CITY OF PALM COAST

Wastewater Management System
Facilities Plan

February 2015

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P.E. Number

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EXECUTIVE SUMMARY

1.1 INTRODUCTION

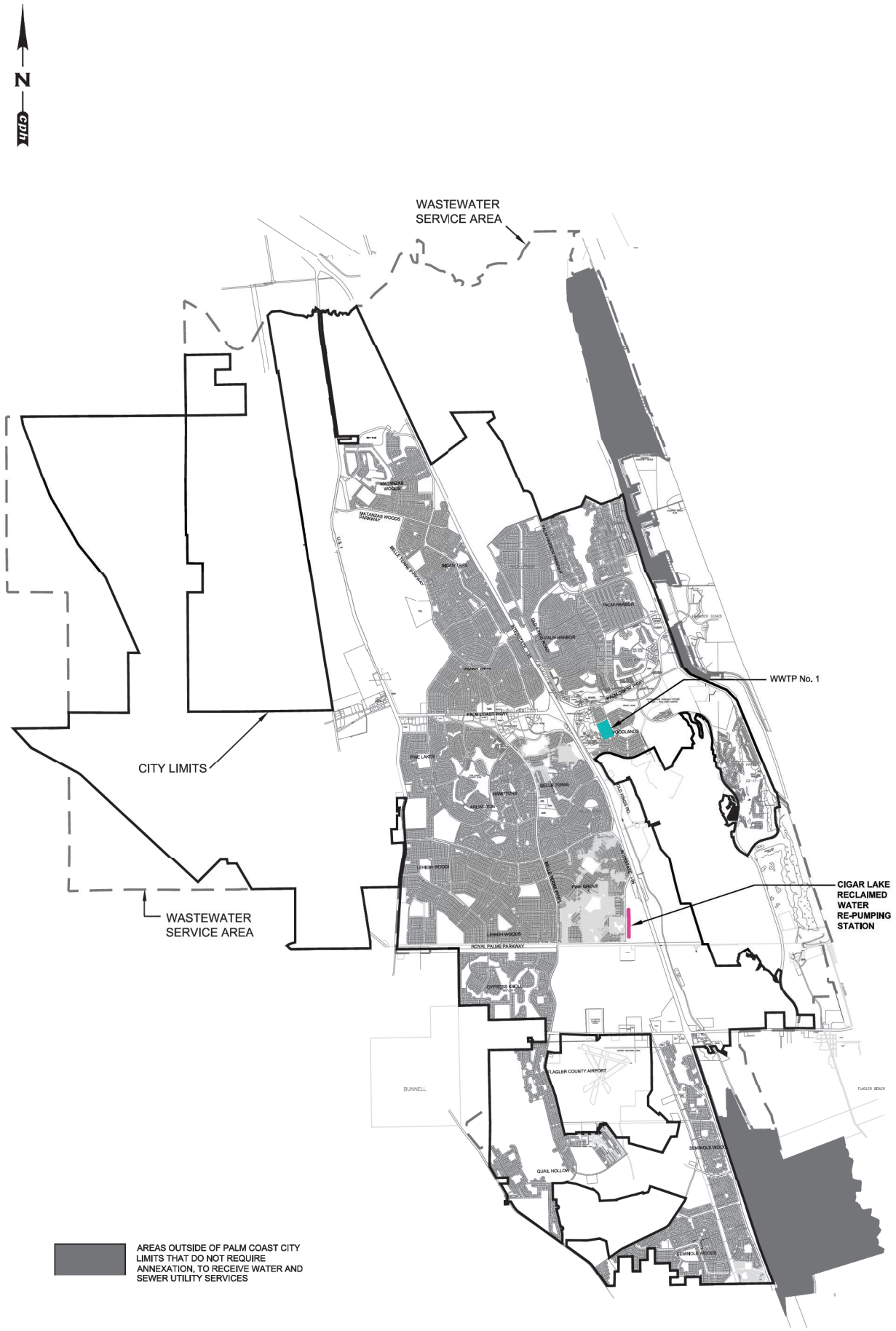
The City of Palm Coast and the Flagler County have experienced considerable residential and commercial development. The residential growth has slowed down during the past few years and growth is expected to return in the next few years. Additional wastewater treatment, wastewater collection, byproduct processing, reclaimed water pumping and reclaimed water conveyance capacity is needed to accommodate the anticipated growth of the community.

This Facility Plan has been prepared for the purpose of evaluating community requirements for wastewater treatment capacity, evaluating alternatives for providing the needed capacity, selecting the most feasible alternatives, and developing a plan for providing needed wastewater treatment facilities.

The City currently operates the wastewater facilities in accordance with Florida Department of Environmental Protection Wastewater Permit No. FL0116009 (Major), issued on April 30, 2012. The service area includes the area within the boundary of the City of Palm Coast and some areas outside the City limits that the City has agreed to serve. **Figure 1-1** "Current Wastewater and Reuse Service Area Map" shows the City Limits for the City of Palm Coast and the Wastewater Utility Service Area.

For the purpose of developing and identifying the future wastewater system improvements, the service area has been divided into two service areas, the WWTF No. 1 Service Area (Service Areas #1) and the WWTF No. 2 Service Area (Service Area #2). **Figure 1-2** "Proposed Palm Coast Wastewater Service Area Map" shows the planning boundaries for each of the two Service Areas. Each of these two service areas is currently served by the existing WWTF No. 1. The proposed WWTF No. 2 and the associated supporting facilities will serve the Service Area #2.

The City of Palm Coast plans to apply for a State of Florida State Revolving Fund (SRF) Loan to finance the construction of various proposed improvements for the Service Area #2. This Facility Plan has been prepared according to SRF Program requirements. It addresses the improvements needed to expand the City's wastewater system to serve the Service Area #2 located in the northwestern area of the Palm Coast community.



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WASTEWATER AND REUSE SERVICE AREA

CITY OF PALM COAST
PALM COAST, FLAGLER COUNTY, FLORIDA

FIGURE
1-1

N

CITY OF PALM COAST, FLORIDA
PALM COAST
INCORPORATED 1999

WASTEWATER SERVICE AREA

PROPOSED WWTP No. 2

SERVICE AREA #2

SERVICE AREA #1

EXISTING WWTP No. 1

CIGAR LAKE RECLAIMED WATER RE-PUMPING STATION

CITY LIMITS

WASTEWATER SERVICE AREA

CITY LIMITS

MATANZAS WOODS
MATANZAS WOODS PARKWAY
U.S. 1
BELLE TERRE PARKWAY
INDIAN TRAIL
PALM HARBOR PARKWAY
PALM HARBOR
OLD KINGS ROAD
INTERSTATE 95
PALM COAST PKWY
WOODLANDS
PINE LAKES
HAMPTONS
ARLINGTON
BELLE TERRE
OLD KINGS RD
LEHIGH WOODS
PINE GROVE
ROYAL PALMS PARKWAY
CYPRESS KNOLL
FLAGLER COUNTY AIRPORT
BUNNELL
FLAGLER BEACH
SEMINOLE WOODS
QUAIL HOLLOW

WWTP NO. 1 SERVICE AREA #1

WWTP NO. 2 SERVICE AREA #2

AREAS OUTSIDE OF PALM COAST CITY LIMITS THAT DO NOT REQUIRE ANNEXATION, TO RECEIVE WATER AND SEWER UTILITY SERVICES

Drawing name: J:\P61117.27A\Civil\Documents\Reports\Facility Plan\Figures\Figures Need to Work On_JS\P61117.27A FIGURE 1-2 FACILITY PLAN.dwg Jan 20, 2015 - 11:40am jshoemaker

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Scale: N.T.S
File: FIGURE 1-2

FACILITY PLAN

CITY OF PALM COAST

Proposed Wastewater Service Area Map

FIGURE
1-2

1.2 RECOMMENDED PLAN

1.2.1 Summary of Recommendations

This Facility Plan recommends constructing the WWTF No. 2 along with its supporting improvements by early 2018. These facilities are needed to keep pace with the projected increased wastewater treatment demand and to meet the need of the proposed new developments and the growth of the existing residential area in the northwestern portion of the Palm Coast community.

The WWTF No. 2 will provide Advanced Wastewater Treatment. Advanced Wastewater Treatment is required in accordance with the Apricot Rule to allow permitting of a backup reclaimed water discharge to a receiving stream.

The supporting improvements for the WWTF No. 2 include:

Wastewater Collection and Transmission System

- Peavey Grade Wastewater Force Main
- Matanzas Pump Station
- Matanzas Pump Station Outflow Force Main to Developer's Main

Reclaimed Water Reuse, Disposal, and Backup Discharge Facilities

- Peavey Grade Reclaimed Water Main
- Matanzas Woods Parkway Reclaimed Water Main
- Backup Surface Water Discharge to Hulett Swamp

To meet scheduling requirements for funding, the engineering design, the preparation of detailed plans, and the preparation of project specifications are scheduled to be completed in May 2015. Forecast for completion of construction of WWTF No. 2 and the associated supporting improvements are in early 2018.

Population projections and associated wastewater flow estimates indicate the current Palm Coast wastewater treatment System capacity will be reached by early 2018**.**

A Request for Inclusion has recently been submitted to the Florida Department of Environmental Protection in Tallahassee for a SRF loan application to finance the construction of the proposed wastewater treatment, force main and reclaimed water main improvements.

1.2.2 WWTF No. 2 and Supporting Improvements

1.2.2.1 Proposed WWTF No. 2

The City of Palm Coast has annexed approximately 5,000 acres in an area located northwest of the City. A new wastewater treatment facility is required in the northwestern portion of the City to support the build out of the Matanzas Woods and Indian Trails subdivisions as well as the Palm Coast Park DRI. The proposed location of WWTF No. 2 is shown on **Figure 1-2**.

The proposed WWTF No. 2 has been designed and permitted in 2011. Due to the slowdown of the economy and growth, the City put the implementation of the project on hold in 2011. The plant was designed to provide Advanced Wastewater Treatment (AWT) standards which will facilitate the expansion of the City's reuse system and allow for reclaimed water disposal under the Florida Apricot Rule. The Florida Apricot Rule provides for backup surface water disposal of up to 30 percent of a facility's permitted reuse disposal capacity or the permitted AWT treatment capacity annually to waters of the state.

The design is currently been updated based on the new and improved membrane bioreactor equipment and other associated process equipment.

The proposed WWTF No. 2 will include the following major treatment processes and process equipment:

- Mechanical Drum Screens with a compactor
- Grit Removal Unit with a Grit Pump and Classifier
- Influent Flow Measurement
- Odor Control
- Equalization Tanks
- Biological Treatment Processes and Equipment
- Membrane Biological Reactor Process Equipment
- Chlorine Contact Chambers
- Effluent Transfer Pumping Station
- Reclaimed Water Ground Storage Tank
- Reject Water Storage and Pumping Station
- Reclaimed Water Distribution Pumping Station
- Standby Generator
- Chemical Storage and Feed System
- Sludge Holding and Dewatering
- Electrical, Instrumentation and Control System

Figure 1-3 shows the proposed WWTF No. 2 site layout and **Figure 1-4** shows the process schematic.

1.2.2.2 Proposed Peavey Grade Wastewater Force Main

The proposed 18-inch Peavey Grade force main will connect to an existing 16-inch force main on US Highway 1 and will convey wastewater to WWTF No. 2 from the future Palm Coast Park developments and the existing Matanzas Woods and Indian Trails area of Palm Coast.

1.2.2.3 Proposed Matanzas Pump Station

Wastewater from the Service Area #2 will be directed to WWTF No. 2 for treatment. This includes all the existing developments and the proposed Palm Coast Park and any future developments within the service area.

None of the existing pumping stations within the Service Area #2 have sufficient capacity to convey wastewater to the proposed WWTF No. 2. A new pump

PNT.	NORTHING	EASTING
100	6038.4959	4884.3161
101	5437.0946	4981.3
102	5496.797	5351.517
103	5030.8172	5426.6624
104	6124.4669	5417.4257
105	5972.9032	5565.6772
106	6065.562	5829.9083
107	5505.91	5294.9663
108	5536.1705	5301.5392
109	5548.6829	5293.9284
110	5616.0761	5326.1777
111	5618.791	5276.9109
112	5552.5935	5311.0866
113	5557.3818	5272.9753
114	5556.6783	5283.9523
115	5541.2691	5343.0171
116	5551.2745	5366.7055
117	5628.6408	5487.5491
118	5640.6162	5488.3166
119	5569.6601	5551.9087
120	5535.7239	5549.7338
121	5529.6161	5645.0383
122	5580.5174	5648.3004
123	5709.8865	5650.5791
124	5715.2269	5567.2501
125	5826.6528	5637.0905
126	5767.7296	5675.7327
127	5787.3216	5698.3625
128	5837.7515	5689.5751
129	5846.2121	5716.1115
130	5796.506	5739.1482
131	5792.029	5809.0048
132	5796.266	5819.4024
133	5794.3473	5849.341
134	5725.4464	5732.9883
135	5704.8835	5743.7349
136	5674.0078	5729.6957
137	5644.89	5708.3126
138	5608.7639	5706.0101
139	5559.1334	5688.8006
140	5589.072	5690.7193
141	5556.5751	5728.7187
142	5555.1964	5750.1783
143	5586.5137	5730.6374
144	5607.101	5731.8568
145	5643.0272	5734.2592
146	5477.6491	5698.9798
147	5536.1899	5702.7354
148	5479.6317	5668.0445
149	5538.1723	5671.8001
150	5463.3209	5620.2594
151	5564.6963	5732.6143
152	5575.9364	5949.1232
153	5644.7931	5953.3882
154	5599.8853	5950.6362
155	5577.5333	5924.1744
156	5646.3921	5928.5834
157	5601.4842	5925.7004
158	5586.6253	5552.998
159	5617.2561	5300.8608
160	5573.8898	5312.4515
161	5553.6469	5293.679
162	5676.7413	5687.1166
163	5738.4723	5717.0551
164	5707.3475	5689.0419
165	5769.9893	5640.4731
166	5539.7861	5365.97
167	5847.1039	5702.1962
168	5847.8141	5690.169
169	5561.297	5896.0785
170	5532.0941	5486.0924
171	5538.0438	5393.323
172	5565.45	5380.0501
173	5567.7525	5344.1238
174	5714.9699	5493.0818
175	5712.7137	5417.6983
176	5647.8574	5375.3284
177	5657.9217	5218.2889
178	5625.0765	5132.3345
179	5639.9453	5072.3547
180	5675.8532	5063.978
181	5712.8337	5054.639
182	5802.8709	5040.1826
183	5833.6347	5062.9311
184	5836.469	5080.56
185	5844.3086	5099.8262
186	5876.6802	5145.952
187	5918.8935	5162.4758
188	5995.6452	5145.9034
189	6028.5985	5168.4058
190	6041.7622	5250.0345
191	6019.5945	5281.4577
192	6005.4785	5284.3012
193	5919.3121	5312.3831
194	5904.2853	5318.5907
195	5454.9392	5276.558
196	5458.4838	5276.121
197	5516.9188	5354.6966
198	5514.778	5349.9588
199	5509.8454	5318.3699
200	5469.6406	5328.535
201	5786.7003	5608.1782
202	5745.3101	5827.7176
203	5665.8669	5902.7673
204	5751.0363	5462.5169
205	5783.9008	5520.8459
206	5914.2375	5667.8384
207	5902.8472	5849.7738
208	5646.0688	6023.1022
209	5652.9172	5916.24
210	5562.4388	5909.5329
211	5564.0619	5884.2073
212	5540.7769	5506.9694
213	5517.427	5480.4205
214	5519.3103	5308.1561
215	5510.1233	5548.0931
216	5487.7175	5559.1828
217	5486.0043	5526.011
218	5464.9897	5359.6851
219	5500.2364	5354.0011
220	5467.8119	5152.9355
221	5492.493	5148.9554
222	5497.4292	5148.1593
223	5586.2812	5028.5408
224	5866.2818	4983.1808
225	5880.9449	5073.6938
226	5901.8898	5117.9294
227	6089.687	5084.0951
229	6026.1485	5336.3034
230	5932.6087	5365.8621
231	5770.7838	5441.5047
232	5836.4191	5415.5248
233	5708.4627	5769.9624
234	5727.432	5774.6632
235	5719.0678	5782.0198
236	5716.8269	5762.6057
237	5829.6185	5811.4138
238	5834.0955	5741.5573
239	5792.7728	5613.3039
240	5705.3874	5517.519
241	5663.9661	5514.8644
242	5536.7075	5293.1609
243	5617.334	5378.365
244	5619.3167	5347.4284
245	5771.8206	5851.7762
246	5679.8687	5915.7021
247	5662.3207	5914.5775
248	5787.7691	5691.3792
249	5780.8654	5746.9953
250	5844.6859	5812.5111
251	5849.1833	5742.335
252	5886.9858	5744.7577
253	5882.4883	5814.3337
254	5818.2998	5714.3226
255	5403.0632	5616.3876
256	5475.2963	5621.0269

CURVE TABLE					
CURVE	LENGTH	RADIUS	DELTA	TANGENT	CHORD
C1000	117.81	75.00	90°00'00"	75.00	106.07
C1001	117.81	75.00	90°00'00"	75.00	106.07
C1002	117.81	75.00	90°00'00"	75.00	106.07
C1003	44.79	200.00	12°49'50"	22.49	44.69

LINE TABLE		
LINE	LENGTH	BEARING
L1000	31.01	N86°19'59"W
L1001	145.00	N03°40'01"E
L1002	225.00	S86°19'59"E
L1003	104.58	S03°40'01"W
L1004	24.72	N80°50'21"E
L1005	30.98	N80°50'21"E
L1006	131.79	S86°19'49"E
L1007	106.45	N03°40'01"E

WETLAND W3
0.41± ACRES

WETLAND F4
0.23± ACRES

2.0 MG
REJECT STORAGE POND

2.0 MG
GROUND STORAGE TANK

WETLANDS

PROPOSED CHAIN LINK FENCE

SLUDGE TRUCK LOADING STATION

SLUDGE PUMP STATION

BLOWERS

FUTURE SLUDGE HOLDING TANK

FUTURE SLUDGE HOLDING TANK

SLUDGE HOLDING TANK

SLUDGE HOLDING TANK

SLUDGE DEWATERING BUILDING

EQUALIZATION TANK

EQUALIZATION TANK

PRE ANOXIC

PRE ANOXIC

OXIC TANK

OXIC TANK

POST ANOXIC

POST ANOXIC

MBR TANK

MBR TANK

MBR TANK

MBR TANK

PUMPS / BLOWERS AREA

IN-PLANT PUMP STATION
GRIT CHAMBER

4 MG (ADF) HEADWORKS

INFLUENT METER

SODIUM HYPO-CHLORITE ALUM FEED SYSTEM

MAIN ELECTRICAL MCC BLDG.

PROPOSED WWTP #2

SEPTIC DRAINFIELD
(To Be Removed)

SEPTIC TANK
(To Be Removed)

WORKSHOP

GARAGE

CARPORT

CARPORT

CONNECT TO EXISTING CHAIN LINK FENCE

STOP SIGN AND STOP BAR

CHEMICAL STORAGE BUILDING

EMERGENCY GENERATOR BUILDING

FUTURE CLEARWELL

EXISTING WTP #3

CHLORINE CONTACT CHAMBERS/
RECLAIMED WATER TRANSFER PUMPS

RECLAIMED WATER RECYCLE PUMP STATION

FUTURE CCC

WATER QUALITY CONTROL VALVES

FUTURE 2 MGD PROCESS TANKS

DISTRIBUTION PUMP STATION

MCC BLDG.

F.F. EL. 39.5

PROPOSED 65' FP&L CO. EASEMENT

PROPERTY BOUNDARY

EXISTING FENCE

GRAPHIC SCALE
80 0 40 80
(IN FEET)
1" = 80 ft.

Sign Symbols

(S) R1-1 STOP SIGN
SEE DETAIL 16 ON SHEET C-11

Drawing name: J:\P61117.27A\Civil\Documents\Reports\Facility Plan\Figures\Figures Need to Work On_JSI\P61117.27A FIGURE 1-3 WWTF No2 SITE LAYOUT.dwg Jan 15, 2015 - 4:30pm jshoemaker

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Drawn by:	JCS	Job No. P61117.27A
Checked by:	YCL	File: FIGURE 1-3
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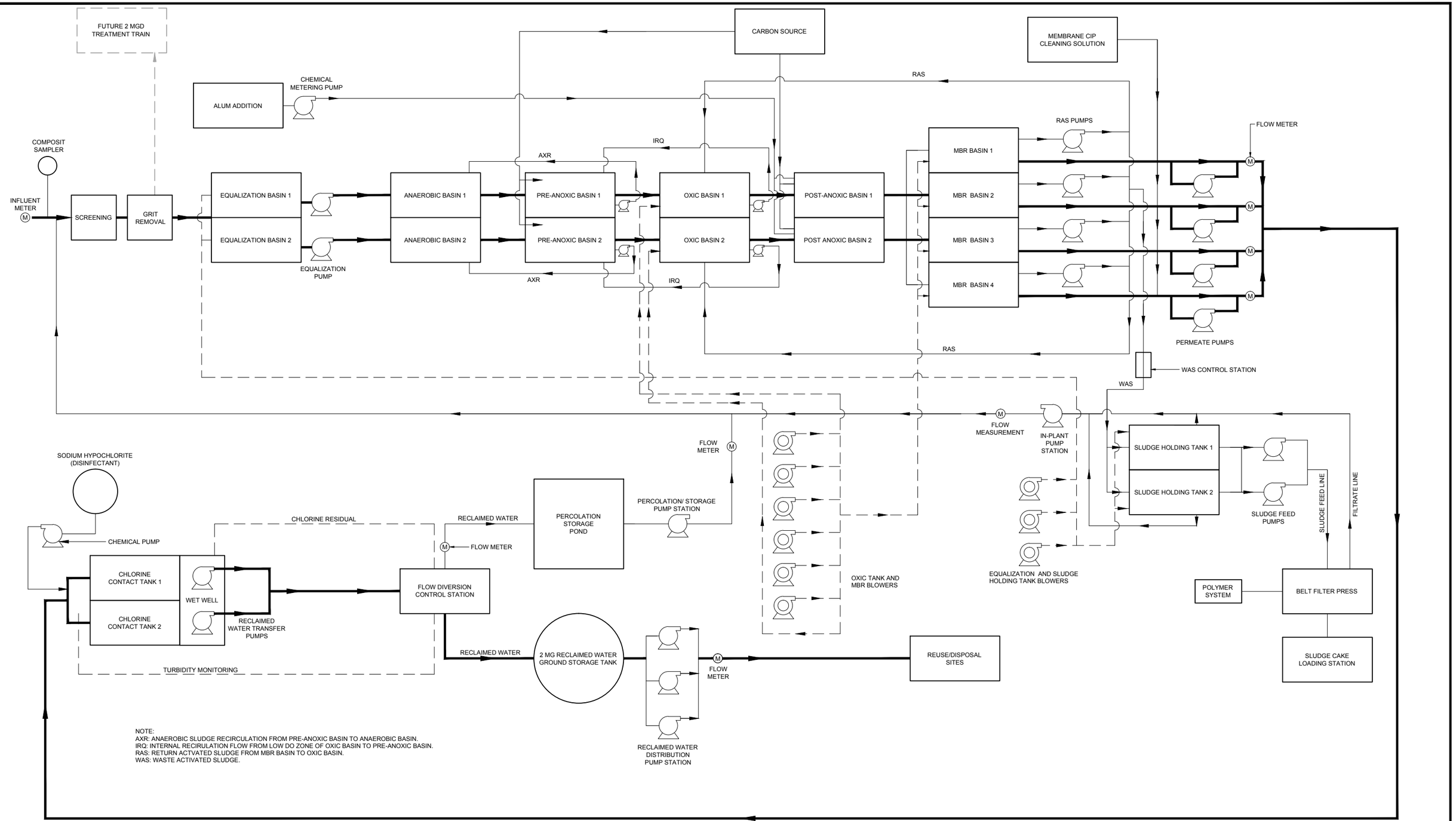
FL. P.E. NO. 31371

SITE LAYOUT

CITY OF PALM COAST
Wastewater Treatment Plant No. 2

Figure
1-3



NOTE:
AXR: ANAEROBIC SLUDGE RECIRCULATION FROM PRE-ANOXIC BASIN TO ANAEROBIC BASIN.
IRQ: INTERNAL RECIRULATION FLOW FROM LOW DO ZONE OF OXIC BASIN TO PRE-ANOXIC BASIN.
RAS: RETURN ACTVATED SLUDGE FROM MBR BASIN TO OXIC BASIN.
WAS: WASTE ACTIVATED SLUDGE.

