050 wastewater flow projection for DLWRF is illustrated in **Table 6-6** with the following assumptions:

- A single-family house will be built on 50% of the 534 vacant lots.
- 50 parcels in the DLWRF service area currently on septic tanks will be connected to sewers yearly.
- Average household size is 2.87 persons per
<https://www.census.gov/quickfacts/fact/table/deltonacityflorida/PST045222>.
- A unit wastewater flow rate of 67 gpcd, based on the 2022 flow.



Legend

- Existing Sewer Lift Station
- Existing Sewer Force Main
- Existing Gravity Sewer
- Deltona Lakes WRF
- Approximate DLWRF Service Area
- City of Deltona
- Volusia Blue Spring Priority Focus Area (PFA)

Decade Constructed & Sewer Connection Status

- | | |
|----------------------------|----------------------------|
| 1910 - 1919, Not Connected | 2000 - 2009, Not Connected |
| 1920 - 1929, Not Connected | 2010 - 2019, Not Connected |
| 1930 - 1939, Not Connected | 2020 - 2029, Not Connected |
| 1940 - 1949, Not Connected | 1960 - 1969, Connected |
| 1950 - 1959, Not Connected | 1970 - 1979, Connected |
| 1960 - 1969, Not Connected | 1980 - 1989, Connected |
| 1970 - 1979, Not Connected | 1990 - 1999, Connected |
| 1980 - 1989, Not Connected | 2000 - 2009, Connected |
| 1990 - 1999, Not Connected | 2010 - 2019, Connected |
| | 2020 - 2029, Connected |



DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
EXISTING SEWER CONNECTIONS
City of Deltona
Volusia County, FL

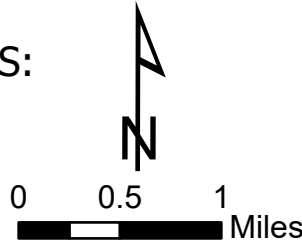


TABLE 6-5: STATISTICS OF PARCELS IN PFA WITHIN APPROXIMATE DLWRF SERVICE AREA

Decade Built ^(a)	Total Number of Parcels	Total Number of Parcels in Currently Sewered Areas	Total Number Parcels < 1.0 Acre in Unsewered Area
1930 - 1939	0		
1940 - 1949	0		136
1960 - 1969	1,547	1,366	746
1970 - 1979	1,384	75	936
1980 - 1989	2,069	35	569
1990 - 1999	737	90	542
2000 - 2009	1,033	383	42
2010 - 2019	124	77	36
2020 - 2029	50	13	136
Vacant	534	106	186
Grand Total	7,478 (6,944 Developed)	2,145 (2,039 Developed)	3,193 (3,007 Developed)
Data Source: (a) Based on GIS layer "Parcels Dissolved by Decade of Actual Year Built in Florida – 2022" downloaded from https://fgdl.org/meta/YB_DECADES.xml . The originator of this layer is University of Florida GeoPlan Center.			

TABLE 6-6: YEAR 2050 WASTEWATER FLOW PROJECTION FOR DLWRF

Item	Value
2022 Wastewater Flow (MGD AADF) ^(a)	0.510
Number of Vacant Parcels to Be Developed (50% of the Vacant Parcels) ^(b)	267
Wastewater Flow due to Development (MGD AADF)	0.051
Number of Parcels <1 acre to Be Converted to Sewers from Septic Tanks Each Year in the DLWRF Service Area ^(c)	50
Total Number of Parcels < 1 acre to Be Converted to Sewers from Septic Tanks between 2022 and 2050	1,400
Wastewater Flow due to Septic to Sewer Conversion (MGD AADF)	0.269
Total 2050 Wastewater Flow (MGD AADF)	0.830
Total Number of Parcels to Be Served by DLWRF	3,706
Total 2050 Population to Be Served by DLWRF ^(d)	10,636
Wastewater Flow Peaking Factor ^(e)	3.0
Design Peak Hour Flow (MGD)	2.49
Data Sources: (a) Table 3-2 of this report. (b) Assumed. (c) Assumed. (d) Using an average household size of 2.87 persons per house. (e) Table 510-1 Wastewater Peaking Factors, Deltona Water "Utilities Standards and Specifications Manual".	

The 2050 wastewater flow is the sum of the 2022 wastewater flow, wastewater flow due to development and wastewater flow due to septic to sewer conversion; it is estimated to be 0.83 MGD AADF. The flow peaking factor is 3.0 based on Table 510-1 Wastewater Peaking Factors, Deltona Water "Utilities Standards and Specifications Manual". The design peak hour flow is 2.49 MGD.

7. Alternatives Analysis

Based on the flow projections, the City's current plan to implement Phase IB to expand EWRF to 1.5 MGD, the potential future EWRF expansions (Phase II and Phase III), and the potential diversion of 1.0 MGD from the DLWRD to the Volusia County's Southwest Regional WRF (VC SWRWRF), the following three alternatives were analyzed:

- **Alternative 1** – Rehab DLWRF to an advanced wastewater treatment (AWT) facility.
- **Alternative 2** - Decommission DLWRF and convert it to a master lift station (MLS). The MLS will pump to EWRF. This alternative will require expansion at EWRF.
- **Alternative 3** – Decommission DLWRF and convert it to an MLS. The MLS will pump to VC SWRWRF. This alternative will require coordination with the County about the peak flow SWRWRF can receive, timeline, discharge point, force main route and cost, etc.

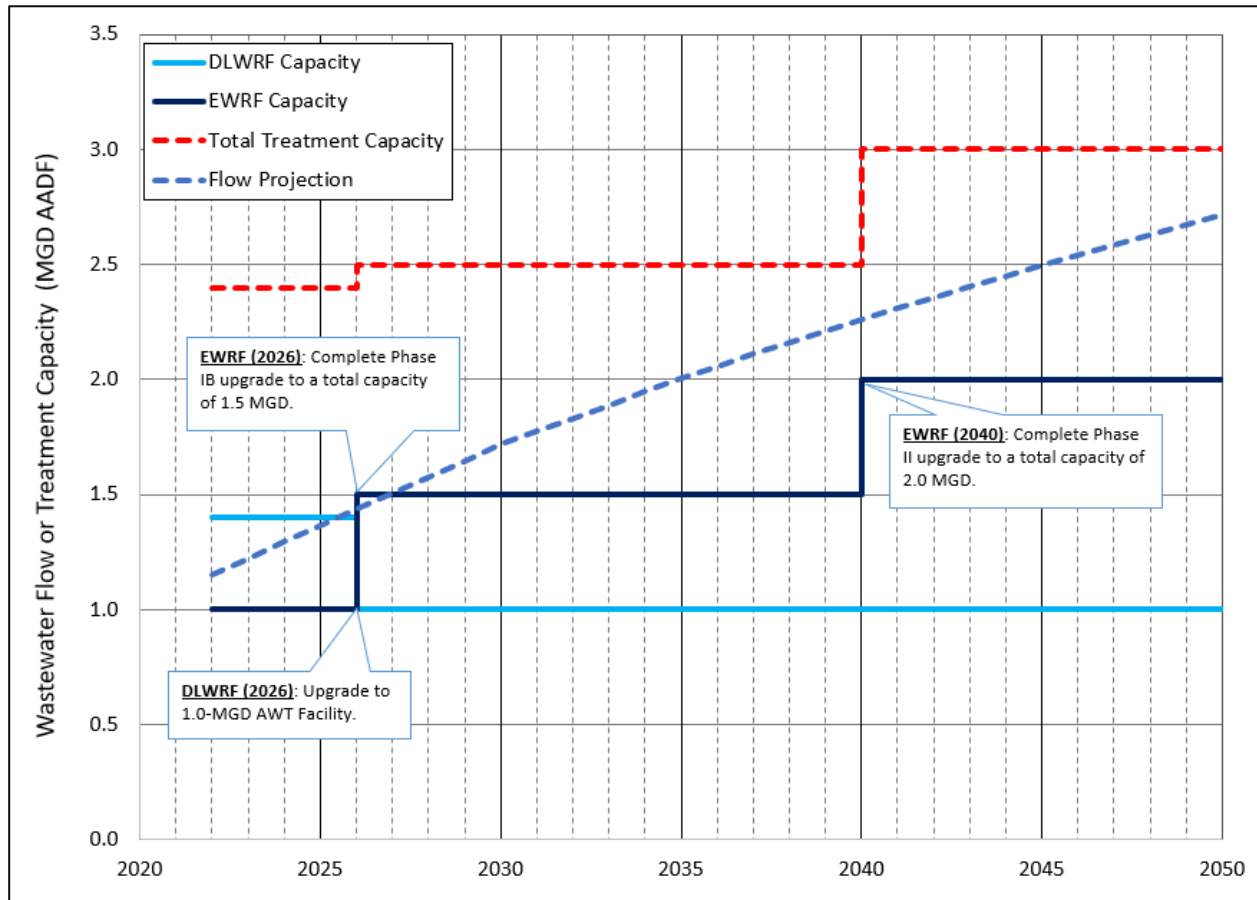
These alternatives are further elaborated below.

