

SPECIAL PLANNING COMMISSION
October 28, 2020

Virtual Meeting Due to COVID-19 Pandemic

The public may view the public meeting at:
www.youtube.com/user/cityofisleofpalms

Public Comment: Citizens may provide public comment here:
<https://www.iop.net/public-comment-form>

AGENDA

The Isle of Palms Planning Commission will hold a SPECIAL meeting on
Wednesday, October 28, 2020 at 3:00 p.m.

- A. Call to order and acknowledgment that the press and the public were duly notified in accordance with state law
- B. Consider making a recommendation to City Council regarding a zoning amendment affecting sewer infrastructure in residential zoning districts
- C. Adjourn

Sec. 5-4-32. - SR-1 single-family residential district.

In addition to all other applicable requirements of this chapter and other City ordinances, the requirements for the SR-1 district are as follows:

- (1) *Purpose.* The purpose of the SR-1 single-family residential district is:
 - a. To provide for quiet, low-density residential neighborhoods on comparatively large lots.
 - b. To discourage unwarranted encroachment by prohibiting commercial uses and to prohibit other uses which would interfere with the development or continuation of single-family use.
 - c. To encourage the cessation of nonconforming uses.
 - d. to discourage uses which would generate traffic on minor streets other than required to serve residences on those streets.
 - e. To maintain the integrity of established residential neighborhoods, and to minimize the disruption of existing residential patterns by the scattered development of comparatively large residential lots.
- (2) *Permitted uses.* Permitted uses in the SR-1 single-family residential district shall be:
 - a. Detached, single-family dwelling.
 - b. Residential accessory uses.
 - c. Sewer pump stations with a footprint of one thousand square feet (1,000 sq') or less.
- (3) *Permitted special exceptions.* Permitted special exceptions in the SR-1 single-family residential district shall be:
 - a. Elementary and secondary schools offering general education courses.
 - b. Church, synagogue, or other place of worship.
 - c. Group dwellings.
 - d. Golf courses.
 - e. Home occupations meeting the requirements of section 5-4-44.
 - f. Public utility and municipal uses satisfying the special exception requirements set forth in subsection (9) of this section.
- (4) *Conditional uses.* Public utility and municipal uses satisfying the conditional use requirements set forth in subsection (9) of this section shall be conditional uses in the SR-1 single-family residential district.
- (5) *Minimum lot requirements.* Minimum lot requirements in the SR-1 single-family residential district are as follows:
 - a. Lot area: thirty-five thousand (35,000) square feet of contiguous highland.
 - b. Lot width: seventy feet (70') measured at building line.
 - c. Lot depth: one hundred ten feet (110').
 - d. Lot frontage: sixty feet (60') on a public or private street; thirty feet (30') on a public or private cul-de-sac.

Vehicle access to the lot from a public or private street shall be provided within the required lot frontage.
- (6) *Minimum yard requirements.* Minimum yard requirements in the SR-1 single-family residential district are as follows:

- a. Front yard: thirty feet (30').
- b. Side yard: ten feet (10').
- c. Rear yard: thirty feet (30').

Exception: minimum yard requirements for lots with an area less than seventeen thousand five hundred (17,500) square feet.

- a. Front yard: twenty-four feet (24').
- b. Side yard: ten feet (10').
- c. Rear yard: twenty-four feet (24').

- (7) *Maximum height.* Maximum height in the SR-1 single-family residential district shall be forty feet (40').
- (8) *Double frontage lots.* Double frontage lots are prohibited in the SR-1 single-family residential district.
- (9) *Public utilities and municipal uses.*

- a. *Public utility facilities and uses.* This subsection (9)a applies to wastewater treatment facilities, public works maintenance and storage facilities, and all other public utility facilities or uses.

- (i) Construction or alteration of a public utility facility may be approved in a residential zoning district as a conditional use subject to a finding by the Zoning Administrator that the facility satisfies all of the following conditions:

- 1. The facility is located on a lot that is at least one (1) acre in size;
- 2. The overall lot coverage of the facility is less than fifty percent (50%);
- 3. The minimum setback for any structure is thirty feet (30') from all property lines;
- 4. The maximum overall height of any structure is thirty feet (30');
- 5. The minimum buffer along all property lines is twenty feet (20') wide with at least six (6) canopy trees, twelve (12) understory trees, and one-hundred (100) three-gallon shrubs per one-hundred (100) linear feet of property line; with each species approved by the Zoning Administrator based on its ability to provide screening and drought tolerance;

- (ii) The Board of Zoning Appeals may approve construction or alteration of a public utility facility in a residential zoning district as a special exception subject to the requirements of section 5-4-5(c) and upon a finding that the following additional conditions are met:

- 1. The facility is located on a lot that is at least one-half (½) acre in size;
- 2. The overall lot coverage of the facility is less than fifty percent (50%);
- 3. The minimum setback for any structure is twenty feet (20') from all property lines;
- 4. The maximum overall height of any structure is forty feet (40');
- 5. The minimum buffer along all property lines is ten feet (10') wide with at least six (6) canopy trees, twelve (12) understory trees, and one-hundred (100) three-gallon shrubs per one-hundred (100) linear feet of property line; with each species approved by the Zoning Administrator based on its ability to provide screening and drought tolerance.

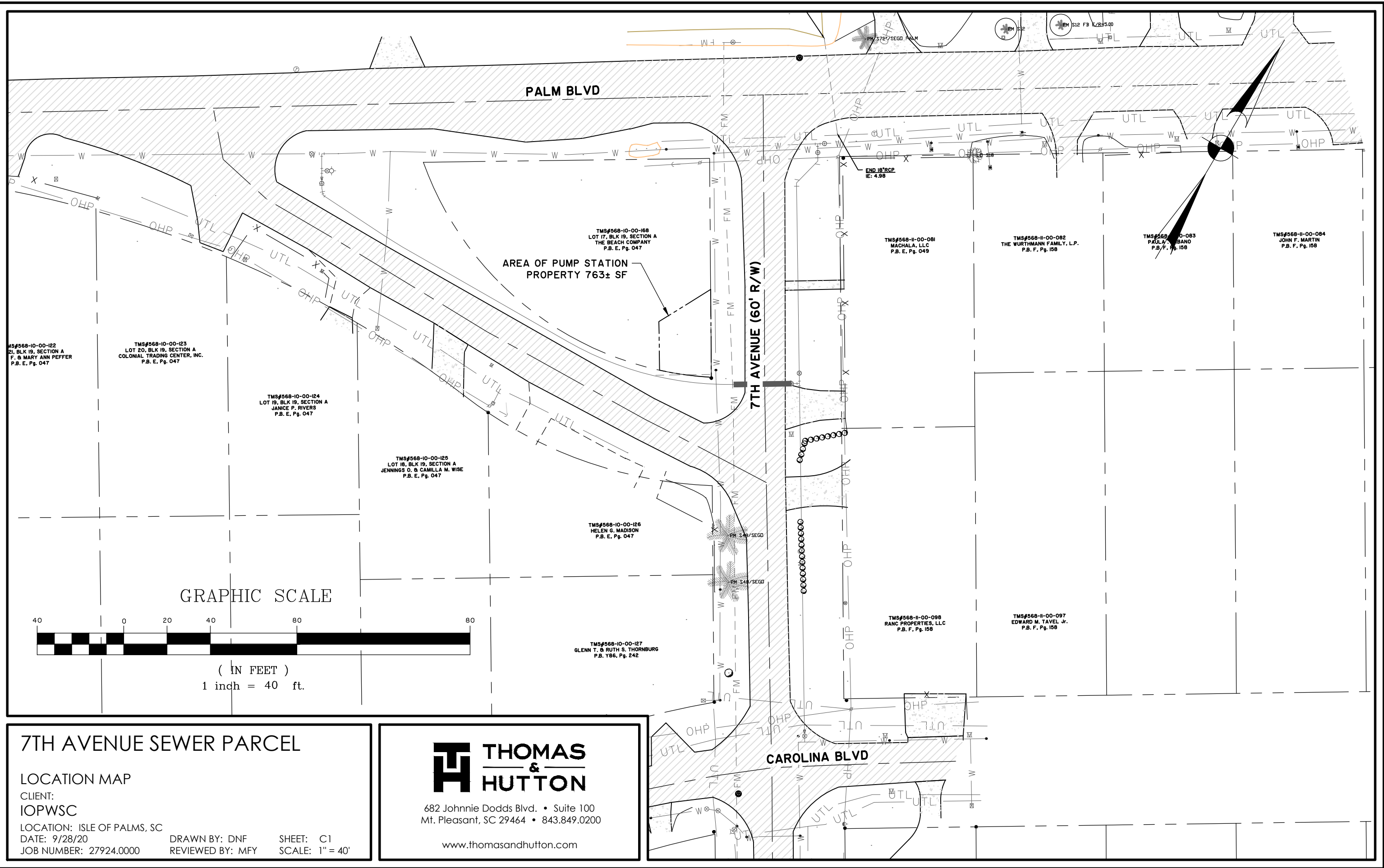
- b. *Municipal facilities and uses.* This subsection (9)b applies to all municipal facilities, including but not limited to City halls, fire stations, police stations, public safety facilities,

and recreation centers, parks, playgrounds, and any other municipal use, but excludes public utility facilities or uses.

- (i) Construction or alteration of a municipal facility may be approved in a residential zoning district as a conditional use subject to a finding by the Zoning Administrator that the facility satisfies all of the following conditions:
 - 1. The facility is located on a lot that conforms in size to the applicable zoning district requirement;
 - 2. The overall lot coverage is less than forty percent (40%);
 - 3. The minimum building setback from the front or rear lot line is thirty feet (30');
 - 4. The minimum building setback from any side lot line is ten feet (10');
 - 5. The maximum overall height of any structure is forty feet (40');
 - 6. A buffer is installed that complies with section 5-4-71.
- (ii) The Board of Zoning Appeals may approve construction or alteration of a municipal facility in a residential zoning district as a special exception subject to the requirements of section 5-4-5(c) and upon a finding that the following additional conditions are met:
 - 1. The facility is located on a lot that conforms in size to the applicable zoning district requirement;
 - 2. The overall lot coverage is less than fifty percent (50%);
 - 3. The minimum building setback from the front or rear lot line is twenty feet (20');
 - 4. The minimum building setback from any side lot line is ten feet (10');
 - 5. The maximum overall height of any structure is forty feet (40');
 - 6. A buffer is installed that complies with section 5-4-71.

(Ord. No. 2015-15, § 1, 2-23-2016; Ord. No. 2019-07, 4-23-2019)

Z:\27294\27294.0000\Engineering\Drawings\Exhibits\27294.0000 - Pump Station Site Plan at 7th Avenue.dwg - Sep 28, 2020 - 2:41:41 PM



7TH AVENUE SEWER PARCEL

LOCATION MAP

CLIENT:

IOPWSC

LOCATION: ISLE OF PALMS, SC

DATE: 9/28/20

JOB NUMBER: 27924.0000

DRAWN BY: DNF

REVIEWED BY: MFY

SHEET: C1

SCALE: 1" = 40'



682 Johnnie Dodds Blvd. • Suite 100
Mt. Pleasant, SC 29464 • 843.849.0200

www.thomasandhutton.com

(IN FEET)
1 inch = 5 ft.



STATE RD S-10-340



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This map illustrates a general plan of the development which is for discussion purposes only, does not limit or bind the owner/developer, and is subject to change and revision without prior written notice to the holder. Dimensions, boundaries and position locations are for illustrative purposes only and are subject to an accurate survey and property description.

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**ISLE OF PALMS
SEWER MASTER PLAN UPDATE
CHARLESTON COUNTY, SOUTH CAROLINA**

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

FINAL
December 2018

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION AND PURPOSE

The Sewer Master Plan Update addresses the consolidation of the wastewater treatment facilities for Isle of Palms, to provide all treatment at the Forest Trails plant site and plans collection of wastewater from the unsewered areas on the Island.