NOTE: FUTURE PLANT EXPANSION FACILITIES NOT SHOWN

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FL. P.E. NO. 31371

FLOW SCHEMATIC

CITY OF PALM COAST
Wastewater Treatment Plant No. 2

Figure **1-4**

station is proposed along Matanzas Woods Parkway to collect wastewater from the existing system as well as a portion of the Palm Coast Park DRI. The proposed Matanzas Pump Station will provide pumping capacity and piping configurations to convey wastewater to WWTF No. 2 when it becomes operational.

1.2.2.4 Proposed Matanzas Pump Station Outflow Force Main

The proposed Matanzas Pump Station will need a force main to convey wastewater to WWTF No. 2 via the existing force main on US Highway 1 and the proposed Peavey Grade Force Main. The proposed 16-inch Matanzas Pump Station Outflow Force Main will connect to the existing 16-inch force main at the US Highway 1 and Matanzas Woods Parkway intersection. The Proposed Matanzas Pump Station will convey the wastewater through the 16-inch pump station outflow force main, the existing 16-inch force main on US Highway 1 and the proposed 18-inch force main to the proposed WWTF No. 2.

1.2.2.5 Proposed Matanzas Pump Station Inflow Force Main

The proposed Matanzas Pump Station will require a new inflow force main to be installed along Matanzas Woods Parkway. This inflow force main will connect to the force mains that convey wastewater from all existing developments in Matanzas Woods and the Indian Trails and along Belle Terre Parkway.

The proposed Matanzas Pump Station Inflow Force Main will be 16-inch from the Matanzas Pump Station to an existing force main connection at Belle Terre Parkway.

The piping configuration of the Belle Terre and the Matanzas Pump Station Inflow Force Mains will allow wastewater to be conveyed from the existing Pump Station 13-1 to the proposed WWTF No.2 through Matanzas Pump Station.

1.2.2.6 Proposed Peavey Grade Reclaimed Water Reuse Main

The proposed WWTF No. 2 will convey reclaimed water for beneficial reuse via an 18-inch Reclaimed Water Main along Peavey Grade to the Palm Coast Park reclaimed water distribution system connection at US Highway 1. The existing reclaimed water distribution system along US Highway 1 will need to be expanded in the future to serve the proposed Palm Coast Park DRI areas.

1.2.2.7 Matanzas Woods Parkway Reclaimed Water Main

A reclaimed water main is currently being installed along Matanzas Woods Parkway from US Highway 1 to Old Kings Road to connect the WWTF No. 1 and the WWTF No. 2 reclaimed water reuse systems. The construction of this reclaimed water main will not be funded by the SRF loan.

1.2.2.8 Proposed Backup Surface Water Discharge

The proposed WWTF No. 2 will need to have a backup surface water discharge. During periods when the production of reclaimed water exceeds the reclaimed

water reuse demand, a backup surface water discharge will be required. Since the proposed WWTF No. 2 will provide AWT standards, a backup surface water discharge to the Hulett Swamp wetlands is proposed. A reclaimed water main will be routed from WWTF No. 2, along Peavey Grade to the west side of US Highway 1, south to the Hulett Swamp wetlands discharge location between Belle Terre Parkway and US Highway 1.

The surface water discharge will flow through the Hewlett Swamp wetlands to the Hulett Brach into the Pellicer Creek, and eventually to the Intracoastal Waterway.

De-chlorination and monitoring of chlorine residual and flow will be required prior to discharging to Hewlett Swamp Wetlands.

1.3 PROJECT COST SUMMARY

The Palm Coast Wastewater Facilities Improvements discussed in this Facility Plan are to be implemented within the next three years and are to be funded with the FDEP SRF Loan. Proposed improvements will include the new WWTF No. 2 and wastewater collection system and reclaimed water reuse and disposal system improvements.

The construction of the new WWTF No. 2 is scheduled to begin in early 2016 and to be completed and in service in early 2018. Wastewater force main and reclaimed water main improvements related to WWTF No. 2 are also scheduled to be constructed and placed into service by early 2018.

Florida Department of Environmental Protection SRF is expected to be used to fund the proposed wastewater system improvements. A Request for Inclusion for SRF funding of the projects listed in **Table 1-1** has been submitted to DEP in November of 2014. The SRF Planning Document is expected to be submitted to the Department in March of 2015.

Table 1-1: Palm Coast Proposed Wastewater Facility Plan Improvements SRF Preliminary Engineer's Project Cost Estimate

Description	Cost
Wastewater Treatment Facility No. 2	$21,460,800
Peavey Grade Wastewater Force Main	$ 320,000
Reclaimed Water Mains and Backup Surface Water Discharge	$ 2,059,700
Peavey Grade Reclaimed Water Main	$ 320,000
Matanzas Pump Station and Force Mains	$ 1,839,500
Total	$26,000,000

1.4 PROJECT SCHEDULE

An expected schedule for implementation of the proposed FDEP SRF Loan is provided in **Table 1-2**.

Table 1-2: Palm Coast Wastewater Facilities Improvements Project Schedule

Description	Date
Submit Request for Inclusion	November 2014
Complete Facility Plan	January 2015
Complete Capital Financing Plan	January 2015
Hold Public Hearing on Facility Plan and Capital Financing Plan	February 2015
Submit Planning Document to FDEP for Review	March 2015
Submit Certification of Site Availability to FDEP in Tallahassee	March 2015
Complete Preparation of Plans and Specifications for all Improvement Projects	May 2015
Obtain all FDEP Construction Permits	May 2015
Receive Approval of the Planning Document from FDEP for SRF Loan Application	May 2015
Submit Ready-to-Proceed Package to FDEP	June 2015
Submit SRF Loan Application	September 2015
Sign SRF Loan Agreement	November 2015
Advertise for Bids	December 2015
Receive Approval of the Contract Documents and Authorization from FDEP in Tallahassee to Incur Project Construction Costs	December 2015
Receive Approval for State Revolving Loan Funding (SFR)	January 2016
Receive Bids	January 2016
City to Receive and Accept SRF Loan Offer	February 2016
Award Bid and Start Construction	April 2016
Substantial Completion of Construction	February 2018
Completion of Construction and Acceptance	March 2018
Start Up and Operational Acceptance	March 2018

1.5 CONCLUSIONS

A Request for Inclusion has been submitted to the Florida Department of Environmental Protection in Tallahassee for a SRF Loan in November of 2014. The funds will be used for improvement and expansion of the City of Palm Coast wastewater treatment facility, force mains, pumping station, and reclaimed water reuse and disposal infrastructures. The SRF Loan Program will provide low interest funding for this facilities plan program, which has been adopted by the City of Palm Coast.

Expansion of the wastewater treatment and associated facilities is needed to serve the proposed Palm Coast Park DRI along US Highway 1 and the northwestern area of Palm Coast. The projected demand for wastewater treatment will reach the current WWTF No. 1 capacity of 6.83 MGD AADF in early 2018.

The proposed WWTF No. 2 was designed and permitted in 2011. The design is currently being updated to reflect the new and improved treatment process equipment. Design and preparation of plans and specifications of the wastewater collection and reclaimed water reuse and disposal facilities are currently underway. FDEP permits for construction of these facilities will be obtained and submitted to FDEP SRF for review and approval.

The wastewater system improvements included and recommended in this facility plan will produce treated water suitable for reuse. Use of treated reclaimed water for irrigation will reduce the use of potable water for irrigation. This in turn will conserve the high quality potable water available, and reduce the rate of groundwater withdrawal.

SECTION 2.0
EXISTING CONDITIONS

2.1 PERMITS AND LAND USE PLAN

The City operates the existing WWTF No.1 under the Florida Department of Environmental Protection (FDEP) Wastewater Permit No. FL0116009. The current permit was issued on April 30, 2012 and will expire on April 29, 2017.

The FDEP Permit for construction of WWTF No.2 (Permit No. FL0710008-004-DWF) was issued on May 16, 2011 and will expire on May 15, 2016. The permit was modified in 2014 to reflect the updated construction schedule.

The City of Palm Coast has prepared a Comprehensive Land Use Plan. The Plan was adopted by the City on April 6, 2004 and was last amended on June 17, 2008.

2.2 WASTEWATER TREATMENT CAPACITY HISTORY

The current Palm Coast WWTF No.1 was constructed in 1983 with an initial 1.0 MGD AADF treatment capacity. The plant was expanded to 2.0 MGD treatment capacity in 1989. In 1995, the plant was expanded to 4.0 MGD. In 2004, the FDEP approved re-rating of the 4.0 MGD treatment capacity from 4.0 MGD to 4.55 MGD. In January of 2006, the FDEP approved re-rating of the facility permitted capacity from 4.55 MGD to 5.30 MGD.

Upon completion of a major facility upgrading and expansion in 2006, the WWTPF No. 1 was permitted as a 6.83 MGD AADF advanced secondary treatment plant.

2.3 POPULATION AND LAND USE

2.3.1 Current Land Use within the Service Area

The City of Palm Coast was incorporated in December 31, 1999, and has been one of the fastest growing cities in Florida. In 2006, the US Census Bureau reported that Flagler County was the fastest growing county in the United States (percentage increase) for two consecutive twelve month reporting periods (July 2003 through July 2005). The Census Bureau also reported that Flagler County was the fastest growing county, with a population over 10,000, between 2000 and 2006. However, the rate of population growth has decreased significantly after 2007.

The basis of the population estimates are from Bureau of Economic Business Research (BEBR), at the University of Florida and the City of Palm Coast Comprehensive Land Use Plan. BEBR provides Flagler County population projections and annual updates between the decennial census enumerations. The Comprehensive Plan provides the City's projections of the percentage of the Flagler County population which is attributed to Palm Coast.

The Palm Coast Wastewater Service Area extends beyond the City limits. The inside and outside City limit population projections are adjusted to mid-year values. The population and number of wastewater Equivalent Residential Service Connections (ERC's) from 2005 through 2014are tabulated in **Table 2-1**. The ERC's have been based on BEBR data and 2.4 persons per connection.

Table 2-1: Palm Coast Wastewater Service Area Historical Population and ERC (Mid-Year)

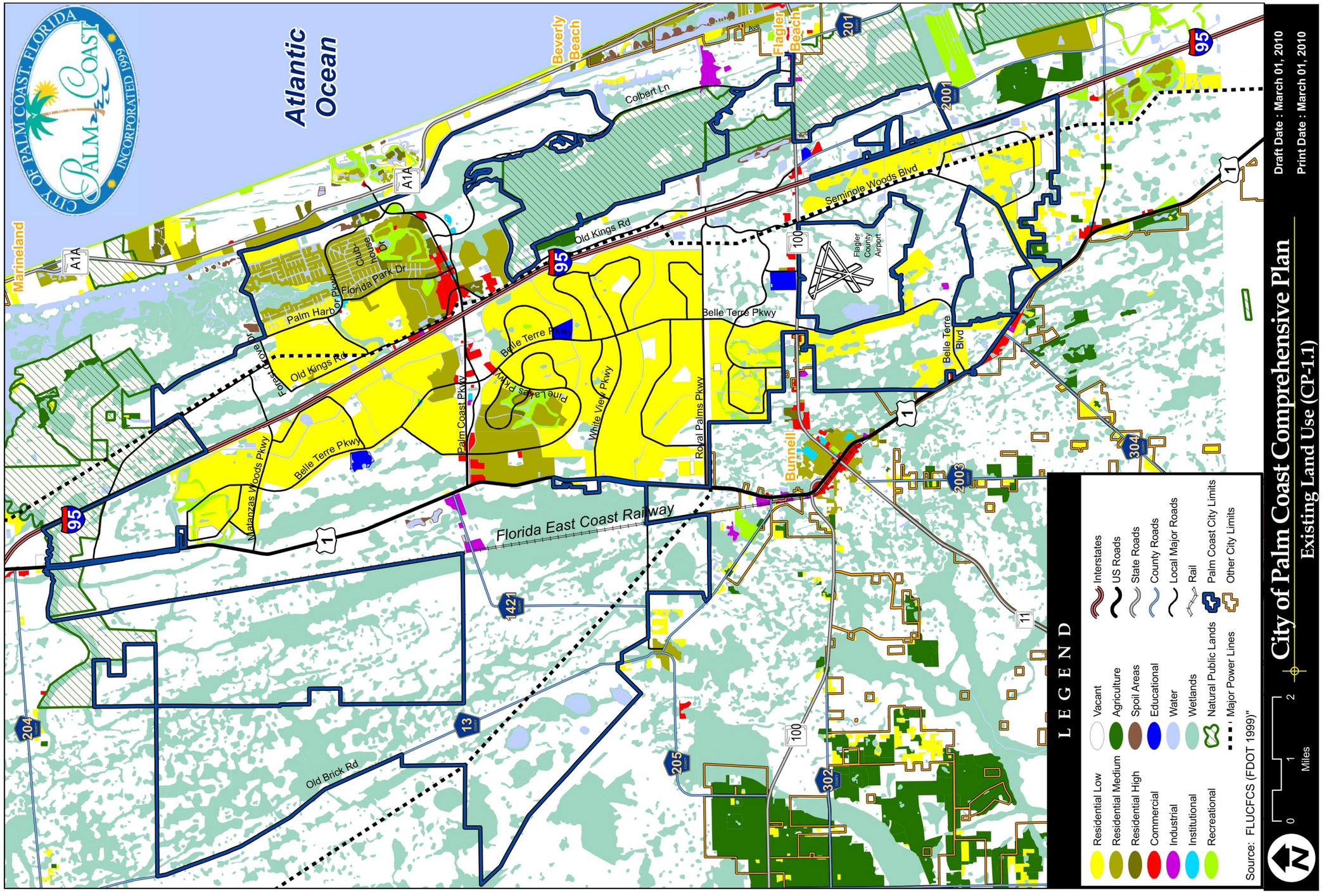
Year	Palm Coast Inside City Limits		Service Area Outside City Limits		Total Wastewater Service Area	
	ERC's	Population	ERC's	Population	ERC's	Population
2005	25,258	60,620	40	96	25,298	60,716
2006	28,514	68,433	60	144	28,574	68,577
2007	29,458	70,698	62	149	29,520	70,848
2008	30,125	72,301	64	153	30,189	72,454
2009	30,630	73,511	65	157	30,695	73,668
2010	31,357	75,258	67	160	31,424	75,417
2011	31,504	75,609	67	160	31,570	75,769
2012	31,766	76,240	67	162	31,834	76,401
2013	32,214	77,313	288	692	32,502	78,004
2014	32,734	78,561	293	703	33,027	79,264

2.3.2 Current Land Use within the Service Area

Palm Coast is a Master Planned Community, and has been designed as a series of suburban residential neighborhoods. The majority of the land use is residential. The majority of the residential uses are low-density, single-family units, with approximately two (2) units per acre. There are some Planned Unit Developments with densities of six (6) units per acre.

Other land uses are commercial, industrial, educational, institutional, and recreational. The Current Land Use Map from the 2010 updated Comprehensive Plan is presented in **Figure 2-1.** The Palm Coast Zoning Map, dated November 2008, is presented in **Figure 2-2.**

Commercial: Most of the commercial development is concentrated along Palm Coast Parkway (the City's main street), US Highway No. 1, Old Kings Road, and SR 100.



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Lndscp. Lic. No. LC0000298

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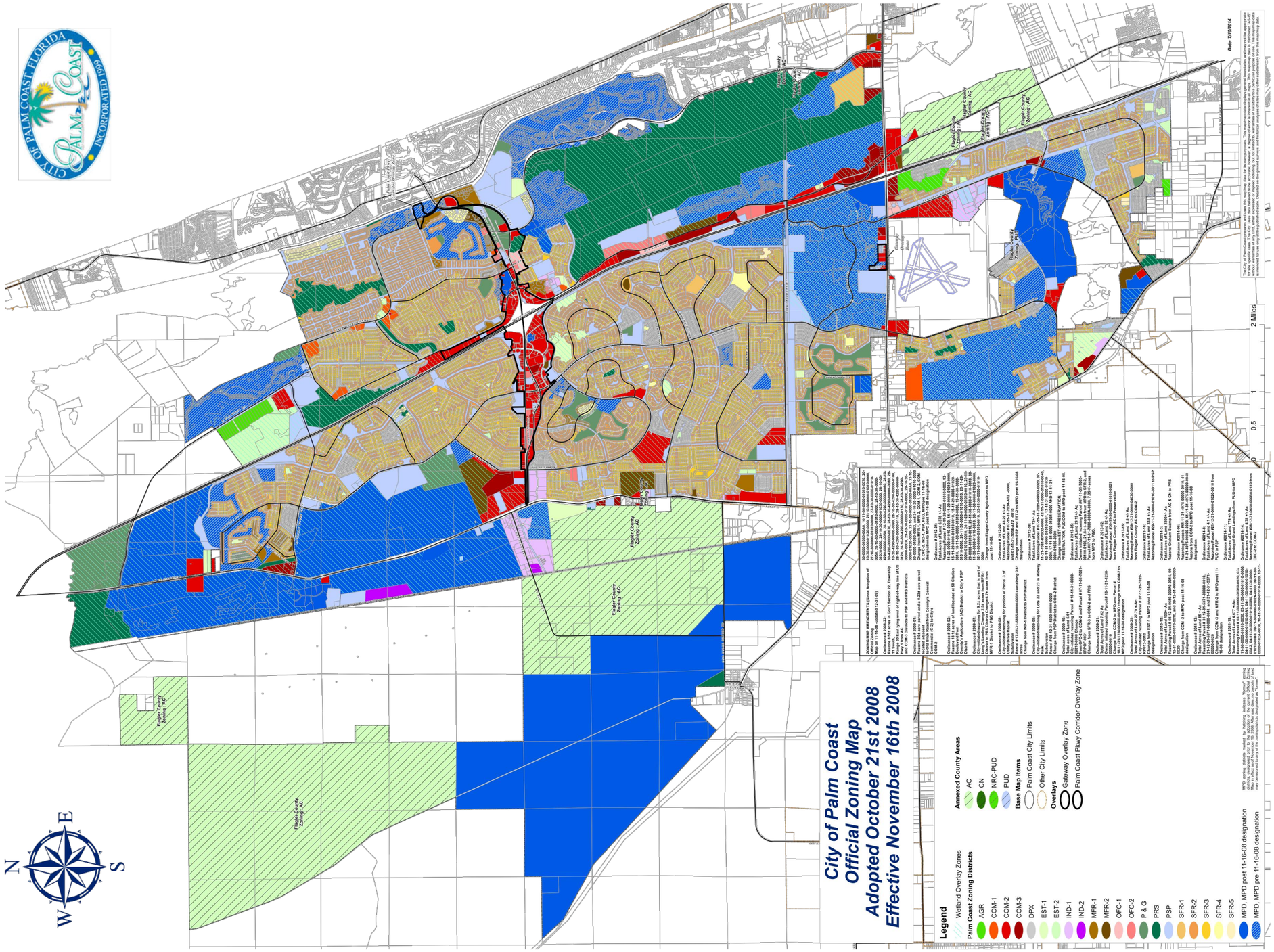
FL. P.E. NO. 31371

City of Palm Caost Current Land Use Map

Figure **2-1**

Drawing name: J:\P61117.27A\Civil\Documents\Reports\Facility Plan\Figures\Figures Need to Work On_JS\P61117.27A FIGURE 2-1 CITY OF PALM COAST CURRENT LAND USE MAP.dwg Jan 20, 2015 - 12:37pm jshoemaker



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YING C. LEE
FL. P.E. NO. 31371

City of Palm Caost Zoning Map

Figure **2-2**

Drawing name: J:\P61117.27A\Civil\Documents\Reports\Facility Plan\Figures\Figures Need to Work On_JSI\P61117.27A FIGURE 2-2 CITY OF PALM COAST ZONING MAP.dwg Jan 20, 2015 - 12:42pm jshoemaker

Industrial: An Industrial Park Area (light manufacturing and warehousing) is located at the intersection of Palm Coast Parkway and US Highway 1. Over 80 businesses employing over 1,000 persons are located in the Palm Coast and Pine Lake Industrial Parks. An additional Industrial Park Area is located along Hargrove Grade.

Educational: There are ten existing K-12 public educational facilities, several private schools, and a community college.

Institutional: A hospital and library are the primary institutional uses.

Recreation: The City owns 890 acres of parks, recreation, and open space. 530 acres are currently undeveloped.

2.4 WASTEWATER FLOWS

The Palm Coast Wastewater Treatment Facility wastewater flow data for January 2004 through June 2014 is provided in **Table 2-2** as the monthly average daily flow (MADF), three-month average daily flow (TMADF) and annual average daily flow (AADF). Flow data was obtained from the monthly discharge monitoring reports (DMRs) for the facility. The TMADF and AADF are calculated values using the MADF data as a basis.

The recorded MADF flows are based on the effluent meter readings for the WWTF (Monitoring Site No. EFA-1). A Parshall Flume measures the influent flow in the facility headworks. Effluent flows are measured with ultrasonic transducers and weirs at the outlet of the chlorine contact tank. These were calibrated in April of 2008.

Figure 2-3 presents the graphical plots of the MADF, TMADF and AADF for January 2004 through June 2014, respectively. A discussion of observed seasonal variations is provided in a later section of this report.

Table 2-2: Palm Coast WWTF No.1 Historical Flows.