A. Alternative 1 – Rehab DLWRF to An Advanced Wastewater Treatment Facility

To accommodate the projected 2050 wastewater flow for DW's wastewater service area, Alternative 1 will entail the following major upgrades as shown in **Figure 7-1**:

- **DLWRF**: Upgrade to 1.0-MGD AWT facility by 2026 before the existing operating permit expires. This 1.0-MGD capacity will be sufficient to treat the projected 2050 wastewater flow from the DLWRF service area shown in **Figure 6-3**.
- **EWRF**:
 - Phase IB**: Add 0.5 MGD capacity to reach a total treatment capacity of 1.5 MGD at EWRF by 2026. This capacity expansion is underway. It is not considered in the cost estimate.
 - Phase II**: Add 0.5 MGD capacity to reach a total treatment capacity of 2.0 MGD at EWRF by 2040. This upgrade will entail:
 - a. Modify preliminary treatment to accommodate additional capacity.
 - b. Add a second BNR/MBR process structure for an additional 1.0 MGD capacity for potential future expansion, but equipment for an additional 0.5 MGD capacity.
 - c. Add a second chlorine contact chamber.
 - d. Upgrade the effluent transfer pump station.
 - e. Upgrade the reclaimed water master pump station.
 - f. Upgrade the residuals handling facility.
- 1. **Effluent Disposal**: Construct at least 0.5 MGD of additional effluent disposal capacity. This additional capacity is needed to offset wet weather flows currently directed to Volusia County if disposal to Volusia County becomes insufficient or unavailable.

FIGURE 7-1: ALTERNATIVE 1 – TIMELINE OF MAJOR UPGRADES



(1) DLWRF Upgrade to 1.0-MGD AWT Facility

Per the 2022 Florida Statutes Section 403.086(4), an advanced wastewater treatment (AWT) shall provide a reclaimed water product that:

- (a) *Contains not more, on a permitted annual average basis, than the following concentrations:*
 1. *Biochemical Oxygen Demand (CBOD5).....5mg/l*
 2. *Suspended Solids.....5mg/l*
 3. *Total Nitrogen, expressed as N.....3mg/l*
 4. *Total Phosphorus, expressed as P.....1mg/l*
- (b) *Has received high level disinfection, as defined by rule of the department.*

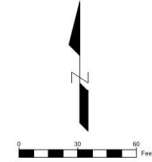
To rehab DLWRF to an AWT facility, the following are proposed as shown in **Figure 7-2**:

- Pretreatment
 - a. Construct a new 0.5-MG flow equalization tank
 - b. Replace sluice gates and bar screens
 - c. Add grit removal
- Secondary treatment
 - a. Add a pre-anoxic reactor
 - b. Raise existing oxidation ditch walls and modify aeration
 - c. Add a post-anoxic reactor
 - d. Add two clarifiers

- e. Install new RAS and WAS piping
 - f. Remove boat clarifier
- Tertiary treatment
 - a. Upgrade intermediate pump station
 - b. Convert existing sand filter process to AquaDiamonds process to increase capacity
 - c. Keep the existing chlorine contact chambers
 - d. Install new chlorine storage
- Effluent Facility
 - a. Rehab effluent transfer pump station
 - b. Keep the existing effluent holding percolation pond
- Substandard Effluent Handling
 - a. Keep the 2.0-MG substandard effluent storage tank
 - b. Keep substandard effluent pump station
- Sludge Handling
 - a. Keep existing sludge thickener
 - b. Keep existing rotary drum thickener
 - c. Add new pre-engineered metal building for dewatered sludge holding
- Power supply and electrical
 - a. Add a new transformer
 - b. Add an electrical room with new switchgear and distribution equipment
 - c. Add a new diesel generator
- Demolition
 - a. Flow equalization tank
 - b. Clarifier No.1
 - c. Clarifier No.3
 - d. Digester No. 1
 - e. Digester No. 3
 - f. Contact Tanks
 - g. Stabilization Basin No. 1
 - h. Stabilization Basin No. 2
- Effluent Disposal
 - a. Additional 0.50 MGD RIB or alternative wet weather disposal facilities



- LEGEND
- BUILDING/STRUCTURES TO BE DEMOLISHED, REMOVED
 - ① PROPOSED CLARIFIERS
 - ② PROP. RAS /WAS PIPING
 - ③ PROPOSED ELECTRICAL BUILDING
 - ④ PROPOSED PRE-ANOXIC REACTOR
 - ⑤ PROPOSED POST-ANOXIC REACTOR
 - ⑥ REMOVE BOAT CLARIFIER
 - ⑦ RAISE OXIDATION DITCH WALLS AND MODIFY AERATION
 - ⑧ PROPOSED NaOCL STORAGE TANK
 - ⑨ AQUADIAMOND FILTERS



Mead & Hunt
Mead and Hunt, Inc.
2440 Deming Way
Middleton, WI 53562
phone: 608-273-6380
meadhunt.com



These documents shall not be used for any purpose not intended by the City of Deltona. The City of Deltona is not responsible for any errors or omissions in these documents. The City of Deltona is not responsible for any damages, including consequential damages, arising out of such use or reuse of these documents. In addition, the City of Deltona is not responsible for any damages, including consequential damages, arising out of such use or reuse of these documents.

CITY OF DELTONA
DELTONA LAKES WRF
PLANNING ANALYSIS
2345 PROVIDENCE BLVD.
DELTONA, FL 32725

ISSUED

NOT FOR CONSTRUCTION

RAW NO. 1000707-230866.01
DATE August, 2023
DESIGNED BY BTB
DRAWN BY SEM
CHECKED BY AEL

DO NOT SCALE DRAWINGS
SHEET CONTENTS
CONCEPTUAL SITE PLAN

SHEET NO.

