



FINAL

City of DeLand BMAP Compliance Plan

JANUARY 2024



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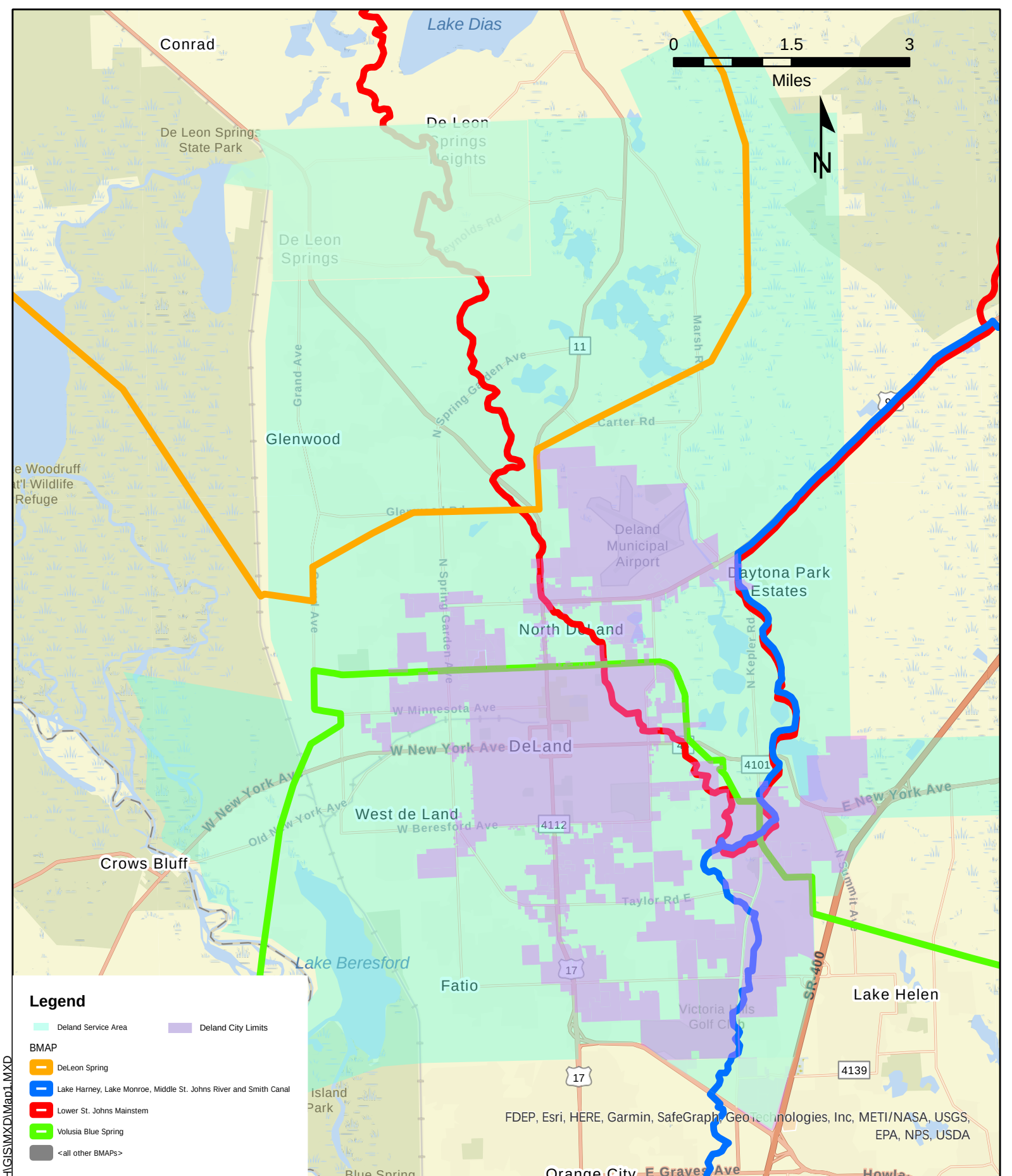
Appendix A: Wiley M Nash WRF Nutrient and Flow Data

Appendix B: Capacity Analysis Report

1. Introduction

The City of DeLand is located in Western Volusia County. The City owns and operates a utility system which provides water, wastewater, and reclaimed water service to residents and businesses within the City of DeLand and adjoining unincorporated areas within northwestern Volusia County. The municipal boundary encompasses approximately 18.5 square miles, and the utility service area (which includes unincorporated areas) encompasses approximately 99.6 square miles. The City's service area overlaps with four BMAPs: Volusia Blue Springs, DeLeon Springs, Lower St. Johns River (LSJR) Mainstem, and Lake Harney, Lake Monroe, Middle St. Johns River, and Smith Canal. **Figure 1-1** displays the overlap of the City's service area with these BMAPs.

The City has authorized preparation of this Basin Management Action Plan (BMAP) Compliance Plan to identify and discuss remediation projects anticipated to occur over the next 20 years. It identifies system improvements that are currently required and establishes a schedule for implementation of future projects based on short term (< 5years), midterm (5-10 years), and long term (>10 years). This compliance plan is broken into two parts: a wastewater treatment plan and an onsite sewage treatment and disposal system (OSTDS) remediation plan as required by FDEP Final order Subparagraph 403.067(7)(a)9.



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City of DeLand BMAP Compliance Plan

Figure 2-1 DeLand Service Area and BMAP Overlay

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2. Wastewater Treatment Plan

The City of DeLand operates a municipal wastewater treatment facility at 1101 South Amelia Avenue (29.009450, -81.298140) in DeLand, Florida. The Wiley M. Nash Water Reclamation Facility utilizes an activated sludge process with secondary clarification, filtration, disinfection, and reuse distribution, with the ability to de-chlorinate effluent and directed flow to the St. Johns River during extreme weather events. The facility (FL0020303) has a permitted capacity of 6.0 million gallons a day (MGD) based on the Annual Average Daily Flow (AADF).

The Wiley M Nash Water Reclamation Facility (WRF) capacity expansion and improvements project is currently under construction. The expansion will increase capacity of the plant to 8 MGD to meet demands of expanding development and population growth. The improvements will upgrade processes to meet advanced wastewater treatment (AWT) requirements with limits of 5-5-3-1 for Biological Oxygen Demand-Total Suspended Solids (BOD-TSS), Total Nitrogen (TN), and Total Phosphorus (TP), respectively. The AWT standards are required by FDEP to satisfy total maximum daily load (TMDL) reduction requirements established for the BMAPs.

2.1 Nutrient Loading

Table 1-1 indicates the WRF's permitted TN and TP effluent limits under the current permit for surface water discharge, and reuse and land application systems. During the year, all reclaimed water from the facility is used for public access reuse. Occasionally during wet weather months, the city discharges to the Saint John's River through there 20-inch outfall. **Figure 2-1** displays the flow through the plant over the past 5 years. **Figure 2-2** displays the nutrient discharging from the facility over the past 5 years to reuse land applications. **Figure 2-3** displays the nutrient discharging from the facility over the past 5 years to surface water discharge (Saint John's River). **Appendix A** displays the monthly data from which Figures 2-1, 2-2, and 2-3 were generated.

TABLE 2-1: FACILITY'S PERMITTED TN AND TP EFFLUENT LIMITS

Permitted TN and TP Effluent Limits					
Parameter	Units	Max/Min	Surface Water	Reuse & Land Application	Statistical Basis
Nitrogen, Total	mg/L	Max	Report	Report	Monthly Average Weekly Average Single Sample
Phosphorus, Total (as P)	mg/L	Max	1.0 1.0 1.5 2.0	Report	Annual Average Monthly Average Weekly Average Single Sample