Dates	MADF-Monthly Average Daily (MGD)	TMADF-Three-Month Avg. Daily (MGD)	AADF-Annual Average Daily Flow (MGD)
Jun-14	5.194	5.518	**5.834**
May-14	5.805	5.804	5.882
Apr-14	5.554	5.984	5.928
Mar-14	6.052	5.986	5.892
Feb-14	6.347	5.762	5.811
Jan-14	5.56	5.467	5.707
Dec-13	5.379	5.567	5.680
Nov-13	5.463	5.834	5.680
Oct-13	5.859	6.139	5.696
Sep-13	6.179	**6.162**	5.742
Aug-13	6.38	6.130	5.763
Jul-13	6.23	6.121	5.808
Jun-13	5.781	5.753	**5.741**
May-13	6.352	5.518	5.771

Dates	MADF-Monthly Average Daily (MGD)	TMADF-Three-Month Avg. Daily (MGD)	AADF-Annual Average Daily Flow (MGD)
Apr-13	5.126	5.101	5.641
Mar-13	5.075	5.136	5.620
Feb-13	5.102	5.237	5.611
Jan-13	5.231	5.423	5.598
Dec-12	5.377	5.817	5.580
Nov-12	5.661	6.166	5.575
Oct-12	6.413	6.587	5.516
Sep-12	6.425	6.259	5.400
Aug-12	6.923	6.162	5.270
Jul-12	5.430	5.454	5.084
Jun-12	6.132	**5.268**	**5.037**
May-12	4.800	4.878	4.904
Apr-12	4.873	4.926	4.888
Mar-12	4.962	4.977	4.886
Feb-12	4.943	5.093	4.881
Jan-12	5.026	5.096	4.895
Dec-11	5.311	5.096	4.876
Nov-11	4.952	4.947	4.825
Oct-11	5.025	4.861	4.809
Sep-11	4.865	4.806	4.779
Aug-11	4.693	4.699	4.772
Jul-11	4.860	4.667	4.786
Jun-11	4.543	4.663	4.785
May-11	4.597	4.785	4.824
Apr-11	4.849	**4.957**	4.857
Mar-11	4.910	4.939	4.890
Feb-11	5.113	4.869	4.974
Jan-11	4.793	4.750	5.044
Dec-10	4.701	4.707	5.097
Nov-10	4.756	4.734	5.133
Oct-10	4.663	4.772	5.159
Sep-10	4.783	4.831	5.086
Aug-10	4.869	4.907	5.151
Jul-10	4.840	4.947	5.255
Jun-10	5.011	5.084	5.268
May-10	4.990	5.385	5.311
Apr-10	5.251	5.707	5.431
Mar-10	5.913	**5.767**	5.351
Feb-10	5.957	5.505	5.222
Jan-10	5.432	5.209	5.067
Dec-09	5.126	4.661	4.985
Nov-09	5.068	4.808	4.928
Oct-09	3.790	5.157	4.881
Sep-09	5.567	5.558	4.968
Aug-09	6.115	5.546	**4.969**
Jul-09	4.991	5.651	4.922
Jun-09	5.531	**5.418**	4.906
May-09	**6.431**	5.029	4.777
Apr-09	4.292	4.251	4.577
Mar-09	4.365	4.302	4.591

Dates	MADF-Monthly Average Daily (MGD)	TMADF-Three-Month Avg. Daily (MGD)	AADF-Annual Average Daily Flow (MGD)
Feb-09	4.096	4.328	4.643
Jan-09	4.444	4.463	4.679
Dec-08	4.444	4.593	4.715
Nov-08	4.501	4.975	4.758
Oct-08	4.835	5.324	4.726
Sep-08	**5.588**	5.312	4.803
Aug-08	5.548	4.775	**4.813**
Jul-08	4.800	4.270	4.721
Jun-08	3.976	4.155	4.716
May-08	4.034	4.496	4.717
Apr-08	4.455	4.661	4.730
Mar-08	**4.999**	**4.800**	4.703
Feb-08	4.528	4.786	4.704
Jan-08	4.872	4.648	**4.797**
Dec-07	4.959	4.944	4.808
Nov-07	4.114	5.193	4.784
Oct-07	**5.758**	**5.304**	**4.818**
Sep-07	5.707	4.964	4.702
Aug-07	4.448	4.393	4.609
Jul-07	4.736	4.305	4.603
Jun-07	3.996	4.106	4.582
May-07	4.182	4.444	4.618
Apr-07	4.140	4.931	4.622
Mar-07	5.011	5.217	4.630
Feb-07	5.641	5.105	4.582
Jan-07	4.999	4.730	4.507
Dec-06	4.676	4.522	4.457
Nov-06	4.516	4.494	4.492
Oct-06	4.374	4.448	4.516
Sep-06	4.591	4.483	4.606
Aug-06	4.379	4.427	4.649
Jul-06	4.478	4.378	4.659
Jun-06	4.424	4.300	4.697
May-06	4.233	4.303	4.729
Apr-06	4.242	4.470	4.749
Mar-06	4.433	4.524	**4.770**
Feb-06	**4.735**	4.743	4.764
Jan-06	4.405	**4.766**	4.698
Dec-05	5.090	5.117	**4.659**
Nov-05	4.804	**5.125**	4.553
Oct-05	**5.457**	5.020	4.480
Sep-05	5.113	4.845	4.387
Aug-05	4.490	4.743	4.414
Jul-05	4.932	4.740	4.443
Jun-05	4.808	4.593	4.343
May-05	4.481	4.446	4.230
Apr-05	4.490	4.265	4.138
Mar-05	4.366	4.080	4.053
Feb-05	3.939	3.898	4.011
Jan-05	3.936	3.896	4.009

Dates	MADF-Monthly Average Daily (MGD)	TMADF-Three-Month Avg. Daily (MGD)	AADF-Annual Average Daily Flow (MGD)
Dec-04	3.820	4.031	**3.970**
Nov-04	3.933	4.568	3.950
Oct-04	4.341	**4.871**	3.944
Sep-04	**5.431**	4.668	3.902
Aug-04	4.842	4.007	3.738
Jul-04	3.730	3.517	3.663
Jun-04	3.449	3.432	3.634
May-04	3.373	3.569	3.603
Apr-04	3.473	3.750	3.580
Mar-04	3.860	3.750	3.576
Feb-04	3.916	3.655	3.602
Jan-04	3.473	3.636	3.561

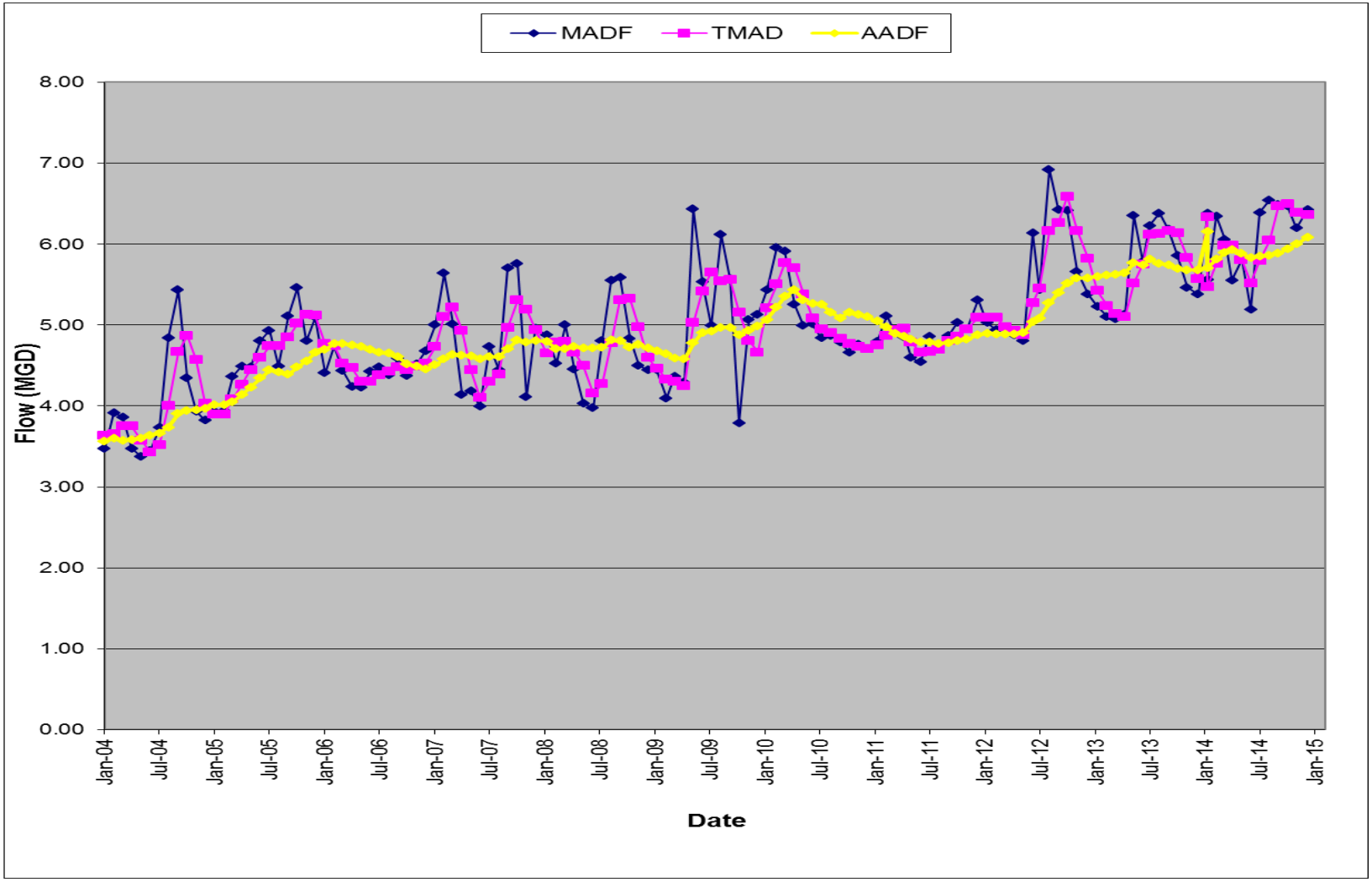


Figure 2-3: Palm Coast Historical Wastewater Flow.

2.5 EXISTING WASTEWATER SYSTEM

2.5.1 General

The City of Palm Coast owns and operates the wastewater collection system, the wastewater treatment facility, and the reclaimed water distribution system. **Figure 1-1** in Section 1 of this Facility Plan shows the Wastewater Service Area which also extends beyond the City limits.

2.5.2 Collection System

Wastewater from individual residences is conveyed to sewage lift stations by a combination of gravity sewers, sanitary, and pre-treatment effluent pumping (PEP) systems. At this time, approximately 40 percent of Palm Coast is served by gravity sewer systems and 60 percent is served by PEP. The gravity sewer system is a combination of vitrified clay pipe, and plastic sewer pipe.

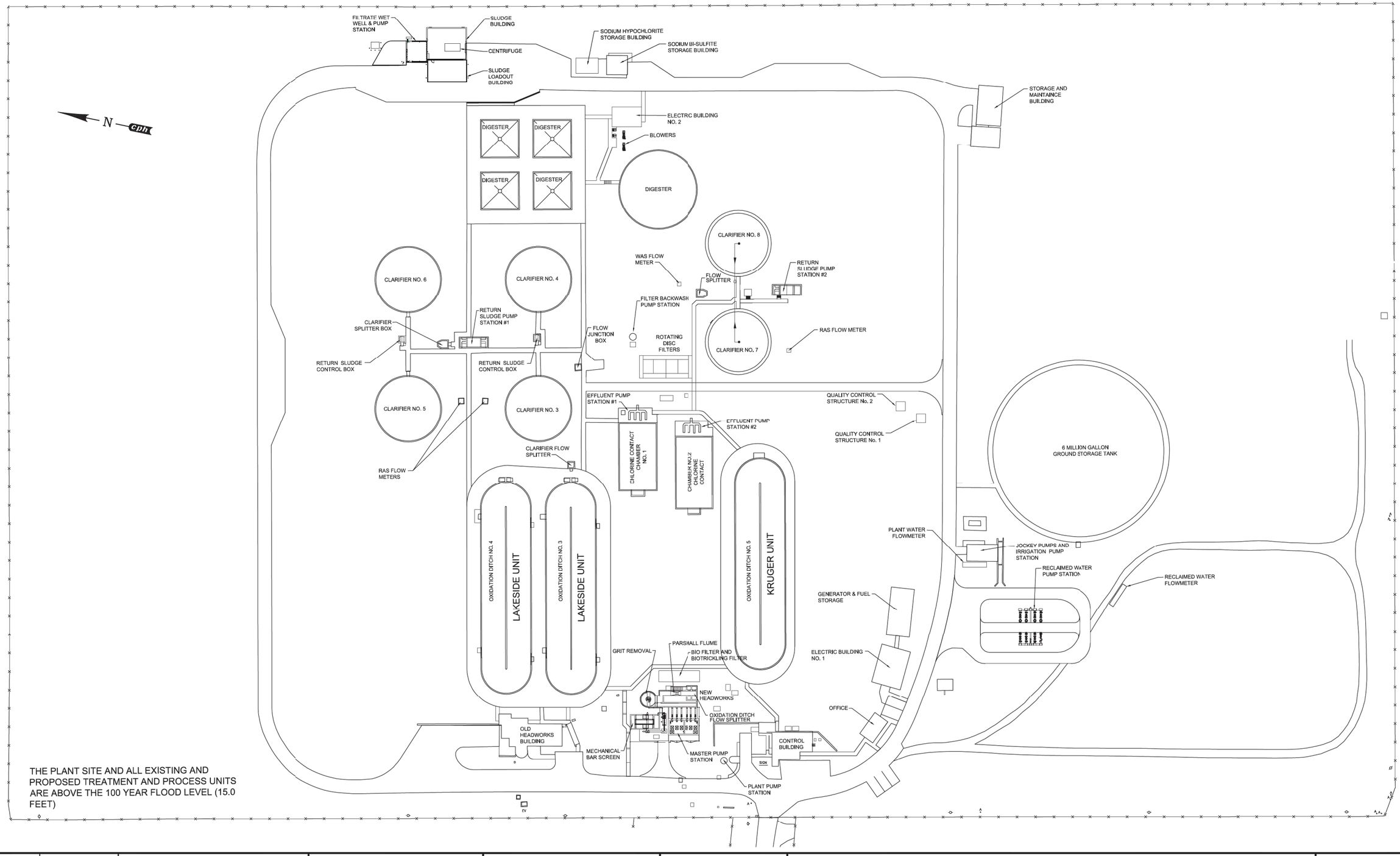
Most of the gravity sewer system, for the initial development, has been installed so that sanitary sewer service can be provided to new residences by extending a sanitary sewer service from the residence to the right-of-way. PEP storage tanks, PEP pumps, and pressure sewer will need to continue to be installed in areas served by the PEP systems. All new developments and sub-divisions are required to install gravity sewer systems.

One hundred fifty-five (155) sewage lift stations currently convey wastewater from individual service areas to the wastewater treatment facility. The majority of the lift stations are City owned and operated, and the others are privately owned. Most of the lift stations have submersible sewage pumps. Many of the sewage lift stations pump to an adjacent gravity sewer, or to another lift station. Sixteen (16) lift stations pump directly to the wastewater treatment facility.

The lift stations and sewage force mains were designed to accommodate the present and the additional sewage flows expected to be received in the next few years. The sewage force mains are a combination of ductile iron and some PVC. This system was not designed for build-out because the pipeline velocity would be below 2.0 feet per second. As additional development occurs within the service area, the lift station pumps will have to be replaced with larger capacity pumps and parallel or larger sewage force mains may need to be installed.

2.5.3 Wastewater Treatment Facility Layout and Process Flow

The Palm Coast WWTF No. 1 is an oxidation ditch-type activated sludge wastewater treatment facility. Reclaimed water complies with advanced secondary standards and can be used for irrigation of areas with public access. Reclaimed water can also be disposed of in percolation ponds with controlled access. The location of the facility is presented on **Figure 1-1** in Section 1 of this Facility Plan. The facility Site Plan and Process Flow Schematic including the biosolids, reclaimed water and aerobic digestion facilities are presented in **Figure 2-4** and **Figure 2-5**, respectively.



THE PLANT SITE AND ALL EXISTING AND PROPOSED TREATMENT AND PROCESS UNITS ARE ABOVE THE 100 YEAR FLOOD LEVEL (15.0 FEET)

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Approved by:	ARB		
Scale:	1" = 100'		

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Construction Management
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Palm Coast, Fl. 32137
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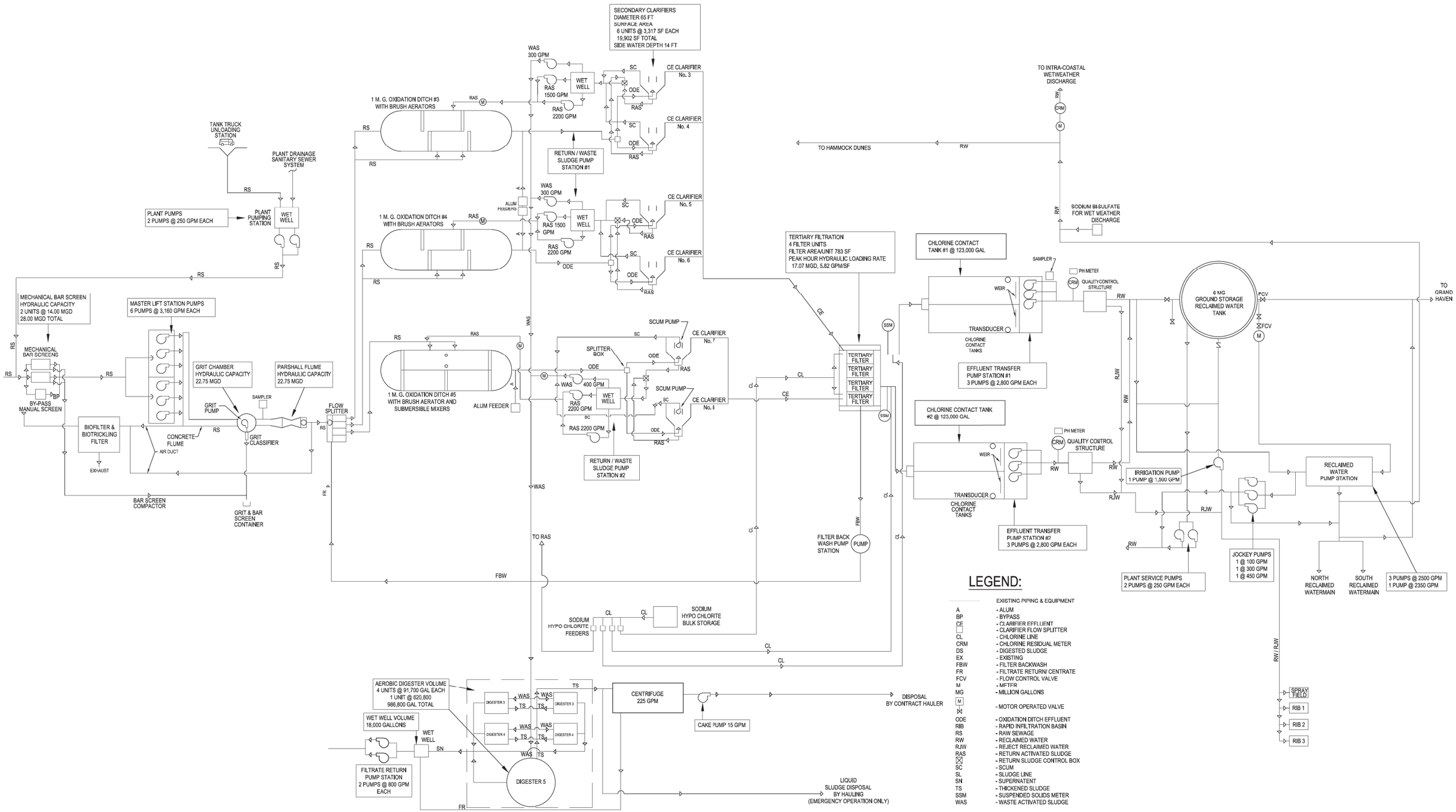
Fax: 386.447.8991

SITE PLAN

CITY OF PALM COAST WWTF NO. 1

FIGURE 2-4



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PROCESS FLOW DIAGRAM

CITY OF PALM COAST WWTF NO. 1

FIGURE
2-5

2.5.4 Plant Elevation / Flood Plain

The ground elevation at the WWTF No. 1 varies from elevation 33-feet to 17-feet. The plant is located on high ground and is above the 100-year flood level (15 feet M.L.S.). The plant and treatment units will remain operational during a 25-year flood event, in accordance with the FDEP and EPA Class I Reliability Criteria.

2.5.5 Wastewater Treatment Unit Processes and Major Equipment

Major Unit Process Volumes are given in **Table 2-3**. The Major Equipment Capacities are tabulated in **Table 2-4**.

Table 2-3: Palm Coast WWTF No.1 Major Process Units

Unit Process	No. of Units	Capacity Per Unit		Total Capacity
Influent Master Pump Station	1	9.1	MGD, AADF	9.10
Headworks Structure	1	9.1	MGD, AADF	9.10
Oxidation Ditch	3	2.28	MGD	6.84
Clarifier	4	347,365	Gal	1,984,928
	2	297,734	Gal	
Discfilter (Submerged Filter Area)	4	509	Sq. Ft.	2,036
Chlorine Contact Tank	4	63,042	gal	252,166
Aerobic Digestion	4	91,700	gal	986,800
Aerobic Digestion	1	620,000	gal	
Reclaimed Water Storage	1	6.0	MG	6.0

2.5.6 Pumping and Preliminary Treatment

Wastewater is pumped from off-site pumping stations to the Wastewater Treatment Facility on-site lift station. The wastewater is pumped from the lift station to the headworks where preliminary treatment is performed. Preliminary treatment equipment includes mechanical screens, grit removal unit, flow measurement, bio-trickling filter and bio-filter odor control system.

2.5.7 Headworks

Two mechanic screens remove large solids (more than 3 mm diameter) from the influent flow. Six variable speed submersible sewage pumps pump the wastewater to the grit removal system. A Parshall flume measures the plant influent flow. A flow splitter equally divides the influent flow between the three existing process trains and a future process train. The screen structure, pumping station, and headworks are covered. The air above the water in these structures is routed through a bio-trickling filter and bio-filter for odor control.

Table 2-4: Palm Coast WWTF No.1 Major Equipment List.

Item	No. Units	Capacity Per Unit	Total Capacity
Mechanical Screens	2	14.0 MGD	28.0 MGD
Master Pump Station Pumps (30 HP)	6	1,500 - 3,160 gpm	9,000 - 18,960 gpm
Vortex Grit Chamber	1	22.75 MGD	22.75 MGD
Grit Pump	2	200 gpm	200 gpm
WasteTech Grit Washing System	1	22.75 MGD	22.75 MGD
Influent Parshall Flume	2	22.75 MGD	22.75 MGD
Biofilter	1	2,000 cfm	2,000 cfm
BioTrickling Filter	1	2,000 cfm	2,000 cfm
Flow Splitter	4	6.0 MGD	24.0 MGD
Oxidation Ditch Brush Aerators (50 HP)	8	90 lbs/hr	720 lbs/hr
Oxidation Ditch Brush Aerators (40 HP)	5	110 lbs/hr	550 lbs/hr
Alum Metering Pumps	3	2.0 gpm	6.0 gpm
Clarifiers	6	0.35 MG	2.10 MG
Return Variable Speed Sludge Pump (35 HP)	4	600 - 2,200 gpm	2,400 - 8,800 gpm
Return Variable Speed Sludge Pump (20 HP)	2	350 - 1,500 gpm	750 - 3,000 gpm
Waste Sludge Pump (5 HP)	2	300 gpm	600 gpm
Waste Sludge Pump (5 HP)	1	400 gpm	400 gpm
Discfilter	4	509 sq. ft.	2036 sq. ft.
Discfilter Pump Station	2	300 gpm	600 gpm
Chlorine Feeder	2	13.5 gal/hr	27.0 gal/hr
Chlorine Feeder	2	20.0 gal/hr	40.0 gal/hr
Effluent Flow Measurement (Weirs & Level Transducer)	4	6.0 MGD	24.0 MGD
Effluent Variable Speed Transfer Pump (60 HP)	6	1,600 - 2,800 gpm	9,600 - 16,800 gpm
Reclaimed Water Variable Speed Pump (150 HP)	1	2,350 gpm	2,350 gpm
Reclaimed Water Variable Speed Pumps (150 HP)	3	2,500 gpm	7,500 gpm
High Pressure Irrigation Pump (75 HP)	1	1,500 gpm	1,500 gpm
Plant Service Water Pump (10 HP)	1	100 gpm	100 gpm
Plant Service Water Pump (25 HP)	1	300 gpm	300 gpm
Plant Service Water Pump (40 HP)	1	450 gpm	450 gpm
Course Bubble Aeration Diffusers	80	31.18 scfm	2,494 scfm
Multistage Centrifugal Air Blowers (150 HP)	2	2,490 scfm	4,980 scfm
Sludge Centrifuge Feed Pumps (20 HP)	3	300 gpm	900 gpm
Inline Sludge Grinder / Macerator (3 HP)	1	300 gpm	300 gpm
Polymer Feed System (1/2 HP)	1	0.12 - 2.5 gpm	0.12 - 2.5 gpm
Solid Bowl Decanter Centrifuge (200 HP)	1	225 gpm	225 gpm
Progressive Cavity Cake Pump (15 HP)	1	5 - 15 gpm	5 - 15 gpm
Filtrate Return Pumps (20 HP)	2	800 gpm	1600 gpm
Plant Pumping Station (5 HP)	2	250 gpm	500 gpm
Sodium Bisulfite Feeder	1	12 gal/hr	12 gal/hr
Standby Electrical Generator	1	500 KW	500 KW
Standby Electrical Generator	1	1500 KW	1500 KW

2.5.8 Secondary Treatment

The Palm Coast WWTF No. 1 is an oxidation-ditch activated sludge wastewater treatment facility permitted for 6.83 MGD. Pretreated wastewater flows to three process trains, each of which includes a 2.28 MG oxidation ditch and two secondary clarifiers. The oxidation ditches provide biological treatment of the pre-treated wastewater. Two of the oxidation ditches have four surface brush aerators each. The third oxidation ditch has five surface brush aerators and two submersible mixers.