Figure 7-2

CONCEPTUAL SITE PLAN

The existing 0.9-MGD contact stabilization treatment train will be demolished. The tanks are too old and too small to have any salvage value. The BOAT clarifier in the existing 0.5-MGD treatment train will be removed and the oxidation ditches will be modified and rehabilitated. This alternative will result in a 1.0-MGD permitted capacity at the DLWRF, lower than the existing permitted capacity of 1.4 MGD. This will provide sufficient capacity to satisfy the needs of the local service area in addition to infill and septic tank retrofit as defined in previous sections of this report.

A new self-cleaning bar screen will remove large objects and debris to prevent them damaging the downstream equipment. Grit removal is typical for any/all new AWT facilities and serves to reduce sand, gravel, and other heavy particles settle out to avoid abrasion and wear downstream on equipment.

In the pre-anoxic reactor, wastewater with low dissolved oxygen (DO) content will be introduced to create anoxic conditions. Nitrate (NO_3^-) in the wastewater is converted to nitrogen gas (N_2) under anaerobic conditions, reducing its concentration in the effluent. In the oxidation ditch, the wastewater will be mixed with activated sludge containing microorganisms that biologically break down organic matter, converting it into carbon dioxide and water. This process will also promote the removal of nutrients like phosphorus and nitrogen. After the wastewater is treated in the oxidation ditch, it will be directed to a clarifier. In the clarifier, the activated sludge will settle to the bottom as sludge, while the clarified effluent will rise to the top. The sludge will be recycled back to the oxidation ditch to maintain the microbial population. In the post-anoxic reactor, any remaining nitrate will be converted to nitrogen gas under anoxic conditions.

The effluent from the clarifier or post-anoxic reactor will pass through cloth media AquaDiamond filter to remove fine particles and provide low total suspended solids effluent <5 mg/l in accordance with public access reclaimed water standards. The effluent will be disinfected in the chlorine contact tank to achieve high level disinfection requirements.

(2) EWRf Upgrades

EWRf was designed to meet the AWT water quality standards, utilizing Biological Nutrient Removal (BNR) with Membrane Bioreactors (MBR). The first phase (Phase IA) of construction of the EWRf was completed in 2016 and the facility became operational in May 2016. EWRf is currently permitted by the FDEP for 1.0 MGD AADF, but it has been permitted for a 0.5-MGD Phase IB expansion, which is underway. The facility consists of pretreatment containing influent screening and vortex grit removal; BNR containing flow equalization, anaerobic, first anoxic, aeration, and second anoxic; membrane bioreactor, chlorine contact chamber (with provision for future ultraviolet disinfection); a 5 MG reclaimed water storage tank; and a 2.5 MG reject water storage tank. Biosolids handling consists of sludge holding bins, chemical neutralization, thickening and dewatering polymer system to meet Class AA stabilization criteria. Biosolids will also be received from DLWRF.

EWRf was master planned to expand to a build-out treatment capacity of 4.5 MGD AADF according to the WSP's 2019 Master Plan Report with the following phases:

- Phase 1A – 1.0 MGD (Current capacity)
- Phase IB – 0.5 MGD (Upgrade underway)
- Phase II – 1.5 MGD (Future expansion)
- Phase III – 1.5 MGD (Future expansion)

Phase IB 0.5 MGD Retrofit (By 2026) is underway. The facility was designed to provide 1.5 MGD of treatment capacity after initial Phase IA construction. All processes and appurtenances were designed for 1.5 MGD. However, the BNR/MBR process was only outfitted with media to provide 1.0 MGD of treatment. Phase IB expansion would include a retrofit for the existing installation by outfitting the empty bays to add one (1) more MBR media. The upgrade would increase the treatment capacity of the facility by an additional 0.5 MGD. Phase IA has been permitted by FDEP Permit Number FLA709883 issued on October 6, 2021 and expiring on October 5, 2026.

However, due to the much lower revised flow projections, Phase II and Phase III expansions, if needed, could happen at 0.5 MGD modules. Future expansions beyond 1.5 MGD could occur in one or two 0.5 MGD modules. As such, the possible Phase II and Phase III expansions could be:

Phase II, 0.5 MGD Expansion (By 2040)

- Modify preliminary treatment to accommodate additional capacity
- Add a second BNR/MBR process structure for 1.0-MGD capacity and equipment for 0.5 MGD capacity
- Add a second chlorine contact chamber
- Upgrade the effluent transfer pump station
- Upgrade the reclaimed water master pump station
- Upgrade the residuals handling facility

Phase III, 0.5 or 1.0 MGD Expansion (Beyond 2050)

- Add a third BNR/MBR process structure and equipment to treat an additional 1.0 MGD
- Add a third chlorine contact chamber
- Upgrade the effluent transfer pump station
- Add a 3.0 MG PAR storage tank
- Add a 2.00 MG reject tank
- Upgrade the reclaimed water master pump station
- Upgrade the residuals handling facility

(3) Additional Effluent Disposal

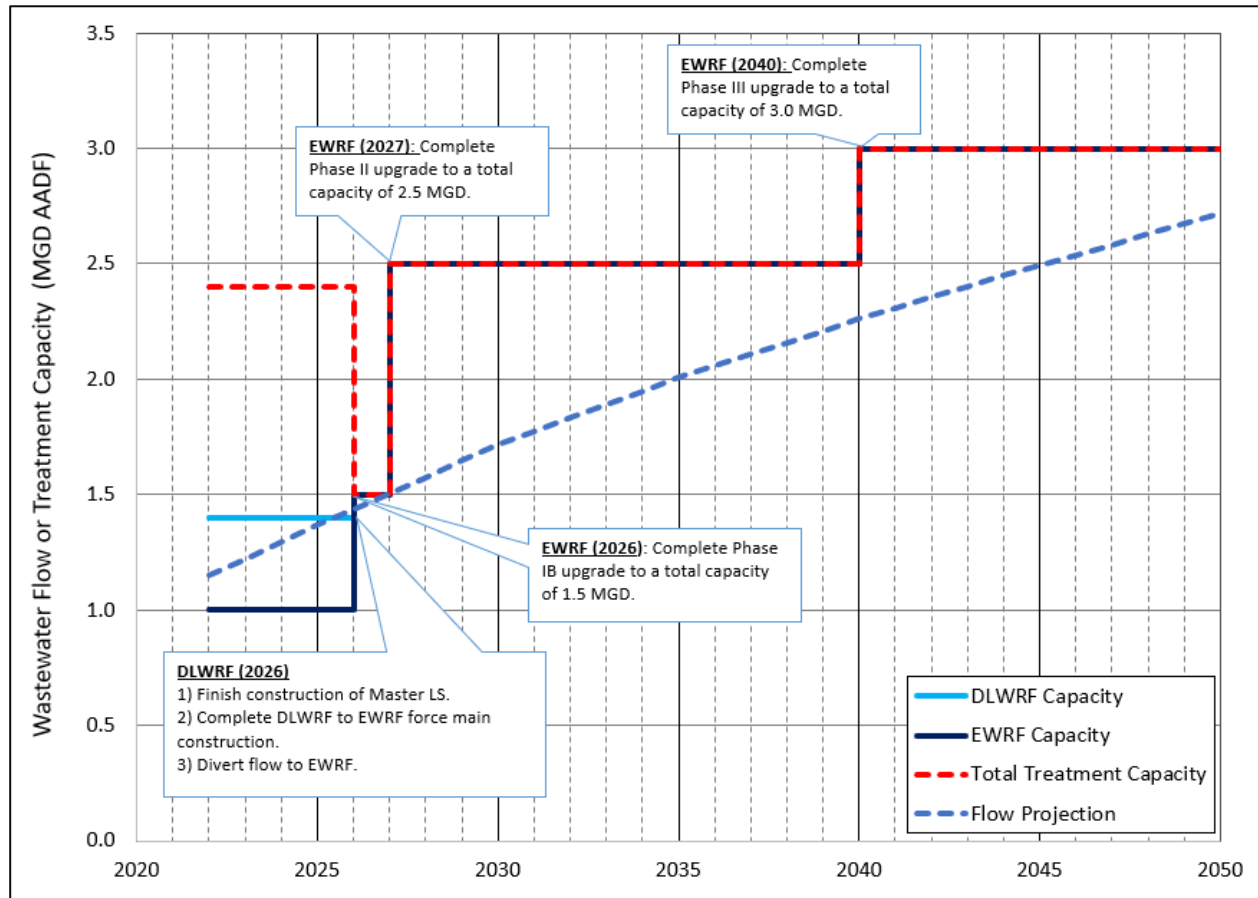
Additional wet weather disposal facilities will be required to accommodate at least 0.5 MGD of excess reclaimed water in order to satisfy wet weather disposal requirements for the 1.0-MGD permitted capacity. Currently, the facility discharges effluent to the Alexander Ave. Facility RIB site and the public access reclaimed water distribution system. During periods of extreme wet weather, the City has been discharging to the Volusia County's RIB sites via the interconnections. This analysis assumes that the current disposal capacity at the County's sites would be unavailable, and an alternative means of disposal will be required. This disposal could be accomplished with additional RIB sites or via a lower Floridan aquifer (LFA) injection aquifer storage and recovery (ASR) or injection well. Sufficient transmission capacity exists in the Doyle Rd reclaimed water main; therefore, any land or alternative means of effluent disposal could be accomplished on either the east or western sides of the City's service area.