The purpose is to:

1. Identify collection and pumping deficiencies and/or requirements for future improvements.
2. Identify new pump stations for unsewered areas.
3. Identify pump station upgrades for unsewered areas.
4. Identify Wastewater Treatment Plant (WWTP) upgrades, expansions, and effluent disposal.
5. Master Plan the future sewer collection system for sewerage unsewered areas.
6. Determine preliminary phasing of improvements.
7. Develop preliminary opinions of probable cost for the improvements.
8. Summarize findings and exhibits into a short report.

Section 2 describes the wastewater and projects future flows.

ES.2 WASTEWATER

Wastewater to be treated will be predominantly domestic in nature. Wastewater flow projections were developed using a unit-based approach and compared to flows based upon population projections. These two different flow projection methods produce similar results. The Island-wide flow projections, in million gallons per day (MGD), are presented in **Table ES-1**.

Table ES-1 Summary of System-Wide Wastewater Flow Projections Isle of Palms Sewer Master Plan Update		
Condition	2020 Flow (mgd)	Build-Out Flow (mgd)
Annual Average Daily Flow (AADF)	1.1	1.6
Peak Month Flow (PMF) – Average 4-month high during week	1.6	2.3
Peak Week Flow (PWF)	1.9	2.8
Peak Day Flow (PDF)	2.2	3.2

ES.3 COLLECTION SYSTEM

One goal of this update is to plan how to sewer the unsewered areas on the Island within eight years. Gravity collection and pumping systems were planned to provide sewer service for the balance of the Island. **Table ES-2** presents a summary of the collection system costs.

Table ES-2 Conventional Gravity Sewer Basin Cost Summary (2018 dollars) <i>Isle of Palms Sewer Master Plan Update</i>					
Basin	Construction Cost with Contingency	Soft Costs	TOTAL COST	TOTAL COST ROUNDED	Potential Costs
A	\$ 985,792	\$ 138,011	\$ 1,123,802	\$ 1,124,000	\$ 65,716
25	\$ -	\$ -		\$ -	
B	\$ 1,694,560	\$ 237,238	\$ 1,931,798	\$ 1,932,000	\$ 97,291
26	\$ 420,588	\$ 58,882	\$ 479,470	\$ 479,000	\$ 11,924
24	\$ 222,477	\$ 31,147	\$ 253,624	\$ 254,000	\$ 13,450
C	\$ 1,760,749	\$ 246,505	\$ 2,007,253	\$ 2,007,000	\$ 106,115
23	\$ 620,999	\$ 86,940	\$ 707,938	\$ 708,000	\$ 15,932
D	\$ 816,841	\$ 114,358	\$ 931,198	\$ 931,000	\$ 71,337
22	\$ -	\$ -		\$ -	
E	\$ 488,382	\$ 68,373	\$ 556,755	\$ 557,000	\$ 42,268
F	\$ 1,880,767	\$ 263,307	\$ 2,144,074	\$ 2,144,000	\$ 74,115
20	\$ -	\$ -		\$ -	
G	\$ 2,470,376	\$ 345,853	\$ 2,816,229	\$ 2,816,000	\$ 145,108
H	\$ 1,970,940	\$ 275,932	\$ 2,246,872	\$ 2,247,000	\$ 125,819
I	\$ 1,250,768	\$ 134,011	\$ 1,425,875	\$ 1,426,000	\$ 83,115
J	\$ 1,290,705	\$ 138,290	\$ 1,471,403	\$ 1,471,000	\$ 140,714
K	\$ 1,595,658	\$ 170,963	\$ 1,819,051	\$ 1,819,000	\$ 112,613
L	\$ 1,537,267	\$ 164,707	\$ 1,752,485	\$ 1,752,000	\$ 128,645
M	\$ 1,764,818	\$ 189,088	\$ 2,011,892	\$ 2,012,000	\$ 200,696
N	\$ 2,307,132	\$ 247,193	\$ 2,630,130	\$ 2,630,000	\$ 283,043
O	\$ 1,470,528	\$ 157,557	\$ 1,676,401	\$ 1,676,000	\$ 58,411
P	\$ 1,552,736	\$ 166,365	\$ 1,770,118	\$ 1,770,000	\$ 141,055
TOTALS	\$ 26,102,079	\$ 3,234,718	\$ 29,756,370	\$ 29,755,000	\$ 1,917,366

Potential costs are possible but are not definite at this stage. These potential costs are listed for informational purposes. Potential costs are described in Attachment 1, paragraph 11.0

Costs for new pump stations, existing pump station upgrades, and new force mains are included in **Table ES-2**. A rough estimate of potential land costs for pump stations was made and are included in the potential costs section of the detailed estimates and Table ES-2. The total estimated land cost is \$760,000.

Section 5 and Attachment 2 describe the wastewater treatment plant.

ES.4 TREATMENT PLANT

The updated plant layout was developed for ultimate conditions and took into account the needs of the operating personnel.

The existing equalization (EQ) basin at the Forest Trails plant does not need to be modified during the initial plant consolidation, but additional EQ volume will be needed in the future as actual flows increase. The treatment process should be able to handle the peak month flow (PMF) with EQ sized to dampen the flow variations occurring during the day.

The existing Forest Trails treatment plant uses the Membrane Bioreactor (MBR) treatment process. One of the many advantages of the MBR process is that it can ramp up and down with permeate pumps and other adjustments to meet varying flow while maintaining effluent quality. Therefore, generally the EQ storage for flow equalization is sized to mitigate changes in flow rates through the day by providing storage to hold water when it is arriving too rapidly, and to supply additional wastewater for treatment as required during low flow conditions.

Since the MBR process can handle the monthly and weekly increased inflow during the tourist season for a coastal community like the Isle of Palms, the EQ storage will be sized for the daily diurnal variation. The diurnal flow for a day was used to calculate the ultimate EQ storage volume needed. The existing EQ storage volume (300,000 gallons) was deducted from the ultimate calculation to arrive at a projected additional EQ storage volume required. An additional 135,000 gallons of EQ storage is projected to be needed in the future.

MBRs can handle roughly twice the base flow, so the membrane (MBR) system will be sized for the figures below. The flow ranges noted below are to account for the possible increase in the unit flows due to the resort nature of the Island.

- AADF 1.5 to 1.8 mgd
- PMF 2.3 to 2.7 mgd
- PWF 2.7 to 3.3 mgd
- PDF 4.2 to 5.0 mgd

In addition to the extra MBR treatment capacity and EQ needed, a sludge holding basin, an effluent pump station, odor control, a new standby generator, and sludge dewatering were laid out.

Table ES-3 presents the costs to build-out the Forest Trails WWTP.

Table ES-3 Forest Trails WWTP Consolidation <i>Isle of Palms Sewer Master Plan Update</i>	
Description	Projected Total Cost
IOPWSC FEMA Grant Related	\$ 8,990,000
Forest Trails Balance	\$10,000,000
Total	\$18,990,000

1.0 BACKGROUND

The Isle of Palms, located in Charleston County, South Carolina, is a barrier island approximately 6.5 miles east of the peninsular area of Charleston and is situated between two other islands – Sullivan's on the west and Dewees on the east. The Isle of Palms is further bordered by the Atlantic Ocean on the south and the Intracoastal Waterway and Hamlin Creek on the north. The Island is presently served by two existing wastewater treatment plants (WWTP) on the Island (the Forest Trails and the Wild Dunes facilities). Earlier in the Island's history, wastewater service was created by private utilities for two different development areas on the Island. Over the years, the City of Isle of Palms purchased both the utilities providing wastewater service, formed a Commissioners of Public Works called the Isle of Palms Water & Sewer Commission (IOPWSC), and combined the utilities.

To date, the wastewater treatment plants have operated independently, but there are two existing lines between the plants (a 12-inch and a 6-inch PVC line). Both facilities were old steel activated sludge package plants. The Forest Trails Plant was recently replaced with a cast-in-place concrete structure using the Membrane Bioreactor (MBR) treatment process in 2014. The Wild Dunes WWTP is older, requires continuous maintenance, and needs to be replaced. This report addresses consolidation of the Wild Dunes treatment at the Forest Trails plant site as well as updating the sewer master plan for the Island to show how to collect wastewater from areas served by septic tanks.

1.1 Purpose

The purpose of this document is to:

1. Identify collection system and pumping deficiencies and/or requirements for future improvements.
2. Identify new pump stations for unsewered areas.
3. Identify pump station upgrades for unsewered areas.
4. Identify WWTP upgrades, expansions, and effluent disposal.
5. Master Plan the future sewer collection system for sewerage unsewered areas.
6. Determine preliminary phasing of improvements.
7. Develop preliminary opinions of probable cost for the improvements.
8. Summarize findings and exhibits into a short report.

1.2 Study Area and Wastewater Treatment Plant (WWTP) Locations

The Study Area is on the Isle of Palms, South Carolina. The Isle of Palms is about 6 miles long and 1 mile wide at its widest point. It has an area of around 4.8 square miles (3,077 acres) of which approximately 30 acres are marsh.

The Isle of Palms is a resort and an upscale community. The resort development, Wild Dunes, is located on the east end of the Island. The Isle of Palms is one of the many islands in a chain of islands which form a barrier along the coast of South Carolina and thus has many features similar to other coastal islands. Elevations range from mean sea level to about 17 feet above mean sea level. The mean tide range is approximately 5.2 feet with a 6.1-foot spring tide.

The average annual precipitation is 47.1 inches, with a range of 3.5 inches/month in the winter to 4.4 inches/month in the summer.

Nuisance flooding occurs with rainfall events of high intensity and short durations, especially if the rain occurs during a high tide and/or easterly wind. Heavy rains cause excessive flooding.

A significant portion of the Island is served by septic tanks while the balance of the Island contains conventional gravity sewer collection with a significant mix of simplex grinder pumps where septic tanks cannot be approved. **Figure 1** shows the Forest Trails WWTP service area, which includes all of the unsewered area on the Island.

The Forest Trails WWTP is located at the intersection of 41st Avenue and Waterway Boulevard. This plant serves the west end of the Island starting around 41st Avenue and running toward Breach Inlet. A large portion of the Forest Trails Plant service area is currently served by septic tanks and individual grinder pumps. See **Figures 1 and 2**.

The Forest Trails plant currently has a capacity of 0.35 million gallons per day (mgd) and discharges treated effluent to the Intracoastal Waterway (ICW) under NPDES Permit #SC0025283. By permit, it can also dispose of treated effluent to an irrigation holding pond at the Wild Dunes golf courses.

The older Wild Dunes plant services the east end of the Island, mainly the property within the resort at Wild Dunes. Its capacity is 1.07 mgd with effluent being land applied (ND #0062260) on 27 holes of the two golf courses within the Wild Dunes resort. Refer to **Figure 2** for the Wild Dunes service area. The 1.07 mgd capacity is limited by a ND effluent disposed discharge permit. Therefore, the total current Island treatment capacity is 1.42 mgd.

1.3 Contact Information

Utility

Isle of Palms Water & Sewer Commission (IOPWSC)

Contact: Ms. Kristen J. Champagne, P.E.

P.O. Box 528

1300 Palm Boulevard

Isle of Palms, SC 29451

(843) 886-6148 – phone

(843) 886-6894 – fax

kchampagne@iopwsc.com

Municipality

City of Isle of Palms

Post Office Drawer Q

Isle of Palms, SC 29451

Contact: Desiree Fragoso

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desireef@iop.net

Consultant

Thomas & Hutton Engineering Co.