The aerated wastewater flow from each oxidation ditch is equally split between two clarifiers. There are a total of six clarifiers. Return sludge is pumped from the clarifiers back to the activated sludge treatment process, or wasted to aerobic sludge digesters.

2.5.9 Tertiary Filtration

Following the oxidation ditch process, the clarification process separates the solids from the liquid to produce clarified effluent. Clarified effluent is routed to a tertiary filter for additional treatment.

There are four tertiary disc filter units with 13 rotating discs per unit with a total submerged filter surface area of 2,036 square feet.

2.5.10 Disinfection

Effluent from the tertiary filter is routed to two separate chlorine contact tanks. Liquid sodium hypochlorite is used for disinfection. The two Chlorine Contact Tanks, each with two Chlorine Contact Chambers, provide the required chlorine contact time. Effluent from the chlorine contact chambers meets Advanced Secondary Treatment criteria with high-level disinfection treatment and can be used for public access reclaimed water irrigation, or disposed of in rapid infiltration basins, or a spray field. Reclaimed water is also permitted to discharge to the Intracoastal Waterway as the last disposal method.

2.5.11 Effluent Flow Measurement

Plant effluent flow is measured in each Chlorine Contact Chamber. An Ultrasonic Transducer prior to the Fiberglass weir located at the discharge of each Chlorine Contact Chamber records the flows. This point is defined in the FDEP wastewater permit as Monitoring Location Site No. EFA-1. The wastewater flows recorded at this site are the basis for effluent meter readings for the WWTF No. 1

The influent Parshall flume, effluent ultrasonic transducers, and weirs are regularly calibrated.

Effluent transfer pumps located adjacent to the Chlorine Contact Tanks convey the reclaimed water to a 6.0 MG Ground Storage Tank or to Rapid Infiltration Basins (percolation ponds), or to the Intracoastal Waterway.

2.5.12 Physical, Chemical, and Biological Characteristics of Wastewater

The key characteristics for measurement of the Removal Efficiency at the Palm Coast Wastewater Treatment Facility are Five-Day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$) and Total Dissolved Solids (TSS). **Table 2-5** tabulates the concentrations of $CBOD_5$ and TSS data from April 2006 (when the new disc filters were installed) through June 2014.

The average removal efficiency of $CBOD_5$ and TSS for the facility from April 2006 through June 2014 has been greater than 98%. All the averages expressed below are over this time period.

The average influent $CBOD_5$ concentration is 151 mg/L. The minimum and maximum influent $CBOD_5$ concentration is 76 mg/L and 233 mg/L.

The average influent TSS concentration is 137 mg/L. The minimum and maximum influent TSS concentration is 45 mg/L and 314 mg/L.

The average effluent $CBOD_5$ concentration of the effluent is 2.2 mg/L. The minimum and maximum effluent $CBOD_5$ concentration is 2.0 mg/L and 15 mg/L.

The average effluent TSS concentration is 1.9 mg/L. The minimum and maximum effluent TSS concentration is 1.0 mg/L and 7.0 mg/L.

Table 2-5: Palm Coast WWTF No.1 Influent and Effluent Water Quality.

Month	MADF MGD	$CBOD_5$ (mg/L)*			TSS (mg/L)*		
		Influent	Effluent	% Removal	Influent	Effluent	% Removal
Apr-06	4.242	143	2.5	98.3%	109	2.0	98.2%
May-06	4.233	149	2.8	98.1%	105	2.9	97.2%
Jun-06	4.424	168	2.8	98.3%	98	2.3	97.7%
Jul-06	4.478	172	2.3	98.7%	132	2.0	98.5%
Aug-06	4.379	158	2.1	98.7%	150	2.0	98.7%
Sep-06	4.591	153	2.0	98.7%	144	2.3	98.4%
Oct-06	4.374	137	2.0	98.5%	63	2.0	96.8%
Nov-06	4.516	156	2.0	98.7%	75	2.0	97.3%
Dec-06	4.676	160	2.0	98.8%	56	2.0	96.4%
Jan-07	4.999	143	2.0	98.6%	73	2.0	97.2%
Feb-07	5.641	139	2.0	98.6%	80	2.0	97.5%
Mar-07	5.011	142	2.0	98.6%	67	2.0	97.0%
Apr-07	4.140	150	2.0	98.7%	75	2.0	97.3%
May-07	4.182	176	2.0	98.9%	130	2.0	98.5%
Jun-07	3.996	148	2.1	98.6%	116	2.0	98.3%
Jul-07	4.736	130	2.0	98.5%	63	2.0	96.8%
Aug-07	4.448	134	2.0	98.5%	98	2.0	98.0%
Sep-07	5.707	105	2.2	97.9%	69	2.0	97.1%
Oct-07	5.758	132	2.0	98.5%	77	2.0	97.4%
Nov-07	4.114	148	2.0	98.6%	82	2.0	97.6%

Month	MADF MGD	$CBOD_5$ (mg/L)*			TSS (mg/L)*		
		Influent	Effluent	% Removal	Influent	Effluent	% Removal
Dec-07	4.959	152	2.0	98.7%	94	2.0	97.9%
Jan-08	4.872	140	2.0	98.6%	84	2.8	96.7%
Feb-08	4.528	140	2.0	98.6%	75	2.0	97.3%
Mar-08	4.999	153	2.0	98.7%	103	4.4	95.7%
Apr-08	4.455	140	2.0	98.6%	84	2.8	96.7%
May-08	4.034	166	2.0	98.8%	137	2.3	98.3%
Jun-08	3.976	145	3.0	97.9%	112	4.0	96.4%
Jul-08	4.800	148	2.0	98.6%	117	2.6	97.8%
Aug-08	5.548	128	2.0	98.4%	113	2.4	97.9%
Sep-08	5.588	99	2.0	98.0%	51	2.4	95.3%
Oct-08	4.835	125	2.0	98.4%	83	2.4	97.1%
Nov-08	4.501	150	2.0	98.7%	75	2.6	96.5%
Dec-08	4.444	164	2.4	98.5%	140	2.4	98.3%
Jan-09	4.444	195	2.1	98.9%	171	2.1	98.8%
Feb-09	4.096	153	2.2	98.6%	67	2.1	96.9%
Mar-09	4.365	173	2.0	98.8%	149	2.0	98.7%
Apr-09	4.292	160	2.0	98.8%	137	2.0	98.5%
May-09	6.431	170	2.0	98.8%	179	2.2	98.8%
Jun-09	5.531	89	2.0	97.8%	47	2.0	95.7%
Jul-09	4.991	76	2.0	97.4%	45	2.1	95.3%
Aug-09	6.115	104	2.0	98.1%	109	2.0	98.2%
Sep-09	5.567	125	2.0	98.4%	143	2.6	98.2%
Oct-09	3.790	160	2.5	98.4%	156	2.3	98.5%
Nov-09	5.068	168	2.2	98.7%	188	2.0	98.9%
Dec-09	5.126	186	2.1	98.9%	168	2.0	98.8%
Jan-10	5.432	163	2.0	98.8%	117	2.0	98.3%
Feb-10	5.957	**233**	2.1	99.1%	203	2.0	99.0%
Mar-10	5.913	168	2.0	98.8%	145	2.1	98.6%
Apr-10	5.251	164	2.0	98.8%	156	2.0	98.7%
May-10	4.990	108	2.0	98.1%	66	2.0	97.0%
Jun-10	5.011	157	2.0	98.7%	177	2.1	98.8%
Jul-10	4.840	166	2.0	98.8%	178	2.0	98.9%
Aug-10	4.869	183	2.0	98.9%	183	2.0	98.9%
Sep-10	4.783	150	2.0	98.7%	172	2.0	98.8%
Oct-10	4.663	145	2.0	98.6%	150	2.0	98.7%
Nov-10	4.756	178	2.0	98.9%	173	2.0	98.8%
Dec-10	4.701	184	15.0	91.8%	196	4.8	97.6%
Jan-11	4.793	187	6.9	96.3%	187	7.0	96.3%
Feb-11	5.113	184	2.0	98.9%	174	2.0	98.9%
Mar-11	4.910	170	3.2	98.1%	182	1.8	99.0%
Apr-11	4.849	172	2.0	98.8%	168	1.4	99.2%
May-11	4.597	158	2.0	98.7%	190	1.1	99.4%
Jun-11	4.543	152	2.0	98.7%	164	1.0	99.4%
Jul-11	4.860	127	2.0	98.4%	155	1.1	99.3%

Month	MADF MGD	$CBOD_5$ (mg/L)*			TSS (mg/L)*		
		Influent	Effluent	% Removal	Influent	Effluent	% Removal
Aug-11	4.693	142	2.0	98.6%	175	1.1	99.4%
Sep-11	4.865	124	2.0	98.4%	158	1.4	99.1%
Oct-11	5.025	132	2.0	98.5%	207	1.0	99.5%
Nov-11	4.952	134	2.0	98.5%	145	1.0	99.3%
Dec-11	5.311	134	2.0	98.5%	164	1.8	98.9%
Jan-12	5.026	175	2.0	98.9%	188	1.6	99.1%
Feb-12	4.943	171	2.0	98.8%	180	1.6	99.1%
Mar-12	4.962	162	2.0	98.8%	170	1.2	99.3%
Apr-12	4.873	166	2.0	98.8%	167	1.0	99.4%
May-12	4.800	170	2.0	98.8%	176	1.4	99.2%
Jun-12	6.132	133	2.0	98.5%	135	1.2	99.1%
Jul-12	5.430	165	2.0	98.8%	135	1.3	99.0%
Aug-12	6.923	152	2.2	98.6%	125	1.2	99.0%
Sep-12	6.425	123	2.0	98.4%	143	1.4	99.0%
Oct-12	6.413	125	2.0	98.4%	133	1.2	99.1%
Nov-12	5.661	168	2.0	98.8%	136	1.5	98.9%
Dec-12	5.377	170	2.0	98.8%	183	1.5	99.2%
Jan-13	5.231	194	2.0	99.0%	216	1.3	99.4%
Feb-13	5.102	187	2.0	98.9%	193	1.3	99.3%
Mar-13	5.075	187	2.0	98.9%	187	1.4	99.3%
Apr-13	5.126	168	2.0	98.8%	295	1.4	99.5%
May-13	6.352	160	2.0	98.8%	176	1.4	99.2%
Jun-13	5.781	148	2.0	98.6%	173	1.4	99.2%
Jul-13	6.230	148	2.0	98.6%	150	1.5	99.0%
Aug-13	6.380	160	2.0	98.8%	138	1.3	99.1%
Sep-13	6.179	115	2.0	98.3%	143	1.0	99.3%
Oct-13	5.859	158	2.0	98.7%	140	1.0	99.3%
Nov-13	5.463	150	2.0	98.7%	165	1.0	99.4%
Dec-13	5.379	202	2.0	99.0%	220	1.0	99.5%
Jan-14	5.560	170	2.0	98.8%	314	1.0	99.7%
Feb-14	6.347	122	2.0	98.4%	110	1.0	99.1%
Mar-14	6.052	109	2.0	98.2%	103	1.0	99.0%
Apr-14	5.554	125	2.0	98.4%	83	1.0	98.8%
May-14	5.805	103	2.0	98.1%	62	1.0	98.4%
Jun-14	5.194	145	2.0	98.6%	153	1.0	99.3%
Wastewater Quality (April 2006- June 2014)							
Max.	6.923	233	15.0	99.1%	314	7.0	99.7%
Average	5.084	151	2.2	98.5%	137	1.9	98.3%
Min	3.790	76	2.0	91.8%	45	1.0	95.3%
Note: * 2.0 mg/L is the detection limit							

2.5.13 Sludge Processing

Sludge processing at Palm Coast WWTP No. 1 consists of aerobic digestion and dewatering. Waste sludge is pumped from the clarifiers to the aerobic digesters. There are four 91,700-gallon aerobic sludge digesters each with a floating aerator and one 620,000-gallon aerobic digester with coarse bubble diffusers.

The five aerobic digesters are used to partially stabilize waste sludge from the secondary clarifiers. After aerobic digestion and decanting, the solid content of the sludge pumped from the aerobic digesters is approximately 0.70 -1.5 percent.

Polymer is added to the partially stabilized sludge and the sludge is dewatered by a centrifuge to approximately 16-20 percent solids by weight. A screw pump conveys the dewatered sludge cake to truck loading station. The sludge cake is transported by truck to a contracted regional management facility for further treatment and disposal.

A Filtrate Pumping Station, with two 800-gpm pumps, conveys filtrate from the centrifuge and decant from the aerobic digesters to the plant headworks.

2.5.14 Sludge Disposal

The existing aerobic digesters do not provide sufficient treatment for the residual solids to be classified as Class B sludge.

The sludge cake is transported to a regional bio-solids management facility approved by FDEP for final treatment and disposal. The City pays a fee based on $/wet ton of sludge cake to the contracted regional management operator for trucking, treatment and final disposal of the biosolids end product.

2.6 WASTEWATER TREATMENT SUPPORT FACILITIES

2.6.1 Plant Waste Pumping Station

A plant waste pumping station, with two 250-gpm pumps, conveys plant sanitary waste to the plant headworks.

2.6.2 Operations and Electrical Buildings

An operations building includes a laboratory, office, and facilities for the plant staff. A separate building houses the 500 KW standby generator, and electrical control room. The 1500 KW generator is housed in a sound attenuated enclosure.

Two electrical rooms and one office building were constructed with the 2006 plant upgrading and expansion.

2.6.3 Standby Power

A 500 KW and 1500 KW generator provide sufficient standby power to operate the entire existing wastewater treatment facility during times of a power failure.

2.6.4 Private Wastewater Treatment Facilities

There are no recorded private wastewater treatment facilities within the Palm Coast Wastewater Service Area.

2.6.5 Potable Water System

Potable Water is supplied to the existing WWTF No. 1 from the Palm Coast Water Utilities main on Utility Drive.

2.7 RECLAIMED WATER RUSE AND DISPOSAL

2.7.1 Reclaimed Water Quality Limitations

The WWTF No. 1 provides advanced secondary treatment with tertiary filtration and high-level disinfection.

Reclaimed water used for irrigation of public access areas must receive advanced secondary treatment with tertiary filtration and high-level disinfection (1 mg/L of chlorine residual). $CBOD_5$ are limited to not to exceed 20 mg/L (annual average), 30 mg/L (monthly average), 45 mg/L (weekly average), and 60 mg/L (single sample). Total Suspended Solids are limited not to exceed 5 mg/L for any single sample.

Reclaimed water disposed of in rapid infiltration basins and the spray field, with restricted access, must receive secondary treatment and basic disinfection (0.5 mg/L of chlorine residual). $CBOD_5$ and TSS are limited not to exceed 20 mg/L (annual average), 30 mg/L (monthly average), 45 mg/L (weekly average), and 60 mg/L (single sample). The nitrate [NO_3] shall not exceed 12 mg/L for any single sample).

Reclaimed water produced from the WWTF No. 1 meets all the above standards.

2.7.2 Reuse System

At the Palm Coast WWTF No. 1, reclaimed water is pumped from either of the Effluent Transfer Pump Stations (adjacent to the Chlorine Contact Tanks) to the Ground Storage Tank or to the Rapid Infiltration Basins sites.

A 6 million gallon Ground Storage Tank is located at WWTF No. 1 for storage of advanced secondary reclaimed water.

Reclaimed water can flow by gravity from the 6.0 MG ground storage tank to Rapid Infiltration Basins No. 1, 2, or 3. Reclaimed water must be pumped to the Spray Field with an irrigation pump.

The reclaimed water conveyed from the Ground Storage Tank to Grand Haven and Hammock Dunes Developments is pumped by the reclaimed water pumping stations at the WWTF No. 1 site. Grand Haven, Hammock Dunes, Hidden Lakes, Town Center, and Wild Oaks are developments currently using reclaimed water for irrigation.

The new reclaimed water pumping stations and plant service water pumping station at the WWTF No. 1 site have additional pumping capacity to supply reclaimed water to areas north and south of the WWTF No. 1.

2.7.3 Permitted Land Application Reuse Sites

A Reuse Service Area Report was prepared in November of 2007 and submitted to the Florida Department of Environmental Protection. Two separate Reuse Service Areas were identified, the WWTP No. 1 Service Area and the proposed WWTF No. 2 service area. The future WWTF No. 2 Reuse Service Area will be described in Section 3.

The Palm Coast WWTF No. 1 currently has a permitted land application reuse capacity of 13.634 MGD. Restricted public access use accounts for 3.07 MGD and the current permitted public access irrigation accounts for 10.564 MGD. The majority of the reclaimed water use is for irrigation of golf courses, landscaping, and general public access areas. Two additional sites, Palm Coast Parkway Median and Palm Harbor Golf Course are planned to receive reclaimed water. The total projected capacity of these sites is 0.481 MGD, which increases the public access irrigation capacity to 11.045 MGD.

The Grand Haven and the Hammock Dunes developments are the two largest users of the City's reclaimed water for irrigation.

The permitted and proposed disposal sites for WWTF No. 1 are listed in **Table 2-6** and presented in **Figure 2-6**. **Figure 2-6** also shows the proposed reuse sites for the proposed WWTF No. 2. All capacities are in terms of annual average daily flow (AADF).

Table 2-6: Palm Coast WWTF No.1 Reclaimed Water Disposal Capacity.

Site No.	Site Location	Area Irrigated (Acres)	Capacity (MGD/AADF)
WWTF No. 1			
R-001	**Restricted Public Access Irrigation Systems and Rapid Rate Infiltration Basins**		
Site # 1	Palm Coast Spray Fields*	60.0	0.60
Site # 2	Palm Coast RIB No. 1 (North)*	8.0	1.00
Site # 3	Palm Coast RIB No. 2 (South)*	12.5	0.92
Site # 4	Palm Coast RIB No. 3 (West)*	17.0	0.55
	R-001 CAPACITY =		**3.07**
R-002	**Public Access Irrigation Systems**		
	Grand Haven Golf Course*	127	0.726
	Grand Haven Common Areas*	45	0.274
Site # 1	**Total, Grand Haven**	**172.0**	**1.00**
	Hammock Dunes Golf Course*	96.0	0.35
	Dunes Residential Service Area*	254.0	1.00
	Ocean Hammock Golf Course*	96.0	0.35
	Ocean Hammock Residential*	100.0	0.90
Site # 2	**Total, Hammock Dunes**	**546.0**	**2.60**

Site No.	Site Location	Area Irrigated (Acres)	Capacity (MGD/AADF)
	DCDD Creek Course*	128.9	0.35
	Conservatory Development*	179.0	0.49
	New High School landscape Area*	18.4	0.05
	FPL Row Residential	92.1	0.25
Site # 3	**Total**	**418.4**	**1.14**
	Hidden Lakes Residential Area*	102.4	0.28
	Residential Developments*	147.3	0.40
Site # 4	**Total, Old Kings Road South**	**249.7**	**0.68**
Site # 5	Town Center Landscape Area*	**405.1**	**1.40**
	Cement Plant Landscape Area	4.0	0.01
	Grand Haven Estates Residential Area	44.2	0.12
	Future Development near Colbert Residential Area	209.9	0.57
Site # 6	**Total, Colbert Lane**	**258.1**	**0.70**
Site # 7	South of Airport (Residential Areas)	**869.2**	**2.36**
Site # 8	Old Kings Road Median / ROW South of WWTP No. 1	28.5	0.08
Site # 9	Old Kings Road Median / ROW North of WWTP No. 1	23.3	0.06
Site # 10	FPL ROW South of WWTF No. 1	128.6	0.35
Site # 11	Hidden Lakes Office Complex (Landscape Areas)	60.0	0.19
	Palm Coast Parkway Median (Landscape Areas)	2.8	0.011
	Palm Harbor (Golf Course)	120.0	0.470
	WWTP No. 1 (Landscaped Areas)*	8.4	0.02
Site # 12	Total, Palm Harbor	131.2	0.50
	R-002 CAPACITY =		**11.065**

Note:

* Sites are the active reclaimed water disposal and reuse sites with a total disposal capacity of 9.64 MGD.

2.7.4 Wet Weather Surface Water Discharge

Palm Coast WWTF No. 1 currently has one permitted operating surface water discharge outfall. Outfall D-001 is a wet weather surface water discharge permitted for an annual average of 1.6 MGD to the Intracoastal Waterway. The permit allows the City to discharge based on the annual TN and TP discharge allowances specified in the permit. The reclaimed water is de-chlorinated at the plant site prior to discharging to the Intracoastal Waterway. Flow measurement equipment and a chlorine residual analyzer are housed within a fenced area near the point of discharge. Wet weather flows discharged to the Intracoastal Waterway is measured and recorded. Discharge to Intracoastal Waterway is the last resort for reclaimed water disposal after reuse and disposal in rapid infiltration basins.

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* AS OF 04/2010

cph

Engineers (C.O.A. No. 3215)
Architects (Lic. No. AA2600926)
Surveyors (L.B. No. 7143)
Landscape Arch. (Lic. No. LC0000298)
Planners
Environmental Scientists
Construction Management
Traffic / Transportation

520 Palm Coast Parkway SW
Palm Coast, Fl. 32137
Phone: 386.445.6569
Fax: 386.447.8991

Designed by:	JCS	Date: July 2011	
Drawn by:	JCS	Job No. P61206	
Checked by:	YCL	Scale: 1" = 8000'	
Approved by:	RP	File: P61206 FIG.5	

Certificate of Authorization No. 3215

PALM COAST RECLAIMED WATER SITES

CITY OF PALM COAST
PALM COAST, FLAGLER COUNTY, FLORIDA

FIGURE 2-6

2.7.5 Rapid Infiltration Basins

Excess reclaimed water from the WWTF No. 1 is conveyed to four restricted-access land application sites. These sites include a Spray Field and three Rapid Infiltration Basin (RIB) sites owned by the City of Palm Coast. The RIB No. 1 was constructed in a concentric circular pattern, and was one of the first RIB's of its kind constructed in Florida. RIB No. 2 and 3 are multi-pond RIBs. (See **Figure 2-6** for site locations and **Table 2-6** for permitted capacities).

Table 2-7 provides the recorded flow data from January 2007 through June 2014 for each of the effluent and reuse system discharge sites currently in use.

Table 2-7: Palm Coast WWTF No.1 Reuse System Average Daily Flow Data.