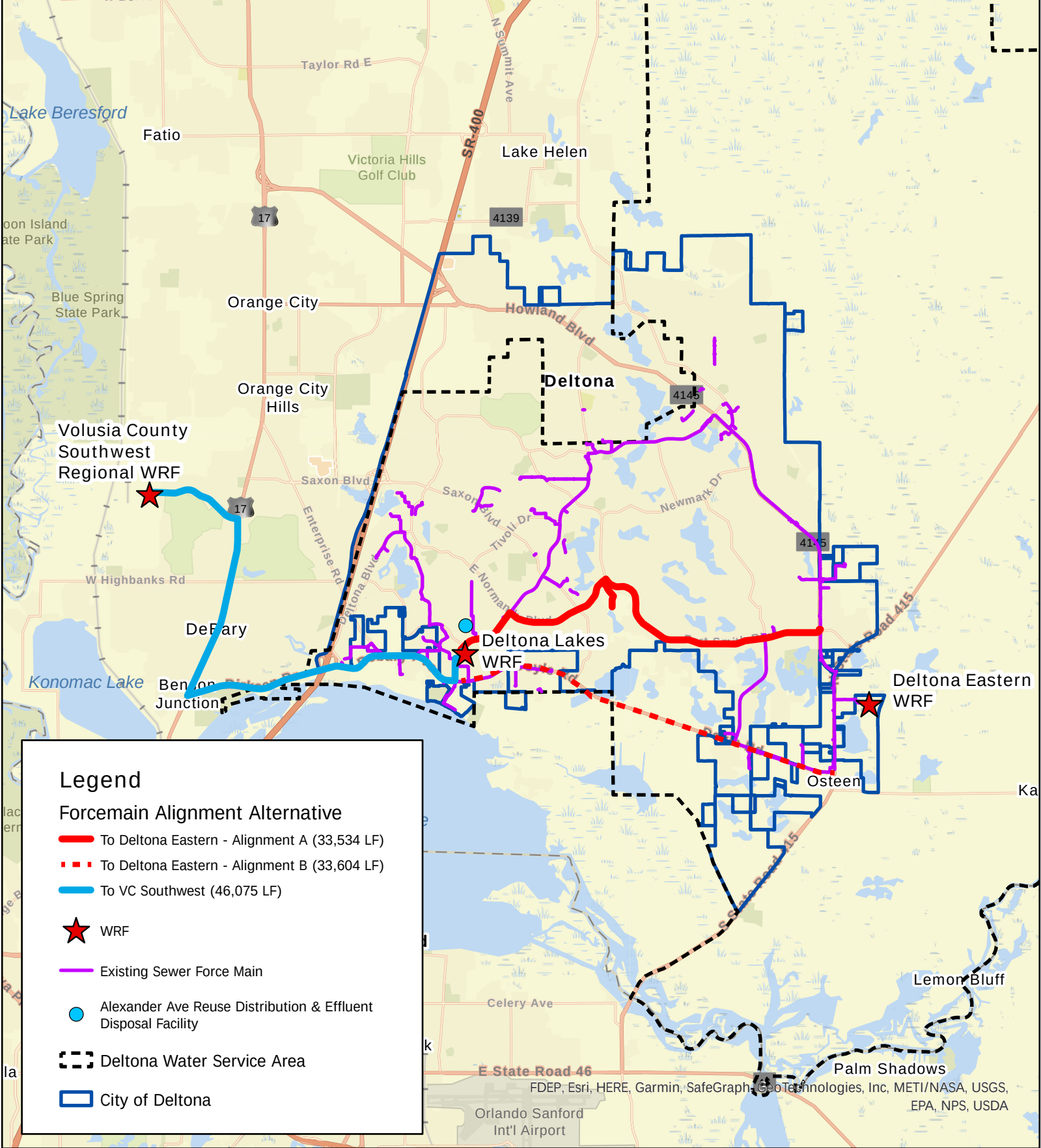
B. Alternative 2 – Convert DLWRF to a Master Lift Station (MLS) Pumping to EWRF

To accommodate the projected 2050 wastewater flow for DW's wastewater service area, Alternative 2 will entail the following major upgrades as shown in **Figure 7-3**:

- **DLWRF:** (1) Construct a 2.5-MGD master lift station by 2026. (2) Complete PVC DR18 16" or 18" force main from DLWRF to EWRF by 2026. (3) Decommission DLWRF. There are two potential force main routes as shown in **Figure 7-4**. Their lengths are about the same. A route study is recommended to consider other factors such as availability of right of way, conflicts with existing utilities, environmental impacts, and ease of construction, etc.
- **EWRF:**
 - Phase IB:** Add 0.5 MGD capacity to reach a total treatment capacity of 1.5 MGD at EWRF by 2026. This capacity expansion is already planned/budgeted. It is not considered in the cost estimate.
 - Phase II:** Add 1.0 MGD capacity to reach a total treatment capacity of 2.5 MGD at EWRF by 2027. This upgrade will entail
 - a. Modify preliminary treatment to accommodate additional capacity
 - b. Add a second BNR/MBR process structure and equipment to treat an additional 1.0 MGD
 - c. Add a second chlorine contact chamber
 - d. Upgrade the effluent transfer pump station
 - e. Add a 3.0 MG PAR storage tank
 - f. Add a 2.00 MG reject tank
 - g. Upgrade the reclaimed water master pump station
 - h. Upgrade the residuals handling facility
 - Phase III:** Add 0.5 MGD capacity to reach a total treatment capacity of 3.0 MGD at EWRF by 2040. This upgrade will entail adding a third BNR/MBR process structure and equipment to treat an additional 0.5 MGD.
- **Effluent Disposal:** Construct at least 0.5 MGD of additional effluent disposal capacity. This additional capacity is needed to offset wet weather flows currently directed to Volusia County.