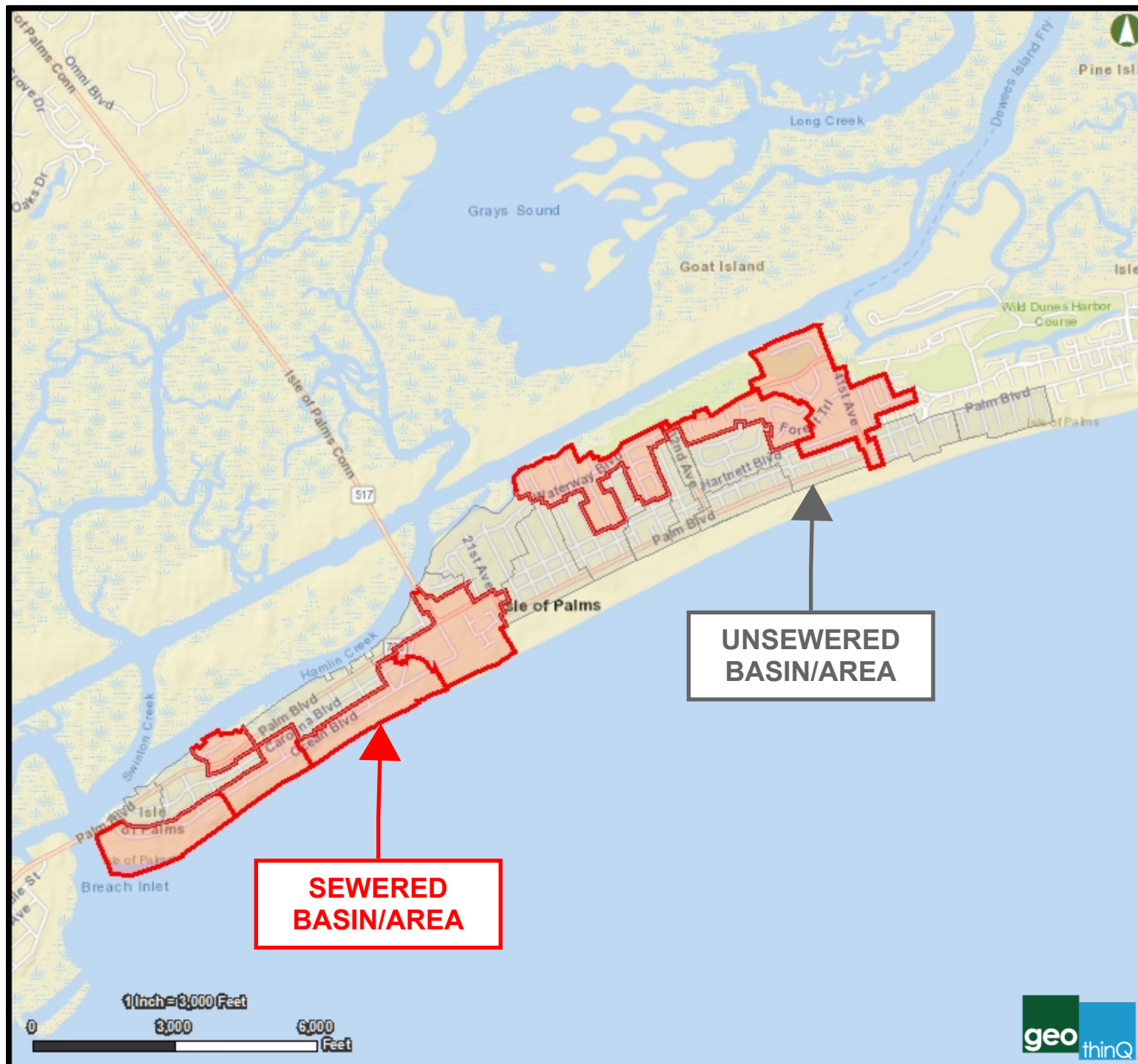
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(843) 725-5236



Yodice.m@thomasandhutton.com



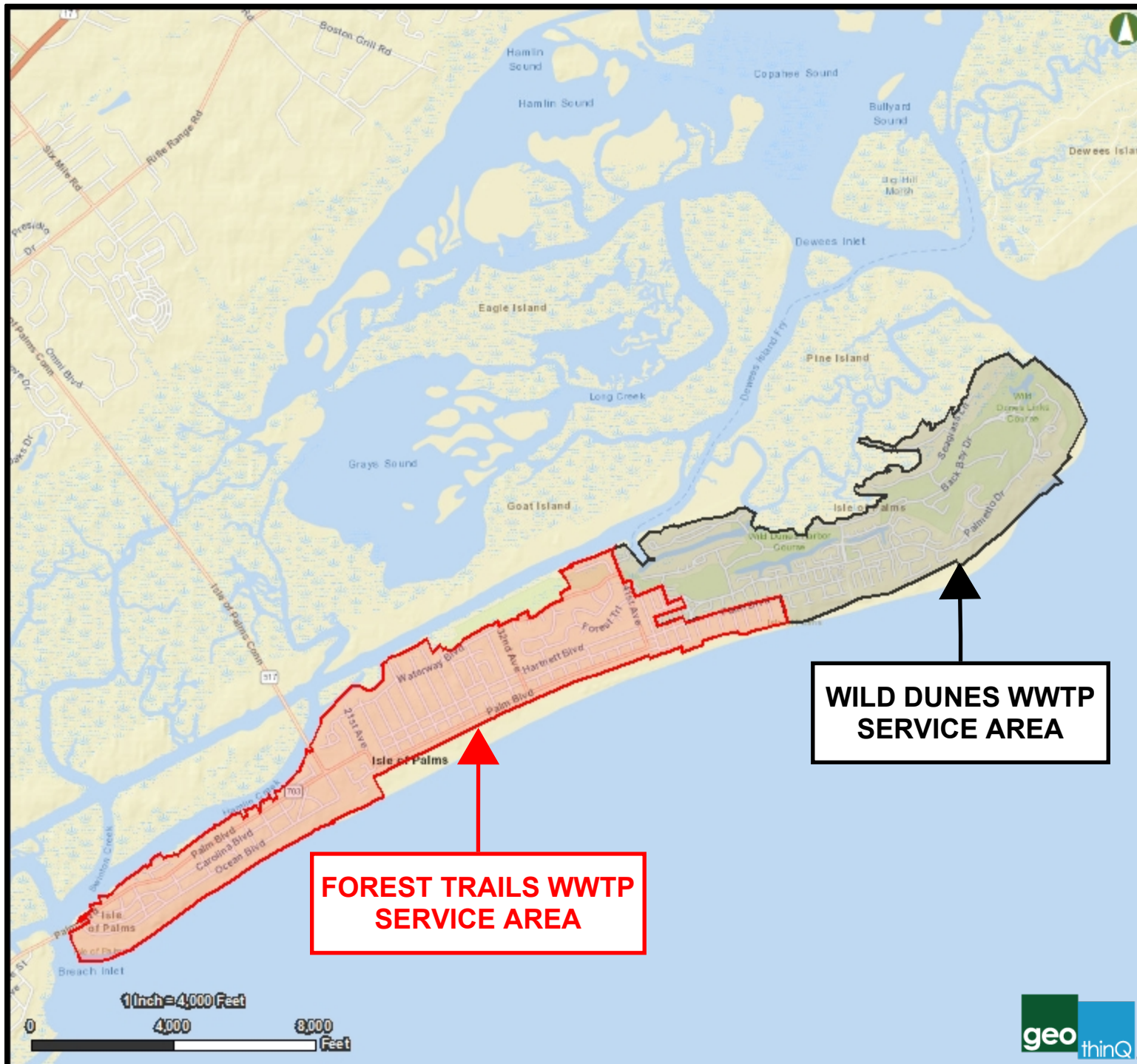
IOPWSC SEWER MASTER PLAN UPDATE

FOREST TRAILS WWTP SERVICE
AREA
01/10/2019

FIGURE 1

-  UNSEWERED
-  SEWERED





IOPWSC SEWER MASTER PLAN UPDATE

WASTEWATER TREATMENT PLANT
SERVICE AREA
01/10/2019

FIGURE 2



2.0 WASTEWATER DESCRIPTION

2.1 Type of Waste

Most of the wastewater generated on the Isle of Palms is domestic in nature from residential areas, with some minor amounts of commercial flow. Future flows will be predominantly from domestic sources.

2.2 Wastewater Flows

Table 2.1 presents the estimated wastewater flows for the Isle of Palms at buildout using the South Carolina Department of Health and Environmental Control (SCDHEC) approved unit contributory loading (UCL) for the Isle of Palms Water & Sewer Commission (IOPWSC) rounded to 250 gallons per day (gpd)/residential equivalent unit (REU). Although the average annual daily flow (AADF) projection at buildout ranges from 1.5 million gallons per day (mgd) to 1.8 mgd (if the UCL increases from 250 gpd/REU to 300 gpd/REU); unit processes will be designed to be modular in nature to match actual wastewater flows.

REUs are also referred to as ERUs
(equivalent residential units)

Table 2.1 Influent Flow Projection <i>Isle of Palms Sewer Master Plan Update</i>					
CRITERIA	Peak Factor (PF)	2020 (mgd)	2025 (mgd)	2030 (mgd)	2034 (mgd)
Annual Average Daily Flow (AADF)	1	1.08	1.39	1.47	1.55
Peak Month Flow (PMF)	1.5	1.62	2.09	2.20	2.3
Peak Week Flow (PWF)	1.8	1.94	2.51	2.65	2.75
Peak Day Flow (PDF)	2.1	2.21	2.93	3.09	3.21

2.3 Land Use and Population Projections

The population growth for Isle of Palms is limited since the service area is a barrier Island. Land uses are provided by the City of Isle of Palms. It was assumed that all developed land is nearly built-out and the Wild Dunes Resort is limited by zoning restrictions to 2,449 units. Wild Dunes is currently about 340 units away from this maximum ceiling.

2.3.1 Future Flow Projections

Table 2.2 outlines the wastewater influent flow projections calculated using units for the consolidated WWTP at the Forest Trails site through buildout. Table 2.1 was developed from the data from Table 2.2. The projected influent flow peaks around the year 2034. IOPWSC has developed strategies as to when plant expansions should occur to accommodate the flow projection shown in the tables. Flow projection charts are included in **Attachment 5**. These charts illustrate the projected flow increase for the WWTP and when capacity increases are expected to occur. The chart should be adjusted year-to-year as actual plant flow data is collected.

Table 2.2 Total Wastewater Flow Summary based upon units/lots Isle of Palms Sewer Master Plan Update					
Description	Intensity	Units	UCL gpd/Unit	Average Daily Flow	
				gpd	gpm
Existing Residential Accounts	3,075	ea.	250 ⁽¹⁾	768,750	534 ⁽²⁾
Existing Commercial Accounts	125	ea.	540 ⁽⁴⁾	67,500	94 ⁽³⁾
Unsewered Lots	1,346	lots	250 ⁽¹⁾	336,500	234 ⁽²⁾
Wild Dunes PD Growth Remaining	340	units	250 ⁽¹⁾	85,000	59 ⁽²⁾
Infill/Other Growth	160	units	250 ⁽¹⁾	40,000	28 ⁽⁴⁾
Misc. Flow Increases	150	units	250 ⁽¹⁾	37,500	26
ERUs or REUs from Master Accounts ⁽⁵⁾	690	units	250 ⁽¹⁾	172,500	120
Total Flow at SC DHEC Recommended Flow Rates				1,507,750	1,094

- 1- Flows are based upon SCDHEC UCL for the Isle of Palms (245 gpd) rounded to 250 gpd.
- 2- Residential Average Daily Flow is based upon 24 hours/day.
- 3- Commercial development Average Daily Flow in gpm is based upon 12 hours/day.
- 4- Existing commercial is based upon a UCL of 300 gpd with an Equivalent Residential Unit Factor of 1.8 or 540 gpd.
- 5- ERUs or REUs from master accounts provided by IOPWSC rate consultant and historical records.

Notes:

UCL = Unit Contributory Loading

ERU = Equivalent Residential Unit / REU = Residential Equivalent Unit

The Island is a vacation destination; therefore, the four summer months have flows well above the average annual daily wastewater flow or the AADF. The year-round population is approximately 4,375 persons, but the summer population is forecast to reach 12,000. Table 2.1 presented a look at the flow variation from the average annual daily flow to the peak day flow. The various flow definitions used herein are:

- Annual Average Daily Flow (AADF) =
 - Total Flow during a 12-month period divided by 365.
- Peak Day Flow (PDF) =
 - Maximum flow received in a continuous 24-hour period.
- Peak Month Flow (PMF) =
 - Maximum flow received in the highest one month expressed on a daily basis.
- Peak Week Flow (PWF)
 - Maximum flow received in a 7-day (1-week) period expressed on a daily basis.
- Average Flow of the 4 Highest Monthly Flows for the year (AMF High) =
 - Average of the 4 highest monthly flows expressed on a daily basis. Note this figure is reported as the PMF for the Island since it occurs for over 3 continuous months.