Dates	Spray Field (MGD)	RIB No. 1 (MGD)	RIB No. 2 (MGD)	RIB No. 3 (MGD)	Hammock Dunes (MGD)	Grand Haven (MGD)	Wet Weather Discharge (MGD)
Jun-14	0.004	14.370	5.589	5.908	65.703	37.697	0.000
May -14	0.000	23.703	20.090	12.584	59.283	36.425	0.000
Apr-14	16.518	16.296	17.977	14.045	50.016	26.490	0.000
Mar-14	28.054	11.835	25.064	10.965	46.217	14.762	25.938
Feb-14	27.219	15.467	25.447	10.160	30.748	9.170	36.800
Jan-14	17.894	17.191	25.716	11.662	19.484	7.087	42.051
Dec-13	14.305	15.169	36.621	8.601	46.838	18.795	0.000
Nov-13	10.648	13.118	34.999	13.718	46.771	17.747	0.000
Oct-13	11.596	19.707	38.396	15.656	51.877	19.167	0.000
Sep-13	0.032	15.358	37.300	11.541	58.215	17.806	0.000
Aug-13	0.032	23.591	28.609	16.677	61.761	22.967	7.969
Jul-13	2.226	22.312	36.398	20.823	44.578	14.693	10.291
Jun-13	0.124	20.367	25.841	14.003	61.399	21.483	7.187
May-13	0.089	21.225	37.580	2.398	60.854	24.368	8.950
Apr-13	11.804	18.672	20.256	16.132	45.961	20.207	0.000
Mar-13	12.639	12.942	22.975	13.574	50.941	22.975	0.000
Feb-13	9.340	18.594	18.042	13.962	48.379	15.849	0.000
Jan-13	15.840	15.846	28.067	8.078	39.081	13.532	9.054
Dec-12	2.768	10.903	31.808	21.959	38.842	8.879	17.319
Nov-12	2.128	16.936	34.688	0.140	58.778	19.881	0.000
Oct-12	18.063	14.940	23.438	17.774	53.889	12.450	18.373
Sep-12	13.631	12.263	27.642	7.492	57.096	11.947	10.279
Aug-12	10.260	25.251	11.432	23.612	0.994	6.721	39.178
Jul-12	18.957	8.598	11.770	2.575	72.088	30.348	1.840
Jun-12	15.065	6.544	23.739	27.059	44.216	13.190	10.177
May-12	14.851	2.879	1.313	6.688	68.768	19.058	0.000
Apr-12	14.897	3.455	17.261	0.975	66.690	17.961	0.000
Mar-12	17.245	18.180	27.291	7.660	45.744	13.759	0.000
Feb-12	14.318	16.998	22.600	10.203	37.549	6.452	0.000
Jan-12	16.144	10.712	26.411	13.205	43.044	7.566	13.288
Dec-11	14.859	15.057	27.884	15.209	48.465	9.007	19.075
Nov-11	12.880	2.140	22.503	12.047	50.144	17.312	0.000
Oct-11	10.981	5.707	10.609	10.754	52.727	51.799	0.000
Sep-11	11.053	6.563	2.635	3.056	62.622	40.859	0.000

Dates	Spray Field (MGD)	RIB No. 1 (MGD)	RIB No. 2 (MGD)	RIB No. 3 (MGD)	Hammock Dunes (MGD)	Grand Haven (MGD)	Wet Weather Discharge (MGD)
Aug-11	11.799	0.672	1.943	2.341	70.600	38.757	0.000
Jul-11	9.198	4.742	7.584	6.881	58.187	35.436	0.000
Jun-11	9.053	1.362	3.743	1.799	68.047	30.249	0.000
May-11	14.732	6.051	1.817	1.823	70.342	32.857	0.000
Apr-11	12.667	13.276	11.366	11.008	54.330	13.812	0.000
Mar-11	10.776	11.094	26.695	2.591	47.700	14.672	0.000
Feb-11	10.878	13.914	17.083	16.859	24.221	7.098	25.552
Jan-11	10.217	12.454	25.584	12.438	37.480	5.302	25.971
Dec-10	10.469	25.063	25.584	12.438	37.480	10.188	0.000
Nov-10	9.539	3.053	32.513	1.468	56.280	13.710	0.000
Oct-10	12.629	0.000	9.044	1.361	77.923	21.451	0.000
Sep-10	16.636	5.778	17.951	0.827	64.197	16.670	0.000
Aug-10	17.090	8.617	15.132	0.928	59.983	14.434	0.000
Jul-10	21.036	7.118	15.871	1.284	64.642	21.011	0.000
Jun-10	15.982	15.255	15.294	1.089	64.364	28.509	0.000
May-10	16.515	20.451	11.683	2.991	64.391	21.527	0.000
Apr-10	18.690	12.155	23.483	8.005	50.278	14.939	4.826
Mar-10	16.850	24.980	28.803	22.000	28.564	3.211	35.393
Feb-10	11.957	20.364	35.396	13.264	14.935	0.934	56.467
Jan-10	8.575	19.932	16.842	20.221	27.785	5.645	36.346
Dec-09	7.036	16.835	25.201	22.322	25.986	6.649	37.881
Nov-09	8.374	24.269	32.293	0.349	45.992	14.016	0.000
Oct-09	13.945	10.092	31.686	10.250	68.323	15.845	0.000
Sep-09	12.879	48.361	16.269	20.818	45.048	9.453	25.436
Aug-09	13.019	35.020	29.184	34.557	48.531	12.712	34.307
Jul-09	13.672	28.508	27.204	24.351	40.229	10.135	13.479
Jun-09	15.796	13.166	26.122	20.809	53.847	15.840	14.648
May-09	10.453	19.737	5.276	28.495	41.027	11.080	29.897
Apr-09	15.354	13.880	14.634	4.880	51.178	18.170	0.000
Mar-09	13.638	14.857	18.106	12.194	46.820	13.365	0.000
Feb-09	11.071	15.980	29.621	10.405	30.018	8.721	6.759
Jan-09	14.004	15.378	22.679	12.283	20.194	9.497	14.409
Dec-08	17.111	11.869	39.178	11.725	37.943	8.107	0.000
Nov-08	15.906	11.923	16.656	21.401	48.734	11.281	0.000
Oct-08	14.384	19.870	25.276	0.048	55.831	19.532	0.000
Sep-08	5.295	0.000	38.711	19.799	64.367	16.985	10.610
Aug-08	13.995	0.000	19.127	33.356	63.536	15.129	10.812
Jul-08	4.950	0.000	23.358	17.799	49.309	11.463	0.000
Jun-08	8.095	0.000	3.843	17.684	52.218	17.832	0.000
May-08	15.010	0.087	9.355	0.260	70.072	19.448	0.000
Apr-08	9.015	10.738	22.031	9.933	52.916	25.281	4.455
Mar-08	14.169	19.438	26.522	11.978	49.347	26.736	10.701
Feb-08	20.715	15.010	31.915	14.114	43.805	6.319	17.833
Jan-08	18.004	18.202	18.179	27.532	40.589	10.921	12.430
Dec-07	14.105	18.545	40.526	19.918	51.321	14.191	10.900
Nov-07	23.954	11.600	28.453	19.487	50.864	16.382	2.100
Oct-07	15.229	30.740	23.563	26.099	55.132	13.073	19.814
Sep-07	16.542	22.324	26.757	30.686	50.637	11.332	15.351
Aug-07	14.664	15.721	18.978	7.870	65.863	16.650	7.000

Dates	Spray Field (MGD)	RIB No. 1 (MGD)	RIB No. 2 (MGD)	RIB No. 3 (MGD)	Hammock Dunes (MGD)	Grand Haven (MGD)	Wet Weather Discharge (MGD)
Jul-07	13.509	22.061	32.193	25.850	36.762	14.824	5.666
Jun-07	13.557	10.350	2.065	13.356	66.169	19.625	0.000
May-07	12.074	4.522	11.263	0.530	75.717	25.091	0.000
Apr-07	19.843	14.037	12.367	15.700	52.237	19.447	0.000
Mar-07	9.956	0.078	30.206	15.121	49.680	16.726	18.794
Feb-07	8.259	0.000	30.651	12.035	33.948	11.250	31.767
Jan-07	2.989	0.000	44.271		25.776	8.011	39.051

SECTION 3.0
FUTURE CONDITIONS

3.1 SERVICE AREA POPULATION AND FLOW PROJECTIONS

3.1.1 Population Projections

The City of Palm Coast's Comprehensive Land Use Plan includes population projections for the City. The Comprehensive Plan provides the City's projections of the percentage of the Flagler County population which is attributed to Palm Coast. The Palm Coast Wastewater Service Area includes all of the City of Palm Coast and extends beyond the City limits. The City limits and the Wastewater Service Area are presented in **Figure 1-1** in Section 1 of this Facility Plan.

Table 3-1 provides projections of population and Equivalent Residential Service Connections (ERC's) from 2015 through 2035. **Table 3-1** identifies populations inside the City Limits, outside of the City Limits and the total for the Wastewater Service Area.

To provide a consistent basis for annual averages, projections for population and ERC's, wastewater flows are adjusted to mid-year. Not all of the areas outside of the City Limits and within the designated Wastewater Service Area are connected to the Wastewater System. The ERC projections for inside the City Limits are calculated from the population estimate divided by the BEBR provided and Comprehensive Plan Level of Service ratio of 2.4 persons per ERC. The ERC projections for outside the city limits are based on known development plans (service agreements/residential lot counts) and a growth rate equal to population rate of change for the corresponding period. **Figure 3-1** provides graphical description of historical and future population growth projections within the Wastewater Service Area.

The population projections for outside the city limits are calculated from the ERC estimate multiplied by the 2.4 ratio. It is expected that additional developments that are currently outside of the City limits will request current or future voluntary annexation along with wastewater and/or reclaimed water service.

Table 3-1: Palm Coast Wastewater Service Area Population and ERC Projections

	Inside City Limits		Outside City Limits		Total Service Area	
Year	ERC's	Population	ERC's	Population	ERC's	Population
2015	33,274	79,858	298	715	33,572	80,573
2016	33,837	81,208	303	727	34,140	81,935
2017	34,422	82,612	308	739	34,730	83,351
2018	35,030	84,072	314	752	35,344	84,825
2019	35,870	86,089	321	771	36,191	86,860
2020	37,139	89,134	332	798	37,472	89,932
2021	38,855	93,253	348	835	39,203	94,088
2022	40,963	98,311	367	880	41,330	99,191
2023	43,260	103,824	387	929	43,647	104,753
2024	45,973	110,336	411	988	46,385	111,324
2025	48,172	115,613	431	1,035	48,603	116,648
2026	49,660	119,184	444	1,067	50,105	120,251
2027	51,148	122,756	458	1,099	51,606	123,855
2028	52,636	126,327	471	1,131	53,108	127,458
2029	54,125	129,899	484	1,163	54,609	131,062
2030	55,611	133,467	498	1,195	56,109	134,661
2031	57,093	137,024	511	1,226	57,604	138,251
2032	58,576	140,582	524	1,258	59,100	141,840
2033	60,058	144,139	538	1,290	60,596	145,429
2034	61,540	147,697	551	1,322	62,091	149,019
2035	62,918	151,003	563	1,352	63,481	152,354

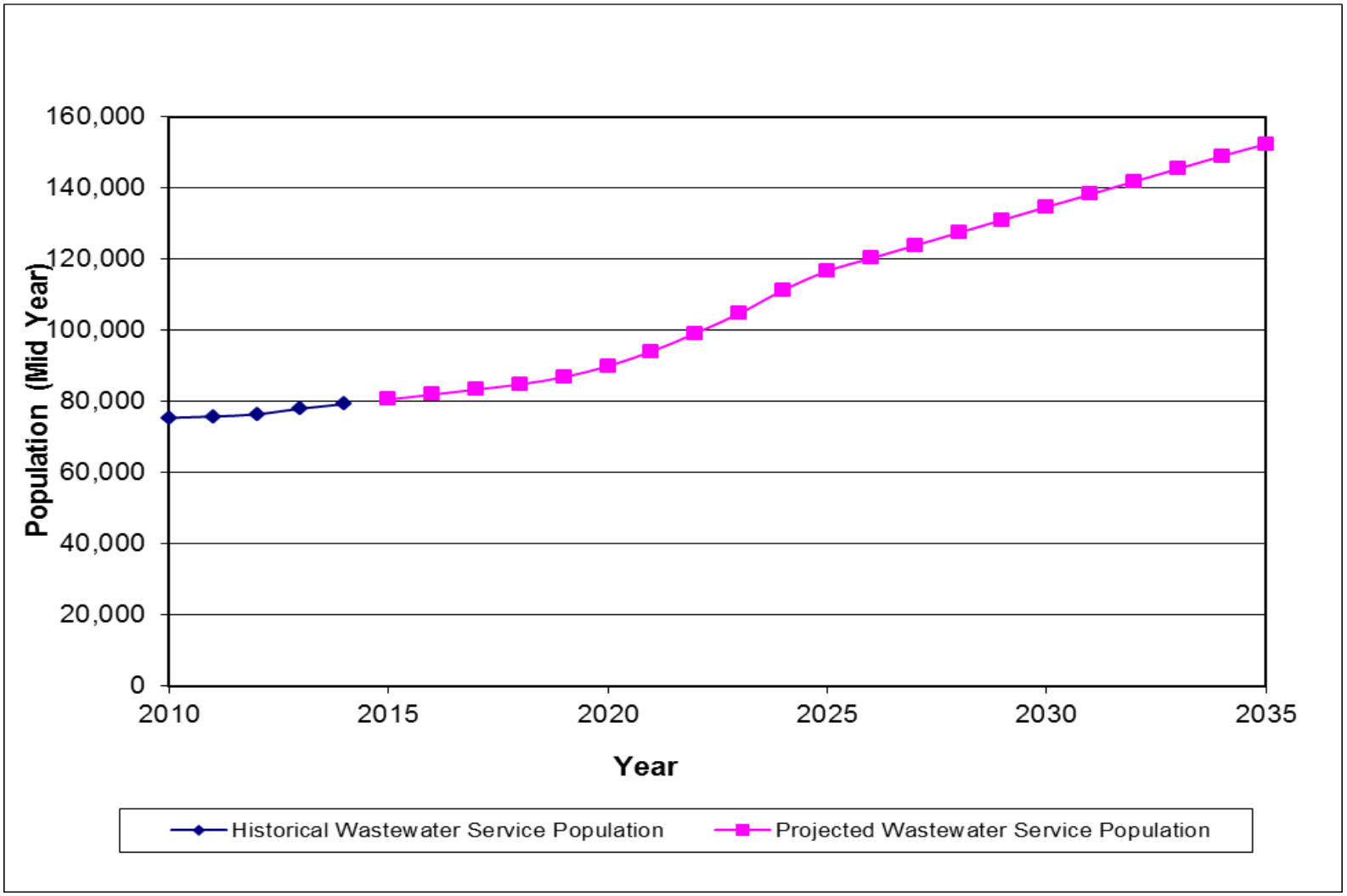


Figure 3-1: Palm Coast Wastewater Service Area Population Projection

3.1.2 Wastewater Flow Projections

Wastewater flow projections are calculated by multiplying the projections of ERCs by the historical Average Flow per ERC to obtain the Annual Average Daily Flow.

Table 3-2 tabulates the Average Flow per Equivalent Residential Connection using data from 2010 through 2014. The ERC values were obtained from **Table 2-1** in Section 2 of this Facility Plan and the corresponding Annual Average Daily Flow (AADF) and Three Month Average Daily Flow (TMADF) to the existing Wastewater Treatment Facility were obtained from **Table 2-2** in Section 2 of this Facility Plan.

Table 3-2: Palm Coast Wastewater Average Flow per ERC.

Year	Yearly Average ERC	AADF (MGD)	Average Flow per ERC (gpd)	TMADF, MGD	TMADF/AADF
2010	31,357	5.268	168	5.767	1.095
2011	31,504	4.785	152	4.957	1.036
2012	31,766	5.037	158	5.268	1.046
2013	32,214	5.741	177	6.587	1.147
2014	32,734	5.834	177	6.162	1.056

The Ratio of the Maximum Three-Month Average Daily Flow (TMADF) to the Annual Average Daily Flow (AADF) represents the seasonal variation in the wastewater influent flows compared to the yearly average.

Projected Wastewater Flows are presented in **Table 3-3**. The flow projections are based on Projected ERC's from **Table 3-1** and Average Flow per ERC from **Table 3-2**. These wastewater flow projections are mid-year (July 1) projections.

Projected Wastewater Flows are plotted in **Figure 3-2** along with the existing wastewater treatment capacity and the projected future wastewater treatment plant construction and /or expansions. **Figure 3-2** assumes the following wastewater treatment facility construction completion:

- Wastewater Treatment Facility No. 2 (Initial 2.0 MGD) – 2018
- Wastewater Treatment Facility No. 2 expansion to 4.0 MGD – 2024
- Wastewater Treatment Facility No. 1 expansion to 9.1 MGD – 2030

Table 3-3: Palm Coast Wastewater Flow Projections.

Year	Total Service Area		AADF / ERU	AADF	TMAADF / AADF	TMADF
	ERC	Population	(gal/ERU)	(MGD)		(MGD)
2015	33,572	80,573	177	5.930	1.094	6.485
2016	34,140	81,935	177	6.030	1.094	6.594
2017	34,730	83,351	177	6.135	1.094	6.708
2018	35,344	84,825	177	6.243	1.094	6.827
2019	36,191	86,860	177	6.393	1.094	6.991
2020	37,472	89,932	177	6.619	1.094	7.238
2021	39,203	94,088	177	6.925	1.094	7.573
2022	41,330	99,191	177	7.300	1.094	7.983
2023	43,647	104,753	177	7.710	1.094	8.431
2024	46,385	111,324	177	8.193	1.094	8.960
2025	48,603	116,648	177	8.585	1.094	9.388
2026	50,105	120,251	177	8.850	1.094	9.678
2027	51,606	123,855	177	9.116	1.094	9.968
2028	53,108	127,458	177	9.381	1.094	10.258
2029	54,609	131,062	177	9.646	1.094	10.548
2030	56,109	134,661	177	9.911	1.094	10.838
2031	57,604	138,251	177	10.175	1.094	11.127
2032	59,100	141,840	177	10.439	1.094	11.416
2033	60,596	145,429	177	10.704	1.094	11.705
2034	62,091	149,019	177	10.968	1.094	11.994
2035	63,481	152,354	177	11.213	1.094	12.262

Table 3-4 presents an estimated summary of the forecast for each of the two individual service areas for current and 2035. The wastewater flows are conservative estimates for preliminary planning.

Table 3-4: Palm Coast Wastewater Service Area Flow Projections

Date	Proposed Service Area #1 (MGD)	Proposed Service Area #2 (MGD)
Current	**4.25**	**1.47**
2035	**7.84**	**3.00**

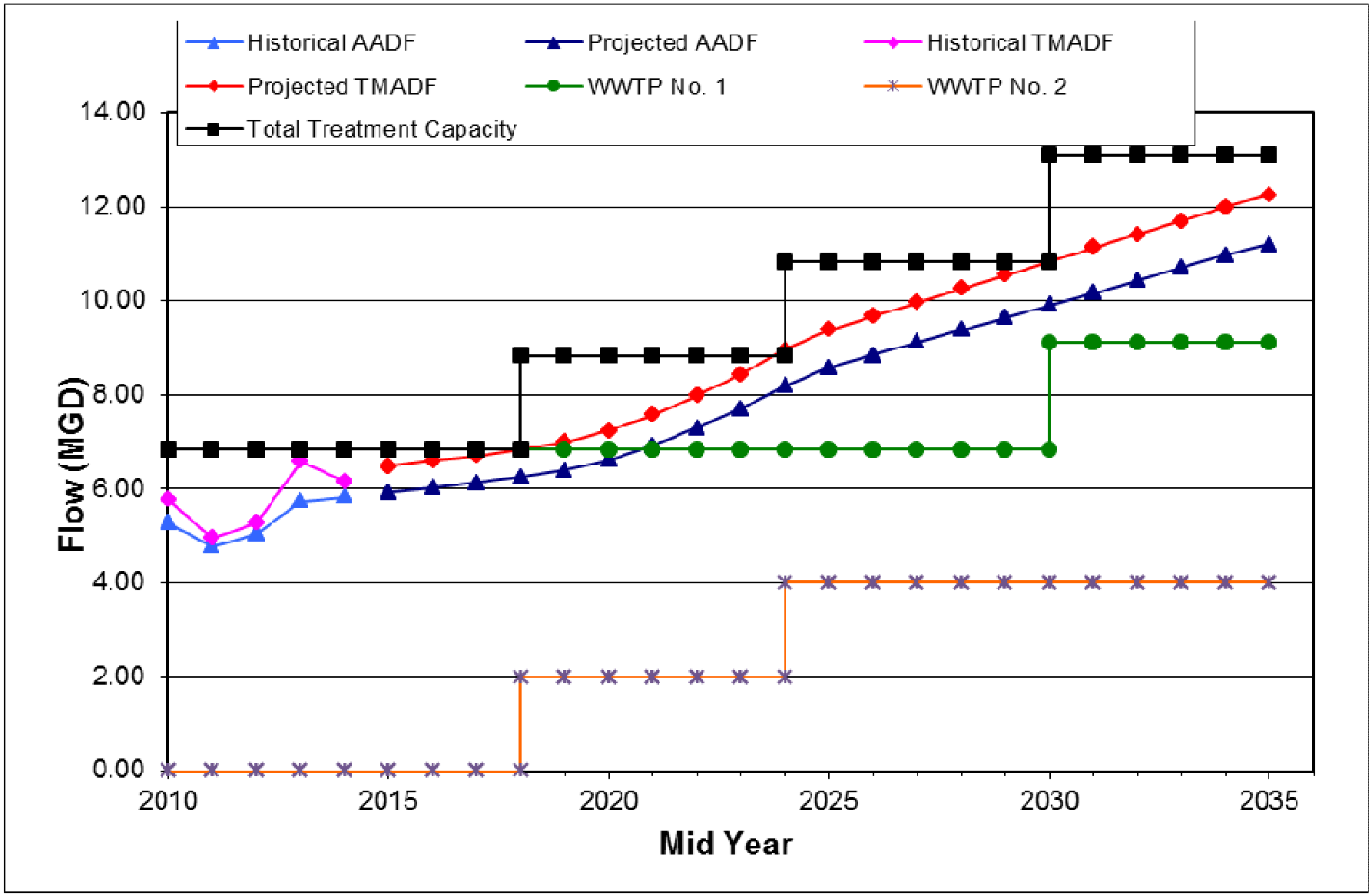


Figure 3-2: Projected Palm Coast Wastewater Flow and Plant Capacity

The proposed site for WWTF No. 2 is on Peavey Grade in the northwestern area of the City. Co-located with WWTF No. 2 is the Water Treatment Plant No. 3 on the south side of this site. A FPL Substation is located between the site and the Florida East Coast Railroad. The proposed WWTF No. 2 will be constructed with an initial 2.0 MGD capacity and can be expanded in 2.0 MGD increments up to 6.0 MGD capacity.

A primary area for development and population growth is expected to be in the north and west portion of the City which will be served by WWTF No. 2. The proposed water and wastewater treatment facilities are in close proximity to the largely undeveloped areas east of the Florida East Coast Railway and west of US Highway 1. Additional development is expected west of the railroad. The area west of the railroad was not included in the wastewater growth estimates, but its proximity to both the City's water and wastewater infrastructure improvements should not be overlooked.

The wastewater treatment facilities and the proposed service areas for Palm Coast are shown in **Figure 1-2** in Section 1 of this report, and are described below:

- The proposed WWTF No.2 will serve the Service Area #2 of Palm Coast. This service area covers the entire area north of the Palm Coast Parkway and west of I-95. The proposed Palm Coast Park DRI is to be developed along US Highway 1 north of Palm Coast Parkway and extended north to the area south of the St. Johns County line. The proposed WWTF No. 2 will also serve the area west of the railroad track where large scale residential developments, such as Three Lakes and Old Brick are being planned.

- The existing WWTF No. 1 will serve the rest of the area outside Service Area #2 (Service Area # 1). The Service Area #1 includes several beachside communities outside the Palm Coast City limits.