FIGURE 7-3: ALTERNATIVE 2 – TIMELINE OF MAJOR UPGRADES





Legend

- Forcemain Alignment Alternative**
- To Deltona Eastern - Alignment A (33,534 LF)
 - - - To Deltona Eastern - Alignment B (33,604 LF)
 - To VC Southwest (46,075 LF)
- ★ WRF
- Existing Sewer Force Main
- Alexander Ave Reuse Distribution & Effluent Disposal Facility
- Deltona Water Service Area
- City of Deltona



DELTONA LAKES/FISHER WRF PLANNING ANALYSIS:
PROPSOED FORCEMAIN ALIGNMENTS
City of Deltona
Volusia County, FL

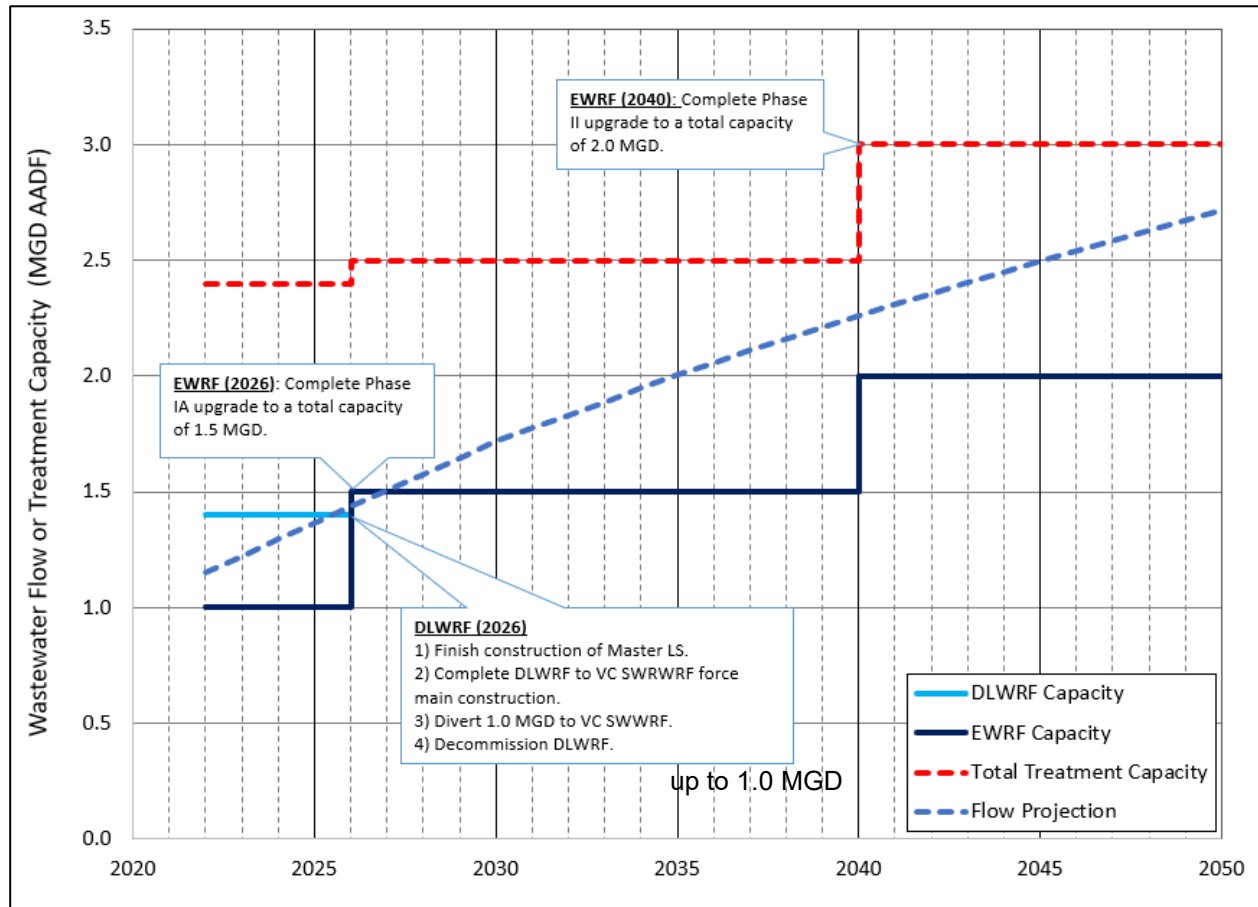
C. Alternative 3 – Convert DLWRF to a Master Lift Station (MLS) Pumping 1.0-MGD Flow to VC SWRWF

To accommodate the projected 2050 wastewater flow for DW's wastewater service area, Alternative 3 will entail the following major upgrades as shown in **Figure 7-5**:

- **DLWRF:** (1) Construct a 2.5-MGD master lift station by 2026. (2) Complete a PVC DR18 16" or 18" force main from DLWRF to VC SWWRF by 2026. A conceptual force main route is shown in **Figure 7-4**. (3) Decommission DLWRF.
- **VC SWRWF:** Receive flow from DLWRF by September 2026.
- **EWRF:**
 - Phase IB:** Add 0.5 MGD capacity to reach a total treatment capacity of 1.5 MGD at EWRF by 2026. This capacity expansion is already planned/budgeted. It is not considered in the cost estimates.
 - Phase II:** Add 0.5 MGD capacity to reach a total treatment capacity of 2.0 MGD at EWRF by 2040. This upgrade will entail
 - i. Modify preliminary treatment to accommodate additional capacity
 - j. Add a second BNR/MBR process structure and equipment to treat an additional 1.0 MGD
 - k. Add a second chlorine contact chamber
 - l. Upgrade the effluent transfer pump station
 - m. Upgrade the reclaimed water master pump station
 - n. Upgrade the residuals handling facility
- **Effluent Disposal:** Construct 0.5 MGD of additional effluent disposal capacity with the construction of the EWRF Phase II. Prior to the EWRF Phase II expansion, additional effluent disposal capacity may not be needed.

The County completed the construction of SWRWF in 2018 with a treatment capacity of 2.7 MGD, which can meet TN of 3.0 mg/L. The County is in the process of upgrading the facility to 5.0 MGD. Up to 1.0 MGD of wastewater from DW's service area can potentially be sent to the County for treatment. The 2022 annual average flow at DLWRF was 0.51 MGD. There is potential to purchase less than 1.0 MGD of capacity from the County. This could enable a "pay as you go" approach for capacity investment. Volusia County has existing, available RIB capacity at the Deltona North WRF; therefore, additional wet weather disposal capacity would not be required for the flow diverted to VC SWRWF.

FIGURE 7-5: ALTERNATIVE 3 – TIMELINE OF MAJOR UPGRADES



8. Cost Estimate and Present Worth Analysis

To compare the three alternatives ecumenically, planning level cost estimate were estimated.

A. Planning Level Capital Cost Estimate

The planning level cost estimates for the three alternatives are provided in **Tables 8-1, 8-2 and 8-3**, respectively.