- Average Flow of the 8 Lowest Monthly Flows (AMF Low) =
 - Average of the 8 lowest monthly flows expressed on a daily basis.

To check the unit count flow projection, a different method was used. Another way to project future wastewater flows is based upon population. Census data shows an average annual increase of 0.76%/year (roughly 32 persons per year). Historical flow records show a 7,285 gal/year annual increase (this equals approximately 29 REU/year). Based upon these different growth factors, a 30-unit per year increase is used to chart flow growth.

The results of the different flow projection methods, by units and by population, are very similar. Detailed projections are shown in **Attachment 5**.

2.4 Wastewater Characteristics

Typical wastewater characteristics as seen on the Island are shown in **Table 2.3**.

Table 2.3
Typical Domestic Wastewater
Isle of Palms Sewer Master Plan Update

Type	Amount
Solids	
Settleable	10 mg/L
Suspended	270 mg/L
Fixed	65 mg/L
Volatile	200 mg/L
Dissolved	500 mg/L
Fixed	300 mg/L
Volatile	200 mg/L
Floating	50 to 100 mg/L
Strength of Wastewater	
BODs	275 mg/L
COD	500 mg/L
TOC	160 mg/L
Color	
Domestic in nature, so color is not anticipated other than typical gray	
pH	
Range 6.7 to 7.3 (historical values)	6.9 average
Alkalinity	
Total @ CaCO ₃ expected	100 mg/L
Heavy Metals	
Heavy metal, noxious, toxic or hazardous compounds not expected to be found.	
Biological Degradation	
Materials resistant to biological degradation are not expected.	
Phosphorus	
Total	9 mg/L
Organic	3 mg/L
Inorganic	5 mg/L
Nitrogen	
Total	40 mg/L
Organic	15 mg/L
Free Ammonia	25 mg/L
Nitrites	0
Nitrates	0

2.5 Treatability of Waste

Wastewater generated on the Island is domestic with no known sources that could influence or change its characteristics. Zoning as well as the limits of the Island helps restrict development to maintain the domestic nature of the raw wastewater. Therefore, treatment is routine. Currently, IOPWSC staff reports no grit problem at either plant. Provisions will be made to screen the wastewater with two levels of protection: primary and secondary screens, from the multitude of items seen in wastewater at a seasonal destination like the Isle of Palms.

2.6 Existing Effluent Permits

The Forest Trails WWTP has an existing NPDES Permit #SC0025283 which allows discharge of treated effluent to the Intracoastal Waterway (ICW) behind the Island adjacent to the City's marina and, if needed, to the Wild Dunes effluent holding pond for land application on 27 holes of the golf course. There are no changes to this permit required, but future regulatory modifications may require permit changes. Currently the existing NPDES permit does not restrict flow but discharge is limited by loading. Based upon current permit limits and given the exceptional effluent quality from MBR treatment, the allowable flow discharge to the ICW can be up to 1.2 mgd. This estimate of the allowable discharge to the ICW is based upon the current discharge limits and should be reevaluated as needed.

Effluent can also be land applied on golf holes in Wild Dunes under permit number ND 0062260. There are no changes to this permit needed. This permit allows a maximum daily discharge of 1.07 mgd.

The Wild Dunes site has an existing effluent holding pond to store 7 days of effluent in case of inclement weather when land application is not possible.

Future effluent quality will be near reuse standards due to the superior treatment capabilities of the MBR process.

3.0 SANITARY SEWER COLLECTION SYSTEM

3.1 Existing Collection System

The main thrust of the master plan update is to plan gravity extensions and pumping scenarios to collect wastewater from unsewered areas and transport it to the consolidated Forest Trails WWTP. Conventional gravity sewer was laid out using the criteria in **Attachment 3** with a goal to keep the maximum depth of trenches to 10-12 feet below the existing surface to reduce construction costs, minimize restoration, and diminish impacts to residents.

Limits of service basins and planned collection and pumping are shown in **Attachment 6**. All wastewater is collected and transported to the Forest Trails wastewater plant.

4.0 PUMP STATION AND FORCE MAIN EVALUATION

4.1 Existing Pump Stations

Pump stations or lift stations are wastewater pumping facilities. If wastewater flow from a service basin cannot flow by gravity to the downstream treatment facility, then it must be collected and pumped to a gravity point that flows to the wastewater treatment plant property. Pump stations are generally discouraged because of the high initial costs to build and the ongoing operating and maintenance costs associated with pumping wastewater. As gravity sewer extends to the unsewered areas, more lift stations are needed due to topographical constraints. See **Attachment 6** for general locations of proposed pump stations and the associated pumping scenario.

4.2 Plant Consolidation

Currently, the raw wastewater from the IOPWSC's collection system for the Forest Trails service area is gravity fed to existing Pump Station #18 located on the treatment plant property. This is a complete system consisting of pumps, motors, piping with associated valves, wet well, power supply, and an alarm system. This station also serves as the plant drain lift station for the Forest Trails Plant site.

The wet well chamber contains two non-clog centrifugal, submersible pumps. The pump station was designed by others to pump 711 gpm at 42 feet of total dynamic head. This pump station needs to be modified to fit new operating conditions. A future capital improvement plan (CIP) project will address the necessary modifications while the consolidation is underway.

5.0 FOREST TRAILS TREATMENT PLANT

5.1 Screening

The membrane treatment process has two levels of screening protection. The primary screening or Stage 1 screens have a regular screen opening. The secondary screens or Stage 2 screens have a smaller or finer screen to remove additional material.

The existing Forest Trails treatment facility is already equipped with two primary screens (Stage 1), two 150,000-gallon equalization basins (300,000-gallon total), a transfer pump station and two secondary (Stage 2) screens are placed prior to the anoxic zone of the MBR process basin. The consolidated facilities will include adding a third Stage 2 screening on the existing structure and adding four new Stage 2 screens on the new basins. The purpose of the Stage 2 screens is to protect the MBR membranes by removing the finer debris that passes through the Stage 1 primary screens. Grit removal is not included since IOPWSC reports no issues with grit.

Screens are required in treatment facilities to protect downstream equipment such as pumps and mixers, and to reduce debris accumulation in the sludge. The design criteria for the existing Stage 1 primary screens are presented in **Table 5.1**. The existing screens have a drop chute connected to a covered hopper and are located upstream of the equalization basins.

The influent flow enters into a single unit screen at the entrance of the headworks structure via a 6-inch force main. An 8-inch bypass system is installed to divert the influent flow to either of the existing equalization basins in case of maintenance to the primary screen. The Stage 1 screen is designed to operate continuously and is self-cleaning.

The screen assemblies are covered to minimize odor release. Odorous air generated in the screen area is drawn off and piped to an existing odor control unit for treatment.

The older of the two existing primary or Stage 1 screens, is a Vulcan model LFS-485 rotary drum screen (2mm-0.080 inches, 1050 gpm). This screen will be replaced since the Vulcan screen does not screen well enough to protect the membranes and therefore is not used. Replacing the Vulcan Stage 1 screen will provide an operating redundant Stage 1 screen.

Table 5.1
Stage 1 Screening
Isle of Palms Sewer Master Plan Update

Parameter	Screen 1 (Existing-Replace)	Screen 2 (Existing to Remain)	Replacement Screen
Number of Units	1 Standby	1 Duty	1 Standby
Type	Rotary drum, perforated plate, with chute and covered hopper	Rotosieve Rotary Drum	New Rotosieve Rotary Drum
Model	Vulcan Model LFS-485	Model 2024-55	Model 2024-55
Perforation size	2 mm (0.080 inches)	2 mm (0.080 inches)	2 mm (0.080 inches)
Hydraulic Capacity	1,050 gpm	1,315 gpm	1,315 gpm

5.2 Equalization

The Forest Trails plant site includes an existing equalization (EQ) basin with two 150,000-gallon cells which can be isolated. The EQ basins are equipped with an air diffuser system to keep the contents of the basins in suspension and to prevent odors. The cells are covered to minimize odor release. Odorous air generated in the EQ basins is drawn off and piped to an existing odor control unit for treatment. The walls within each cell are coated.

The design criteria for the existing EQ basins are presented in **Table 5.2**.

Table 5.2
Existing Equalization (EQ) Basins and Diffuser System Criteria
Isle of Palms Sewer Master Plan Update

Parameter	Design Value
Number of Tanks/Basins	2
Type	Rectangular Concrete
Volume	150,000 gallons each – 300,000 gallons total
Dimensions per Tank	36' x 36' x 15'-7" SWD
Diffusers	
Diffuser zones per tank	3
Blower	
Number of units	4
Type	Multi-stage, centrifugal
Capacity, each	1,600 scfm
Motor HP, each	60 HP
Manufacturer	Gardener-Denver

The existing EQ basins do not need to be modified during the consolidation but improvements such as adding VFDs to the existing blowers and possibly adding DO probes should be considered.

Since the higher peak flows on the Island occur for a long duration, equalization would be excessive to dampen the flow to the AADF. Therefore, the treatment process should be able to handle the peak month flow (PMF) with EQ sized to dampen the flow variations occurring during the day.

The existing Forest Trails treatment plant uses the MBR (Membrane Bioreactor) treatment process. One of the many advantages of the MBR process is that it can ramp up and down with permeate pumps and other adjustments to meet varying flow while maintaining effluent quality.

Therefore, generally the EQ storage or flow equalization is sized to mitigate changes in flow rates through the day by providing storage to hold water when it is arriving too rapidly, and to supply additional wastewater for treatment when it is arriving less rapidly than desired. For wastewater treatment, the rate at which the waste arrives at the treatment process varies dramatically during the day. Therefore, it is convenient to equalize flow before feeding it to the MBR. This allows a steady state process.

Since the MBR process can handle the monthly and weekly increases in flow during the year for a coastal community like the Isle of Palms, the EQ storage will be sized for the daily diurnal variation. An additional 135,000 gal of EQ storage will be needed. See **Attachment 3** for further details of how this additional storage need is determined.

MBRs can handle roughly twice the base flow, so the membrane (MBR) system will be sized for (see Section 2.2 and 2.3):

- AADF 1.5 to 1.8 mgd
- PMF 2.3 to 2.7 mgd
- PWF 2.7 to 3.3 mgd
- PDF 4.2 to 5.0 mgd

5.3 Existing Transfer Pump Station

The existing EQ transfer pump station and force main transfers influent flow to two existing Stage 2 (secondary) fine screens on the existing Forest Trails plant.

The transfer station is capable of pumping the flows for current MBR capacities of 0.35 mgd only. So, the station must be upgraded or expanded to handle the consolidated flows. Another transfer pumping system and structure is also needed. The design criteria for the existing and planned transfer pump stations are presented in **Table 5.3**.

Table 5.3 Existing Transfer Pump Station Current Criteria <i>Isle of Palms Sewer Master Plan Update</i>		
Parameter	Design Value	
Design Criteria	Current	Planned
Number of pumps	2 (1 duty + 1 standby)	4 (3 duty-1 standby)
Type	End suction	TBD-Include VFD
Capacity	250 gpm (1 pump running) @ 27 ft TDH	685 gpm (1 pump running)
Manufacturer & Model	PUMPEX K80	TBD
Motor HP	5 HP	TBD

5.4 Stage 2 Fine Screens

Stage 2 fine screening is generally preferred in treatment facilities that employ MBR technology to protect the membranes from fouling by fine debris and particulate matter in the raw wastewater and to prevent accumulation of such debris in the bioreactors. Stage 2 screens have a smaller opening to remove even finer particles. The design criteria for the second-stage screen is presented in **Table 5.4**. These screens were installed downstream of the Stage 1 screens.

There are two existing Stage 2 fine screens, one duty and one standby, with washers/conditioners that will screen 0.35 mgd. A third Stage 2 screen is needed on the existing basin to bring capacity to 0.7 mgd. The third standby screen provides 100 percent redundancy. The screens will be band screens with a minimum of 1.0 mm opening size.