3.1.3 Land Use

Land uses within the service area have been designated in the City of Palm Coast 2004 Comprehensive Plan. The Current Land Use Map from the Comprehensive Plan is presented in **Figure 2-1** in Section 2 of this Facility Plan. The latest update of the Current Land Use Map is the Official Zoning Map presented in **Figure 2-2** in Section 2 of this Facility Plan.

3.1.4 Wastewater Characteristics

The historical wastewater and reclaimed water characteristics are presented in **Table 2-5** in Section 2 of this Facility Plan.

The design criteria for the proposed WWTF No. 2 will be based on Advanced Wastewater Treatment (AWT) Standards.

3.2 PROPOSED IMPROVEMENTS FOR WWTF NO. 2 SERVICE AREA

3.2.1 General

Wastewater from the Service Area # 2 is currently conveyed to WWTF No. 1 for treatment. Upon completion of the proposed WWTF No. 2 and associated supporting improvements, wastewater from this area will be diverted to the proposed WWTF No. 2. In addition areas north and/or west of the Florida East Coast Railway will be included in the WWTF No. 2 Service Area. The schedule for development of this area has yet to be determined. Wastewater service for this area will be addressed as needs arise.

New wastewater force mains and a pump station will need to be installed to convey wastewater to WWTF No. 2. The direct benefits of conveying existing wastewater flows to WWTF No. 2 are:

1. WWTF No. 2 will require wastewater flows to be redirected from existing developed areas (Matanzas Woods and Indian Trails Subdivisions) to provide stable wastewater base flows for the initial facility operation. The Palm Coast Park Development wastewater flows to WWTF No. 2 will increase as facilities become operational.
2. Redirecting wastewater flow from the northwestern portion of the City to WWTF No. 2 will reduce wastewater flows to WWTF No. 1, and provide additional WWTP No. 1 capacity for serving the new developments within the Service Area #1.

The Palm Coast Park DRI is located along both sides of US Highway 1 between Palm Coast Parkway and the Palm Coast Industrial Park on the south to Old King's Road and Ranch House Grade on the north. The developer has installed water mains, wastewater force mains and reclaimed water mains along US Highway 1 to facilitate the 4,740 acre development. The proposed Peavey Grade Wastewater Force Main will connect to the developer's wastewater force main system on US Highway 1. This will allow the wastewater to be conveyed to WWTF No. 2.

3.2.2 Peavey Grade Wastewater Force Main

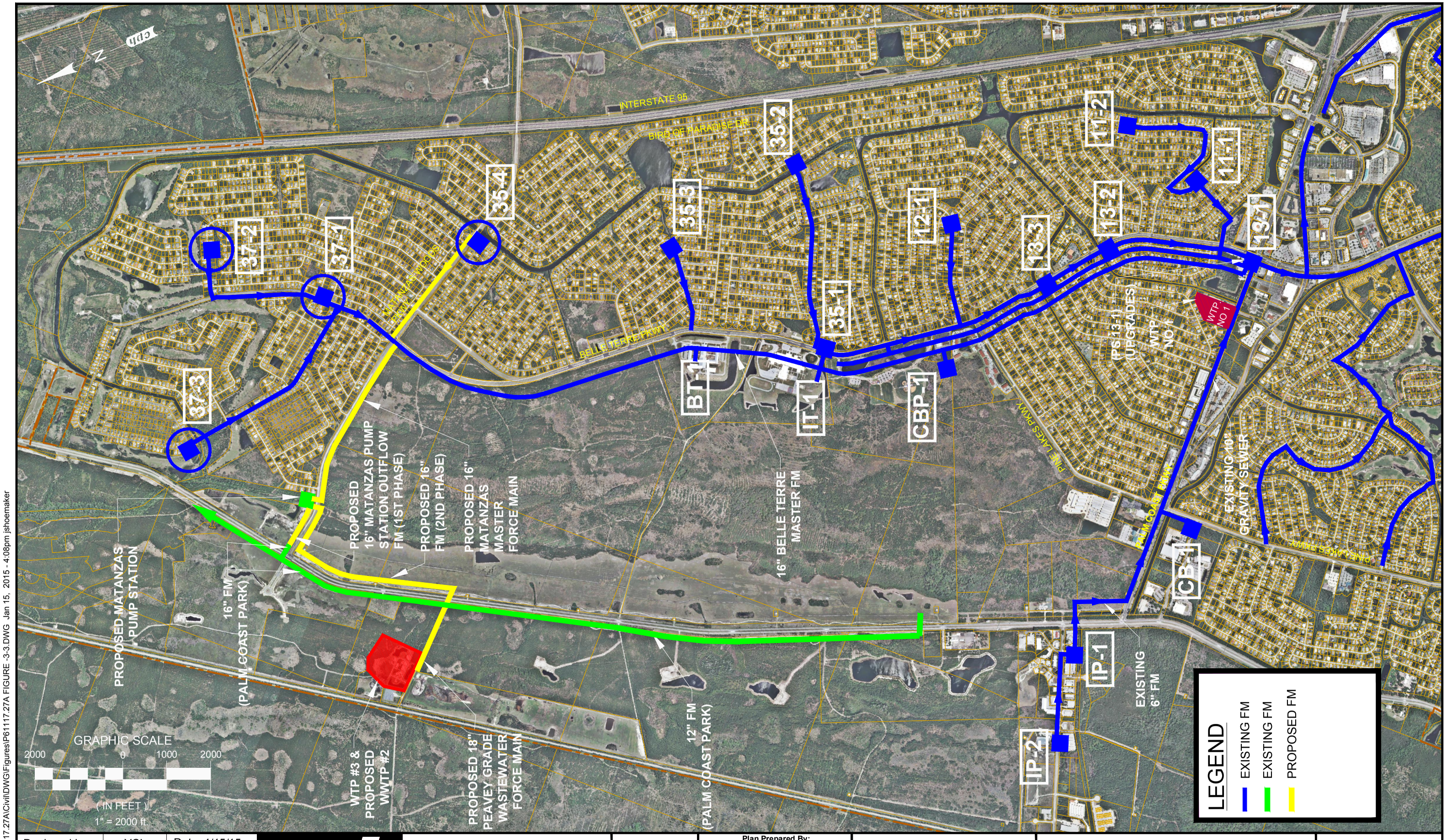
A new wastewater force main is required to convey wastewater from the intersection of Peavey Grade and US Highway 1 to the proposed WWTF No. 2 along Peavey Grade. An 18-inch wastewater force main will be installed from the Palm Coast Park Development wastewater distribution system to a force main at the entrance to the Water Treatment Plant No. 3 site which is also the entrance to the WWTF No. 2 site as presented in **Figure 3-3**. The construction of Water Treatment Plant No. 3 includes the installation of an 18-inch wastewater force main across the water plant site to the adjacent site for the proposed WWTF No. 2. The 18-inch force main is the primary transmission main into WWTF No. 2.

3.2.3 Matanzas Pump Station

Existing lift stations in the Matanzas Woods and Indian Trails subdivisions do not have the pumping capacity to convey wastewater directly to WWTF No. 2. A pump station will be required in the vicinity of the intersection of Matanzas Woods Parkway and US Highway 1. The location of this pump station is adjacent to Ashwood Channel on the north side of Matanzas Woods Parkway, as presented in **Figure 3-3**.

The proposed Matanzas Pump Station will receive flows from three separate force mains. Palm Coast Park Development facilities north of Matanzas Woods Parkway and east of US Highway 1 will be connected to the pump station by the developer. Four existing lift stations (i.e. PS 35-4, 37-1, 37-2 & 37-3) serving the Matanzas Woods subdivision and northern Indian Trails subdivision will be connected by a force main along Matanzas Woods Parkway. Wastewater flows south of Matanzas Woods Parkway and north of Palm Coast Parkway will also be directed along Belle Terre Parkway to Matanzas Pump Station, and then pumped to WWTF No. 2. The force main improvements from the pump station to WWTF No. 2 will be discussed later in this section.

The Matanzas Pump Station will be designed for phased expansion as the wastewater flows increase. Two submersible sewage pumps will be installed with the initial construction. Additional pumps will be installed as the sewage flows increase. The pumping station will include odor control and a standby generator



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PROPOSED WASTEWATER IMPROVEMENTS

CITY OF PALM COAST
Wastewater Treatment Plant No. 2

Figure
3-3

3.2.4 Matanzas Pump Station Outflow Force Main

Outlet flows from the proposed Matanzas Pump Station have several options for the routing paths to WWTF No. 2.

The initial phase would utilize the Palm Coast Park Development force main on the west side of US Highway 1 and the 16-inch branch along Matanzas Woods Parkway east of US Highway 1. The developer's 16-inch main will convey the wastewater to the proposed Peavey Grade Wastewater Force Main which connects to the proposed WWTF No. 2.

The future phase would route a separate 16-inch force main directly from the pump station along Matanzas Woods Parkway, turning south, east of US Highway 1, crossing US Highway 1 to the Peavey Grade Wastewater Force Main, and on to WWTF No. 2. A 16-inch force main is anticipated to be required for the build-out flows to the Matanzas Pump Station.

The initial phase will require construction of approximately 1,500 feet of 16-inch force main from the proposed Matanzas Pump Station to the Developer's 16-inch force main connection on the east side of US Highway 1.

The future phase will require construction of approximately 4,200 feet of 16-inch force main from Matanzas Woods Parkway along the east side of US Highway 1 to Peavey Grade. Approximately 300 feet of directionally drill or jack and bore would be required to cross under US Highway 1 prior to connecting into the proposed Peavey Grade Wastewater Force Main.

The location of the proposed sewage force mains is presented in **Figure 3-3**.

3.2.5 Redirect Flows from Pump Stations 35-4, 37-1, 37-2, and 37-3

Significant wastewater flows will be required from existing Palm Coast subdivisions to support the initial operation of WWTF No. 2. Redirecting existing wastewater flows from Matanzas Woods subdivision and the Indian Trails subdivision is a viable option to support initial WWTF No. 2 operations.

This improvement will require a new force main to redirect wastewater from existing force mains from Pump Stations 35-4, 37-1, 37-2, and 37-3 to the proposed Matanzas Pump Station.

The Palm Coast Park Development, which directly surrounds the proposed WWTF No. 2, will also provide additional wastewater flows to WWTF No. 2 as facilities in the development become operational.

Additional pumps and lift stations within the Indian Trails Subdivision between Palm Coast Parkway and Matanzas Woods Parkway along Belle Terre Parkway will be discussed later in this section.

Approximately 4,300 feet of force main needs to be installed along Matanzas Woods Parkway to the proposed Matanzas Pump Station to redirect wastewater

flows from Pump Stations 35-4, 37-1, 37-2, and 37-3, as presented in **Figure 3-3**. It has been determined that this force main will be 16-inch diameter.

The new force main will connect to existing force mains at the intersection of Lakeview Boulevard and Matanzas Woods Parkway. Pump Stations 37-1, 37-2, and 37-3 are connected by the force main routed along Lakeview Boulevard and Pump Station 35-4 from the force main routed along Matanzas Woods Parkway.

3.2.6 Belle Terre Master Force Main

Existing Pump Station 13-1 currently pumps all of the existing wastewater flows from Service Area #2 to WWTF No. 1. This portion of the existing Service Area includes the Matanzas Woods Subdivision, the Indian Trail Subdivision, the Belle Terre Elementary School, the Indian Trail Middle School, the Indian Trail Sports Complex, Palm Coast Industrial Park west of US Highway 1, and Pine Lake Industrial Park south of Palm Coast Parkway.

When WWTF No. 2 becomes operational, much of the wastewater flows to Pump Station 13-1 will ultimately be redirected to the new facility. Wastewater can be pumped by pump station 13-1 through an existing 16-inch master force main along Belle Terre Parkway north to Matanzas Woods Parkway and then to Matanzas Pump Station.

The Belle Terre Master Force Main will also receive flows from existing pump stations and lift stations along the route as presented in **Figure 3-3**.

The 16-inch Belle Terre Master Force Main will provide a connection between Lift Station 13-1 and Matanzas Woods Parkway. The 16-inch Matanzas Master Force Main will provide a connection of the Belle Terre Master Force Main to the proposed Matanzas Pump Station.

The pump stations along Belle Terre Parkway have been upgraded to provide sufficient pumping capacity to convey wastewater to the Matanzas Pump Station.

3.2.7 Matanzas Master Force Main

To complete the connection between Pump Station 13-1 and the Matanzas Pump Station, the 16-inch Matanzas Master Force Main will need to be constructed along Matanzas Woods Parkway to the pump station. The Matanzas Master Force Main is required to support operation of WWTF No. 2 and Matanzas Pump Station.

Approximately 4,400 feet of 16-inch force main will need to be constructed from the intersection of Lakeview Boulevard and Matanzas Woods Parkway to the Matanzas Pump Station.

Upon WWTF No. 2 becoming operational, the Belle Terre Master Force Main in conjunction with the Matanzas Master Force Main will be able to be configured to convey wastewater flows to WWTF No. 2. The pump stations and force main

system has been designed to allow the wastewater to be pumped to either the WWTF No. 1 or WWTF No. 2. Under normal operation, the wastewater will be pumped to the new WWTF No. 2.

3.2.8 Redirect Existing Flows from Western Palm Coast Parkway

A portion of the existing wastewater flows to Pump Station 13-1 originates from the western portion of Palm Coast Parkway. This section includes three pump stations (i.e. IP-1, IP-2 and CB-1) in the Palm Coast Industrial Park and Pine Lakes Industrial Park as presented in **Figure 3-3**. The pressurized force main from these three pump stations is conveyed into a gravity sewer just east of the intersection of Palm Coast Parkway and Pine Lakes Parkway.

The construction of the proposed WWTF No. 2 will provide the opportunity to redirect existing flows from these three pump stations by a significantly shorter route to a wastewater treatment facility.

This improvement will redirect wastewater flows from Pump Stations IP-1, IP-2 and CB-1 to WWTF No. 2 by way of a new force main, a proposed Developer's pump station and the developer's force main.

Reconfiguration of existing force mains and installation of approximately 3,200-feet of 12-inch sewage force main is necessary to redirect the wastewater flows from Palm Coast Industrial Park and Pine Lakes Industrial Park to WWTF No. 2. The existing pressurized force main would be capped or valved before the entrance into the gravity sewer. A new force main installed from the existing force main that crosses US Highway 1 south of the Humane Society to the proposed Palm Coast Park Developer's 12-inch force main located along US Highway 1 between Raw Water Wells SW-35 and SW-36.

3.2.9 Proposed Wastewater Treatment Facility No. 2

3.2.9.1 General

The site for the proposed WWTF No. 2 is located along Peavey Grade east of the Florida East Coast Railway as presented in **Figure 1-2** in Section 1 of this Facility Plan.

The City obtained the 30.1 acre site (22.8 acres Uplands & 7.3 acres Wetlands) for the construction of WTP No. 3 and the proposed WWTF No. 2. WTP No.3 is located on the south portion of the site. WWTF No. 2 is proposed to be constructed on the north and west portion of this site.

As presented in **Figure 3-2** and tabulated in **Table 3-3**, the Palm Coast Wastewater Treatment System flows are projected to increase and additional wastewater treatment capacity will be required on a regular basis for the next 20 years.

The proposed Service Area # 2 for WWTF No. 2 includes the area west of I-95 and north of Palm Coast Parkway is shown in **Figure 1-2**. The service area includes the recently annexed site of the Palm Coast Park Development. A recent addition to the Palm Coast Wastewater System Service lies west of the Florida East Coast Railway and outside of the City Limits. This addition has over 26,000 acres of currently undeveloped land and has only limited road access from Palm Coast. However, this area is projected for future development.

The proposed Service Area #2 is projected to have an annual average daily flow of 3.00 MGD in year 2035 as tabulated in **Table 3-4**. This flow is projected to be primarily from the existing developments and the proposed Palm Coast Park DRI.

As the 26,000 acres undeveloped area west of the railroad track is developed, the wastewater from this area will be conveyed to WWTF No. 2 for treatment. Provisions should be made for WWTF No. 2 treatment capacity to be expanded in the future.

To accommodate the current wastewater flows and future wastewater flows, WWTF No. 2 is proposed to be constructed in phases. The first phase is to be a 2.0 MGD capacity and the second phase 2.0 MGD module will provide sufficient wastewater treatment for the projected Service Area wastewater flow at ultimate build-out within the City Limits. It is recommended that space be provided and provision be made for the future construction of a third 2.0 MGD module for a total treatment capacity of 6.0 MGD because of the possibility of significant additional development outside of the City limits, but within the Service Area.

As the facilities become operational, wastewater from Palm Coast Park if developed will be conveyed to WWTF No. 2 for treatment. Wastewater within the Service Area east of US Highway No. 1 will be redirected from WWTF No. 1 to WWTF No. 2.

3.2.9.2 Need for Advanced Wastewater Treatment at WWTF No. 2

A significant amount of the reclaimed water produced at WWTF No. 2 is expected to be utilized for irrigation within the Palm Coast Park DRI development. The proposed Palm Coast Park DRI encompasses 4,750 acres surrounding WWTF No. 2.

It is expected that a portion of the plant's reclaimed water reuse will need to utilize surface water "backup discharge" to a nearby waterway. It is expected that during wet weather periods that part or all of the plant's reclaimed water will also have to be discharged to a nearby waterway. The initial operation of WWTF No. 2 will need to provide for this "backup discharge" capacity for the reclaimed water.

If WWTF No. 2 produces reclaimed water that complies with Advanced Wastewater Treatment criteria, surface water discharges under the Apricot Rule can be permitted. Reclaimed water reuse options are discussed later in this section. Wastewater treatment criteria, including Advanced Wastewater Treatment criteria, are discussed more fully in **Section 4**.

3.2.9.3 WWTF No. 2 Treatment Process Consideration

The biological process alternatives under consideration are Membrane Bioreactor, 5-Stage Bardenpho Process and Conventional Activated Sludge processes. The biological process alternatives will be evaluated more fully in **Section 4**.

Depending on the biological process used and the configuration of the process components, it is possible that up to 6.0 MGD of wastewater treatment capacity could be constructed on the proposed WWTF No. 2 site.

Regardless of the biological process chosen, WWTF No. 2 will require construction of the following process components.

3.2.9.3.1 Headworks

The headworks constructed with the initial design of WWTF No. 2 will have a capacity of 4.0 MGD AADF and 10.0 MGD PHF. The 4.0 MGD headworks will include the following treatment units.

- Mechanical Screens. Screening material will be screened from the influent wastewater. Initially, the mechanical screens will be sized to handle A trash compactor will compact the screenings and deposit the screenings in a dumpster.
- Grit Removal System. Grit removal system will remove grit prior to wastewater being discharged to the biological treatment processes. A grit pump will convey the grit to a classifier, washer, and a dewatering screw prior to being discharged to a dumpster. Grit removal system will be sized to handle the peak hourly flow to the plant.
- Odor Control Unit. Bio-Trickling filter or ozone treatment system can be used to treat the hydrogen sulfide to control the odor in the raw wastewater.
- Equalization Tanks. Equalization tanks will be constructed to equalize the peak flows to the plant to enhance the biological treatment processes performance.

3.2.9.3.2 Chlorination and Effluent Transfer Pumping

Sodium hypo-chlorite is to be used for disinfection of treated effluent. The Chlorine Contact Tanks will have two separate baffled chambers. so that one chamber can be dewatered while the other remains in service. Baffle walls will prevent short-circuiting of the chlorine contact chamber. Chlorine residual analyzers will monitor the chlorine residual. The plant effluent flow will be measured by ultra-sonic transducers and weirs.

Two variable speed vertical turbine pumps (each sized for 1200 gpm maximum pumping rate) will convey the chlorinated plant effluent to a quality control structure.

3.2.9.3.3 Quality Control Structure

The quality control structure will have two motor operated butterfly valves. If the plant effluent quality complies with reclaimed water standards (TSS less than 5 mg/l and chlorine residual greater than 1 mg/l) the plant effluent will be conveyed to a ground storage tank. If the plant effluent water quality does not comply with reclaimed water standards an alarm will be actuated and the motor operated butterfly valves will convey plant effluent to a reject pond.

When the effluent water quality complies with the turbidity and chlorine residual limits, the plant effluent will be conveyed to the Ground Storage Tank.

3.2.9.3.4 Reclaimed Water Distribution Pumping Station

A reclaimed water pumping station is to be provided to convey reclaimed water from the ground storage tank to provide reclaimed water to the reclaimed water distribution system and to provide the plant service water for the facility.

The reclaimed water pumps will be vertical turbine can type pumps with variable frequency drives. The pumps to be installed with the first 2.0 MGD module improvements and using a 2.5 peaking factor are listed below:

- Two 2,000 gpm pumps
- One 1,000 gpm pump
- One 500 gpm pump
- One 200 gpm pump

The reclaimed water distribution pumping station design will provide for installation of additional reclaimed water pumps for future plant expansion.

Flow meters will monitor and record the reclaimed water provided to the reclaimed water distribution system and for plant service water use.

A dechlorination system will be provided for the surface water backup discharge under the Apricot Rule. The dechlorination system will include a Sodium Bisulfite bulk storage tank, chemical metering pumps, flow meters and residual chlorine monitor to monitor and record the reclaimed water for discharge.

3.2.9.3.5 Ground Storage Tank

A 2.0 MG ground storage tank is to be provided to store the reclaimed water.

3.2.9.3.6 Reject Water Pond and Reject Pumping Station

An on-site reject pond will store one day’s production of reject water (2.0 MG). The reject water will be conveyed to a reject pumping station and pumped back to the headworks using two submersible centrifugal pumps at 350 gpm.

An additional 2.0 MG of reject storage will be required when the Phase 2 improvements are constructed. This additional 2.0 MG of reject storage can be provided with a Reject Water Ground Storage Tank as space will not be available to construction additional reject storage pond.

3.2.9.3.7 Aerobic Digestion

Aerobic sludge holding/digesters are to be provided for partial treatment of the sludge. Sludge is to be periodically pumped to two 0.25 MG holding/digesters that are to be provided for the initial 2.0 MGD plant capacity and two additional 0.25 MG digesters that are to be provided when the plant is expanded to 4.0 MGD.

Aeration, mixing and decanting equipment will keep the digester contents mixed and also provide dissolved oxygen. Sludge is to be periodically pumped from the holding/digesters to a belt filter press for dewatering.

Supernatant can be periodically be decanted from the digester to an on-site pumping station.

3.2.9.3.8 Belt Filter Press

A belt filter press will be used to dewater the sludge to approximately 16% solids by weight. The belt filter press is sized to operate approximately 4 hours per day 5 days per week to handle the waste active sludge generated from the 2.0 MGD plant capacity. When the plant is expanded to 4.0 MGD, the dewatering operation will need to be extended to 8 hours per day operation. A conveyor is to be provided with the belt filter press for loading of sludge cake to a hauling truck.

It is currently expected that the dewatered sludge will be transported to a contracted regional management facility for further treatment and final disposal.

3.2.9.3.9 On-Site Pumping Station

Supernatant from the digesters, centrate from the centrifuge and plant drainage will be conveyed to an on-site pumping station. Drains will be provided for all of the tanks and the tank drainage will be conveyed to the on-site pump station and pumped back to the upstream side of the flow splitter. A flow meter will measure and record the on-site pump station flow.

3.2.9.3.10 Operations Building

The operations building provided with Water Treatment Plant No. 3 will be shared with the Wastewater Treatment Plant No. 2. A separate administration building is not required.

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3.2.9.4 WWTF No. 2 Reclaimed Water System Improvements

3.2.9.4.1 Peavey Grade Reclaimed Water Mains

Reclaimed water mains will need to be installed to convey reclaimed water from the proposed WWTF No. 2 to the reclaimed water irrigation system main on US highway 1 installed by the Palm Coast Park Development.