TABLE 8-1: COST ESTIMATE FOR UPGRADING DLWRF TO A 1.0-MGD AWT FACILITY (ALTERNATIVE 1)

ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST (2023 Value)	TOTAL COST (2023 Value)
A. DLWRF - Upgrade to 1.0-MGD AWT Facility (2026)					
1	Demolition	1	LS	\$750,000	\$750,000
2	Sitework	5	Acres	\$100,000	\$500,000
3	Yard piping	1	LS	\$2,500,000	\$2,500,000
4	Bar Screen and Grit Removal	1	LS	\$800,000	\$800,000
4	Equalization Basin	1	LS	\$750,000	\$750,000
5	Pre-Anoxic Tank	1	LS	\$1,250,000	\$1,250,000
6	Post-Anoxic Tank	1	LS	\$1,250,000	\$1,250,000
7	Mixers & mechanical eqpt.	1	LS	\$2,000,000	\$2,000,000
8	Electrical and Operations Building	1	LS	\$500,000	\$500,000
9	Intermediate PS	1	LS	\$800,000	\$800,000
10	Secondary Clarifier (structure)	2	EA	\$500,000	\$1,000,000
11	Clarifier Equipment	2	EA	\$350,000	\$700,000
12	RAS & WAS Pumping	1	LS	\$400,000	\$400,000
13	Raising of Oxidation Ditch Wall	1	LS	\$500,000	\$500,000
14	Blowers, Diffusers and Mixers	1	LS	\$1,000,000	\$1,000,000
15	Converting Existing Sand Filter Process to AquaDiamond Process	2	EA	\$1,000,000	\$2,000,000
16	Aerated Sludge Holding	1	EA	\$300,000	\$300,000
17	Disinfection Equipment	1	EA	\$250,000	\$250,000
18	Effluent Pump Station Upgrades	1	LS	\$500,000	\$500,000
18	Electrical and I & C	1	LS	\$1,800,000	\$1,800,000
19	Generator and ATS	1	LS	\$800,000	\$800,000
				Subtotal	\$20,350,000
B. EWRF - Phase II, 0.5-MGD Expansion (2040)					
1	Sitework	2	Acres	\$100,000	\$200,000
2	Yard piping	1	LS	\$1,500,000	\$1,500,000
3	EQ/BNR/MBR Structure	1	LS	\$3,000,000	\$3,000,000
4	EQ Pumps and Equipment	1	LS	\$500,000	\$500,000
5	MBR Equipment	1	LS	\$2,500,000	\$2,500,000
6	Blowers and Aeration Equipment	1	LS	\$500,000	\$500,000
7	Additional Sludge Press	1	EA	\$300,000	\$300,000
8	Disinfection Equipment	1	EA	\$250,000	\$250,000

ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST (2023 Value)	TOTAL COST (2023 Value)
9	Electrical and I & C	1	LS	\$1,500,000	\$1,500,000
10	Generator and ATS	1	LS	\$500,000	\$500,000
				Subtotal	\$10,750,000
C. Effluent Disposal					
1	0.5 MGD EFFLUENT DISPOSAL	1	LS	\$4,000,000	\$4,000,000
				Subtotal	\$4,000,000
				Total Materials, Equipment & Labor	\$35,100,000
				GC OH & Profit @ 20%	\$7,020,000
				Taxes, Bond & Ins @ 5%	\$1,755,000
				Construction Sub-total	\$43,875,000
				Contingency @ 35%	\$15,356,250
				Planning, Design & Permitting @ 15%	\$8,884,688
				Total Cost Estimate	\$68,115,938

TABLE 8-2: COST ESTIMATE FOR CONVERTING DLWRF TO A 2.5-MGD MASTER LIFT STATION AND PUMPING FLOW TO EWRF (ALTERNATIVE 2)

ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST (2023 Value)	TOTAL COST (2023 Value)
A. DLWRF - Convert DLWRF to a Master Lift Station (2026)					
1	Demolition	1	LS	\$1,000,000	\$1,000,000
2	2.5-MGD Pump Station	1	LS	\$2,000,000	\$2,000,000
3	16" PVC or 18" HDPE Force Main	34,500	LF	\$200	\$6,900,000
4	Valves & Fittings	1	LS	\$800,000	\$800,000
5	Generator and ATS	1	LS	\$300,000	\$300,000
				Subtotal	\$11,000,000
B. EWRF - Phase II, 1.0-MGD Expansion (2027)					
1	Sitework	2	Acres	\$100,000	\$200,000
2	Yard piping	1	LS	\$1,500,000	\$1,500,000
3	Pre-Treatment Structure Modifications	1	LS	\$1,000,000	\$1,000,000
4	EQ/BNR/MBR Structure	1	LS	\$4,000,000	\$4,000,000
5	EQ Pumps and Equipment	1	LS	\$500,000	\$500,000
6	MBR Equipment	1	LS	\$5,000,000	\$5,000,000
7	Blowers and Aeration Equipment	1	LS	\$750,000	\$750,000
8	Additional Chlorine Contact Chamber and Equipment	1	LS	\$2,000,000	\$2,000,000
9	Effluent Pump Station Upgrade	1	LS	\$300,000	\$300,000
10	Reclaimed Water Pump Station Upgrade	1	LS	\$500,000	\$500,000
11	A New PAR Storage Tank	1	LS	\$2,000,000	\$2,000,000
12	A New Reject Tank	1	LS	\$1,000,000	\$1,000,000
13	Additional Sludge Press	1	EA	\$500,000	\$500,000
14	Electrical and I & C	1	LS	\$1,800,000	\$1,800,000
15	Generator and ATS	1	LS	\$750,000	\$750,000
				Subtotal	\$21,800,000
C. EWRF - Phase III, 0.5-MGD Expansion (2040)					
1	MBR Equipment	1	LS	\$500,000	\$500,000
2	Blowers and Aeration Equipment	1	LS	\$500,000	\$500,000
3	Additional Sludge Press	1	EA	\$300,000	\$300,000
4	Disinfection Equipment	1	EA	\$250,000	\$250,000
5	Electrical and I & C	1	LS	\$500,000	\$500,000
				Subtotal	\$2,050,000
C. Effluent Disposal					
1	0.5 MGD EFFLUENT DISPOSAL	1	LS	\$4,000,000	\$4,000,000
				Subtotal	\$4,000,000

ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST (2023 Value)	TOTAL COST (2023 Value)
				Total Materials, Equipment & Labor	\$38,850,000
				GC OH & Profit @ 20%	\$7,770,000
				Taxes, Bond & Ins @ 5%	\$1,942,500
				Construction Sub-total	\$48,562,500
				Contingency @ 35%	\$16,996,875
				Planning, Design & Permitting @ 15%	\$9,833,906
				Total Cost Estimate	\$75,393,281

TABLE 8-3: COST ESTIMATE FOR CONVERTING DLWRF TO A 2.5-MGD MASTER LIFT STATION AND PUMPING FLOW TO VC SWRWRF (ALTERNATIVE 3)