FIGURE 2-1: FLOW THROUGH PLANT

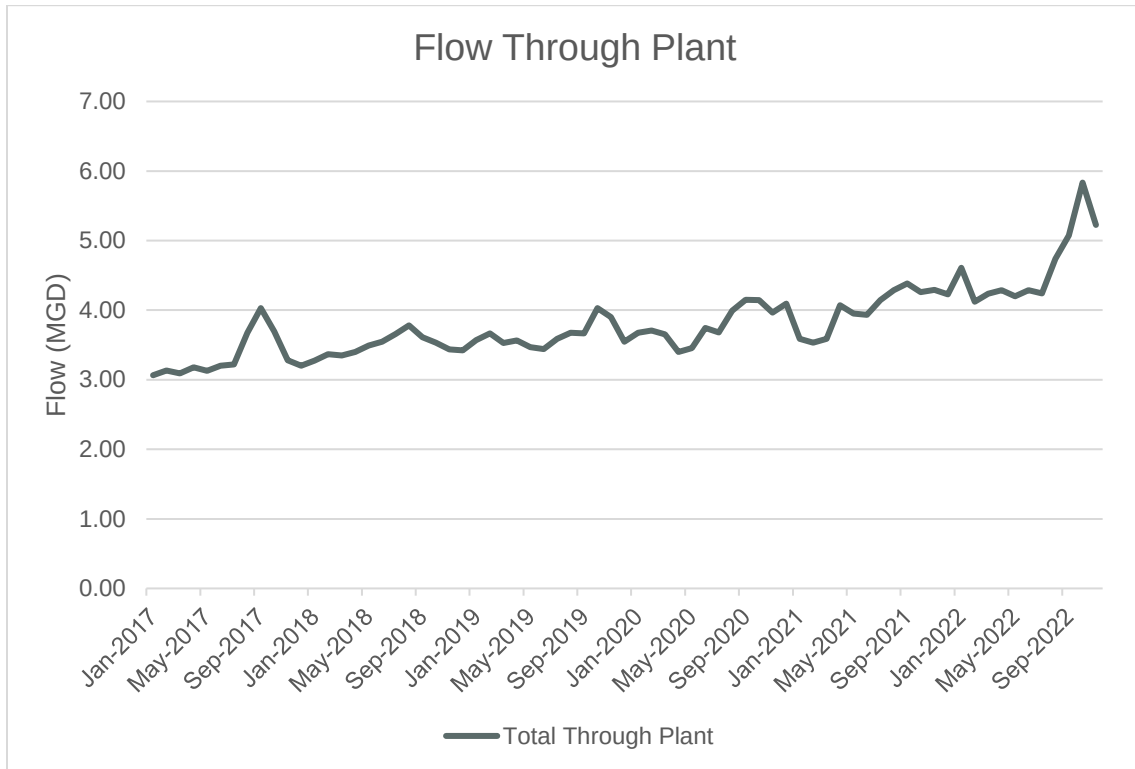


FIGURE 2-2: REUSE AND LAND APPLICATION SYSTEMS EFFLUENT NUTRIENT LOAD

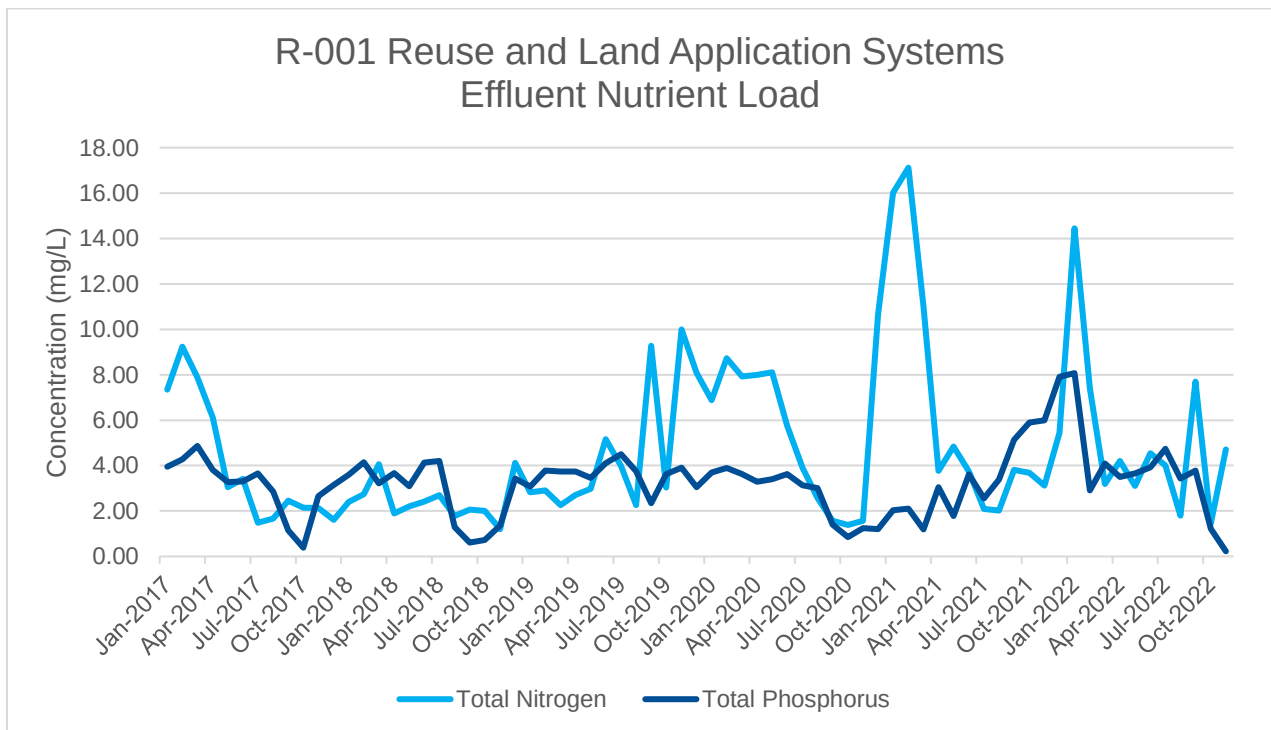
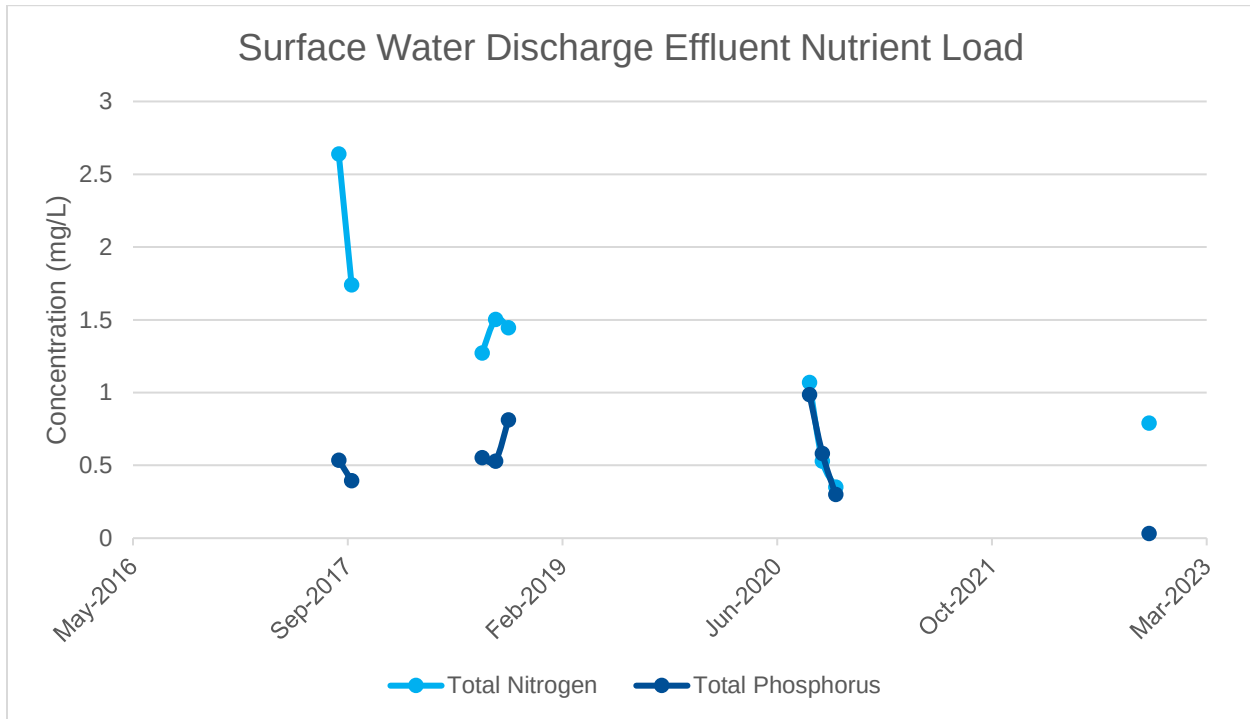


FIGURE 2-3: SURFACE WATER DISCHARGE EFFLUENT NUTRIENT LOAD



2.2 Capacity Analysis

A capacity analysis was performed for the City of DeLand mid-2023. That capacity analysis report has been updated and included as **Appendix B**.

The summary of this capacity analysis report is as follows:

“Projected flow increases in the DeLand service area necessitate expansion of the Wiley M. Nash Water Reclamation Facility. The plant is projected to reach its 6.0 mgd capacity by 2029. As mentioned in previous sections, the Wiley M. Nash WRF expansion is currently under construction. This expansion will increase capacity to 8 mgd ADF (16 mgd peak) to meet demands of expanding development and population through 2040. The current design allows for future expansions to follow, for a total capacity build out of 13 mgd average daily flow (26 mgd peak).”

2.3 Summary of Wiley Nash WRF Expansion

Construction of the Wiley M Nash Water Reclamation Facility Expansion & upgrades project began October 2023, and is expected to be completed by November 2026. To achieve the more stringent TMDL limits, the improvements will take the facility from an advanced secondary wastewater treatment facility to an advanced wastewater treatment facility. These improvements will bring the capacity from 6 MGD average annual daily flow (AADF), to 8 MGD AADF, with a hydraulic peaking factor of 16 MGD. The improvements include an additional influent pump station with fine screening, odor control, Degrift system, two 4-stage Biological Nutrient Removal (BNR) trains, two clarifiers, a UV disinfection within the existing chlorine contact chambers, and additional effluent transfer pumps. Startup of the expanded facility is anticipated in June 2026. The construction cost of the improvements is approximately \$78,420,420.

3. Onsite Sewage Treatment and Disposal System (OSTDS) Remediation Plan

3.1 Existing Collection System

The City of DeLand's sewage collection system consists of a combination of gravity sewers and pressurized force mains shown in **Figure 3-1**. The City's large service area relies on a network of "interceptor" force mains to collect flow from outlying areas and convey pumped sewage to the Wiley M. Nash WRF treatment plant. The City owns no vacuum sewers or grinder systems. It is the position of DeLand's utility department to continue operating a "conventional" gravity sewer and force main collection system. Most areas identified as belonging within the Central City area are currently served by the existing collection system. Additionally, all newly developed areas are required to connect to City sewer. The City recently conducted a Level of Service (LOS) study in 2021 and a per capita flow rate of 225 GPD/ERU (equivalent to 100 gpcd) was established.

Existing collection system infrastructure adequately supports existing development and can support infill which may occur within developed areas. As such, few improvements are proposed within areas currently served. Improvements that were proposed in the City of Deland's wastewater master plan are intended to support growth in undeveloped and underserved areas. Proposed collection system components are also sized to handle additional connections within developed areas served by septic tanks.

3.2 Existing Septic Tanks within Service Area

To determine the number of septic tanks within the City of DeLand, and within the City of DeLand's current service area, GIS data was gathered from the Health Department and Volusia County. After reviewing their data, and reviewing it with the city, it was determined that this data was inaccurate.

Alternatively, to determine the number of septic tanks in the DeLand service area and customers connected to the existing collection system, the existing City of DeLand wastewater master plan, Volusia County property appraiser, and level of service (LOS) report were utilized. **Figure 3-1** shows in pink the number of single family lots within the City of Deland's service area. This accounted for just over 24,000 known single-family homes within Deland's service area (not accounting for commercial and multifamily homes). In the LOS report, it was determined that an average of 225 GPD is contributed per ERU to the collection system. The United States Census estimated a population of 42,000 within city limits of DeLand. With the use of Volusia County property appraiser GIS shown in figure 3-1, and the wastewater master plan, it was determined that there is approximately 28,000 people outside of DeLand's city limits, but within their service area. The United States census estimated approximately 2.42 people per household in the City of DeLand. This statistic was utilized to calculate the equivalent ERUs from the population estimates shown in **Table 3-1** below.

TABLE 3-1: POPULATION & ERU ESTIMATE

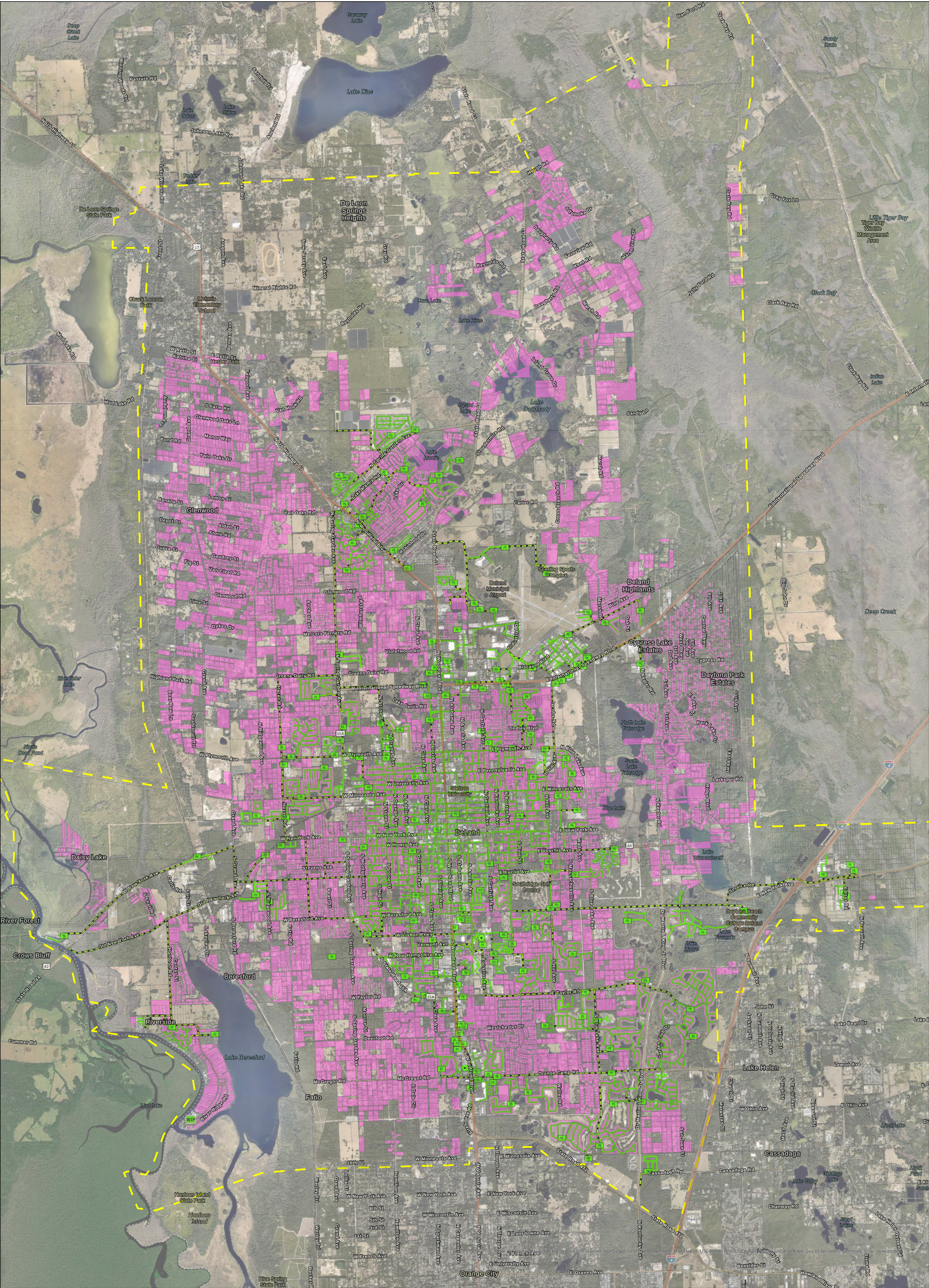
Location	Population	Equivalent ERU's
Within City limits	42,000	17,500
Outside of City limits	28,000	11,500
Total	~70,000	~29,000

The City of DeLand WRF currently has a ADF of 4.6 MGD. At 225 GPD per ERU, that is equivalent to 20,500 ERUs. Table 3-2 depicts the estimated number of septic tanks still in use within the City of DeLand's service area.