In addition to adding a third screen to the existing structure, new Stage 2 screens will be added for the increased capacity treatment. Four additional Stage 2 screens will be added. These new Stage 2 fine screens will be added as part of the consolidation. Those screens will be similar to the existing.

Table 5.4 Existing Stage 2 Fine Screening Design Criteria <i>Isle of Palms Sewer Master Plan Update</i>	
Parameter	Design Value
Number of Units	3 (2 duty + 1 standby)
Type	Bar Screen
Model	FA-1600N FM (1mm screen) Flow range 220 gpm to 4000 gpm
Peak design flow capacity	450 gpm
Conveyor/washer/compactor	Screw Type (450 gpm) by Ovivo
Number of screening washer/conditioners	1
Motor	0.25 HP

The Stage 2 fine screens will operate continuously and are self-cleaning. Fine screenings are collected inside the screens and lifted into a washer, where they are washed into a debris trough. The wash water from the washer will be drained into the plant drain system to be treated with the main stream. Washed fine screenings will flow by gravity into a conditioning unit and be discharged into a roll-off container.

5.5 Screening Disposal

The screenings from the Stage 1 primary screens are presently collected in an enclosed roll-off box adjacent to the headworks structure. The screenings from the Stage 2 fine screens are collected in another enclosed roll-off box adjacent to the anoxic basin. Each roll-off box has the capacity to hold its contents for several days, after which the contents are hauled off-site for disposal. A new roll-off box will be needed near the new Stage 2 screens included in the new structure.

5.6 Effluent Flow Measurement

The amount of treated wastewater is currently measured and recorded at various points by magnetic flow meters or ultrasonic flow meters for monitoring purposes. Two new flow meters will be installed downstream of the disinfection process. One meter will measure flow to the Intracoastal Waterway, and the other meter will be installed to measure flow to the Wild Dunes effluent holding pond. The total effluent flow from the plant will be recorded and monitored by the SCADA system.

Table 5.5 summarizes the design criteria for the effluent flow meters.

Table 5.5 Effluent Flow Metering Design Criteria <i>Isle of Palms Sewer Master Plan Update</i>	
Item	Description
Intracoastal Waterway	
Quantity	1
Meter Type	Magmeter 1.5 mgd (effluent to ICW)
Manufacturers	Rosemount or equivalent
Quantity	1
Meter Type	Ultrasonic (1.5 mgd to ICW)
Wild Dunes	
Quantity	1
Meter Type	Magmeter 1.5 mgd (to Wild Dunes Golf Course holding pond)
Manufacturers	Rosemount or equivalent

5.7 Effluent Flow Sampling

An automatic final effluent sampler will collect effluent samples downstream of the disinfection process following the flow measurement to demonstrate compliance with the effluent quality limits. Sampling will be done in the form of flow-weighted composite samples by a composite sampler manufactured by ISCO, American Sigma, or similar.

5.8 Chemical Feed Facility

In addition to biological treatment processes, chemicals will occasionally be needed to maintain appropriate treatment conditions and clean the membranes. Membrane cleaning-related chemicals will be stored in the lower level of the MBR equipment facility.

5.8.1 Sodium Hypochlorite and Acid Systems for MBR System

Sodium hypochlorite will also be used occasionally to clean the membranes. Citric or Oxalic acid may also be used to clean membranes in conjunction with the sodium hypochlorite. The membrane equipment supplier selected will provide dosages for these chemicals, and these in turn will be used to design the feed systems. The storage and feed systems will be located along with the other MBR equipment. Chemicals, if needed, are only used occasionally so they can be brought to the site as necessary.

5.9 Disinfection

Disinfection of treated effluent (or permeate) will be by ultraviolet (UV) light. UV uses the electromagnetic energy from mercury lamps to kill or inactivate microorganisms in the wastewater. The UV light provides rapid, effective inactivation of microorganisms. The design dose will ensure that the effluent receives a minimum UV transmittance of 65% at peak flow. The dosage shall be calculated at the end of lamp life (defined as a lamp at 80% of a new lamp). An inline UV system will follow the permeate pumps. There will be three units with one for low flow and one unit for standby UV. The initial phase will include two units; one online and one on standby.

5.10 Effluent Pump Station

A new effluent pump station structure will be constructed to pump effluent to the Wild Dunes effluent holding pond and to the waterway during peak flows (under normal operations gravity flow can discharge effluent to the ICW but there could be occasions during periods of high flow that the effluent will need to be pumped). Flows to each outfall will be measured:

- To Wild Dunes – Magnetic flow meter
- To the waterway – Ultrasonic sensor on v-notch weir under gravity assisted flow and a magnetic flow meter when pumping.

Submersible pumps will be installed in an 85,000-gallon effluent clear well to prevent noise. The clear well will be coated and will be cast-in-place concrete constructed.

5.11 Plant Drain Pump Station

A plant drain gravity collection system exists on the plant property already. A new drain line will be extended to collect fluids from the new unit processes by gravity and flow back to existing P.S. #18 where it can be pumped back thru the treatment process. Therefore, P.S. #18 acts as a plant drain pump station in addition to an influent pump station. The process drains that will flow to the plant drain system include the following:

- Process flow drained from treatment units that have been isolated for cleaning or maintenance (the MLSS from one train will be drained into the other train, unless it is absolutely necessary to drain into the drainage system).
- Wastewater generated from flushing sludge pumps.
- Filtrate from sludge dewatering and screenings wash water.
- Sanitary waste from the various facilities.

5.12 Process Control and Instrumentation

For overall plant security and control, a Supervisory Control and Data Acquisition (SCADA) system is used to monitor the overall facility with a PLC and the SCADA system operating the MBR process. The SCADA system also receives status and alarm information from major process equipment and flow and level equipment throughout the facility.

The influent flow rate to the WWTP is measured using an electromagnetic flow meter. The total effluent from the plant is measured and recorded via ultrasonic flow meters. An additional magnetic flow meter will be installed to measure the effluent water going to the irrigation holding pond. Flow meters will be provided as needed for process control (such as WAS quantity and process air flow).

The effluent from the disinfection process will be monitored for BOD₅, TSS, NH₃-N, TP, fecal coliform, pH, and other parameters to meet permit reporting requirements to demonstrate compliance with effluent quality limits.

5.13 Miscellaneous Plant Items

- **Buffers:** Buffers are required around the plant property line by City zoning. These buffers exist around the property and do not need to be enhanced.
- **Setbacks:** City of Isle of Palms Zoning requires a 30-foot setback from all property lines. Structures are planned at least 30 feet away from the property lines.
- **Existing Facilities:** The existing facilities on the site include Pump Station 18 (which is used as a plant drain pump station as well as the influent station), screens, an equalization basin, odor control, standby power, and the 0.35 mgd MBR plant. The existing structure is sized to be expanded to 0.7 mgd by adding membranes and another Stage 2 screen.
- **Elevations:** Existing site elevations range from a low of 6 NGVD 29 to a high of 10 NGVD 29.
- **Flood Zones:** The flood zone for the site is shown on FEMA Flood Insurance Rate Map (F.I.R.M.) # 45019C0542J, Revised 11/17/2004. The site is located in Flood Zone AE, Base Elevation 13.

Stormwater Management: Low Impact Development (LID) techniques and stormwater BMP's are used to improve stormwater quality and manage runoff from the plant site.

Maintaining uninterrupted wastewater treatment and proper effluent disposal is paramount. Therefore, the entire treatment plant and related process will be provided with standby power or emergency generators should the primary power supply fail. Another generator will be added to service the entire consolidated plant. Consideration will be given to providing redundant key operations equipment to provide a backup in case of equipment failure. Examples of components potentially needing redundancy are:

- Pumps
- Screens
- Blowers
- Treatment process equipment
- Disinfection

6.0 CAPITAL IMPROVEMENTS

The intent of the plan update is to show how to provide sewer to the unsewered areas on the Island over an 8-year period with the initial work commencing in 2019. Therefore, this section outlines an 8-year extension plan based upon several criteria including but not limited to:

1. Number of existing individual grinder pumps taken out of service by extending gravity collection.
2. Location of historic flooding.
3. Logical or the necessary infrastructure to collect and transport wastewater to the consolidated Forest Trails WWTP site.

The future phases were laid out. An opinion of probable cost was developed for each phase. Then the cost was inflated to the year of execution using historical inflation rates. Listed below from the Congressional Budget Office (CBO) are the basis of inflation rates.

Congressional Budget Offices (CBO) Historical Inflation Rates	
Average 5-year inflation	1.4%/year
Average 7-year inflation	1.7%/year
Average 10-year inflation	1.7%/year

CBO projects an average annual inflation rate of 1.9% per year for the upcoming period of 2019. Therefore, a 1.9% inflation rate per year is used to estimate future costs.

A phasing summary is included as **Table 6.1**. Many factors (such as economies, other work on the Island, funding, etc.) can influence the phasing shown in Table 6.1. Therefore, the phasing plan should be reviewed frequently and adjusted due to these influencing factors. Further, the plan should consider other work which occurs on the Island and coordinate with the City of Isle of Palms, the South Carolina Department of Transportation (SCDOT), and other utility companies (e.g., SCE&G) to have construction synchronized. This will achieve economies and limit frequency of inconveniences to residents and visitors.



Table 6.1
Isle of Palms Sewer Master Plan Update
Projected Construction Cost - Phasing Breakdown

Phase	Basin	2019 Cost Projected Construction	2020 Cost Projected Construction	2021 Cost Projected Construction	2022 Cost Projected Construction	2023 Cost Projected Construction	2024 Cost Projected Construction	2025 Cost Projected Construction	2026 Cost Projected Construction
1	N	\$2,679,970							
	L	\$1,785,288							
	M	\$2,050,228							
	Total	\$6,515,486							
2	K		\$1,888,779						
	J		\$1,527,429						
	I		\$1,480,703						
	Total		\$4,896,910						
3	H			\$2,377,528					
	G			\$2,979,581					
	Total			\$5,357,109					
4	O				\$1,807,052				
	P				\$1,908,403				
	Total				\$3,715,455				
5	E					\$611,964			
	F					\$2,355,568			
	26					\$526,267			
	Total					\$3,493,800			
6	A						\$1,258,379		
	B						\$2,162,979		
	23						\$792,644		
	Total						\$4,214,002		
7	C							\$2,289,637	
	D							\$1,062,109	
	24							\$289,770	
	Total							\$3,641,516	
8	23								\$837,998
	24								\$300,638
	26								\$566,950
	Total								\$1,705,586
TOTAL									\$33,539,863



THOMAS
&
HUTTON

ATTACHMENT 1

SEWER MASTER PLAN UPDATE SUPPORT

BASIS OF ESTIMATES

COLLECTION SYSTEM

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

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APPENDIX

Cost Estimate Summary	Appendix A
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1.0 PURPOSE OF ESTIMATES

The purpose of the Cost Estimate is to establish an Engineer's Opinion of Probable Cost, including construction costs, design costs, permitting costs, bidding costs, construction administration costs, and other soft costs at the planning level of design development. Estimates of the construction costs are in order of magnitude estimates.

Since the Engineer has no control over the cost of labor, materials, equipment; over the Contractor's methods of determining prices; or over competitive bidding or market conditions, the Opinions of Probable Construction Costs provided for herein are made on the basis of the Engineer's experience and qualifications. These opinions represent the Engineer's best judgment as a design professional familiar with the construction industry. However, the Engineer cannot and does not guarantee that proposals, bids, or the construction cost will not vary from Opinions of Probable Construction Costs prepared by the Engineer.

2.0 GENERAL PROJECT DESCRIPTION

Isle of Palms is in the process of updating its Sewer Master Plan. Thomas & Hutton has been requested to aid in cost estimating for the master planned sewer system improvements, including sewer conveyance systems, pump station improvements, and improvements at the Forest Trails Wastewater Treatment Plant. The baseline of the update is to show how unsewered areas on the Island will be sewerred.