Approximately 2,000 feet of proposed 18-inch reclaimed water main will be installed by the City along Peavey Grade to convey reclaimed water from WWTF No. 2 to the reclaimed water distribution system installed by the Palm Coast Park Development. The Palm Coast Park system will supply irrigation water to approximately 4,750 acres of developed area.

3.2.9.4.2 Matanzas Woods Parkway Reclaimed Water Main

A reclaimed water main is to be installed along Matanzas Woods Parkway from US Highway 1 to Old Kings Road to connect the WWTP No. 1 and WWTP No. 2 reclaimed water mains. This connection will permit reclaimed water from WWTP No. 2 to be conveyed to WWTP No. 1 and reclaimed water users and to also convey reclaimed water from WWTP No. 1 to WWTP No. 2 reclaimed water users. Approximately 17,500-feet of 16-inch reclaimed water main is proposed. This project is currently under construction and will not be funded by the SRF loan.

3.2.9.4.3 Backup Surface Water Discharge for WWTF No. 2

It is proposed that WWTF No. 2 provide advanced wastewater treatment. In accordance with the Florida Apricot Rule, the FDEP could grant a permitted "backup discharge" of up to 30% of the reclaimed water reuse system permitted disposal capacity or the permitted AWT treatment capacity whichever is less on an annual basis. WWTF No. 2 currently has no operational reclaimed water reuse sites. The Palm Coast Park Development has several reclaimed water reuse sites under planning.

The Palm Coast Park development has approximately 2,600 acres of developed area. The public access irrigation sites within the Palm Coast Park Development have an estimated 1.50 MGD of total reuse capacity. In addition, there are also over 27,000 acres of undeveloped area west of the Florida East Coast Railway which was recently added to the Palm Coast wastewater service area. The projected development of the Public Access Reuse Sites presented in **Figure 2-6** have an estimated 7.80 MGD of total reuse capacity as tabulated in **Table 3-5**.

The WWTF No. 2 site is not in the immediate proximity to a waterway for surface water discharge. Options to be considered in more detail for backup surface water discharge points are the natural channel leading to Hulett Branch where it crosses under US Highway 1, discharge to Hulett Branch Wetlands, or to the Parkview Stream Extension.

Table 3-5: Palm Coast Wastewater Treatment Facility No.2 Reclaimed Water Disposal Capacity

Site No.	Site Location	Area Irrigated (Acres)	Capacity (MGD/AADF)
WWTF No. 2			
R-001	**Public Access Irrigation Systems**		
PAA-1	Palm Coast West N-010 (Residential and Office/Commercial)	118.0	0.41
PAA-2	Palm Coast West N-020 (Residential)	4.0	0.01
PAA-3	Palm Coast West N-030 (Industrial and Mixed Use)	18.1	0.06
PAA-4	Palm Coast West N-040 (Commercial and Office)	9.2	0.03
PAA-5	Palm Coast West N-050 (Residential, Commercial/Industrial, Institutional)	8.8	0.03
PAA-6	Palm Coast West N-060 (Residential and Commercial/Industrial)	27.7	0.10
PAA-7	Palm Coast West N-070 (School, Parks)	28.8	0.10
PAA-8	Palm Coast West N-080 (Mixed Use)	56.7	0.15
PAA-9	Future Development West of the Railroad	424	1.15
PAA-10	Palm Coast West N-Sawmill Creek Course (Golf Course) Avg Use	110.7	0.34
PAA-11	Rayonier Property (Mixed Use)	787	2.14
PAA-12	Old Brick (Residential and Commercial)	527	1.43
PAA-13	Three Lakes (Residential and Commercial)	580	1.58
PAA-14	US Highway 1 (Landscaped Areas)	76.3	0.27
	R-001 CAPACITY =	**2776.3**	**7.80**

A reclaimed water main along Peavey Grade and US Highway No. 1 can be used to convey the backup surface water discharge from WWTP No. 2 to the proposed discharge point to Hulett Swamp east of US Highway No. 1 as shown on **Figure 3-4**. De-chlorination and flow measurement facilities will need to be provided near the location where the reclaimed water is discharged to Hulett Swamp wetlands as a back-up surface water discharge.

Scale: 1 " = 1,500 '	
Date: 1/13/2015	
Photo Date: 2011	
Project No. P61117.27A	
Biologist: AED	GIS: RCO

N

City of Palm Coast WWTF No.2 Reclaimed Water Discharge to Hulett Swamp

FIGURE 3-4

Path: M:\PROJECTS\P61117.27\2014 10SRF\AERIAL.mxd

3.2.10 Proposed Improvements to Residuals Processing and Disposal

At WWTF No. 2, a belt thickener will be installed in conjunction with the initial 2.0 MGD construction.

The approximately 16% by weight sludge cake will continue to be transported to a regional biosolids management facility approved by FDEP for further treatment and final disposal. The owner of the biosolids regional management provides this service to the City under a contract. The City sludge is further treated by the regional management facility to Class ”AA” sludge that can be used for beneficial reuse or disposed of in the landfill.

In the meantime, the City is evaluating potential long term options other than the current disposal method for treatment and disposal of biosolids for the current and the proposed WWTF No. 2.

As a long range goal, the Palm Coast Wastewater System Facilities would prefer to use an in-house residuals treatment process that will produce Class “AA” sludge. Class “AA” sludge can be used for fertilizer in areas with public access. It is expected the City Parks and Recreation Department will use the Class “AA” sludge to fertilize parks, medians, and other areas that the City maintains. Residents, nurseries, sod farmers, and others may also be given an opportunity to pick-up and use the Class “AA” sludge for fertilizer.

SECTION 4.0
DEVELOPMENT OF ALTERNATIVES

4.1 GENERAL

This Section develops and evaluates alternatives for wastewater system in Service Area #2. The following four primary wastewater system components are evaluated:

- Wastewater Collection and Transmission
- Wastewater Treatment
- Reclaimed Water Reuse and Disposal
- Residual Solids Treatment and Disposal

4.2 WASTEWATER COLLECTION AND TRANSMISSION SYSTEMS

Collection and conveyance of wastewater from the point where it is generated to the wastewater treatment facilities are the first steps in effective management. The pipes that collect and transport wastewater are called sanitary sewers, and the network of sanitary sewers is called a collection system. Wastewater may flow by gravity in a sewer, or be pumped in a sewage force main. Sewage force mains are called transmission mains. Sewage collection systems for wastewater Service Area #2 will be the conventional gravity sewer system which conveys wastewater to lift stations, and sewage force mains convey the wastewater from the lift stations to the wastewater treatment facility.

4.3 WASTEWATER TREATMENT

4.3.1 Levels of Wastewater Treatment

4.3.1.1 Secondary Treatment

Secondary Treatment is defined as the removal of carbonaceous biological oxygen demand (CBOD5), total suspended solids (TSS), and basic disinfection prior to discharge. Secondary Treatment does not include nutrient removal.

Secondary Treatment can be characterized as:

- CBOD5: $\leq$ 20 mg/L
- TSS: $\leq$ 20 mg/L
- Chlorine Residual: $\geq$ 0.5 mg/L

Secondary Treatment will not produce an effluent that can be used as a commodity (reclaimed water), surface water disposal, wetlands, or for other reuse disposal options. This option is not proposed for the City of Palm Coast.

4.3.1.2 Advanced Secondary Treatment

Advanced Secondary Treatment is secondary treatment with tertiary filtration, high-level disinfection, and limited nutrient removal. Advanced Secondary Treatment can be characterized as:

- CBOD5: ≤ 20 mg/L
- TSS: ≤ 5 mg/L
- NH3-N: ≤ 12 mg/L
- Chlorine Residual: ≥ 1.0 mg/L

Advanced Secondary Treatment produces an effluent that can be used as a commodity (reclaimed water) for urban and agricultural reuse applications.

The existing Palm Coast Wastewater Treatment Facility No. 1 currently processes wastewater to Advanced Secondary Standards.

4.3.1.3 Advanced Wastewater Treatment

Advanced Wastewater Treatment is a step beyond Advanced Secondary Treatment. Nutrients (nitrogen and phosphorous) are removed from the wastewater prior to final disposal. Section 403.086(4) of Florida Statutes defines Advanced Wastewater Treatment as a reclaimed water product having annual average limits for the following contaminates as follows:

- CBOD5: ≤ 5 mg/L
- TSS: ≤ 5 mg/L
- Total Nitrogen: ≤ 3 mg/L
- Total Phosphorous: ≤ 1 mg/L
- Chlorine Residual ≥ 1 mg/L

Advanced Wastewater Treatment and High Level Disinfection are required if the final disposal method incorporating a wetlands treatment or surface discharge as a backup disposal to the public accessible irrigation reuse system.

4.3.2 Construction of New Wastewater Treatment Facilities

The continued growth of existing developments and the construction of new developments within the Palm Coast Service Area will require the following:

- An increase in the wastewater treatment capacity in terms of the quantity of wastewater treated and criteria of wastewater treatment process.
- An upgraded treatment process to allow for additional reclaimed water disposal options including surface water disposal under the Apricot Rule.
- An increase in the disposal capacity of the byproducts (i.e. reclaimed water and sludge).

Each of these areas will be addressed in later in this section.

4.3.2.1 Increased Wastewater Treatment Capacity

Increased wastewater treatment capacity is addressed by the following:

A new wastewater treatment facility (WWTF No. 2) is proposed for Service Area # 2. The design for WWTF No. 2 was designed and permitted in 2011 and is currently under design update to reflect the newer and improved process equipment. The initial treatment capacity will be 2.0 MGD and can be expanded in 2.0 MGD increments to 6.0 MGD capacity.

The proposed WWTF No. 2 will provide AWT standards to allow for reuse of reclaimed water for landscape irrigation of public accessible areas and for permitting of a backup discharge to Hulett Swamp wetlands under the Florida Apricot Act of 1994 and Florida Statutes Section 403.086(7).

4.4 RECLAIMED WATER EFFLUENT DISPOSAL

4.4.1 Methods of Disposal

The following six (6) methods of reclaimed water reuse and disposal are commonly used in Florida:

- Deep Well Injection
- Natural Wetlands Disposal
- Percolation Ponds
- Surface Discharge
- Urban Reuse
- Agricultural Reuse

The level of treatment required for each of the above listed reclaimed water reuse and disposal methods are tabulated in **Table 4-1**.

Table 4-1: Palm Coast Wastewater Service Area Effluent Disposal Methods

Effluent Disposal Method	Required Form of Wastewater Treatment
Deep Well Injection, Percolation Ponds, Limited Wet Weather Discharge to a Receiving Stream	Secondary Treatment
Urban and Agricultural Reuse	Advanced Secondary Treatment
Wetlands Disposal, Surface Water Discharge to a receiving waterway in accordance with the Apricot Rule	Tertiary (Advanced) Treatment

4.4.2 Reclaimed Water Reuse and Disposal in Palm Coast

The current reclaimed water reuse and disposal in the Palm Coast Service Area are urban reuse, Rapid Infiltration Basin (RIB's), limited wet-weather discharge

to the Intracoastal Waterway, and a back-up surface water discharge in accordance with the Apricot Rule.

The reclaimed water reuse and disposal methods proposed for the Palm Coast Service Area # 2 are urban reuse (reclaimed water irrigation) and a backup discharge to wetlands during the period when demand is reduced and there is excess reclaimed water that needs to be disposed of. Irrigation with reclaimed water will reduce the amount of fresh water pumped from the aquifer and used directly for irrigation.

The Palm Coast Sewer Ordinance requires that all new developments install dry reuse lines and use reclaimed water for irrigation when reclaimed water becomes available.

All new developments and subdivisions within Palm Coast Service Area # 2 will be required to install a reclaimed water distribution system and to use reclaimed water for irrigation of residential and common areas.

Reclaimed water will be provided for irrigation of golf courses proposed in Palm Coast Service Area # 2.

Reclaimed water will be provided for irrigation of areas of public beautification such as roadway medians and rights-of-way. Rights-of-way areas include both publicly owned property such as areas adjacent to roadways and privately owned properties such as utility corridors.

4.5 SLUDGE TREATMENT AND DISPOSAL

4.5.1 General

As the Palm Coast wastewater treatment capacity increases, the quantities of sludge byproduct generated also increases. The current Wastewater Treatment Facility No. 1 bio-solids management includes aerobic sludge digestion and dewatering of sludge approximately 16-20% sludge cake. The City of Palm Coast uses a contract service to transport and dispose of solids residuals from Wastewater Treatment Facility No. 1. Similar biosolids treatment and disposal method is proposed for the WWTF No. 2 in Service Area # 2.

4.5.2 WWTF No. 2 Sludge Processing and Disposal

It is expected that aerobic digesters and centrifuges or belt thickeners will be installed at the proposed WWTF No. 2.

The dewatered sludge will then be transported to a regional bio-solids management facility for further treatment and final disposal. The sludge is treated to Class "AA" standards at the regional management facility which can be made available for use as fertilizer in areas with public access and possibility to the public.

4.6 ALTERNATIVES

4.6.1 Wastewater Collection and Transmission Alternatives

4.6.1.1 General

The existing wastewater collection sewers and transmission mains convey wastewater to the Palm Coast Wastewater Treatment Facility No. 1. The Palm Coast Utilities Department provides regular maintenance of the wastewater collection system, pumping stations and transmission system. The collection and transmission systems are in serviceable condition. Rehabilitation and upgrading of the pumping stations and the wastewater collection and transmission system is provided by the Utility Department as deficiencies are observed.

Additional wastewater collection and transmission systems will be required to provide wastewater service for new developments and existing subdivisions in Service Area # 2. For new developments, the City of Palm Coast requires that the Developer of the new development to provide collection, pumping, and transmission systems developments (including pumping stations) that conform to City standards.

City standards permit the use of PVC gravity sewers, submersible sewage pumping stations and PVC sewage force mains. The minimum gravity sewer size is 8-inches and the maximum manhole spacing is approximately 400-feet.

The proposed WWTF No. 2 will require that some new sewage transmission mains and/or wastewater pumping stations be installed to convey the wastewater from the service area to the treatment facility.

4.6.1.2 No-Action Alternative

The No-Action Alternative is not a viable alternative. Additional wastewater collection and transmission improvements are necessary to convey wastewater from the service areas to the Wastewater Treatment Facilities.

Current approved Developments of Regional Impact (DRI) have a significant amount of land development construction completed, or expected to be completed soon including wastewater collection systems, pumping station and transmission lines. Additional build out in existing subdivisions within the City and on-going commercial, institutional and residential developments, which are smaller than the size which requires a DRI, are also expected to continue to add additional flow to the Palm Coast wastewater force main infrastructure.

4.6.1.3 Collection and Transmission Improvements to Support WWTF No. 2

Sewage pumping stations and sewage transmission force mains are required to provide wastewater flows to WWTF No. 2. The Wastewater Service Area #2 is shown in **Figure 1-2**. This service area includes both existing subdivisions and the proposed Palm Coast Park Development.

The Palm Coast Park Development has a significant amount of land development construction which includes wastewater collection systems,

pumping stations and transmission lines. In addition to Palm Coast Park development, additional build out in existing subdivisions within the Service Area # 2 will increase the demand on the wastewater collection and transmission infrastructure.

4.6.1.3.1 Peavey Grade Wastewater Force Main

The proposed construction of WWTF No. 2 requires a force main to be constructed along Peavey Grade to a central connection point at US Highway 1. Wastewater flows from the Palm Coast Park Development collection and transmission system will be received at this connection point.

No-Action is not a viable alternative to this improvement. The only viable alternative to constructing approximately 2,000-feet of the 18-inch sewage force main would be to use another route. Since the proposed route is the shortest distance between the connection at the entrance to WWTF No. 2 and the Palm Coast Park wastewater main, it is the recommended alternative.

The construction for this improvement will occur at the same time when the WWTF No. 2 is under construction.

4.6.1.3.2 Matanzas Pump Station

WWTF No. 2 will require dependable flows for initial operations from existing lift stations in the Matanzas Woods and Indian Trail subdivisions. A pump station will be required to re-pump wastewater from these subdivisions to WWTF No. 2.

No-Action is not a viable alternative to this improvement. Wastewater flows need to be redirected from the existing wastewater collection and transmission system to support the initial operation of WWTF No. 2. Wastewater flows from both the Palm Coast Park Development and the existing Matanzas Woods Subdivision will require a pumping station along Matanzas Woods Parkway. The proposed location of the Matanzas Pump Station is west of Ashwood Channel on the north side of Matanzas Woods Parkway.

Constructing the Matanzas Pump Station is the best alternative for conveying wastewater to WWTF No. 2. Upgrading the pumping capacity and total dynamic head of each of the lift stations in the Service Area is feasible but more costly and time consuming.

4.6.1.3.3 Matanzas Pump Station Outflow Force Mains

Outlet flows from the proposed Matanzas Pump Station will require a force main to convey wastewater to WWTF No. 2.

One option is to construct approximately 5,700 feet of 16-inch force main from the Matanzas Pump Station west along Matanzas Woods Parkway and south along the east side of US Highway 1 to Peavey Grade. Approximately 300 feet of directional drill or jack and bore would be required to cross under US Highway 1 and connect to the Peavey Grade force main.

Another option is to construct approximately 1,500 feet of force main from the proposed Matanzas Pump Station to an existing 16-inch branch main installed by the Palm Coast Park Developer. The developer has constructed a 16-inch force main on the west side of US Highway 1 which can be used to convey the wastewater to the proposed Peavey Grade force main. A 16-inch developer's main crosses US Highway 1 at Matanzas Woods Parkway and travels approximately 180 feet east to an isolation valve.

The advantage of connecting the proposed force main to the Palm Coast Park developer's main at the intersection of U.S. Highway No. 1 and Matanzas Woods Parkway, is that it is the shortest force main which can be constructed at this time. The disadvantage of this alternative is the developer's force main along US Highway 1 from Matanzas Woods Parkway to Peavey Grade is designed to convey all the Palm Coast Park Development flows originating north and south of Peavey Grade. The addition of the existing flows from Matanzas Woods and Indian Trails subdivisions to the Palm Coast Park flows will eventually overload the Developer's force main as the Palm Coast Park facilities come on-line. Eventually, a parallel 16-inch force main will need be installed along either the west or east side of US Highway 1 to Peavey Grade for conveying the wastewater from Matanzas Pump Station to WWTF No. 2.

4.6.1.3.4 Matanzas Master Force Main

A 16-inch Matanzas Master Force Main is needed along Matanzas Woods Parkway to connect the Matanzas Pump Station to the existing 16-inch Belle Terre Master Force Main. Approximately 4,400 feet of 16-inch force main will need to be constructed from to the intersection of Belle Terre Parkway and Matanzas Woods Parkway to the Matanzas Pump Station.

4.6.1.4 Wastewater Collection and Transmission Recommended Alternatives

Redirecting the wastewater flows from existing pump stations to WWTF No. 2 is required to provide sufficient wastewater flows for the initial operation of WWTF No. 2. As the facilities within the Palm Coast Park Development are developed, additional wastewater flows will be directed to WWTF No. 2.

As the Palm Coast Wastewater System wastewater flow increase, additional wastewater flows will need to be redirected to WWTF No. 2 to relieve overloading of the existing transmission mains that convey wastewater to WWWTF No. 1 and to reduce the wastewater flows to WWTF No. 1. The Peavey Grade Wastewater Force Main; the Matanzas Pump Station; the Matanzas Pump Station Outflow Force Main; the Matanzas Master Force Main; the Belle Terre Master Force Main; and Redirecting Flows from Lift Stations 35-4, 37-1, 37-2 & 37-3 need to be completed prior to the completion of the proposed WWTF No. 2.

4.6.2 Wastewater Treatment Alternatives

4.6.2.1 General

The historical wastewater flows have been tabulated in **Table 3-3** and the expected wastewater flows have been projected for a 20-year period. A wastewater flow of 10.835 MGD, AADF has been projected for the year 2035.

The WWTF No. 1 has a current treatment capacity of 6.83 MGD, and there is only sufficient space available to expand to 9.1 MGD. Additional wastewater Treatment facilities will need to be constructed at separate locations. It is planned to construct WWTF No. 2 in the northwest portion of the service area.

4.6.2.2 No-Action Alternative

The No-Action Alternative is not a viable alternative. Growth in the City of Palm Coast and the Palm Coast Wastewater Service Area has been considerable and is expected to continue, although at a lower rate of growth. The US Census Bureau reported that Flagler County (of which Palm Coast is the largest city) was the fastest growing (percentage) county in the United States for 2003 to 2005. Due to the downturn of the economy, the growth of the Palm Coast area has decreased significantly during the past several years. However, the City has recently experienced the return of growth in the City.

Wastewater flows presented in **Figure 3-2** project that the wastewater average annual daily flow will require WWTF No. 2 to be operational in 2018 and that WWTF No. 1 will need to be expanded to 9.1 MGD in 2031.

4.6.2.3 Construction of WWTF No. 2

As discussed in **Section 3.0**, flows to the Palm Coast Wastewater Treatment system are increasing and additional wastewater treatment capacity is required. The continued build out of existing subdivisions in the northwest portion of the City along with the new Palm Coast Park Development will require additional wastewater treatment capacity in this portion of the City.

As also discussed in Section 3.0, the proposed site for WWTF No. 2 at present has only limited availability of reclaimed water reuse or disposal sites in close proximity. To provide for additional options for reclaimed water reuse and disposal, the proposed WWTF No. 2 will be designed to provide Advanced Wastewater Treatment Standards.

The WWTF No. 2 initial construction will have a 2.0 MGD process module. The site layout should also accommodate future expansion to 4.0 or 6.0 MGD.

The WWTF No. 2 will provide treatment to Advanced Wastewater Treatment Standards which are defined on annual average daily basis as:

- BOD5 ≤ 5 mg/L
- Total Suspended Solids ≤ 5 mg/L
- Total Nitrogen ≤ 3 mg/L
- Total Phosphorous ≤ 1 mg/L.

In order for the reclaimed water to comply with the standards for irrigation of areas with public access, the wastewater treatment units must comply with the Class 1 Reliability requirements. Regardless of the biological process chosen, WWTF No. 2 will require construction with the following process support components:

- Influent Equalization Tanks (Optional)
- Mechanical Bar Screen
- Grit Removal
- Flow Measurement
- Odor Control
- Biological Treatment Processes
- Chlorine Contact Tank
- Chemical Feed System
- Effluent Flow Measurement
- Effluent Transfer Pumps
- Reclaimed Water Storage
- Reclaimed Water Distribution Pumps
- Return and Waste Sludge Pumps
- Sludge Holding/Aerobic Digestion
- Sludge Dewatering
- Backup Generator
- Reject Pond (2.0 MG minimum)
- Reject Pump Station
- De-chlorination System

The biological process options being evaluated are Membrane Bioreactor, Oxidation Ditch and Activated Sludge processes.

4.6.2.3.1 Membrane Bioreactor Wastewater Treatment Option

The proposed Membrane Bioreactor (MBR) option can be constructed with two identical 1.0 MGD modular treatment units (2.0 MGD total) which share a common wall. Each MBR modular treatment unit could have two separate process basins (each sized for 0.5 MGD and also separated by a common wall). In this way, the initial 2.0 MGD module will comply with the Class 1 Reliability Requirements of treating 75% of the average daily flow with one MBR basin out of service. The proposed MBR Layout with the associated biological process units is presented in **Figure 1-3**.

In addition to the previously listed process support components, the biological treatment process will include the following:

- Equalization Basins
- Fermentation Basins
- Pre-Anoxic Basins
- Pre-Aeration Basins
- Post-Anoxic Basins
- MBR Basins

This treatment process is a modified 5-Stage Bardenpho process in which the MBR Basins replace the Post-Aeration basins and the conventional secondary clarifiers. The MBR Basins also replace the conventional tertiary filtration system.

The space required for this process is significantly smaller than the space required for the 5-Stage Bardenpho process for the same treatment capacity. This treatment system will reliably achieve the AWT standards of reclaimed water through nitrification and de-nitrification processes. Use of MBR process with other biological processes for AWT is becoming more popular in recent years, especially when the space for construction is limited.