TABLE 3-2: NUMBER OF SEPTIC TANKS IN SERVICE AREA

Total ERU's in Service Area	29,000
ERUs Connected to Plant	20,500
Number of Septic Tanks	~8,500

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Legend

- Sanitary Sewer Gravity Mains
- Sanitary Sewer Force Mains
- PS Pump Stations
- DeLand Service Area
- Single Family Residences

City of DeLand BMAP Compliance

Figure 3-1 Existing Collection System

3.3 Planned Septic to Sewer Projects

As part of the OSTDS remediation plan, the City has many septic to sewer projects planned over the next 20 years as described below. Additionally, the City is not going to permit any new septic systems within the BMAP area that are not aerobic systems.

3.3.1 Spring Hill Septic to Sewer

The City is pursuing plans to extend sewer service to additional residents in the Spring Hill area. This +/- 530-acre area is generally bounded by Beresford Avenue and Taylor Road, west of Woodland Boulevard to SR- 15A. The area has already undergone three phases of improvements, but new additional phases 4, 5A, and 5B are proposed as shown in **Figure 3-2**. These proposed phases would consist of approximately 28,000 LF of gravity sewer to be installed in the spring hill community to bring residents from septic to sewer. The estimated costs are detailed below in **Tables 3-2, 3-4, and 3-5**. It is anticipated that these improvements would occur within the next 3-5 years and is located within the Volusia Blue Springs BMAP.

TABLE 3-3: PRELIMINARY COST ESTIMATE SPRING HILL PHASE 4 (SH-1)

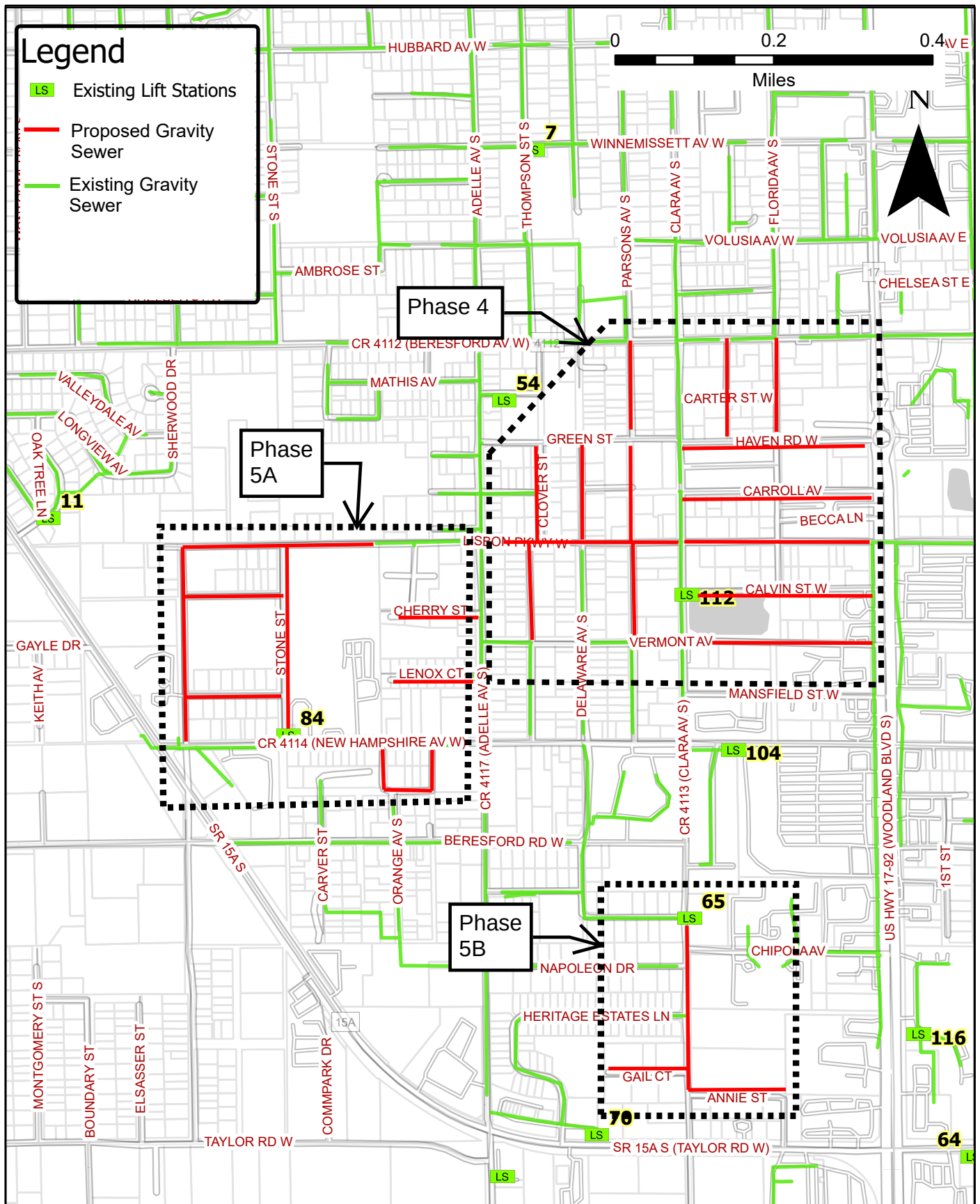
Phase 4					
Item	Description	Qty	Unit	Unit Price	Total
1	8" PVC Gravity Sewer	17,000	LF	\$140	\$2,380,000
2	4' Diameter Manholes	76	EA	\$16,000	\$1,216,000
3	4" Sewer Service	250	EA	\$3,000	\$750,000
4	Video Sewer	17,000	LF	\$5	\$85,000
5	Roadway Construction/ Reconstruction	17,850	LF	\$160	\$2,856,000
6	Tie into Lift Station	2	EA	\$20,000	\$40,000
7	General (5%)	1	LS	\$425,000	\$425,000
	Total Estimated Construction Cost				\$7,752,000
	Contingency @ 20%				\$1,550,400
	Engineering, Construction Administration, and Inspection @15%				\$1,162,800
	TOTAL ESTIMATED PROJECT COST				\$10,465,200

TABLE 3-4: PRELIMINARY COST ESTIMATE FOR SPRING HILL PHASE 5A (SH-2)

Phase 5B					
Item	Description	Qty	Unit	Unit Price	Total
1	8" PVC Gravity Sewer	2,600	LF	\$140	\$364,000
2	4' Diameter Manholes	11	EA	\$16,000	\$176,000
3	4" Sewer Service	35	EA	\$3,000	\$105,000
4	Video Sewer	2,600	LF	\$5	\$13,000
5	Roadway Construction/ Reconstruction	2,730	LF	\$160	\$436,800
6	Tie into Lift Station	1	EA	\$20,000	\$20,000
7	General	1	LS	\$60,000	\$60,000
	Total Estimated Construction Cost				\$1,174,800
	Contingency @ 20%				\$234,960
	Engineering, Construction Administration, and Inspection @15%				\$176,220
	TOTAL ESTIMATED PROJECT COST				\$1,585,980

TABLE 3-5: PRELIMINARY COST ESTIMATE FOR SPRING HILL PHASE 5B (SH-3)

Phase 5A					
Item	Description	Qty	Unit	Unit Price	Total
1	8" PVC Gravity Sewer	8,100	LF	\$140	\$1,134,000
2	4' Diameter Manholes	36	EA	\$16,000	\$576,000
3	4" Sewer Service	120	EA	\$3,000	\$360,000
4	Video Sewer	8,100	LF	\$5	\$40,500
5	Roadway Construction/ Reconstruction	8,505	LF	\$160	\$1,360,800
6	Tie into Lift Station	1	EA	\$20,000	\$20,000
7	General	1	LS	\$200,000	\$200,000
	Total Estimated Construction Cost				\$3,691,300
	Contingency @ 20%				\$738,260
	Engineering, Construction Administration, and Inspection @15%				
	TOTAL ESTIMATED PROJECT COST				\$4,983,255



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City of DeLand BMAP Compliance Plan

Figure 3-2
Spring Hill Gravity Sewer
Phase 4, 5A, & 5B

3.3.2 Daytona Park Estates Septic to Sewer

The residential area west of Kepler Road, south of U.S. Highway 92 and north of Lake Winnemissett is Daytona Park Estates. The area is unincorporated and has an estimated 2020 population of 3,676 people. Residences in the area do not receive water or sewer service and, the streets are unpaved.

A collection system layout was prepared as part of 2015 Masterplan update and remains unchanged for the 2022 update. The layout defines four (4) 'systems', each served by its own lift station, connecting to the East Regional Forcemain. **Figure 3-3** shows the location of the proposed improvements as DP-1, 2, 3, and 4. The improvements are located in the Lake Harney, Lake Monroe, Middle St. Johns River, and Smith Canal BMAP and are anticipated to occur in the next 10-15 years. The preliminary cost estimates are detailed in **Table 3-6, 3-7, 3-8, & 3-9**.

TABLE 3-6: PRELIMINARY COST ESTIMATE DAYTONA PARK ESTATES (SYSTEM #DP-1)

Item	Description	Qty	Unit	Unit Price	
					Total
1	8" PVC Gravity Sewer	42,500	LF	\$140	\$5,950,000
2	4' Diameter Manholes	140	EA	\$16,000	\$2,240,000
3	4" Sewer Service	450	EA	\$3,000	\$1,350,000
4	Pump Station (DP-1)	1	LS	\$550,000	\$550,000
5	6" Force Main	8800	LF	\$100	\$880,000
6	Roadway Construction/ Reconstruction	42,500	LF	\$160	\$6,800,000
7	General	1	LS	\$1,000,000	\$1,000,000
	Total Estimated Construction Cost				\$18,770,000
	Contingency @ 20%				\$3,754,000
	Engineering, Construction Administration, and Inspection @15%				\$2,815,500
	TOTAL ESTIMATED PROJECT COST				\$25,339,500

TABLE 3-7: PRELIMINARY COST ESTIMATE DAYTONA PARK ESTATES (SYSTEM #DP-2)