- Sewer conveyance system improvements include the following:
 - New collection systems required to provide conventional sewer service to unsewered areas on the Island.
 - Existing collection system updates or upgrade.
 - Existing force main enhancements.
 - New force mains.
- Pump station improvements include the following:
 - Enhancements to the existing pump stations.
 - New pump stations required.
- Forest Trails Wastewater Treatment Plant includes the following:
 - Provide additional treatment process to meet consolidation and projected future flows.

3.0 SCOPE OF WORK

The estimates consist of the following key components:

- Open-cut excavation for gravity sewer pipe installation as follows:
 - Trench width excavation determined by pipe diameter with an assumed average trench depth of 8 to 10 feet below the existing surface.
 - Hauling offsite disposal of excess soil.
 - Installation of sewer piping, including 1-foot of stone bedding material and native backfill for the remaining trench.
 - Force mains installed with 3 feet of cover.
 - Dewatering cost for 50% of pipe installed.
 - Pipe material, 8-inch, 10-inch, or 12-inch PVC SDR 26.

BASIS OF ESTIMATES – COLLECTION SYSTEM

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- 4-foot diameter pre-cast concrete manholes spaced 300 to 400 feet apart.
- Use 5-foot diameter manholes at force main connections.
- Gravity main shall not exceed a 12-foot cut.
- Open-cut surface restoration includes the following:
 - Trenching in the existing roads, including 12-inch GABC with 2-inch asphalt pavement overlay patch 2 feet wider than pipe trenching, 1 foot on each side of trench.
 - Trenching in landscaped area including landscaping replacement, 15 feet wide.
- Improvements necessary to existing pump stations include the following:
 - New pumps or impellers as needed to handle increased flows (capacity upgrades to pumps and control system/panel upgrades).
- Private property house connections are an estimate of the average piping and related work projected to be needed to connect the existing house to the new gravity line in the public right-of-way.
- Roadway improvements are listed and are intended to cover repairs from construction damages and for overlaying with asphalt the entire roadway width. The roadways are assumed to be 22 feet wide.
- The SCDOT will require the roadways to be overlaid for the length of the new sewer line. Since the roadway will be overlaid, the SCDOT will allow open cut of the existing road to install the service lateral to the far side of the road (long service in public ROW).
- Restoration of landscaped areas will be based upon the length of the gravity main and a width of disturbance of 15 feet wide at a cost of 7 dollars per linear foot.

4.0 MARK-UPS

These mark-ups are based on general assumptions about how the project will be contracted. Actual mark-up percentages may vary from those shown in Table 1.

TABLE 1 CONTRACTOR MARK-UPS	
Component	Mark-up on Direct Costs (%)
Contractor General Conditions	8
Sales Tax on Material	6
Contractor Overhead	12
Contractor Profit	8
Bonds/Insurance	2.5

5.0 ESCALATION RATE

The estimates are presented in current 2018 dollars. No escalation is included in the base figures. Projected timing of phases will include a 1.9% per year inflation factor from the base year of 2018.

6.0 ESTIMATE CLASSIFICATION

The estimates are prepared based on limited information where preliminary engineering is from 0% to 15% complete. Examples of estimating methods used would include cost/capacity curves and factors, scale-up factors, modeling techniques, and historical prices from similar projects. The expected accuracy ranges for these types of estimates are -20% to -30% for the low range side and +20% to +100% on the high range side. The estimates are prepared based upon scope details and construction industry activity available at the time it is produced. It represents a snapshot in time of what is known and occurring in this region. Therefore, estimates should be viewed in that light and re-evaluated after 180 days. A 12% contingency is included.

7.0 ESTIMATE METHODOLOGY

The cost estimates are mostly generated by using unit prices from historical comparative projects; some costs are from vendors. The estimates include allowances and costs for certain components of the estimate.

8.0 COST RESOURCES

The following are the various cost resources consulted to develop the estimates:

- R.S. Means.
- Thomas & Hutton and Isle of Palms Water & Sewer Commission historical bid data.
- Vendor quotes on equipment and materials where appropriate.
- Estimator judgement.

9.0 MAJOR ASSUMPTIONS

Estimates assume that the work will be done on a competitive bid basis and the Contractor will have a reasonable amount of time to complete the work. We assume that the contractor will have a reasonable project schedule, no overtime, and is under a single contract. The estimates should be evaluated for market changes after 180 days from the issue date. It is assumed that much of the following equipment will be shipped from the mainland United States:

- Pipe material, open cut, assumed polyvinyl chloride (PVC).
- Trench depth assumed 10 to 12 feet below existing ground surface.
- Asphalt paving replacement is assumed to consist of a 2-inch asphalt overlay only.
- Dewatering required.
- Post-construction closed circuit television (CCTV) will be performed on completed gravity mains and are included in unit prices.

10.0 ALLOWANCES

The estimates include allowances for the following work that is not sufficiently detailed at this time:

- Mobilization/demobilization allowance.
- Erosion control allowance.
- Traffic control allowance.
- Design, engineering, survey, and permit allowance.
- Bidding and construction administration allowance.
- Relocation of existing utilities (2.0% of the total construction cost).

11.0 POTENTIAL COSTS

There are some potential costs that are possible but are not definitive at this stage. These potential costs are listed for information purposes only. Further detailed work and permitting is needed in order to determine if these costs, or what portion of these costs, might be applicable.

- Land acquisition and easements acquisition.
- Public outreach/meetings (2% of total cost).
- Full width road overlay (length of sewer pipe using 12 dollars per square yard with an assumed road width of 22 feet or 28 dollars per linear foot).
- Cost to abandon existing septic tank and cost for lateral to connect house to new gravity line sewer service at road right-of-way is an order of magnitude projection. *Grant funds may be available for qualifying homeowners (private property house connections).*

12.0 HOUSE CONNECTION COSTS (Abandon Existing Septic Tanks and Connect)

The work for house service connection or the scope to abandon the existing septic tank and installing piping to connect the house service to the new sewer lateral in the public road right-of-way on private property is a cost that potentially can be included in the general contractor's scope of work or may be contracted with a separate company, like a MEP contractor for economies at the time of the project. Therefore, costs are shown separately as potential costs. It includes the cost to abandon the existing septic tank and connect the house to the new sewer lateral at the edge of the road right-of-way.

If the general contractor is made responsible to connect the house sewer lateral to the new main in the road right-of-way, the potential liability issue to the Commission increases. So, it may be advisable that all work on private property be done independently by homeowners due to the liability issues.

13.0 LAND ACQUISITION AND EASEMENTS FOR PUMP STATION SITES

An estimate of the cost to acquire private property by the IOPWSC for the construction of the pump station sites is included. In order to estimate the cost of this land, available tax assessment data was gathered from the Charleston County Register of Deeds (ROD) office and Thomas & Hutton's internal GIS program, geothinQ. The costs are summarized in Table 2.

TABLE 2 ISLE OF PALMS WATER & SEWER COMMISSION MASTER SEWER PLAN UPDATE ESTIMATED LAND COST BASIS FOR FUTURE PUMP STATION SITES								
Pump Station	Lot Size (AC)	Lot Size (SF)	Value	\$/SF	Min. Station Size (SF)	Prorated Value	Estimated Acquisition Cost	USE
A	0.53	23,087	\$ 82,000	\$ 3.55	900	\$3,197	\$3,836	\$4,000
B	0.22	9,583	\$ 300,000	\$ 31.30	900	\$28,174	\$33,809	\$34,000
C	0.2	8,712	\$ 300,000	\$ 34.44	900	\$30,992	\$37,190	\$38,000
D	0.15	6,534	\$ 200,000	\$ 30.61	900	\$27,548	\$33,058	\$34,000
E	0.42	18,295	\$ 477,900	\$ 26.12	900	\$23,509	\$28,211	\$29,000
F	0.4	17,424	\$ 295,000	\$ 16.93	900	\$15,238	\$18,285	\$19,000
G	1.7	74,052	\$ 1,000,000	\$ 13.50	1,600	\$21,606	\$25,928	\$26,000
H	11.96	520,978	\$ 5,000,000	\$ 9.60	1,600	\$15,356	\$18,427	\$19,000
I	0.29	12,632	\$ 385,400	\$ 30.51	900	\$27,458	\$32,950	\$33,000
J	0.71	30,928	\$ 1,350,000	\$ 43.65	1,600	\$69,841	\$83,809	\$84,000
K	69.61	3,032,212	\$ 1,931,000	\$ 0.64	900	\$573	\$688	\$1,000
L	0.39	16,988	\$ 540,200	\$ 31.80	900	\$28,618	\$34,342	\$35,000
M	0.49	21,344	\$ 1,525,000	\$ 71.45	1,600	\$114,316	\$137,179	\$138,000
N	0.4	17,424	\$ 1,850,000	\$ 106.18	1,600	\$169,881	\$203,857	\$204,000
O	1.11	48,352	\$ 20,000	\$ 0.41	900	\$372	\$447	\$1,000
P	0.43	18,731	\$ 1,050,600	\$ 56.09	900	\$50,480	\$60,577	\$61,000
TOTAL							\$760,000	

Typically, an appraiser uses a combination of three traditional valuation approaches to determine the market value of real property: 1) the cost approach, 2) the sales comparison approach, and 3) the income capitalization approach. A full estimate along the lines of this type of appraisal is beyond the scope of this endeavor. However, an estimate of the pump station property or land acquisition cost is made by prorating the market value of the area required using values for the property from the Charleston County ROD office and adding 20% for temporary construction easements around the site, profits, and miscellaneous.

Currently, legislation cap increases from previous "equalization" programs (based upon County appraisals being conducted every 5 years) so yearly future increases are capped at 3% per year maximum. Therefore, it is recommended that estimated land acquisition costs be increased at least 3% per year from the date of this document.

Several assumptions are included for the land cost projections:

- Property is free and clear of liens.
- No hazardous materials are on the property.
- No endangered species, historic sites, or adverse soil conditions are associated with the property.

14.0 UNITS OF MEASURE

Units of Measure are:

- ac – acres
- cf – cubic feet
- cy – cubic yards
- lf – linear feet

- ea. – each
- ls – lump sum
- sf – square feet
- sy – square yards



THOMAS
&
HUTTON

BASIS OF ESTIMATES
COLLECTION SYSTEM

APPENDIX A
COST ESTIMATE SUMMARY

J – 27294.0000

December 2018

**Isle of Palms Sewer to Unsewered Areas
Conventional Sewer
Basin Cost Summary (2018 dollars)**

Basin	Existing REU	New REU	Total REU	Construction Cost with Contingency	Soft Costs	TOTAL COST	TOTAL COST ROUNDED	Potential Costs
A	12	24	36	\$ 985,792	\$ 138,011	\$ 1,123,802	\$ 1,124,000	\$ 65,716
25	66	0	66	\$ -	\$ -		\$ -	
B	6	93	99	\$ 1,694,560	\$ 237,238	\$ 1,931,798	\$ 1,932,000	\$ 97,291
26	16	24	40	\$ 420,588	\$ 58,882	\$ 479,470	\$ 479,000	\$ 11,924
24	58	0	58	\$ 222,477	\$ 31,147	\$ 253,624	\$ 254,000	\$ 13,450
C	7	126	133	\$ 1,760,749	\$ 246,505	\$ 2,007,253	\$ 2,007,000	\$ 106,115
23	63	0	63	\$ 620,999	\$ 86,940	\$ 707,938	\$ 708,000	\$ 15,932
D	3	27	30	\$ 816,841	\$ 114,358	\$ 931,198	\$ 931,000	\$ 71,337
22	64	0	64	\$ -	\$ -		\$ -	
E	0	14	14	\$ 488,382	\$ 68,373	\$ 556,755	\$ 557,000	\$ 42,268
F	5	112	117	\$ 1,880,767	\$ 263,307	\$ 2,144,074	\$ 2,144,000	\$ 74,115
20	147	0	147	\$ -	\$ -		\$ -	
G	11	149	160	\$ 2,470,376	\$ 345,853	\$ 2,816,229	\$ 2,816,000	\$ 145,108
H	10	102	112	\$ 1,970,940	\$ 275,932	\$ 2,246,872	\$ 2,247,000	\$ 125,819
I	1	24	25	\$ 1,250,768	\$ 134,011	\$ 1,425,875	\$ 1,426,000	\$ 83,115
J	3	73	76	\$ 1,290,705	\$ 138,290	\$ 1,471,403	\$ 1,471,000	\$ 140,714
K	19	79	98	\$ 1,595,658	\$ 170,963	\$ 1,819,051	\$ 1,819,000	\$ 112,613
L	13	79	92	\$ 1,537,267	\$ 164,707	\$ 1,752,485	\$ 1,752,000	\$ 128,645
M	2	86	88	\$ 1,764,818	\$ 189,088	\$ 2,011,892	\$ 2,012,000	\$ 200,696
N	7	86	93	\$ 2,307,132	\$ 247,193	\$ 2,630,130	\$ 2,630,000	\$ 283,043
O	8	57	65	\$ 1,470,528	\$ 157,557	\$ 1,676,401	\$ 1,676,000	\$ 58,411
P	14	38	52	\$ 1,552,736	\$ 166,365	\$ 1,770,118	\$ 1,770,000	\$ 141,055
TOTALS	535	1193	1728	\$ 26,102,079	\$ 3,234,718	\$ 29,756,370	\$ 29,755,000	\$ 1,917,366

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN A

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	24				
EXISTING REU	12				
TOTAL LOTS	36	X	245 GPD =	8,820 GPD	DAILY FLOW
EXISTING COMMERCIAL				3650 GPD	
			TOTAL	12,470 GPD	
AVERAGE DAILY FLOW	1440 (min)			10 GPM	
PEAK FLOW	250%			25 GPM	

Notes: new pump station pumps to gravity line in Basin 25.