ITEM #	DESCRIPTION	QTY	UNIT	UNIT COST (2023 Value)	TOTAL COST (2023 Value)
A. DLWRF - Convert DLWRF to a Master Lift Station (2026)					
1	Demolition	1	LS	\$1,000,000	\$1,000,000
2	2.5-MGD Pump Station	1	LS	\$2,000,000	\$2,000,000
3	16" PVC or 18" HDPE Force Main	36,000	LF	\$200	\$7,200,000
4	Valves & Fittings	1	LS	\$800,000	\$800,000
5	Generator and ATS	1	LS	\$300,000	\$300,000
				Subtotal	\$11,300,000
B. Diverting 1.0-MGD AADF to VC SWRWRF (2026)					
1	Wholesale Capacity Cost	1,000,000	Gallons per Day	\$35	\$35,000,000
				Subtotal	\$35,000,000
C. EWRF - Phase II, 0.5-MGD Expansion (2040)					
1	Sitework	2	Acres	\$100,000	\$200,000
2	Yard piping	1	LS	\$1,500,000	\$1,500,000
3	EQ/BNR/MBR Structure	1	LS	\$3,000,000	\$3,000,000
4	EQ Pumps and Equipment	1	LS	\$500,000	\$500,000
5	MBR Equipment	1	LS	\$2,500,000	\$2,500,000
6	Blowers and Aeration Equipment	1	LS	\$500,000	\$500,000
7	Additional Sludge Press	1	EA	\$300,000	\$300,000
8	Disinfection Equipment	1	EA	\$250,000	\$250,000
9	Electrical and I & C	1	LS	\$1,500,000	\$1,500,000
10	Generator and ATS	1	LS	\$500,000	\$500,000
				Subtotal	\$10,750,000
For Items A and C Only		Total Materials, Equipment & Labor			\$22,050,000
		GC OH & Profit @ 20%			\$4,410,000
		Taxes, Bond & Ins @ 5%			\$1,102,500
		Construction Sub-total			\$27,562,500
		Contingency @ 35%			\$9,646,875
		Planning, Design & Permitting @ 15%			\$5,581,406
		Total Cost Estimate for Items A & C			\$42,790,781
		Total Cost Estimate for Items A, B & C			\$77,790,781

B.
B. Planning Level Operation and Maintenance Cost Estimate

TABLE 8-4: CITY OF DELTONA DLWRF AND EWRF RECENT O&M COSTS

	FY20-21 Actual	FY21-22 Estimated Actual	FY22-23 Budget
Total Wastewater Flow Treated (MGD AADF)	1.1	0.98	1.15
DLWRF – Total O&M Cost ^(a)	\$1,431,815	\$1,829,216	\$1,764,700
EWRF – Total O&M Cost ^(a)	\$788,846	\$2,136,981	\$1,356,500
Annual Average O&M Cost (\$/1,000 Gallons)	\$5.53	\$11.09	\$7.44
3-Year Average O&M Cost (\$/1,000 Gallons)	\$8.02		
Data Source: (a) City of Deltona Water & Sewer Utility Fund			

The current Volusia County wholesale wastewater rate is 87% of \$5.47/1,000 gallons. This equates to a rate of \$4.76/1,000 gallons. This would be applied as a bulk wholesale rate, exclusive of the proposed capital cost for the purchased capacity.

TABLE 8-5: PLANNING LEVEL ANNUAL WASTEWATER TREATMENT O&M COST

Year	Wastewater Flow (MGD AADF) ^(a)	Annual O&M Cost (2023 Value) ^(b)
2022	1.15	\$3,365,670
2023	1.22	\$3,574,529
2024	1.29	\$3,784,915
2025	1.37	\$3,996,841
2026	1.43	\$4,199,319
2027	1.50	\$4,403,157
2028	1.57	\$4,608,367
2029	1.65	\$4,814,962
2030	1.72	\$5,022,955
2031	1.77	\$5,191,196
2032	1.83	\$5,360,199
2033	1.89	\$5,529,967
2034	1.95	\$5,700,508
2035	2.01	\$5,871,826
2036	2.06	\$6,020,079
2037	2.11	\$6,168,830
2038	2.16	\$6,318,080
2039	2.21	\$6,467,832
2040	2.26	\$6,618,089
2041	2.31	\$6,754,855
2042	2.35	\$6,891,992
2043	2.40	\$7,029,500
2044	2.45	\$7,167,382
2045	2.50	\$7,305,639
2046	2.54	\$7,433,532
2047	2.58	\$7,561,710
2048	2.63	\$7,690,177
2049	2.67	\$7,818,932
2050	2.72	\$7,947,977
Data Source: (a) Table 6-4. (b) \$8.02/1,000 gallons x Wastewater Flow (MGD) x 1,000 x 365.		

C.
C. Summary of Planning Level Cost Estimate

TABLE 8-6: SUMMARY OF PLANNING LEVEL COST ESTIMATE

	Alternative 1	Alternative 2	Alternative 3
Capital Cost			
Treatment O&M Cost			
Master List Station O&M Cost			
Total			

9. Comparison of Alternatives

The three alternatives were compared based on monetary and non-monetary factors. Monetary factor is represented by the total net present values shown in **Table 8-1**. Six criteria were included in the non-monetary factor. Each criterion was rated and weighted to score each alternative. The alternative wins the highest score is the preferred alternative.

A. Non-Monetary Criteria

Non-monetary factors include the following:

- Ability to Meet Required Schedule
- Effluent disposal
- Resiliency to uncertainties
- Long-Term Partnership with Volusia County
- Environmental considerations
- Public perception
- Funding Potential

	Description	Alternative 1	Alternative 2	Alternative 3
Ability to Meet Required Schedule				
Effluent disposal				
Resiliency to uncertainties				
Long-Term Partnership with Volusia County				
Environmental considerations				
Public perception				
Funding Potential				

10. Summary and Recommendation

This Facilities Plan presents a comprehensive and holistic approach for the City to properly planning its wastewater treatment capacity needs through year 2050. The Plan should provide sufficient information to help the City decide the future of DLWRF – converting it to an MLS or upgrading it to an AWT facility, and strategize the wastewater treatment planning and reclaimed water disposal.

A. Summary

- DLWRF is in poor condition and it cannot meet the 3 mg/L total nitrogen limit required by the FDEP's Volusia County Blue Spring BMAP. Thus, it will need to be upgraded to an AWT facility or converted to a master lift station pumping to either EWRF or VC SWRWRF, subject to the City's decision.
- There are a total of 8,149 less than 1.0 acre developed parcels with OSTDS within the City's sewer service area and Blue Spring Priority Focus Area. These parcels are required to be provided with enhanced treatment of nitrogen or be connected to sewers within 20 years after the Blue Spring BMAP adoption, which took place on May 18, 2021. Of the 8,149 parcels, 3,007 lie in inside the approximate DLWRF service area. Connecting a parcel to sewers may cost \$30,000.
- DLWRF and EWRF treated 1.15 MGD AADF in 2022, equating to 67 gallons per capita per day. The City's wastewater flow is expected to increase to 2.72 MGD AADF in 2050 based on population forecast by the Florida Office of Economic and Demographic Research (EDR) and the assumed septic to sewer conversion rate.
- DLWRF received 0.51 MGD AADF in 2022. The 2050 wastewater flow in the approximate DLWRF service area is projected to 0.83 MGD AADF. The corresponding peak hour flow is 2.49 MGD. Therefore, the design treatment capacity of the DLWRF could be 1.0 MGD if the City decides to upgrade it to an AWT facility.
- The following three alternatives were analyzed regarding the future of DLWRF:
 - **Alternative 1** – Rehab DLWRF to an AWT facility.
 - **Alternative 2** - Decommission DLWRF and convert it to a master lift station (MLS). The MLS will pump to EWRF.
 - **Alternative 3** – Decommission DLWRF and convert it to an MLS. The MLS will pump to VC SWRWRF. This alternative will require coordination with the County about the peak flow SRWRF can receive, timeline, discharge point, force main route and cost, etc.

All three alternatives will require expansion at EWRF before 2050 in addition to the current Phase IB 0.5 MGD expansion.

- It could be very challenging for Alternative 1 and Alternative 2 to meet the schedule because the current DLWRF operating permit FLA111724 expires on September 19, 2026. Rehabbing DLWRF to an AWT facility or implementing EWRF Phase II expansion requires intensive planning, design, permitting and construction, which may require a minimum of four years.
- If the City selects Alternative 3, negotiations with the County, the design and construction of the force main from DLWRF to VC SWRWRF should begin as soon as possible.
- The net present values of the three alternatives are xx, xx and xx, respectively.
- The City's actual reclaimed water disposal capacity through PAR and RIBs appears to be much lower than the permitted capacity. Additional disposal capacity is required.