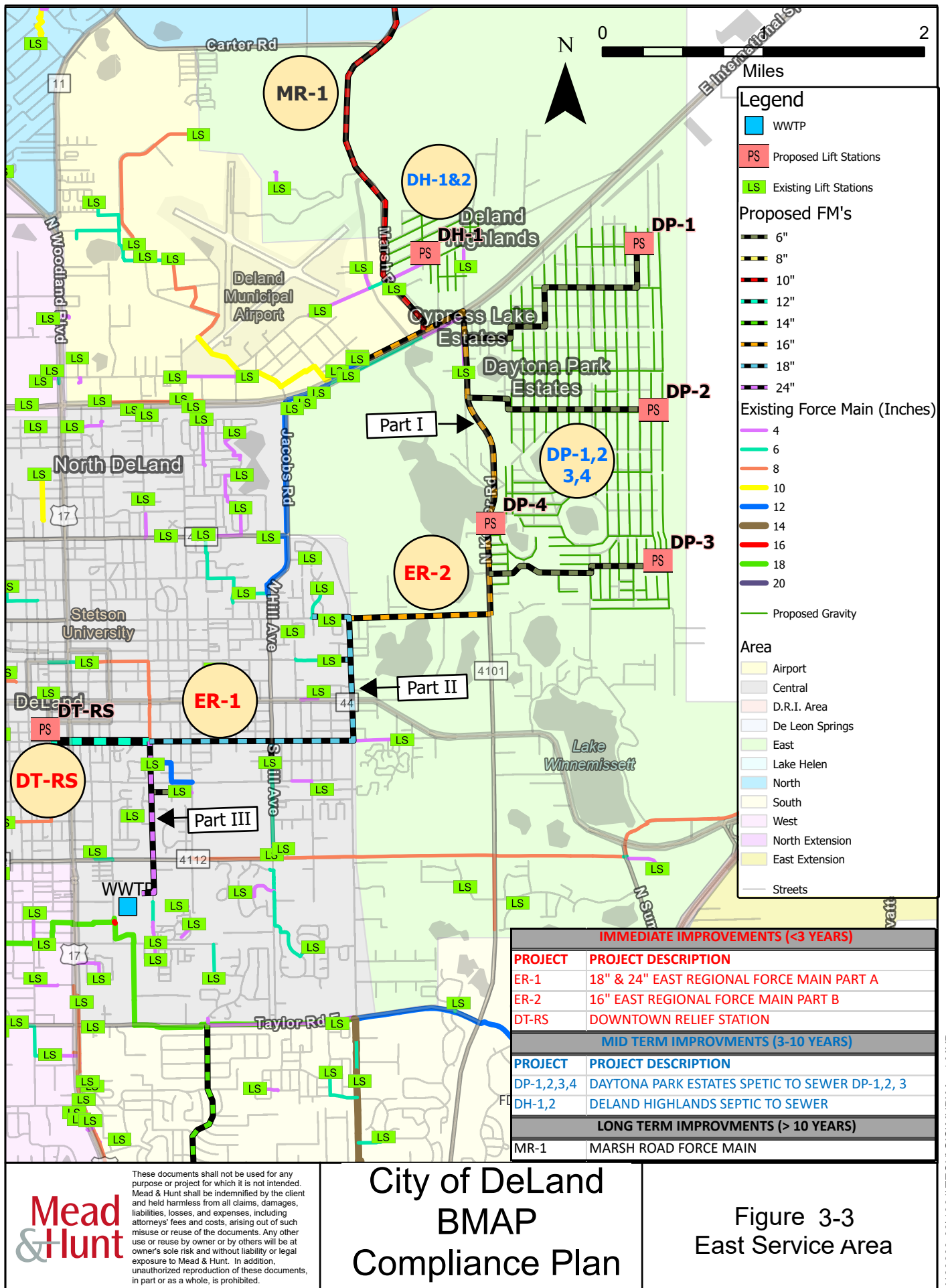
				Unit Price	
Item	Description	Qty	Unit		Total
1	8" PVC Gravity Sewer	87,300	LF	\$140	\$12,222,000
2	4' Diameter Manholes	300	EA	\$16,000	\$4,800,000
3	4" Sewer Service	880	EA	\$3,000	\$2,640,000
4	Pump Station (DP-2)	1	LS	\$550,000	\$550,000
5	8" Force Main	7000	LF	\$100	\$700,000
6	Roadway Construction/ Reconstruction	87,300	LF	\$160	\$13,968,000
7	General	1	LS	\$2,200,000	\$2,200,000
	Total Estimated Construction Cost				\$37,080,000
	Contingency @ 20%				\$7,416,000
	Engineering, Construction Administration, and Inspection @15%				\$5,562,000
	TOTAL ESTIMATED PROJECT COST				\$50,058,000

TABLE 3-8: PRELIMINARY COST ESTIMATE DAYTONA PARK ESTATES (SYSTEM # DP-3)

				Unit Price	
Item	Description	Qty	Unit		Total
1	8" PVC Gravity Sewer	45,700	LF	\$140	\$6,398,000
2	4' Diameter Manholes	150	EA	\$16,000	\$2,400,000
3	4" Sewer Service	460	EA	\$3,000	\$1,380,000
4	Pump Station (DP-3)	1	LS	\$550,000	\$550,000
5	6" Force Main	5500	LF	\$100	\$550,000
6	Roadway Construction/ Reconstruction	45,700	LF	\$160	\$7,312,000
7	General	1	LS	\$1,250,000	\$1,250,000
	Total Estimated Construction Cost				\$19,840,000
	Contingency @ 20%				\$3,968,000
	Engineering, Construction Administration, and Inspection @15%				\$2,976,000
	TOTAL ESTIMATED PROJECT COST				\$26,784,000

TABLE 3-9: PRELIMINARY COST ESTIMATE DAYTONA PARK ESTATES (SYSTEM #DP-4)

Item	Description	Qty	Unit	Unit Price	
					Total
1	8" PVC Gravity Sewer	8,100	LF	\$140	\$1,134,000
2	4' Diameter Manholes	30	EA	\$16,000	\$480,000
3	4" Sewer Service	80	EA	\$3,000	\$240,000
4	Pump Station (DP-1)	1	LS	\$550,000	\$550,000
5	6" Force Main	500	LF	\$100	\$50,000
6	Roadway Construction/ Reconstruction	8,100	LF	\$160	\$1,296,000
7	General	1	LS	\$200,000	\$200,000
	Total Estimated Construction Cost				\$3,950,000
	Contingency @ 20%				\$790,000
	Engineering, Construction Administration, and Inspection @15%				\$592,500
	TOTAL ESTIMATED PROJECT COST				\$5,332,500



3.3.3 DeLand Highlands Septic to Sewer

The residential areas east of Marsh Road, north of U.S. Highway #92 are referred to as the “DeLand Highlands Area”. Some of the area is currently served by City water and a small portion of Kepler Road is on City sewer. A layout has been prepared for sewer service in this area as part of the 2022 Wastewater Master Plan. The layout utilizes existing LS #67 for the DH-2 area and a new lift station for proposed sewers in the DH-1 area. **Figure 3-4** shows the location of the proposed improvements as DH-1 and 2. The improvements are located in the Lower St. Johns Mainstem BMAP and are anticipated to occur in the next 10-15 years. Preliminary cost estimates are detailed below in **Table 3-10** and **Table 3-11**.

TABLE 3-10: PRELIMINARY COST ESTIMATE DELAND HIGHLANDS (PROJECT DH-1)

<i>Item</i>	<i>Description</i>	<i>Qty</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Total</i>
1	8" PVC Gravity Sewer	15,600	LF	\$140	\$2,184,000
2	4' Diameter Manholes	50	EA	\$16,000	\$800,000
3	4" Sewer Service	150	EA	\$3,000	\$450,000
4	Pump Station (DH-1)	1	LS	\$550,000	\$550,000
5	6" Force Main	500	LF	\$100	\$50,000
6	Roadway Construction/ Reconstruction	15,600	LF	\$160	\$2,496,000
7	General	1	LS	\$450,000	\$450,000
	Total Estimated Construction Cost				\$6,980,000
	Contingency @ 20%				\$1,396,000
	Engineering, Construction Administration, and Inspection @15%				\$1,047,000
	TOTAL ESTIMATED PROJECT COST				\$9,423,000

TABLE 3-11: PRELIMINARY COST ESTIMATE DELAND HIGHLANDS (PROJECT DH-2)

<i>Item</i>	<i>Description</i>	<i>Qty</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Total</i>
1	8" PVC Gravity Sewer	4,200	LF	\$140	\$588,000
2	4' Diameter Manholes	15	EA	\$16,000	\$240,000
3	4" Sewer Service	42	EA	\$3,000	\$126,000
4	Roadway Construction/ Reconstruction	4,200	LF	\$160	\$672,000
5	General	1	LS	\$100,000	\$100,000
	Total Estimated Construction Cost				\$1,726,000
	Contingency @ 20%				\$345,200
	Engineering, Construction Administration, and Inspection @15%				\$258,900.00
	TOTAL ESTIMATED PROJECT COST				\$2,330,100

3.3.4 Existing Subdivisions Septic to Sewer

The existing subdivisions in the southern service area are fully developed, and they are all on septic tanks. The Timbers (TT-1) has 50 homes, Westminster Woods (WW-1) has 57 homes, Longleaf Plantation (LL-1) has 140 homes, and Country Club Estates (CC-2) has 125 homes which are shown in **Figure 3-4** as TT-1, WW-1, CC-2, LL-1, and CC-1, respectively. These subdivisions are located in the Volusia Blue Spring BMAP, and the improvements are anticipated to occur over the next 5-10 years. Preliminary cost estimates to provide sewer service to each subdivision have been prepared and detailed below in **Tables 3-12, 3-13, 3-14, & 3-15**.

TABLE 3-12: LONGLEAF PLANTATION SEPTIC TO SEWER (LL-1)

Item	Description	Qty	Unit	Unit Price	Total
1	8" PVC Gravity Sewer	14,000	LF	\$140	\$1,960,000
2	4' Diameter Manholes	140	EA	\$16,000	\$2,240,000
3	4" Sewer Service	140	EA	\$3,000	\$420,000
4	Pump Station	1	LS	\$550,000	\$550,000
5	4" Force Main	1200	LF	\$90	\$108,000
7	Roadway Construction/ Reconstruction	14,000	LF	\$160	\$2,240,000
8	General	1	LS	\$500,000	\$500,000
	Total Estimated Construction Cost				\$8,018,000
	Contingency @ 20%				\$1,603,600
	Engineering, Construction Administration, and Inspection @15%				\$1,202,700
	TOTAL ESTIMATED PROJECT COST				\$10,824,300

TABLE 3-13: COUNTRY CLUB ESTATES SEPTIC TO SEWER (CC-2)