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST	
1	8" Diameter Main	3,000	lf	\$ 115.00	\$ 345,000	
2	Sewer Manhole	20	ea	\$ 4,600.00	\$ 92,000	
3	Well Pointing/Dewatering	1,500	lf	\$ 15.00	\$ 22,500	
4	Long Single Service on Public ROW	1	ea	\$ 2,300.00	\$ 2,300	
5	Short Single Service on Public ROW	5	ea	\$ 1,500.00	\$ 7,500	
6	Long Double Service on Public ROW	15	ea	\$ 2,500.00	\$ 37,500	
7	Short Double Service on Public ROW		ea	\$ 1,750.00	\$ -	
8	Roadway Repairs	200	lf	\$ 40.00	\$ 8,000	
9	Small Capacity Pump Station	1	ea	\$ 250,000.00	\$ 250,000	
10	2" Force Main	700	lf	\$ 20.00	\$ 14,000	
11	Bore Road	4	ea	\$ 7,500.00	\$ 30,000	
12	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000	
13	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000	
14	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000	
15	Restoration	3,000	lf	\$ 12.00	\$ 36,000	
16	Relocation of Utilities	1	ls	\$ 17,371.00	\$ 17,371	2%
SUBTOTAL					\$ 880,171	
Subtotal Construction Cost					\$ 880,171	
Contingency					12%	\$ 105,621
Total - Construction Cost						\$ 985,792
Engineering / Survey / Permit / Design					9%	\$ 88,721
Bidding and Construction Administration					3%	\$ 29,574
Legal / Platting					1%	\$ 9,858
Administrative					1%	\$ 9,858
Project Total - (Year of Opinion)						\$ 1,123,802
COST PER NEW REU						\$ 46,825

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 4,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 19,716	2%
c	Full width roadway overlay	- lf	\$ 28.00	\$ -	
d	Abandon existing septic tank & connect (private property house connections)	12 ea	\$ 3,500.00	\$ 42,000	

Subtotal potential costs: **\$ 65,716**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. 25

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	0			
EXISTING REU	66	Existing Sewered Lots		
TOTAL LOTS	66 X		245 GPD =	16,170 GPD
EXISTING COMMERCIAL				GPD
RECEIVES FROM OTHER BASINS (BASIN A)				12,470 GPD
		TOTAL		28,640 GPD
AVERAGE DAILY FLOW	1440 (min)			20 GPM
PEAK FLOW	250%			50 GPM

Notes:

1. P.S. #25 pumps to gravity in Basin 24 (which contains P.S. #24)
2. P.S. 25 doesn't need upgrade

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	0	lf	\$ 115.00	\$ -
2	Sewer Manhole	0	ea	\$ 4,600.00	\$ -
3	Well Pointing/Dewatering	0	lf	\$ 15.00	\$ -
4	Long Single Service on Public ROW	0	ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	0	ea	\$ 2,500.00	\$ -
7	Short Double Service on Public ROW		ea	\$ 1,750.00	
8	Roadway Repairs	0	lf	\$ 40.00	\$ -
10	Mobilization/Demobilization	1	ls		
11	Traffic Control	1	ls		
12	Erosion Control	1	ls		
13	Restoration	1	lf		
14	Relocation of Utilities	1	ls		
SUBTOTAL					\$ -

Subtotal Construction Cost

Contingency	12%				\$ -
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Total - Construction Cost

Engineering / Survey / Permit / Design	9%				\$ -
Bidding and Construction Administration	3%				\$ -
Legal / Platting	1%				\$ -
Administrative	1%				\$ -
Project Total - (Year of Opinion)					\$ -

COST PER NEW REU

#DIV/0!

Potential Costs

a	Land and easement acquisition	1	ls	Lump Sum		
b	Public meetings/outreach	1	ls	Lump Sum	\$ -	2%
c	Full width roadway overlay	-	lf	\$ 12.00	\$ -	
	Abandon existing septic tank & connect (private property house connections)	0	ea	\$ 3,500.00	\$ -	

Subtotal potential costs: \$ -

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN B

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 93
EXISTING REU 6
TOTAL LOTS 99 X
RECEIVES FROM OTHER BASINS

		DAILY FLOW	
245 GPD =		24,255 GPD	
		0 GPD	
TOTAL		24,255 GPD	
AVERAGE DAILY FLOW	1440 (min)	17 GPM	
PEAK FLOW	250%	42 GPM	

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,800	lf	\$ 115.00	\$ 667,000
2	Sewer Manhole	39	ea	\$ 4,600.00	\$ 179,400
3	Well Pointing/Dewatering	2,900	lf	\$ 15.00	\$ 43,500
4	Long Single Service on Public ROW		ea	\$ 2,300.00	
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	24	ea	\$ 2,500.00	\$ 60,000
7	Short Double Service on Public ROW	28	ea	\$ 1,750.00	\$ 49,000
8	Roadway Repairs	900	lf	\$ 40.00	\$ 36,000
9	Small Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2-1/2" Force Main	1,350	lf	\$ 25.00	\$ 33,750
11	Bore Road	10	ea	\$ 7,500.00	\$ 75,000
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,800	lf	\$ 12.00	\$ 69,600
17	Relocation of Utilities	1	ls	\$ 31,750.00	\$ 31,750

SUBTOTAL

\$ 1,513,000

Subtotal Construction Cost

\$ 1,513,000

Contingency

12%

\$ 181,560

Total - Construction Cost

\$ 1,694,560

Engineering / Survey / Permit / Design 9%
Bidding and Construction Administration 3%
Legal / Platting 1%
Administrative 1%

\$ 152,510
\$ 50,837
\$ 16,946
\$ 16,946

Project Total - (Year of Opinion)

\$ 1,931,798

COST PER NEW REU

\$20,772

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 34,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 33,891	2%
c	Full width roadway overlay	700 lf	\$ 12.00	\$ 8,400	
	Abandon existing septic tank & connect (private property house connections)	6 ea	\$ 3,500.00	\$ 21,000	

Subtotal potential costs: **\$ 97,291**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. 26

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 24
EXISTING REU 16
TOTAL LOTS 40 X
RECEIVES FROM OTHER BASINS

DAILY FLOW
245 GPD = 9,800 GPD
0 GPD
0 GPD
TOTAL 9,800 GPD
AVERAGE DAILY FLOW 1440 (min) 7 GPM
PEAK FLOW 250% 17 GPM

Notes:

1. Flows to P.S. 24

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	1,050	lf	\$ 115.00	\$ 120,750
2	Sewer Manhole	5	ea	\$ 4,600.00	\$ 23,000
3	Well Pointing/Dewatering	525	lf	\$ 15.00	\$ 7,875
4	Long Single Service on Public ROW	4	ea	\$ 2,300.00	\$ 9,200
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	8	ea	\$ 2,500.00	\$ 20,000
7	Short Double Service on Public ROW	4	ea	\$ 1,750.00	\$ 7,000
8	Roadway Repairs	100	lf	\$ 40.00	\$ 4,000
9	Pump Station Upgrade	1	ea	\$ 95,000.00	\$ 95,000
10	Force Main Upgrade	1,000	lf	\$ 50.00	\$ 50,000
12	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
13	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
14	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
15	Restoration	1,050	lf	\$ 12.00	\$ 12,600
16	Relocation of Utilities	1	ls	\$ 8,100.00	\$ 8,100
SUBTOTAL					\$ 375,525

Subtotal Construction Cost

\$ 375,525

Contingency

12%

\$ 45,063

Total - Construction Cost

\$ 420,588

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 37,853
\$ 12,618
\$ 4,206
\$ 4,206

Project Total - (Year of Opinion)

\$ 479,470

COST PER NEW REU

\$ 19,978

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum		
b	Public meetings/outreach	1 ls	Lump Sum	\$ 8,412	2%
c	Full width roadway overlay	1 lf	\$ 12.00	\$ 12	
d	Abandon existing septic tank & connect (private property house connections)	1 ea	\$ 3,500.00	\$ 3,500	

Subtotal potential costs: \$ 11,924

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. 24

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	0			
EXISTING REU	58			
TOTAL LOTS	58 X	245 GPD =	DAILY FLOW	
RECEIVES FROM OTHER BASINS		(Basin 25)	14,210 GPD	
		(Basin B)	28,640 GPD	
		(Basin 26)	24,255 GPD	
		TOTAL	9,800 GPD	
			76,905 GPD	
AVERAGE DAILY FLOW	1440 (min)		53 GPM	
PEAK FLOW	250%		134 GPM	

Notes:

1. Flows to gravity sewer of P.S. 23 (Basin 23)

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main		lf	\$ 115.00	\$ -
2	Sewer Manhole		ea	\$ 4,600.00	\$ -
3	Well Pointing/Dewatering		lf	\$ 15.00	\$ -
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	\$ -
6	Long Double Service on Public ROW		ea	\$ 2,500.00	\$ -
7	Short Double Service on Public ROW		ea	\$ 1,750.00	\$ -
8	Roadway Repairs		lf	\$ 40.00	\$ -
9	Pump Station Upgrade	1	ea	\$ 95,000.00	\$ 95,000
10	Force Main Upgrade	1,600	lf	\$ 50.00	\$ 80,000
12	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
13	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
14	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
15	Restoration	100	lf	\$ 12.00	\$ 1,200
16	Relocation of Utilities	1	ls	\$ 4,440.00	\$ 4,440
SUBTOTAL					\$ 198,640

Subtotal Construction Cost

\$ 198,640

Contingency 12%

\$ 23,836.80

Total - Construction Cost

\$ 222,477

Engineering / Survey / Permit / Design 9%
Bidding and Construction Administration 3%
Legal / Platting 1%
Administrative 1%

\$ 20,023
\$ 6,674
\$ 2,225
\$ 2,225

Project Total - (Year of Opinion)

\$ 253,624

COST PER NEW REU

\$ 4,373

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum		
b	Public meetings/outreach	1 ls	Lump Sum	\$ 4,450	2%
c	Full width roadway overlay	750 lf	\$ 12.00	\$ 9,000	
	Abandon existing septic tank & connect (private property house connections)	ea	\$ 3,500.00	\$ -	

Subtotal potential costs: \$ 13,450

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. C

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 126
EXISTING REU 7
TOTAL LOTS 133 X
RECEIVES FROM OTHER BASIN

		DAILY FLOW	
245 GPD =		32,585 GPD	
		0 GPD	
TOTAL		32,585 GPD	
AVERAGE DAILY FLOW	1440 (min)	23 GPM	
PEAK FLOW	250%	57 GPM	