4.6.2.3.2 5-Stage Bardenpho Wastewater Treatment Option

Carrousel Oxidation Ditch in conjunction with other biological processes will provide Advanced Wastewater Treatment. Typically, a Fermentation Basin followed by a Pre-Anoxic Basin precedes the Oxidation Ditch. A Post-Anoxic Basin immediately follows the Oxidation Ditch. The last process is a Post-Aeration Basin prior to the secondary clarification of the mixed liquor. This is the popular 5-Stage Bardenpho Process which has been widely used in the past 30 years. The process will also reliably treat the wastewater to AWT standards.

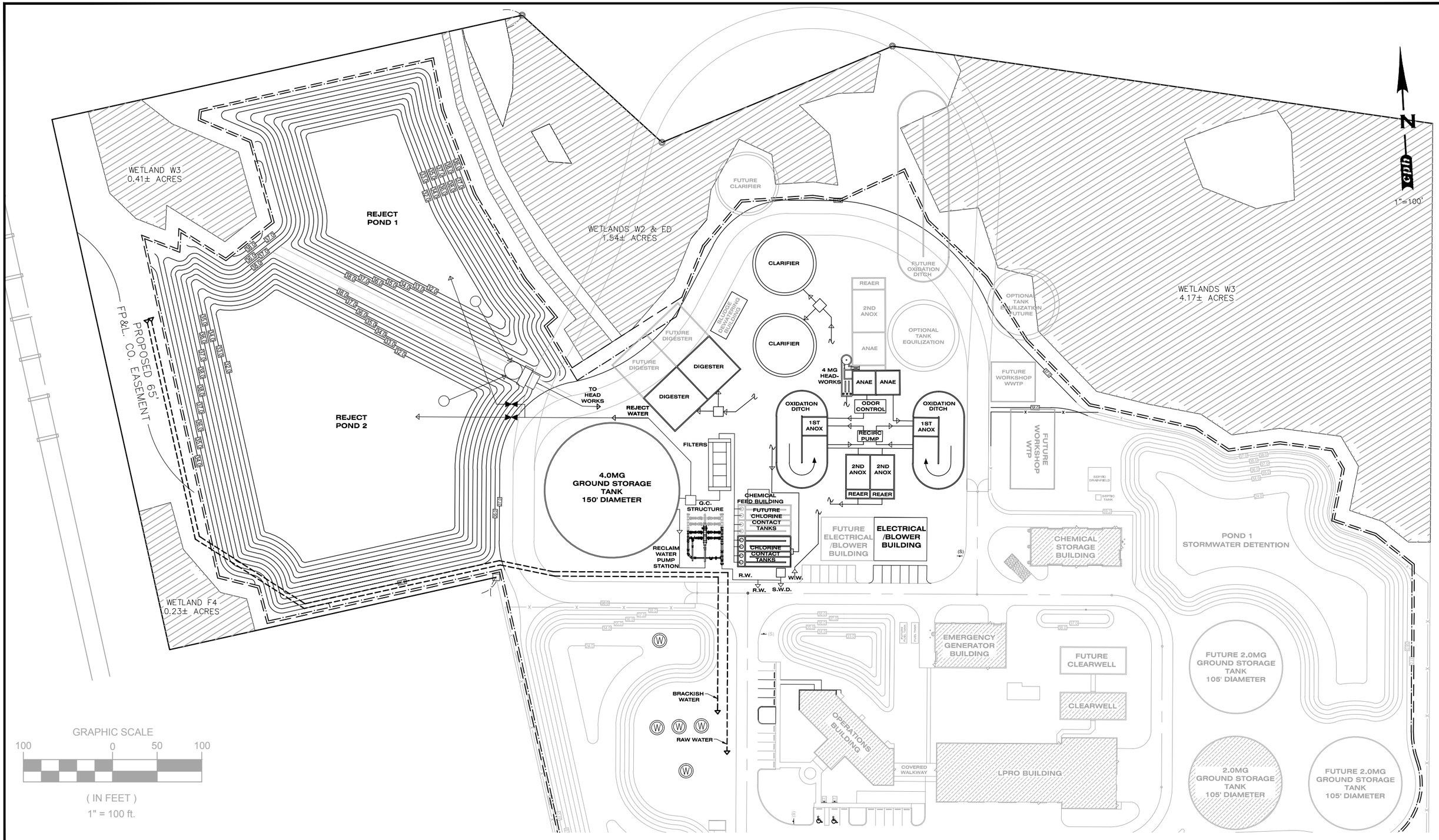
Two separate Carrousel Oxidation Ditches (each sized for 1.0 MGD treatment capacity) will be needed for the initial 2.0 MGD capacity to comply with Class 1 Reliability Requirements. The clarifiers will need to be oversized so each clarifier will comply with the Class 1 Reliability Requirements of treating 75% of the average daily flow with one clarifier out of service. The proposed 5-Stage Bardenpho Process Layout is presented in **Figure 4-1**.

The initial 2.0 MGD 5-Stage Bardenpho Process will include the following units:

- Two Fermentation Units
- Two 1st Anoxic Units
- Two Carrousel Ditches
- Recirculation Pumps
- Two 2nd Anoxic Units
- Two Re-aeration Units
- Two Clarifiers
- Tertiary Filtration Units

The second 2.0 MGD treatment train for expanding the capacity to 4.0 MGD will have the same treatment units as listed above.

The initial 2.0 MGD Oxidation Ditch and process support components can be constructed in upland areas of the WWTF No. 2 site. However, the area required for construction of the second 2.0 MGD process train will infringe on the identified wetlands. There is not sufficient area on the site for future 4.0 0r 6.0 MGD expansion.



Designed by:	YCL	Date: 1/16/15	cph www.cphcorp.com	A Full Service A & E Firm	Offices In:	Plan Prepared By: CPH, Inc.	5-STAGE BARDENPHO PROCESS LAYOUT
Drawn by:	JCS	Job No. P61117.27A		Architects, Engineers, Environmental, Landscape Architects, Traffic/Transportation; M / E / P, Planners, Structural, Surveyors	• Florida • Puerto Rico • Connecticut • Maryland • Texas	500 W. Fulton St. ~ Sanford, Fl. 32771 Ph: 407.322.6841 Licenses: Eng. C.O.A. No. 3215 Survey L.B. No. 7143 Arch. Lic. No. AA2600926 Lndscp. Lic. No. LC0000298	CITY OF PALM COAST Wastewater Treatment Plant No. 2
Checked by:	YCL	File: FIGURE 4-1					
Approved by:	YCL	© 2015				YING C. LEE FL. P.E. NO. 31371	Figure 4-1
Scale:	AS-NOTED						

Drawing name: J:\P61117.27A\Civil\Documents\Reports\Facility Plan\Figures\Figures Need to Work On_JS\P61117.27A FIGURE 4-1 5-STAGE BARDENPHO PROCESS LAYOUT.dwg Jan 16, 2015 - 7:52am jshoemaker

4.6.2.3.3 Conventional Activated Sludge Wastewater Treatment Option

The Activated Sludge Option will provide secondary biological treatment, but additional treatment will be required to provide Advanced Wastewater Treatment.

Three separate aerobic activated sludge tanks are to be provided for the initial 2.0 MGD module. The clarifiers will be oversized so each clarifier will comply with the Class 1 Reliability Requirements of treating 75% of the ADF with one clarifier out of service. The proposed Activated Sludge Layout is presented in **Figure 4-2**.

In addition to the process support units listed in 4.7.2.4, the initial 2.0 MGD Oxidation Ditch option will include the following:

- Two Anaerobic Treatment Units
- Two 1st Anoxic Treatment Units
- Three Aerobic Activated Sludge Basins
- Recirculation Pumps
- Two 2nd Anoxic Treatment
- Two Reaeration Treatment Units
- Clarifier Flow Splitter
- Two Clarifiers
- Tertiary Disc Filter Unit

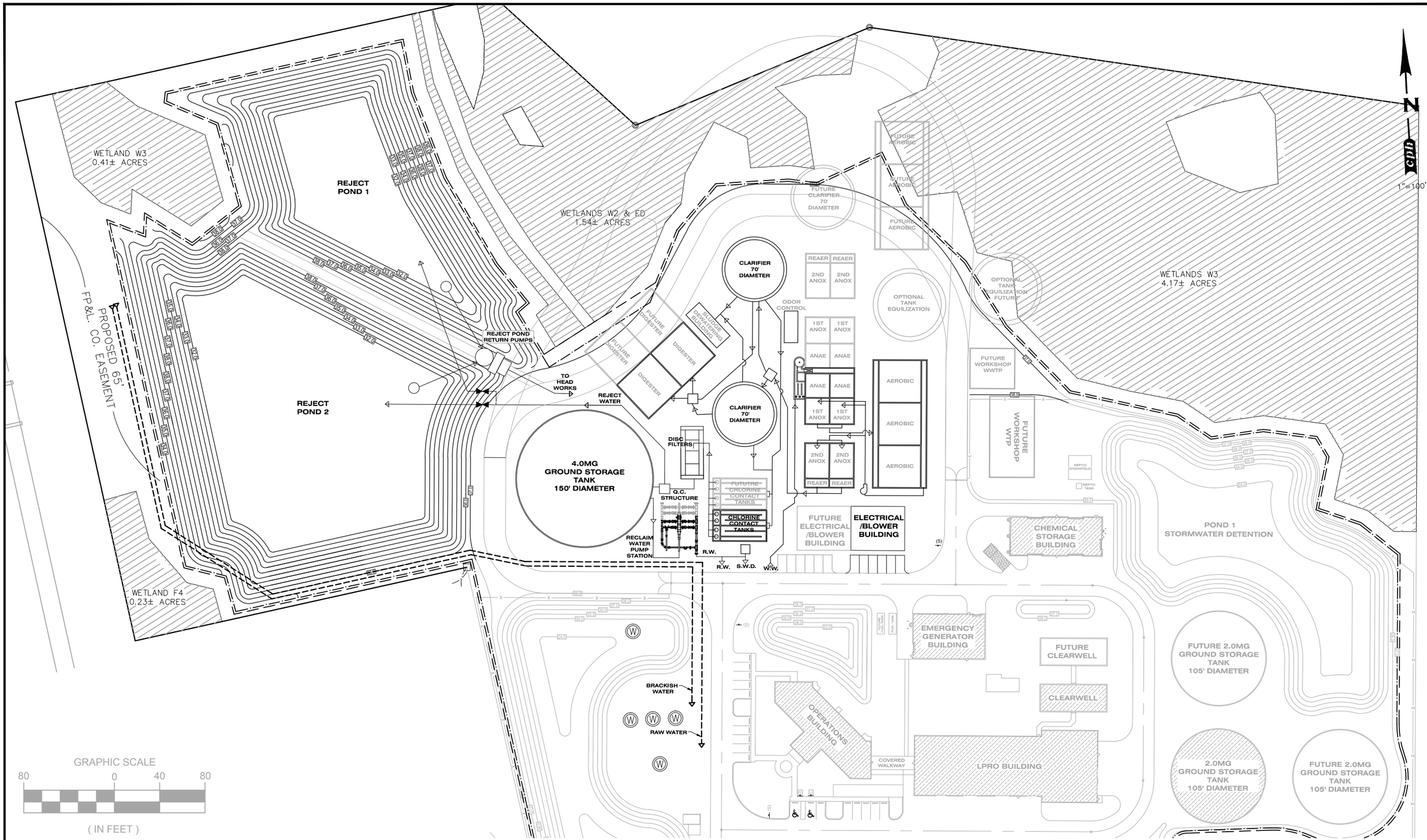
The second 2.0 MGD Activated Sludge module will have the same treatment units as listed above except only one additional oversized clarifier will be required.

The initial 2.0 MGD Activated Sludge module and process support components can be constructed in upland areas of the WWTF No. 2 site. However, the area required for construction of the second 2.0 MGD module to obtain 4.0 MGD treatment capacity will infringe on the identified wetlands. There is not sufficient area on the site for future expansion to 6.0 MGD.

4.6.2.3.4 Comparison of Wastewater Biological Treatment Process Options

The site designated for WWTF No. 2 includes wetlands and a limited amount of uplands. Layouts for each of the options listed above are presented in **Figure 1-3, Figure 4-1** and **Figure 4-2**. The comparison of the three biological treatment process options and proposed facility layouts showed the following:

- The Membrane Bioreactor option presented in **Figure 4-1** demonstrates that up to three 2.0 MGD Membrane Bioreactor Modules for a total of 6.0 MGD can be located on upland areas at WWTF No. 2 site.



Designed by:	YCL	Date: 1/16/15
Drawn by:	JCS	Job No. P61117.27A
Checked by:	YCL	File: FIGURE 4-2
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ACTIVATED SLUDGE LAYOUT

CITY OF PALM COAST
Wastewater Treatment Plant No. 2

Figure **4-2**

- The 5-Stage Bardenpho Process option presented in **Figure 4-2** and Activated Sludge option presented in **Figure 4-3** demonstrate that only one 2.0 MGD Module can be located on upland areas at WWTF No. 2. The identified wetlands will be infringed upon to construct a second 2.0 MGD Module.
- The cost comparison of the three biological processes is presented in **Table 4-2**.

Table 4-2: Preliminary Cost Comparison of the Three Biological Processes

Process Description	Cost Estimation
Membrane Bioreactor (MBR)	$21,460,800
5-Stage Bardenpho	$22,580,000
Activated Sludge	$21,800,000

The 5-Stage Bardenpho process and the Activated Sludge treatment options each require significantly more area than the Membrane Bioreactor option. Since the upland area at WWTF No. 2 is limited and only a 2.0 MGD 5-Stage Bardenpho process or Activated Sludge Module can be constructed on the uplands, these two options have been screened from further consideration. The Membrane Bioreactor option is the recommended biological treatment process option for this improvement.

No-Action is not a viable alternative to constructing WWTF No. 2. The Palm Coast Wastewater Service Area Population Projections are presented in **Figure 3-1. Table 3-3** and **Figure 3-2** show the Projected Maximum Wastewater Flow into the Palm Coast Wastewater Treatment System.

As presented in **Figure 3-1, Figure 3-2** and **Table 3-3**, Wastewater Treatment Facility No. 2 needs to be constructed soon to relieve loading at Wastewater Treatment Facility No. 1. **Figure 3-2** also indicates that Wastewater Treatment Facility No. 1 will need to be expanded to 9.1 MGD and Wastewater Treatment Facility No. 2 will need to be expanded to 4.0 MGD.

The only viable alternative for increasing the Palm Coast Wastewater Treatment System's treatment capacity in the 20 year period is to construct the initial 2.0 MGD WWTF No. 2 in 2018, expand the WWTF No. 2 to 4.0 MGD in 2018, and expand WWTF No. 1 to 9.1 MGD in 2031.

Based on the Palm Coast Wastewater Treatment System Flow Projections presented in **Table 3-3** and **Figure 3-2**, the existing system treatment capacity will be exceeded in 2018.

4.6.2.4 Description of Proposed WWTF No. 2

4.6.2.4.1 General

A brief description of the proposed WWTF No. 2 is provided below.

As discussed in the previous section, constructing the proposed WWTF No. 2 in the northwest portion of the City is the most immediate implementation priority. The projected growth in wastewater flows as facilities in the Palm Coast Park Development come into service as well as the current loading conditions on the wastewater collection and transmission system are key factors in this recommendation.

Based on the need to maximize the reclaimed water reuse and discharge options WWTF No. 2 will be designed and constructed to provide Advanced Wastewater Treatment. The facility projected Service Area does not currently have existing Reclaimed Water facilities in close proximity. The existing residential subdivisions (Matanzas Woods and Indian Trails) in the Service Area do not have reclaimed water distribution systems. The Palm Coast Park Development has installed a Reclaimed Water distribution system as an integral part of the development. The City is constructing a reclaimed water main on the Matanzas Woods Parkway to connect the proposed reclaimed water system in Service Area # 2 with the reclaimed water system in northern part of the Service Area # 1. This will allow the reclaimed water from WWTF No. 2 to be sent to the Service Area # 1 for reuse or the reclaimed water from WWTF No. 1 to be sent to the Service Area # 2 for reuse.

The Advanced Wastewater Treatment at WWTF No. 2 will provide a backup disposal method of discharging to Hulett Swamp under the Apricot Rule.

Based on the projected growth in flows to wastewater treatment system, the WWTF No. 2 is designed with an initial 2.0 MGD capacity and can be expanded up to 6.0 MGD with 2.0 MGD increments.

The biological treatment options considered for WWTF No. 2 were:

- Membrane Bioreactor to provide AWT
- 5-Stage Bardenpho Process to provide AWT
- Conventional Activated Sludge Treatment Process to provide AWT

Since the available upland area at the WWTF No. 2 site will not accommodate the 5-Stage Bardenpho and the Activated Sludge treatment options, these two treatment options have been ruled out for further consideration. Membrane Bioreactor with associated biological treatment processes to provide AWT standards has been selected for implementation.

4.6.3 Reclaimed Water Reuse and Discharge Alternatives

The Reuse Service Area and Existing Developments (Hammock Dunes and Grand Haven) that currently receive and dispose of reclaimed water have been presented in **Figure 2-6**. The Palm Coast Sewer Ordinance requires that all new developments install dry reuse lines.

The City of Palm Coast's Current Permitted and Proposed Reuse Sites are listed in **Table 3-5**. The permitted capacity of each existing site and the estimated capacity of each proposed site are provided.

Reclaimed water will be made available to new developments, provided sufficient reclaimed water is available for their use and they can economically be served.

Reuse demands vary with the weather. During dry periods, the irrigation demands of areas with public access may be equal to the entire plant effluent flow. However, during wet weather periods the irrigation demands are reduced and some of the reclaimed water reuse will need to be discharged in the restricted access Spray Fields and Rapid Infiltration Basins.

WWTF No. 2 will be designed to comply with Advanced Wastewater Treatment standards. The Apricot Rule allows for disposal of reclaimed water which meets Advanced Wastewater Treatment standards in waters of the State. This option expands the disposal alternatives for reclaimed water.

4.6.3.1 No-Action Alternative

The No-Action Alternative is not a viable alternative.

As previously stated, the growth in the City of Palm Coast and the Palm Coast Wastewater Service Area has been considerable and is expected to continue. The increases in the wastewater demand have concurrent increases in demand for reclaimed water reuse or disposal capacity.

4.6.3.2 Reclaimed Water Reuse for Irrigation

4.6.3.2.1 General

The Palm Coast Park Development along US Highway 1 will require construction of reclaimed water distribution facilities from the proposed WWTF No. 2 on Peavey Grade.

New developments within the City will be required to provide for reclaimed water reuse for irrigation through distribution systems installed as part of the land development construction.

4.6.3.2.2 Peavey Grade Reclaimed Water Main

The proposed construction of WWTF No. 2 requires that an 18-inch reclaimed water reuse main be constructed to connect with the irrigation reuse distribution main for the Palm Coast Park Development. This proposed reclaimed water main will be the primary irrigation reuse supply for the Palm Coast Park Development reclaimed water transmission and distribution system. The main will be routed along the Peavey Grade easement.

No-Action is not a viable alternative to this improvement. The only viable alternative to constructing approximately 2,000-feet of the 18-inch reclaimed water main would to use another route. Since the proposed route is the shortest

distance between the connection at the entrance to Water Treatment Plant No. 3 and the Palm Coast Park distribution main, it is the recommended alternative.

The schedule for this improvement will coincide with the schedule for placing WWTF No. 2 into operating service.

4.6.3.2.3 Irrigation along US Highway 1

A bike path and a sidewalk have been constructed along US Highway 1. Disposal of WWTP No. 2 reclaimed water by irrigation along the bike path and sidewalk is one of the reuse options that will be evaluated.

The area available for irrigation and the expected amount of WWTF No. 2 reclaimed water that can be disposed of by irrigation along the bike path and sidewalk is noted below:

Description	Area	Irrigation Rate 0.70 inches/week	Irrigation Rate 0.90 inches/week
West of US 1	45.50 Ac.	0.124 mgd/aadf	0.159 mgd/aadf
East of US 1	30.81 Ac.	0.084 mgd/aadf	0.108 mgd/aadf
Total		**0.208 mgd/aadf**	**0.267 mgdaadf**

Reclaimed water mains have been installed by the developer along the bike path and sidewalk. However, irrigation zone control and irrigation heads would have to be installed to irrigate this area.

4.6.3.3 WWTF No. 2 Effluent Disposal Options

Several options will be evaluated for WWTF No. 2 effluent disposal.

One possible option is a Rapid Infiltration Basin (RIB) on Rayonier property west of the Florida East Coast Railroad track. It is expected that a RIB may be sized for 2.0 MGD and may require 40 to 50 acres of property.

Another option is construction of an Exfiltration Trench. Possible Exfiltration Trench locations include:

- Along the WTP No. 3 Phase 1 Well Field Phase 1 raw water main (along the east side of the Florida East Coast railroad)
- Along the access roads to the WTP No. 3 Phase 2 raw water main (on the west side of the Florida East Coast railroad)
- In the US Highway 1 right-of-way, or adjacent to the right-of way, between Peavey Grade and the point where Hulett Branch crosses US Highway No. 1.

One option is disposal of the WWTP No. 2 reclaimed water in an existing wetlands south of Peavey Grade, east of US Highway No. 1. The reclaimed water will have to be de-chlorinated and distributed to the wetlands in accordance with the FAC requirements for wetlands disposal. Monitoring of the wetlands water and vegetation will be required in accordance with the provision of the FAC.

4.6.3.4 Reclaimed Water Discharges under the Florida Apricot Rule

4.6.3.4.1 Backup Surface Water Discharge for WWTP No. 2

The proposed WWTF No. 2 is designed to provide Advanced Wastewater Treatment. In accordance with the Florida Apricot Rule, a "backup discharge" of up to 30% of the total permitted treatment capacity or reclaimed water disposal capacity whichever is less can be permitted for discharge to a receiving stream 365 days a year.

The WWTF No. 2 site is not in the immediate proximity to a waterway. The best option for "backup discharge" is to discharge the reclaimed water into the Hulett Swamp south of Peavey Grade and east of US Highway 1.

Reclaimed water must be de-chlorinated before being discharged to the wetlands. The reclaimed water can be de-chlorinated at the WWTF No. 2 but a separate pipeline will need to be installed to convey the reclaimed water to the discharge point. Another option is to use the reclaimed water distribution system to convey reclaimed water to the backup surface water discharge point and to de-chlorinate the reclaimed water before discharging to the wetlands.

No-Action is not a viable alternative to this improvement. A study indicates that the most feasible alternative is to construct the reclaimed water main to the Hulett wetlands south of WWTF No. 2 and east of US Highway 1. Hulett Wetlands discharge to Hulett Branch, which eventually discharges into Pellicer Creek, which is an Outstanding Florida Water. This option has been approved by FDEP in 2011.

The schedule for this improvement will coincide with the schedule for placing WWTF No. 2 into operating service.

4.6.3.5 Reclaimed Water Reuse and Discharge Recommended Alternatives

When WWTF No. 2 becomes operational, reclaimed water will need to be conveyed to the Palm Coast Park Development if developed. The Peavey Grade Reclaimed Water Main is required to supply the Palm Coast Park Development irrigation transmission and distribution system. The reclaimed water from WWTF No. 2 can be also conveyed to OKR areas east of I-95 via the 16-inch reclaimed water main on Matanzas Woods Parkway.

4.6.4 Sludge Treatment and Disposal Alternatives

The current practice of contract hauling, treatment and disposals services provided by a FDEP approved bio-solids regional management facility operator will continue for both the existing WWTF No. 1 and the proposed WWTF No. 2. The biosolids are further treated by the contracted regional management facility operator to Class "AA" standards.