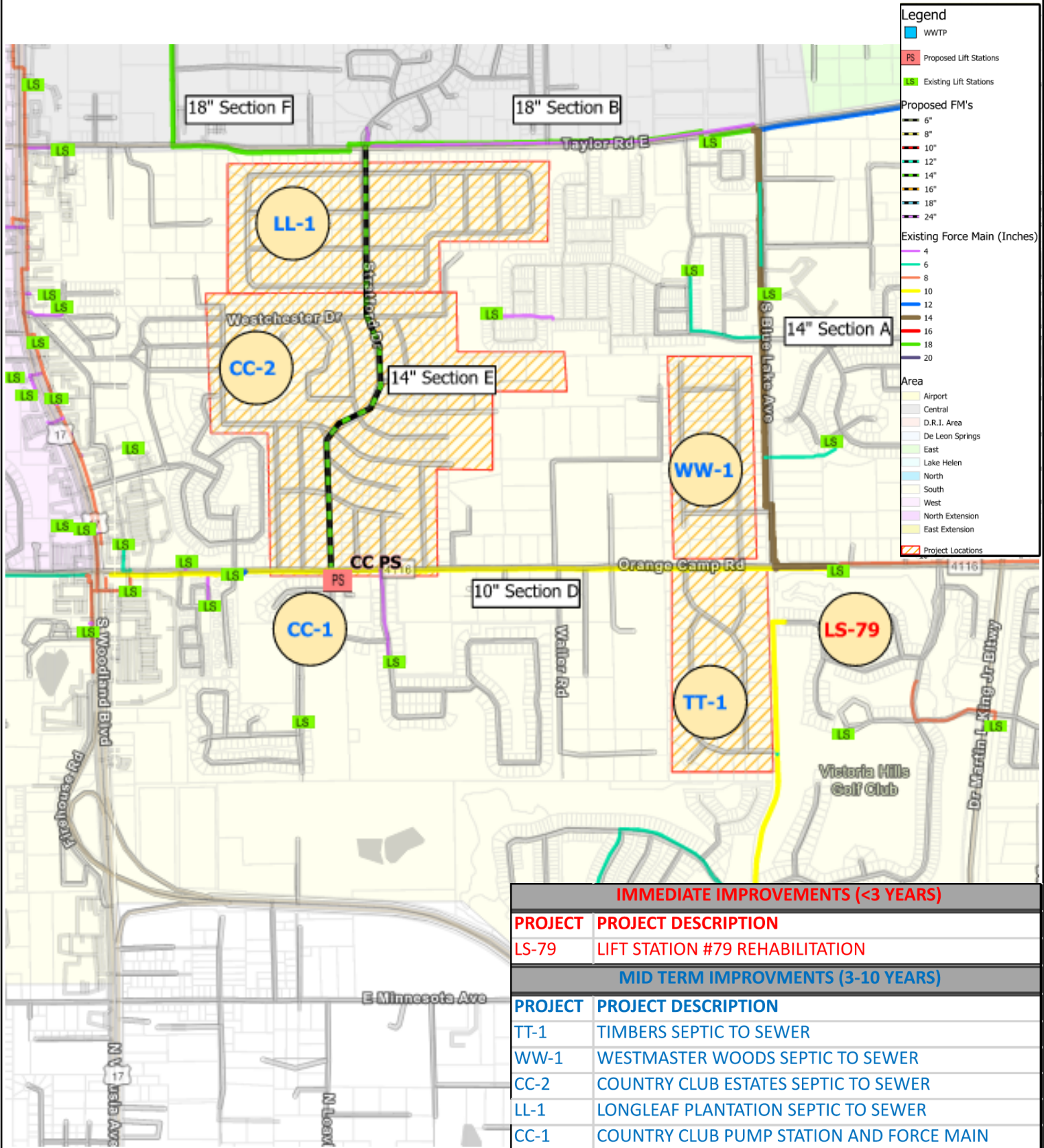
Item	Description	Qty	Unit	Unit Price	Total
1	8" PVC Gravity Sewer	15,000	LF	\$140	\$2,100,000
2	4' Diameter Manholes	55	EA	\$16,000	\$880,000
3	4" Sewer Service	125	EA	\$3,000	\$375,000
4	Pump Station	2	LS	\$550,000	\$1,100,000
5	8" Force Main	2000	LF	\$120	\$240,000
6	Roadway Construction/ Reconstruction	15,000	LF	\$160	\$2,400,000
7	General	1	LS	\$500,000	\$500,000
	Total Estimated Construction Cost				\$7,595,000
	Contingency @ 20%				\$1,519,000
	Engineering, Construction Administration, and Inspection @15%				\$1,139,250
	TOTAL ESTIMATED PROJECT COST				\$10,253,250

TABLE 3-14: THE TIMBERS SEPTIC TO SEWER (TT-1)

<i>Item</i>	<i>Description</i>	<i>Qty</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Total</i>
1	8" PVC Gravity Sewer	5,700	LF	\$140	\$798,000
2	4' Diameter Manholes	20	EA	\$16,000	\$320,000
3	4" Sewer Service	50	EA	\$3,000	\$150,000
4	Pump Station	1	LS	\$550,000	\$550,000
5	4" Force Main	370	LF	\$90	\$33,300
6	Roadway Construction/ Reconstruction	5,700	LF	\$160	\$912,000
7	General	1	LS	\$200,000	\$200,000
	Total Estimated Construction Cost				\$2,963,300
	Contingency @ 20%				\$592,660
	Engineering, Construction Administration, and Inspection @15%				\$444,495
	TOTAL ESTIMATED PROJECT COST				\$4,000,455

TABLE 3-15: WESTMINSTER WOODS SEPTIC TO SEWER (WW-1)

<i>Item</i>	<i>Description</i>	<i>Qty</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Total</i>
1	8" PVC Gravity Sewer	5,000	LF	\$140	\$700,000
2	4' Diameter Manholes	18	EA	\$16,000	\$288,000
3	4" Sewer Service	57	EA	\$3,000	\$171,000
4	Pump Station	1	LS	\$550,000	\$550,000
5	4" Force Main	400	LF	\$90	\$36,000
6	Roadway Construction/ Reconstruction	5,000	LF	\$160	\$800,000
7	General	1	LS	\$150,000	\$150,000
	Total Estimated Construction Cost				\$2,695,000
	Contingency @ 20%				\$539,000
	Engineering, Construction Administration, and Inspection @15%				\$404,250
	TOTAL ESTIMATED PROJECT COST				\$3,638,250



3.4 Summary of OSTDS Removal and Future Installations

The City of DeLand is expecting significant growth over the next 20 years. Future growth within the City's service area is largely projected to be connected to the sewer system. However, when septic systems are installed, the City will only allow aerobic septic systems for all future OSTDSs within the springs priority focus area and the city limits. The remaining part of the DeLand Utility Service Area that serves unincorporated Volusia County is harder to regulate from an enforcement stand point. City staff has recommended connection to city system or required OSTDS and been overridden by the local Health Department or Volusia County, thus making it a less controlled focus.

The above-mentioned projects will eliminate approximately 2,839 septic systems through septic to sewer conversion in the BMAP areas. This equates to approximately 33% of the existing septic systems in the City's service area and within a BMAP. A portion of the Spring Hill septic to sewer project and the entirety of the Timbers and the Westminster Woods septic to sewer projects are located within the DeLand city limits and within a BMAP. This equates to the elimination of approximately 310 septic systems within the DeLand city limits and within a BMAP. While these proposed projects are planned and being executed to remove existing septic tanks, it has been observed that unless a stricter policy by the state on new septic tanks is adopted, the inventory of septic tanks will only increase instead of decreasing, far surpassing what the City is trying to retrofit. It is intended that no permits are to be issued for OSTDSs by the City of DeLand within their city boundaries unless they are aerobic septic systems, that leaves 5,661 septic systems that will require upgrading to enhanced nutrient reducing OSTDSs. Without increased funding, most of these septic tank conversion projects will not be able to occur as fast, and the timelines will need to be extended further out. Given the typical cost of \$25,000 per septic system, that equates to a total cost of \$141,525,000 to convert the rest of the septic systems within the City limits.

Appendix A

Wiley M Nash WRF Nutrient and Flow Data

	Nitrogen, Total mg/L	Phosphorus, Total (as P) mg/L	Flow (Total through plant) MGD
	600	665	50050
	EFA-1	EFA-1	INF-1
Limits	Report	Report	6
Type	24-hr FPC	24-hr FPC	Totalizer
Frequency	Weekly	Weekly	Continuous
	Single Sample Max.	Single Sample Max.	Monthly Average
Jan-2017	7.35	3.96	3.06
Feb-2017	9.24	4.28	3.13
Mar-2017	7.88	4.86	3.09
Apr-2017	6.12	3.81	3.18
May-2017	3.05	3.28	3.13
Jun-2017	3.41	3.30	3.20
Jul-2017	1.49	3.65	3.22
Aug-2017	1.67	2.85	3.68
Sep-2017	2.45	1.14	4.03
Oct-2017	2.15	0.39	3.69
Nov-2017	2.13	2.65	3.28
Dec-2017	1.61	3.15	3.20
Jan-2018	2.39	3.59	3.28
Feb-2018	2.74	4.15	3.37
Mar-2018	4.06	3.21	3.35
Apr-2018	1.89	3.66	3.40
May-2018	2.20	3.10	3.49
Jun-2018	2.42	4.13	3.55
Jul-2018	2.70	4.20	3.66
Aug-2018	1.78	1.28	3.78
Sep-2018	2.06	0.61	3.61
Oct-2018	2.01	0.72	3.53
Nov-2018	1.20	1.35	3.44
Dec-2018	4.12	3.43	3.42
Jan-2019	2.82	3.07	3.57
Feb-2019	2.90	3.78	3.66
Mar-2019	2.26	3.73	3.53
Apr-2019	2.72	3.74	3.56
May-2019	2.98	3.46	3.47
Jun-2019	5.17	4.11	3.44
Jul-2019	3.98	4.50	3.59
Aug-2019	2.25	3.76	3.67
Sep-2019	9.28	2.35	3.66
Oct-2019	3.03	3.63	4.03
Nov-2019	9.99	3.90	3.90
Dec-2019	8.08	3.06	3.54
Jan-2020	6.89	3.69	3.68
Feb-2020	8.73	3.90	3.71
Mar-2020	7.93	3.63	3.65
Apr-2020	8.00	3.29	3.40
May-2020	8.11	3.41	3.45
Jun-2020	5.76	3.63	3.74
Jul-2020	3.91	3.14	3.68
Aug-2020	2.57	3.01	3.99
Sep-2020	1.57	1.40	4.15
Oct-2020	1.38	0.85	4.14
Nov-2020	1.57	1.24	3.97
Dec-2020	10.65	1.21	4.09
Jan-2021	16.01	2.03	3.59
Feb-2021	17.12	2.10	3.53
Mar-2021	11.01	1.18	3.59
Apr-2021	3.76	3.05	4.07
May-2021	4.84	1.78	3.95
Jun-2021	3.74	3.61	3.93
Jul-2021	2.09	2.56	4.14
Aug-2021	2.02	3.39	4.29
Sep-2021	3.81	5.13	4.38
Oct-2021	3.69	5.90	4.26
Nov-2021	3.12	5.99	4.29
Dec-2021	5.44	7.91	4.23
Jan-2022	14.46	8.07	4.61
Feb-2022	7.40	2.91	4.12
Mar-2022	3.19	4.10	4.23
Apr-2022	4.21	3.50	4.29
May-2022	3.11	3.65	4.20
Jun-2022	4.54	3.92	4.29
Jul-2022	4.01	4.74	4.24
Aug-2022	1.80	3.43	4.74
Sep-2022	7.70	3.78	5.07
Oct-2022	1.46	1.22	5.83
Nov-2022	4.72	0.23	5.22

Appendix B

Capacity Analysis Report

**CITY OF DELAND WILEY M. NASH
WATER RECLAMATION FACILITY
F.D.E.P. WASTEWATER PERMIT
APPLICATION**



-CAPACITY ANALYSIS REPORT-

F.D.E.P. PERMIT NO. FL0020303

Report prepared by



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1. INTRODUCTION

The Wiley M. Nash Water Reclamation Facility, DeLand Regional Wastewater Treatment Plant, is an advanced secondary wastewater treatment facility with a permitted average annual daily flow capacity of 6.0 mgd. Effluent is discharged to surface waters in the St. Johns River approximately six miles from the plant site. The city operates a public access land application reuse system consisting of a reclaimed water transmission/distribution system for irrigation of golf courses, cemeteries, parks and commercial facilities.

11 Plant Information

Florida Department of Environmental Protection Domestic Wastewater Facility Permit - FL0020303

Issuance Date	8/13/2018
Expiration Date	8/12/2023
Facility ID	FL0020303
Permittee	City of DeLand Jim Ailes
Address	1101 South Amelia Avenue DeLand, FL. 32724
Latitude	29°00'36"N
Longitude	81°17'54"W

12 Process Summary

The treatment process includes the following stages:

- 1) Influent screening
- 2) Grit removal and classification
- 3) Raw sewage pumping
- 4) Carrousel oxidation
- 5) Secondary clarification
- 6) Cloth media, traveling bridge filtration
- 7) Chlorine disinfection
- 8) Transfer to reuse or dechlorination and surface water discharge.

Residuals handling processes include:

- 1) Sludge thickening
- 2) Aerobic digestion
- 3) Mechanical dewatering
- 4) Land application

A flow diagram for the treatment works is attached as Figure A.

2. EXISTING CONDITIONS

2.1 HISTORICAL FLOW CONDITIONS

The current rated capacity of the DeLand wastewater treatment plant is 6.0 mgd, based on average daily flow conditions. The design peak factors for maximum monthly flows and hydraulic peaks are 1.2 and 2.0, respectively. Historical flow through the WRF for 2007-2022 are provided in Table 2-1 and the Figure 2-1.