B. Recommendations

- Take a holistic and realistic approach towards the DLWRF planning by
 - Considering Citywide wastewater treatment capacity needs as a whole.
 - Planning wastewater treatment capacity together with reclaimed water disposal capacity.
 - Developing a long-term partnership with Volusia County in developing water, wastewater, reclaimed water, BMAP and grant application strategies.
 - Performing long-term planning up to year 2050.
 - Including resiliency to variabilities and uncertainties.
- Update the wastewater and reclaimed water master plan as soon as possible
 - Wastewater Master Plan update should include the following:
 - ✚ OSTDS – Master treatment feasibility analyses expected by the final Volusia Blue Spring BMAP
 - ✚ I/I reduction plan
 - ✚ Population and wastewater flow projections
 - ✚ Review and revision of level of service (currently 96 gpcd)
 - ✚ Lift station, force main capacity analyses
 - ✚ Treatment plant capacity analyses
 - ✚ Operation strategy
 - ✚ Capital improvement project program
 - ✚ Funding strategy
 - Reclaimed Water Master Plan update should involve the following:
 - ✚ Verification of actual reclaimed water disposal capacity
 - PAR
 - RIBs
 - ✚ Future PAR demand
 - ✚ Water budget analysis for Alexandra Ave Facility to identify supply and disposal gaps
 - Inflows: Reclaimed water from DLWRF and EWRF, stormwater flow
 - Outflows: PAR, RIBS, Volusia County
 - ✚ Committed disposal capacity in Volusia County
 - ✚ Additional disposal capacity needs
- Carry out facilities plan analysis for EWRF to identify Phase II upgrade needs.

Appendix A Wildlife

Appendix A: Wildlife and Threatened and Endangered Species Tables

Plant and Animal Communities, Threatened and Endangered Species in
City of Deltona and Surrounding Areas

USFWS Listed Species in Deltona Service Area			
Category	Species Common Name	Species Scientific Name	Code
Mammals	West Indian (Florida) Manatee	<i>Trichechus manatus latirostris</i>	E/CH
Birds	Everglade Snail Kite	<u>Rostrhamus sociabilis plumbeus</u>	E
	Piping Plover	<i>Charadrius melodus</i>	T
	Florida Scrub-jay	<i>Aphelocoma coerulascens</i>	T
	Wood Stork	<i>Mycteria americana</i>	E
	Red-cockaded Woodpecker	<i>Picoides borealis</i>	E
Reptiles	Gopher Tortoise	<u>Gopherus polyphemus</u>	C
	Eastern Indigo Snake	<i>Dymarchon corais couperi</i>	T
	Green Sea Turtle	<i>Chelonia mydas</i>	E
	Hawksbill Sea Turtle	<i>Eremochelys imbricata</i>	E
	Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	E
	Kemp's ridley Sea Turtle	<i>Lepidochelys kempii</i>	E
	Loggerhead Sea Turtle	<i>Caretta caretta</i>	T
	Atlantic Salt Marsh Snake	<i>Nerodia clarkii (=fasciata) taeniata</i>	T
Plants	Rugel's Pawpaw	<i>Deeringothamus rugelii</i>	E
	Okeechobee gourd	<i>Cucurbita okeechobeensis</i> <i>ssp. okeechobeensis</i>	E

* Endangered (E), Threatened (T), Candidate (C), Species of Special Concern (LS), Recovery (R), Critical Habitat (CH), Not Currently Listed (N)

State and Federal FNAI Species in the City of Deltona and Surrounding Areas

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
<i>Mycteria americana</i>	Wood Stork	G4	S2	LT	FT
<i>Ursus americanus floridanus</i>	Florida Black Bear	G5T2	S2	N	N
<i>Drymarchon couperi</i>	Eastern Indigo Snake	G3	S3	LT	FT
<i>Scrub</i>		G2	S2	N	N
<i>Floridobia monroensis</i>	Enterprise Siltsnail	G1	S1	N	N
<i>Selonodon floridensis</i>	Florida Cebionid Beetle	G2G4	S2S4	N	N
<i>Aphelocoma coerulescens</i>	Florida Scrub-Jay	G2	S2	LT	FT
<i>Mesic flatwoods</i>		G4	S4	N	N
<i>Sandhill upland lake</i>		G3	S2	N	N
<i>Alligator mississippiensis</i>	American Alligator	G5	S4	SAT	FT(S/A)
<i>Athene cunicularia floridana</i>	Florida Burrowing Owl	G4T3	S3	N	SSC
<i>Calopogon multiflorus</i>	Many-flowered Grass-pink	G2G3	S2S3	N	T
<i>Carex chapmanii</i>	Chapman's Sedge	G3	S3	N	T
<i>Centrosema arenicola</i>	Sand Butterfly Pea	G2Q	S2	N	E
<i>Ceratocanthus aeneus</i>	Shining Ball Scarab Beetle	G2G3	S2	N	N
<i>Coelorachis tuberculosa</i>	Piedmont Jointgrass	G3	S3	N	T
<i>Pteronotropis welaka</i>	Bluenose Shiner	G3G4	S3S4	N	SSC
<i>Pycnanthemum floridanum</i>	Florida Mountain-mint	G3	S3	N	T
<i>Salix floridana</i>	Florida Willow	G2	S2	N	E
<i>Sciurus niger shermani</i>	Sherman's Fox Squirrel	G5T3	S3	N	SSC

State and Federal FNAI Species in the City of Deltona and Surrounding Areas

Scientific Name	Common Name	Global Rank	State Rank	Federal Status	State Listing
<i>Conradina grandiflora</i>	Large-flowered Rosemary	G3	S3	N	T
<i>Cucurbita okeechobeensis</i>	Okeechobee Gourd	G1	S1	LE	E
<i>Deeringothamnus rugelii</i>	Rugel's Pawpaw	G1	S1	LE	E
<i>Geolycosa xera</i>	McCrone's Burrowing Wolf Spider	G2G3	S2S3	N	N
<i>Gopherus polyphemus</i>	Gopher Tortoise	G3	S3	C	ST
<i>Grus canadensis pratensis</i>	Florida Sandhill Crane	G5T2T3	S2S3	N	ST
<i>Hartwrightia floridana</i>	Hartwrightia	G2	S2	N	T
<i>Heterodon simus</i>	Southern Hognose Snake	G2	S2	N	N
<i>Illicium parviflorum</i>	Star Anise	G2	S2	N	E
<i>Lechea cernua</i>	Nodding Pinweed	G3	S3	N	T
<i>Lithobates capito</i>	Gopher Frog	G3	S3	N	SSC
<i>Matelea floridana</i>	Florida Spiny-pod	G2	S2	N	E
<i>Mustela frenata peninsulae</i>	Florida Long-tailed Weasel	G5T3	S3	N	N
<i>Nemastylis floridana</i>	Celestial Lily	G2	S2	N	E
<i>Nolina atopocarpa</i>	Florida Beargrass	G3	S3	N	T
<i>Notophthalmus perstriatus</i>	Striped Newt	G2G3	S2	C	N
<i>Pituophis melanoleucus mugitus</i>	Florida Pine Snake	G4T3	S3	N	SSC
<i>Pteroglossaspis ecristata</i>	Giant Orchid	G2G3	S2	N	T
<i>Trichechus manatus</i>	West Indian Manatee	G2	S2	LE	FE