In order to analyze recent historical flow patterns, and to satisfy criteria for the Capacity Analysis Report, Type I facilities are required to graphically display historical flow data. Flow data from January 2017 through November 2022 are compiled and compared to the permitted capacity to review percent of the current capacity being utilized and to assist in projecting flows for the permit duration. Monthly average daily flows and three-month rolling average daily flows were calculated from the Discharge Monitoring Reports (DMRs) and are summarized in Table 2-1 & 2-2.

Figure 2-2 depicts graphically the monthly average daily flows and the three-month average daily flows for the time period of January 2017 through November 2022. The annual average daily flows have grown over the study period but remain below the permitted capacity of 6.0 MGD. The ADF over this five-year period was 3.81 MGD which is 63% of the permitted capacity, maximum monthly ADF was 5.83 MGD in October 2022 due to hurricanes, and the minimum ADF was 3.06 MGD in January 2017. The 3-month ADF has remained below the permit limit.

Existing conditions indicate that average daily flow values remain below 80% of the plant's rated capacity of 6.0 mgd. The Wiley M. Nash WRF expansion is currently under construction. This expansion will increase capacity to 8 MGD to meet demands of expanding development and population.

TABLE 2-1 : WILEY M. NASH WRF ANNUAL AVERAGE FLOW 2007-2022

Year	Total Flow Through Plant AADF (mgd)	Permit Capacity (mgd)
2007	2.75	6
2008	2.81	6
2009	2.87	6
2010	2.92	6
2011	2.83	6
2012	2.87	6
2013	2.89	6
2014	2.98	6
2015	3.10	6
2016	3.16	6
2017	3.32	6
2018	3.49	6

2019	3.64	6
2020	3.80	6
2021	4.02	6
2022	4.62	6

FIGURE 2-1: HISTORICAL WRF FLOWS

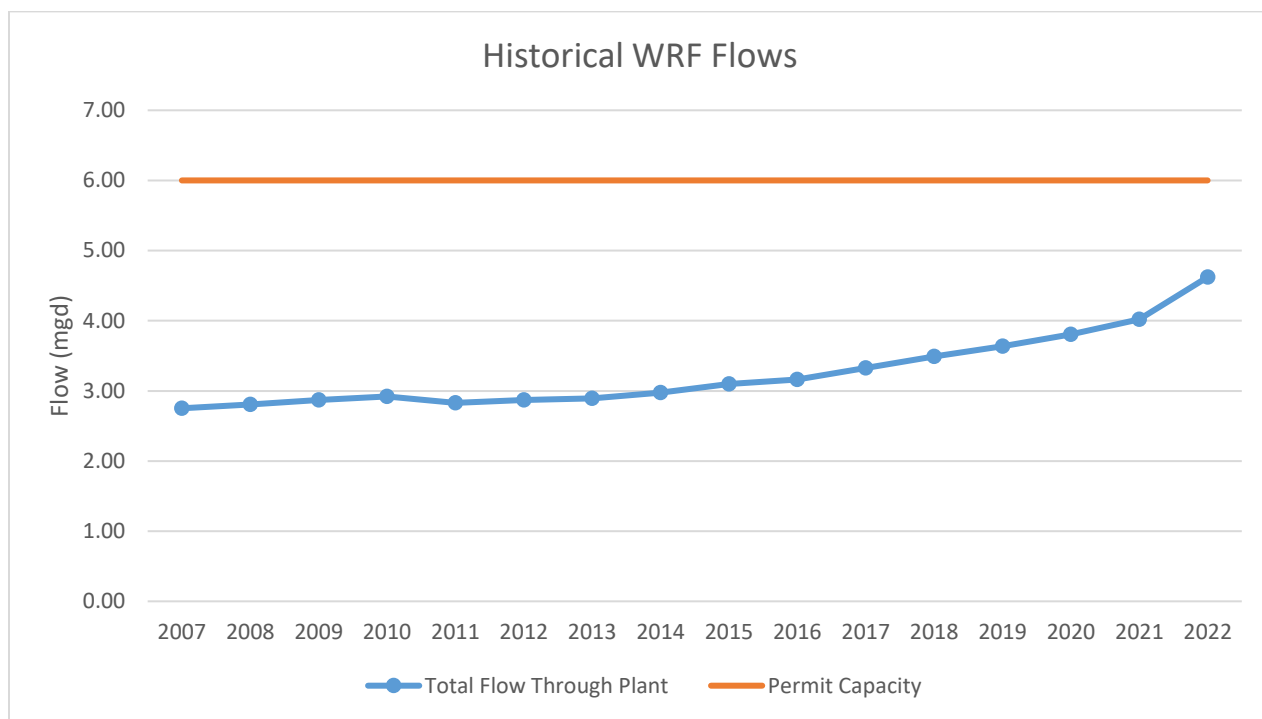


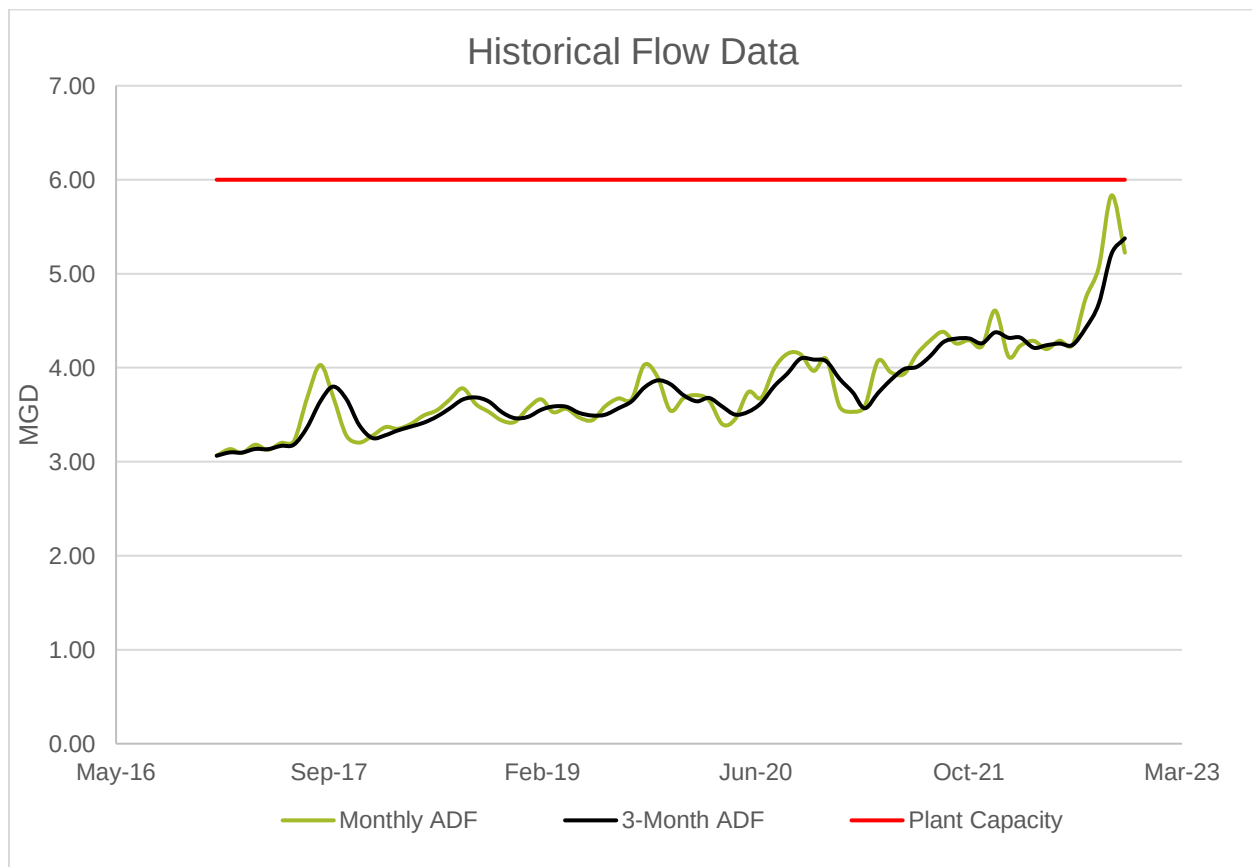
TABLE 2-2: SUMMARY OF HISTORICAL FLOWS

Month	Monthly ADF (mgd)	ADF % of Permit Cap.	3-Month ADF (mgd)
Jan-17	3.06	51%	3.06
Feb-17	3.13	52%	3.10
Mar-17	3.09	52%	3.10
Apr-17	3.18	53%	3.14
May-17	3.13	52%	3.13
Jun-17	3.20	53%	3.17
Jul-17	3.22	54%	3.18
Aug-17	3.68	61%	3.37
Sep-17	4.03	67%	3.64
Oct-17	3.69	62%	3.80
Nov-17	3.28	55%	3.67
Dec-17	3.20	53%	3.39
Jan-18	3.28	55%	3.25
Feb-18	3.37	56%	3.28

Mar-18	3.35	56%	3.33
Apr-18	3.40	57%	3.37
May-18	3.49	58%	3.41
Jun-18	3.55	59%	3.48
Jul-18	3.66	61%	3.57
Aug-18	3.78	63%	3.66
Sep-18	3.61	60%	3.68
Oct-18	3.53	59%	3.64
Nov-18	3.44	57%	3.53
Dec-18	3.42	57%	3.46
Jan-19	3.57	60%	3.48
Feb-19	3.66	61%	3.55
Mar-19	3.53	59%	3.59
Apr-19	3.56	59%	3.58
May-19	3.47	58%	3.52
Jun-19	3.44	57%	3.49
Jul-19	3.59	60%	3.50
Aug-19	3.67	61%	3.57
Sep-19	3.66	61%	3.64
Oct-19	4.03	67%	3.79
Nov-19	3.90	65%	3.87
Dec-19	3.54	59%	3.83
Jan-20	3.68	61%	3.71
Feb-20	3.71	62%	3.64
Mar-20	3.65	61%	3.68
Month	Monthly	ADF % of Permit Cap.	3-Month
Apr-20	3.40	57%	3.59
May-20	3.45	58%	3.50
Jun-20	3.74	62%	3.53
Jul-20	3.68	61%	3.62
Aug-20	3.99	67%	3.80
Sep-20	4.15	69%	3.94
Oct-20	4.14	69%	4.10
Nov-20	3.97	66%	4.09
Dec-20	4.09	68%	4.07
Jan-21	3.59	60%	3.88
Feb-21	3.53	59%	3.74
Mar-21	3.59	60%	3.57
Apr-21	4.07	68%	3.73
May-21	3.95	66%	3.87
Jun-21	3.93	66%	3.99
Jul-21	4.14	69%	4.01
Aug-21	4.29	71%	4.12

Sep-21	4.38	73%	4.27
Oct-21	4.26	71%	4.31
Nov-21	4.29	72%	4.31
Dec-21	4.23	70%	4.26
Jan-22	4.61	77%	4.38
Feb-22	4.12	69%	4.32
Mar-22	4.23	71%	4.32
Apr-22	4.29	71%	4.21
May-22	4.20	70%	4.24
Jun-22	4.29	71%	4.26
Jul-22	4.24	71%	4.24
Aug-22	4.74	79%	4.42
Sep-22	5.07	85%	4.68
Oct-22	5.83	97%	5.21
Nov-22	5.22	87%	5.38
Average	3.81	63%	3.77
Max	5.83	97%	5.38
Min	3.06	51%	3.06

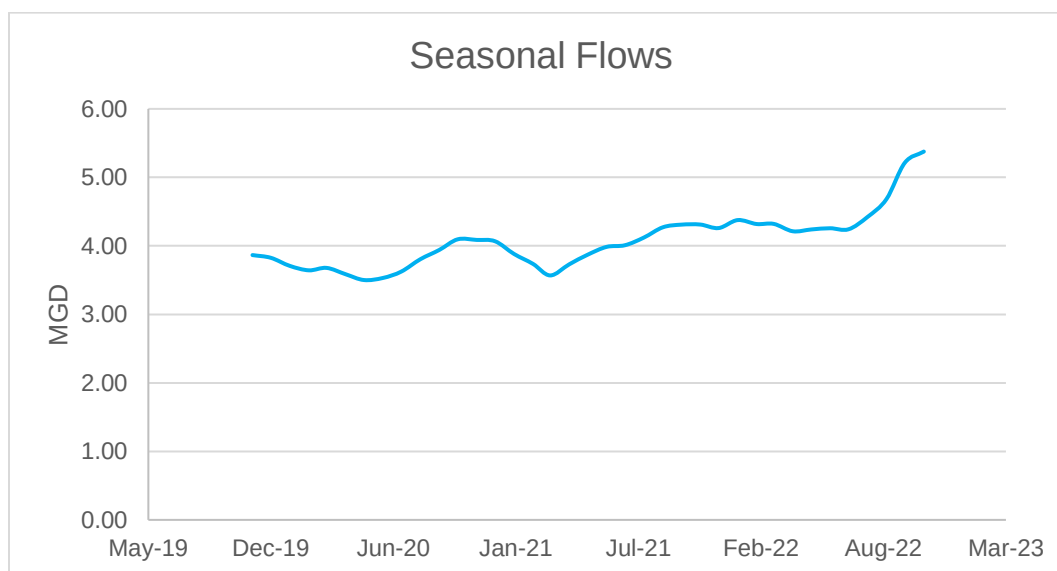
FIGURE 2-2: 2017-2022 HISTORICAL FLOW DATA



22 Seasonal Flow Variations

Figure 2-3 presents three-month rolling averages for the past three (3) years. The data demonstrates that seasonal low flows occur in summer, while seasonal high usage occurs in winter.

FIGURE 2-3: SEASONAL FLOWS



23 DESCRIPTION OF UNIT PROCESSES

This section of the report details plant components and demonstrates the applicability of the permitted capacity.

2.3.1 HEADWORKS

Raw flow entering the plant flows to the headworks which contains bar screens, a primary clarifier and grit classifier. The influent pump station is a split dry well - wet well configuration utilizing vertical mixed flow pumps.

Three bar screens are currently in place, a fixed screen and two self-cleaning screens. The self-cleaning screens have a rated flow capacity of 6.0 mgd. The fixed screen serves as a bypass.

The primary clarifier has dimensions of 24' x 24' x 1.5' deep, with a corresponding volume of 864 c.f.

Peak flow velocities in the grit chamber should not exceed 1.00 fps, per WPCF Mop #8. Actual flow velocities at 6 mgd, with a peak factor of 2.0, are 0.52 fps. Grit chamber capacity is 16 mgd at peak flow.

The existing grit classifier is a 6-inch grit concentrator, it has a capacity of 12 mgd. Maximum grit quantities generated are approximately 10 cf/mgd. At 6 mgd peak grit quantities are 60 cf/day. Grit classifier capacity exceeds current peaks by 100%.

The influent pumping station has three (3) 4,200 gpm vertical mixed flow pumps. With one pump out of service the peak pumping capacity is 8,400 gpm (12 mgd). Existing capacity satisfies design peaks.

The discharge headers serving the three (3) carrousel structures are two (2) 20-inch diameter force mains. Peak flow velocities in the force main should not exceed 5.0 fps. Corresponding flow rates are 9,800 gpm (14 mgd), which is 17% greater than the design peak treatment capacity.

TABLE 2-3: HEADWORKS CAPACITY SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
1	Self-Cleaning Bar Screen	6 mgd	12 mgd	6 mgd
1	Grit Chamber	6 mgd	12 mgd	6 mgd
1	Grit Classifier	6 mgd	12 mgd	6 mgd
3	Influent Pumps	12 mgd (w/1 out of service)	12 mgd	6 mgd
1	Influent Force Main	8 mgd	14 mgd	6 mgd

2.3.2 AERATION BASINS/SECONDARY CLARIFIERS

Flow enters the three (3) carrousel type oxidation ditches. Each oxidation ditch uses two surface mechanical aerators. The ditches are designed to remove carbonaceous BOD, oxidize ammonia to nitrogen and utilize facultative bacteria to denitrify a portion of the wastewater and reduce the corresponding ultimate oxygen demand (UOD) discharged to the St. John's River. The oxidation ditches have a relatively long Solids Residence Time (SRT) which permits a level of sludge digestion to occur in the ditches.

Each carrousel has an outside diameter of 160 feet and an inside diameter of 80 feet, the volume of each is 1.08 million gallons. The corresponding aerobic detention time is 6.48 hours at peak flow.

At current flow rates, BOD removal efficiencies exceed 95% with typical CBOD5 values in the 1-3 mg/L range and similar removal efficiencies for TSS.

Design parameters for the carrousel oxidation system fall within standards in WPCF Mop #8 for Oxidation Ditch Technology, i.e. channel velocities are maintained between 0.8 and 1.2 fps.

Each aeration carrousel has a rated capacity of 2.0 mgd with a design hydraulic peak factor of 2.0 for a peak capacity of 4.0 mgd.

Two (2) 75 horsepower surface aerators provide oxidation and channel flow in each carrousel. The aerators are powered by VFDs and automatically controlled based on DO probes. Under current hydraulic and organic loading conditions approximately 100 horsepower is required to maintain dissolved oxygen levels above 2.0 mg/l. Total available power is 450 horsepower, which exceeds current loading requirements.

The secondary clarifiers are located within the center of each carrousel structure. Each clarifier has an 80-foot diameter and surface area of 5,024 square feet. The surface loading rate is 400 gpd/square foot at 2.0 mgd and 800 gpd/square foot at 4.0 mgd for each clarifier. Sidewater depths for each are 12 feet. Design overflow rates recommended by the "Process Design Manual for Suspended Solids Removal" are 800 gpd/square feet and 1,400 gpd/square feet under average and peak flow conditions, respectively. Recommended sidewater depths are 12 feet.

TABLE 2-4: AERATION CARROUSEL CAPACITY SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
3	Carrousel Aeration Basins	6 mgd (total)	12 mgd (total)	6 mgd
6	75 Hp Aerators	6 mgd (total)	12 mgd (total)	6 mgd
3	Secondary Clarifiers	6 mgd (total)	12 mgd (total)	6 mgd

2.3.3 R.A.S. AND W.A.S. PUMPING FACILITIES

Sludge pumps for the three (3) clarifiers are located in two (2) similar sludge pump stations and return sludge to the influent end of the carrousel structure. The pumps have been outfitted with variable speed drives to permit a finer degree of control for return sludge pumping rates. A total of five (5) return sludge pumps are contained within the sludge pumping station. Individual pump capacities are 1,400 gpm, total R.A.S. capacity with one pump out of service is 5,600 gpm (8.0 mgd).

Current through-plant flow at 3.3 mgd (average) is approximately 55% of the permitted plant capacity. At these inflow rates, the staff has found return sludge rates of 85% to provide optimum treatment. At the design maximum peak influent flow rate of 12 mgd, the maximum return rate would be no higher than 50% (6.0 mgd) to prevent hydraulic overloading.

The four (4) waste sludge pumps are located in the same structures as the return sludge pumps. Each sludge pump has an operating capacity of 350 gpm. Total waste sludge production at 6 mgd ADF is estimated at 120,000 gpd (2%). Assuming a 12 hour/day wasting period, the requisite design flow rate is 167 gpm. Existing W.A.S. pumping capacity exceeds minimum requirements.

TABLE 2-5: R.A.S./ W.A.S. PUMPING SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
5	R.A.S. Pumps	1,400 gpm (2 mgd)	5,600 gpm (8 mgd)	6 mgd
4	W.A.S. Pumps	350 gpm	1,050 gpm (1.5 mgd)	6 mgd

2.3.4 FILTRATION

Effluent flow from the final clarifiers is filtered in cloth media filters. Three automatic backwash filters are operated in parallel operation prior to discharge to the chlorine contact structure. The filters are fed by a single 36-inch diameter gravity pipe from the three (3) secondary clarifiers. The filters control effluent suspended solids and typically produce effluent with suspended solids concentrations below 1 mg/l.

The existing hydraulic gradient from the clarifier to the filters provides hydraulic capacity for an average flow of 8.0 mgd and a peak flow rate of 16.0 mgd.

Three automatic backwash filters were retrofit in 2016 and 2018. Each filter has a bed area of 1,280 square feet and a capacity of 3,472 gpm (5 mgd) at a loading rate of 2.7 gpm/square foot. Acceptable loading rates for single media, continuous operation filters range from 2 to 6 gpm/square foot per Mop #8.

TABLE 2-6: FILTER CAPACITY SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
1	36" Feed Line	8 mgd	16 mgd	6 mgd
3	Automatic Backwash Filter	10 mgd	20 mgd	6 mgd

2.3.5 CHLORINE CONTACT/DECHLORINATION

DeLand's chlorine contact structure serves as the disinfection basin, reclaimed water transfer tank, and de-chlorination basin. The chlorine contact structure has a volume of 134,000 gallons and provides a detention time of 32 minutes at a flow rate of 6 mgd and 16 minutes at 12 mgd. The basin is divided into parallel passes to allow for one side to be taken out of service.

An overflow weir downstream of chlorine contact feeds the reclaimed water storage tank transfer station prior to a final overflow weir which feeds the de-chlorination basin.

Chlorination is accomplished via four (4) 500 pound per day gas chlorinators, average chlorine demand is 330 pounds per day. De-chlorination is accomplished via two 500 pound per day gas sulfonators,

average sulfur dioxide demand is on par with chlorine demand but is only used during river discharge events.

TABLE 2-7: CHLORINATION / DE-CHLORINATION FACILITY SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
1	Chlorine Contact Structure	6 mgd	12 mgd	6 mgd
4	Gas Chlorinators	500#/day (each)	500#/day (each)	n/a
2	Gas Sulfonators	500#/day (each)	500#/day (each)	n/a

2.3.6 RECLAIMED WATER DISTRIBUTION FACILITIES

Three (3) vertical mixed flow pumps at the end of the chlorine contact transfer chlorinated effluent to twin three (3) million gallon prestressed concrete ground storage tanks. Each pump has a transfer capacity of 3,000 gpm. Total transfer capacity, with one pump out of service, is 6,000 gpm (8.64 mgd).

Reclaimed water is withdrawn from storage and sent to distribution via four (4) reuse distribution pumps: (2) 250 horsepower, 2,000 gpm pumps and (2) 250 horsepower, 3,000 gpm high-service pumps. All pumping is PLC controlled with variable speed pumping systems.

TABLE 2-8: RECLAIMED WATER SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
3	Transfer Pumps	3,000 gpm/each	3,000 gpm/each	n/a
2	3 MG Storage Tanks	6 MG	6 MG	6 MG
4	Reuse Distribution Pumps	4.0 mg	10.0 mgd	4.0 mg

2.3.7 SLUDGE HANDLING FACILITIES

Sludge Thickeners

Waste activated sludge is pumped to two (2) rotary drum thickeners prior to aerobic digestion. Each thickener has a rated capacity of 350 gpm and is capable of producing a thickened product up to 5%

solids.

At 6.0 mgd, daily sludge production volumes are approximately 10,000 pounds per day.

Waste sludge delivered to the thickeners has a typical solids concentration of 0-0.75%, thickened sludge is delivered to the digesters with 2% - 3% solids. At 6.0 mgd typical waste sludge flow rates are 50,000± gpd.

Sludge Digesters

Thickened sludge is delivered to the digesters. The wastewater treatment plant has three (3) aerobic digesters. Two (2) digesters are identical and have a volume of 144,000 gallons each and are equipped with course bubble diffusers. The third has a volume of 430,000 gallons and is also equipped with course bubble diffused aerators. The total volume available for digestion is 718,000 gallons.

At 6.0 mgd and 2% solids, the approximate sludge loading rate is 50,000 gpd. The corresponding detention time available in the digesters is approximately 14 days. The calculated sludge retention time (SRT) in the carrousel at 6.0 mgd is approximately 6 days, for a total sludge detention time of 20 days. At 20°C a 40-45% reduction of volatile suspended solids is anticipated per Mop #8 based upon an SRT of 18-20 days.

DeLand currently achieves compliance with EPA 503 sludge disposal regulations by generating a Class "B" sludge. In accordance with EPA 503 compliance with Class "B" Pathogen Reduction Requirements and vector attraction reduction requirements may be achieved with aerobic digestion if the applicant demonstrates sufficient fecal coliform and VSS reductions, respectively. Fecal coliforms must be reduced below 2,000,000 CFU/gram based upon the geometric mean of seven samples. Volatile suspended solids (VSS) shall be reduced such that, "When at the end of 30 days [of the bench scale test], the volatile suspended solids in the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved." Therefore, the benchmarks for Class "B" sludge compliance are fecal coliform levels below 2,000,000 CFU/gram and 30 day VSS reductions below 15 percent.

Belt Presses

Digested sludge is dewatered through the use of three (3) belt filter presses. Dewatered sludge is land applied in restricted access areas.

The sludge processing capacity of each belt filter press is 125 gpm. With one press out of service, approximately 120,000 gallons of sludge may be dewatered during a single eight hour shift. The average daily production sludge at 6.0 mgd is estimated to be approximately 50,000 gpd.

TABLE 2-9: SLUDGE HANDLING FACILITIES SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
2	Sludge Thickeners	6 mgd	8 mgd	6 mgd
3	Sludge Digesters	6 mgd	6 mgd	6 mgd
3	Belt Presses	6 mgd	12 mgd	6 mgd

2.3.8 EFFLUENT PUMPING FACILITIES

All effluent not transferred to reclaimed water storage or distribution is dechlorinated via sulfur dioxide injection and pumped to the St. Johns River. Four (4) 100 horsepower vertical turbine pumps with individual discharge capacities of 2,800 gpm direct flow to the river. With one pump out of service the peak flow capacity is 8,400 gpm (12 mgd).

During the 2013 permit renewal cycle, a hydraulic analysis of the 24-inch diameter outfall line was performed to determine the maximum discharge capacity through the existing outfall. It verified that 12 mgd is the maximum practical limit for the existing pump and pipe configuration. Re-staging of existing pumps will be required to achieve higher peak flows.

TABLE 2-10: EFFLUENT PUMPING SUMMARY

Qty.	Component	Design Capacity	Design Peak	Permitted Capacity
4	Effluent Pumps	2800 gpm/each	8.0 mgd	6 mgd
1	Outfall Main	8.0 mgd	12.0 mgd	6 mgd

3. FUTURE CONDITIONS

The most recent peak month average flow was 5.83 mgd in October of 2022. This was due to hurricanes and does not represent regular peak average month flows. The peak month average flow before this was 4.74 mgd in August 2022, and August 4.38 mgd of 2021.

3.1 FLOW PROJECTIONS

Flow projections for the purpose of this Capacity Analysis Report assume that the historical average growth rate of approximately 0.18 mgd per year and will continue moving forward. The new projections start at 4.62 mgd to reflect the most recent flows from the current service area.

Flow projections have been prepared through the year 2044 with results presented in Table 3-1 & Figure 3-1 below. The projection indicates average flows in 2045 of 8.76 mgd and peak month flows of 9.81 mgd. The plant has adequate capacity to meet the projected demand through 2028 but will undergo construction

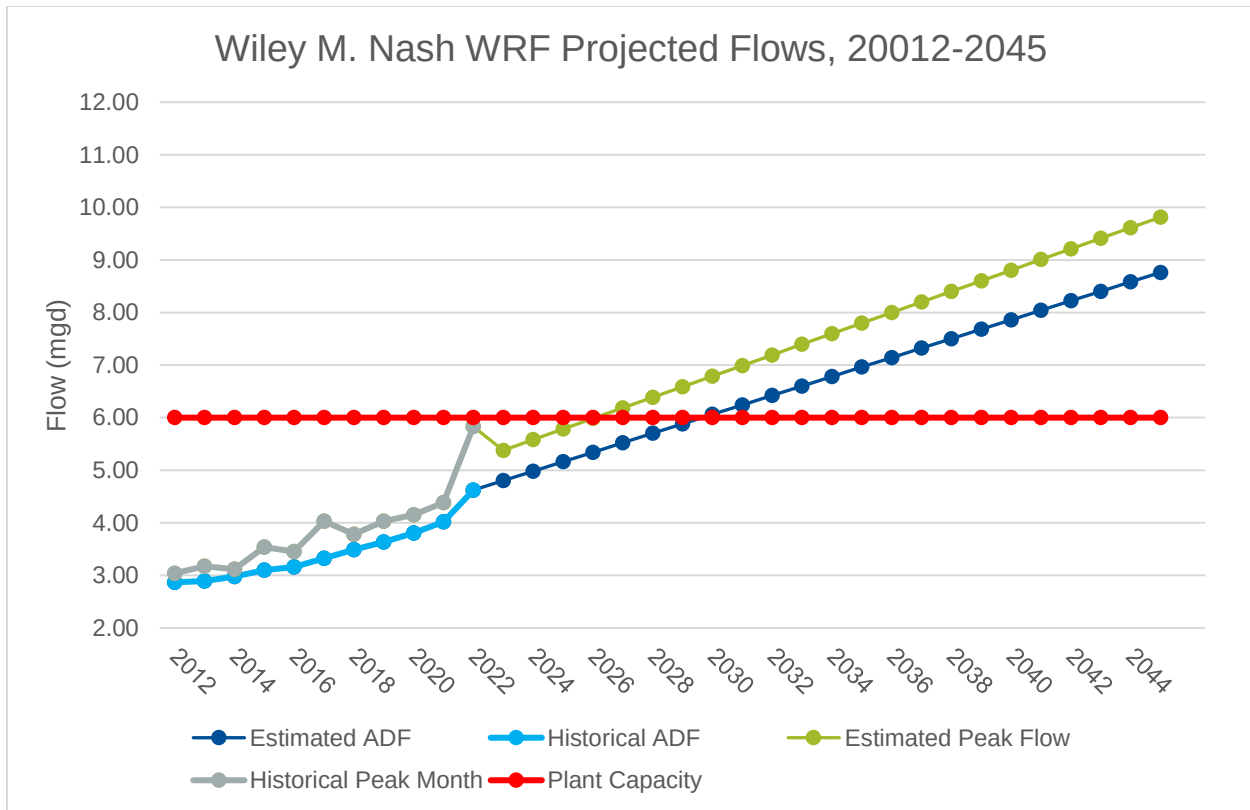
to expand starting at the end of 2023 to upgrade the plant to an 8 mgd ADF (16 mgd peak) capacity which will meet demands through 2040.

TABLE 3-1: WILEY M. NASH WRF FLOW PROJECTIONS 2012-2024

Year	Total Flow Through Plant AADF (mgd)	Yearly Change (MGD)	Peak Month Flow (mgd)	Peak Month Peak Factor	Percent Capacity
2012	2.87	N/A	3.04	1.06	48%
2013	2.89	0.03	3.17	1.10	48%
2014	2.98	0.08	3.12	1.05	50%
2015	3.10	0.12	3.54	1.14	52%
2016	3.16	0.07	3.45	1.09	53%
2017	3.32	0.16	4.03	1.21	55%
2018	3.49	0.17	3.78	1.08	58%
2019	3.64	0.15	4.03	1.11	61%
2020	3.80	0.17	4.15	1.09	63%
2021	4.02	0.22	4.38	1.09	67%
2022	4.62	0.60	5.83	1.26	77%
Historical Averages		0.18		1.12	
2023	4.80	N/A	5.38	1.12	80%
2024	4.98	0.18	5.58	1.12	83%
2025	5.16	0.18	5.78	1.12	86%
2026	5.34	0.18	5.98	1.12	89%
2027	5.52	0.18	6.18	1.12	92%
2028	5.70	0.18	6.39	1.12	95%
2029	5.88	0.18	6.59	1.12	98%
2030	6.06	0.18	6.79	1.12	101%
2031	6.24	0.18	6.99	1.12	104%
2032	6.42	0.18	7.19	1.12	107%
2033	6.60	0.18	7.39	1.12	110%
2034	6.78	0.18	7.60	1.12	113%
2035	6.96	0.18	7.80	1.12	116%
2036	7.14	0.18	8.00	1.12	119%
2037	7.32	0.18	8.20	1.12	122%
2038	7.50	0.18	8.40	1.12	125%
2039	7.68	0.18	8.60	1.12	128%
2040	7.86	0.18	8.81	1.12	131%
2041	8.04	0.18	9.01	1.12	134%
2042	8.22	0.18	9.21	1.12	137%
2043	8.40	0.18	9.41	1.12	140%
2044	8.58	0.18	9.61	1.12	143%

2045	8.76	0.18	9.81	1.12	146%
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FIGURE 3-1: WRF PROJECTED FLOWS



32 Population Projections

Reviewing current population trends assists a municipality in projecting further growth of the area. The data may be used for planning purposes including projecting future wastewater flows.

Population growth within the City of DeLand's service area is estimated to increase over the next decade, primarily as a result of the expanded wastewater service area and proposed developments. Table 3-2 presents the projected population for the planning period based on the City's service area and population projections. The service area map is attached as Figure B.

TABLE 3-2: POPULATION PROJECTION

	Year	Population
Historical	2013	61,218
	2014	61,995
	2015	62,095
	2016	63,740
	2017	64,948
Projected	2020	67,404
	2025	72,007
	2030	76,609
	2035	81,212
	2040	85,815
	2045	90,964

4. SUMMARY AND CONCLUSIONS

Projected flow increases in the DeLand service area necessitate expansion of the Wiley M. Nash Water Reclamation Facility. The plant is projected to reach its 6.0 mgd capacity by 2029. As mentioned in previous sections, the Wiley M. Nash WRF expansion is currently under construction. This expansion will increase capacity to 8 mgd ADF (16 mgd peak) to meet demands of expanding development and population through 2040. The current design allows for future expansions to follow, for a total capacity build out of 13 mgd average daily flow (26 mgd peak).

A capacity summary is provided below for all treatment processes at the DeLand Regional Water Reclamation Facility.

DELAND REGIONAL WATER RECLAMATION FACILITY CAPACITY SUMMARY

Qty.	Component	Design Capacity (mgd)	Design Peak (mgd)	Permitted Capacity (mgd)
1	Self Cleaning Bar Screen	6	12	6
1	Grit Chamber	6	16	6
3	Influent Pumps	12 (w/1 out of service)	12	6
2	Influent Force Main	14	8.50	6
3	Carrousel Aeration Basins	6 (total)	12 (total)	6
6	75 HP Aerators	6 (total)	12 (total)	6

Qty.	Component	Design Capacity (mgd)	Design Peak (mgd)	Permitted Capacity (mgd)
3	Secondary Clarifiers	6 (total)	12 (total)	6
5	R.A.S. Pumps	6 (firm)	12 (firm)	6
4	W.A.S. Pumps			6
1	36" Filter Feed Pipe	8	16	6
3	Automatic Backwash Filters	10 (total)	20	6
1	Chlorine Contact Structure	6	12	6
3	Transfer Pumps	8.64 (firm)	8.64 (firm)	6
4	Reuse Distribution Pumps	4	8.64	6
2	Sludge Thickeners	6	8	6
3	Sludge Digesters	6	6	6
3	Belt Presses	6	12	6
4	Effluent Pumps	12 (firm)	12 (w/1 out of service)	6
1	Outfall Main	8	12	6