Notes:

1. New Pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	6,300	lf	\$ 115.00	\$ 724,500
2	10" Diameter Main		lf	\$ 135.00	\$ -
3	Sewer Manhole	31	ea	\$ 4,600.00	\$ 142,600
4	Well Pointing/Dewatering	3,150	lf	\$ 15.00	\$ 47,250
5	Long Single Service on Public ROW	0	ea	\$ 2,300.00	\$ -
6	Short Single Service on Public ROW		ea	\$ 1,500.00	
7	Long Double Service on Public ROW	52	ea	\$ 2,500.00	\$ 130,000
8	Short Double Service on Public ROW	30	ea	\$ 1,750.00	\$ 52,500
9	Roadway Repairs	500	lf	\$ 40.00	\$ 20,000
10	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
11	3" Force Main	675	lf	\$ 30.00	\$ 20,250
12	Bore Road	8	ea	\$ 7,500.00	\$ 60,000
13	VFD's	0	ea	\$ 30,000.00	\$ -
14	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
15	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
16	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
17	Restoration	6,300	lf	\$ 12.00	\$ 75,600
18	Relocation of Utilities	1	ls	\$ 31,397.00	\$ 31,397
SUBTOTAL					\$ 1,572,097

Subtotal Construction Cost

\$ 1,572,097

Contingency

12%

\$ 188,651.64

Total - Construction Cost

\$ 1,760,749

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 158,467
\$ 52,822
\$ 17,607
\$ 17,607

Project Total - (Year of Opinion)

\$ 2,007,253

COST PER NEW REU

\$ 15,931

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 38,000	2%
b	Public meetings/outreach	1 ls	Lump Sum	\$ 35,215	
c	Full width roadway overlay	700 lf	\$ 12.00	\$ 8,400	
d	Abandon existing septic tank & connect (private property house connections)	7 ea	\$ 3,500.00	\$ 24,500	

Subtotal potential costs: \$ 106,115

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. 23

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	0			
EXISTING REU	63			
TOTAL LOTS	63 X	245 GPD =	15,435 GPD	
EXISTING COMMERCIAL			45,300 GPD	
RECEIVES FROM OTHER BASIN		(Basin 24)	76,905 GPD	
		(Basin C)	32,585 GPD	
		TOTAL	170,225 GPD	
AVERAGE DAILY FLOW	1440 (min)		118 GPM	
PEAK FLOW	250%		296 GPM	

Notes:

1. Flows to P.S. #22
2. Need P.S. upgrade
3. Need to pump directly to P.S. 20 with 8" force main or split flows with part to P.S. #20 and part to new station in Basin F

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main		lf	\$ 115.00	\$ -
2	Sewer Manhole		ea	\$ 4,600.00	\$ -
3	Well Pointing/Dewatering		lf	\$ 15.00	\$ -
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	\$ -
6	Long Double Service on Public ROW		ea	\$ 2,500.00	\$ -
7	Short Double Service on Public ROW		ea	\$ 1,750.00	\$ -
8	Roadway Repairs		lf	\$ 40.00	\$ -
9	Pump Station Upgrade	1	ea	\$ 95,000.00	\$ 95,000
10	8" Force Main	5,200	lf	\$ 65.00	\$ 338,000
11	Bore Road	4	ea	\$ 7,500.00	\$ 30,000
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,200	lf	\$ 12.00	\$ 62,400
17	Relocation of Utilities	1	ls	\$ 11,063.00	\$ 11,063
SUBTOTAL					\$ 554,463

Subtotal Construction Cost

\$ 554,463

Contingency 12%

\$ 66,535.56

Total - Construction Cost

\$ 620,999

Engineering / Survey / Permit / Design	9%	\$ 55,890
Bidding and Construction Administration	3%	\$ 18,630
Legal / Platting	1%	\$ 6,210
Administrative	1%	\$ 6,210

Project Total - (Year of Opinion)

\$ 707,938

COST PER NEW REU

\$ 11,237

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum		
b	Public meetings/outreach	1 ls	Lump Sum	\$ 12,420	2%
c	Full width roadway overlay	1 lf	\$ 12.00	\$ 12	
	Abandon existing septic tank & connect (private property house connections)	1 ea	\$ 3,500.00	\$ 3,500	

Subtotal potential costs: **\$ 15,932**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. D

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	27		
EXISTING REU	3		
TOTAL LOTS	30 X	245 GPD =	DAILY FLOW 7,350 GPD

RECEIVES FROM OTHER BASINS

0 GPD

TOTAL 7,350 GPD

AVERAGE DAILY FLOW

1440 (min)

5 GPM

PEAK FLOW

250%

13 GPM

Notes:

1. New grinder pump station
2. Force main pump into existing gravity sewer to PS #22

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	2,000	lf	\$ 115.00	\$ 230,000
2	Sewer Manhole	12	ea	\$ 4,600.00	\$ 55,200
3	Well Pointing/Dewatering	1,000	lf	\$ 15.00	\$ 15,000
4	Long Single Service on Public ROW	11	ea	\$ 2,300.00	\$ 25,300
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	7	ea	\$ 2,500.00	\$ 17,500
7	Short Double Service on Public ROW	3	ea	\$ 1,750.00	\$ 5,250
8	Roadway Repairs	1,200	lf	\$ 40.00	\$ 48,000
9	Small Capacity Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2" Force Main	100	lf	\$ 20.00	\$ 2,000
11	Connect to Existing Force Main	0	Job	\$ 15,000.00	\$ -
12	(8" from P.S. 22)		ea		\$ -
14	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
15	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
16	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
17	Restoration	2,000	lf	\$ 12.00	\$ 24,000
18	Relocation of Utilities	3	ls	\$ 13,024.00	\$ 39,072
SUBTOTAL					\$ 729,322

Subtotal Construction Cost

\$ 729,322

Contingency

12%

\$ 87,519

Total - Construction Cost

\$ 816,841

Engineering / Survey / Permit / Design

9%

\$ 73,516

Bidding and Construction Administration

3%

\$ 24,505

Legal / Platting

1%

\$ 8,168

Administrative

1%

\$ 8,168

Project Total - (Year of Opinion)

\$ 931,198

COST PER NEW REU

\$ 34,489

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 34,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 16,336.81	2%
c	Full width roadway overlay	875 lf	\$ 12.00	\$ 10,500	
	Abandon existing septic tank & connect (private property house connections)	3 ea	\$ 3,500.00	\$ 10,500	

Subtotal potential costs: \$ 71,337

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO.22

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	0		
EXISTING REU	64		
TOTAL LOTS	64 X	245 GPD =	DAILY FLOW
EXISTING COMMERCIAL			15,680 GPD
RECEIVES FROM OTHER BASINS	(Basin 23)		35,200 GPD
RECEIVES FROM OTHER BASINS	(Basin D)		170,225 GPD
			7,350 GPD
TOTAL			228,455 GPD
AVERAGE DAILY FLOW	1440 (min)		159 GPM
PEAK FLOW	250%		397 GPM

Notes:

1. Upgrade Pump Station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main		lf	\$ 115.00	\$ -
2	Sewer Manhole		ea	\$ 4,600.00	\$ -
3	Well Pointing/Dewatering		lf	\$ 15.00	\$ -
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	\$ -
6	Long Double Service on Public ROW		ea	\$ 2,500.00	\$ -
7	Short Double Service on Public ROW		ea	\$ 1,750.00	\$ -
8	Roadway Repairs		lf	\$ 40.00	\$ -
9	Pump Station upgrade		ea	\$ 95,000.00	\$ -
10	6" Force Main		lf	\$ 50.00	\$ -
11	Connect to Manhole		ea	\$ 5,000.00	\$ -
12	Bore Road		ea	\$ 7,500.00	\$ -
14	Mobilization/Demobilization		ls	\$ 5,000.00	\$ -
15	Traffic Control		ls	\$ 10,000.00	\$ -
16	Erosion Control		ls	\$ 3,000.00	\$ -
17	Restoration		lf	\$ 12.00	\$ -
18	Relocation of Utilities		ls		\$ -
	SUBTOTAL				\$ -

Subtotal Construction Cost

\$ -

Contingency

12%

\$ -

Total - Construction Cost

\$ -

Engineering / Survey / Permit / Design

9%

\$ -

Bidding and Construction Administration

3%

\$ -

Legal / Platting

1%

\$ -

Administrative

1%

\$ -

Project Total - (Year of Opinion)

\$ -

COST PER NEW REU

#DIV/0!

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum		
b	Public meetings/outreach	1 ls	Lump Sum	\$ -	2%
c	Full width roadway overlay	lf	\$ 12.00	\$ -	
	Abandon existing septic tank & connect (private property house connections)				
d		ea	\$ 3,500.00	\$ -	

Subtotal potential costs:

\$ -

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. E

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	14		
EXISTING REU	0		
TOTAL LOTS	14 X	245 GPD =	DAILY FLOW 3,430 GPD

RECEIVES FROM OTHER BASINS

0 GPD

0 GPD

TOTAL 3,430 GPD

AVERAGE DAILY FLOW 1440 2 GPM

PEAK FLOW 250% 6 GPM

Note: 1. New pump station

2. New force main to gravity sewer of Basin F

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	600	lf	\$ 115.00	\$ 69,000
2	Sewer Manhole	8	ea	\$ 4,600.00	\$ 36,800
3	Well Pointing/Dewatering	300	lf	\$ 15.00	\$ 4,500
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW	6	ea	\$ 1,500.00	
6	Long Double Service on Public ROW	4	ea	\$ 2,500.00	\$ 10,000
7	Short Double Service on Public ROW		ea	\$ 1,750.00	
8	Roadway Repairs	100	lf	\$ 40.00	\$ 4,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2" Force Main	450	lf	\$ 20.00	\$ 9,000
11	Connect to Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	2	ea	\$ 7,500.00	\$ 15,000
14	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
15	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
16	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
17	Restoration	600	lf	\$ 12.00	\$ 7,200
18	Relocation of Utilities	1	ls	\$ 7,555.00	\$ 7,555

SUBTOTAL \$ 436,055

Subtotal Construction Cost \$ 436,055

Contingency 12% \$ 52,326.60

Total - Construction Cost \$ 488,382

Engineering / Survey / Permit / Design 9% \$ 43,954

Bidding and Construction Administration 3% \$ 14,651

Legal / Platting 1% \$ 4,884

Administrative 1% \$ 4,884

Project Total - (Year of Opinion) \$ 556,755

COST PER NEW REU \$ 39,768

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 29,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 9,768	2%
c	Full width roadway overlay	- lf	\$ 12.00	\$ -	
	Abandon existing septic tank & connect (private property house connections)	1 ea	\$ 3,500.00	\$ 3,500	

Subtotal potential costs: \$ 42,268

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. F

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 112
EXISTING REU 5
TOTAL LOTS 117 X
RECEIVES FROM OTHER BASINS

		DAILY FLOW
245 GPD =		28,665 GPD
(Basin E)		3,430 GPD
TOTAL		32,095 GPD
AVERAGE DAILY FLOW	1440 (min)	22 GPM
PEAK FLOW	250%	56 GPM

Notes:

1. New P.S.

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	6,650	lf	\$ 115.00	\$ 764,750
2	Sewer Manhole	42	ea	\$ 4,600.00	\$ 193,200
3	Well Pointing/Dewatering	3,325	lf	\$ 15.00	\$ 49,875
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	\$ -
6	Long Double Service on Public ROW	34	ea	\$ 2,500.00	\$ 85,000
7	Short Double Service on Public ROW	25	ea	\$ 1,750.00	\$ 43,750
8	Roadway Repairs	1,500	lf	\$ 40.00	\$ 60,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2-1/2" Force Main	1,375	lf	\$ 25.00	\$ 34,375
11	Connect to Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	8	ea	\$ 7,500.00	\$ 60,000
14	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
15	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
16	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
17	Restoration	6,650	lf	\$ 12.00	\$ 79,800
18	Relocation of Utilities	1	ls	\$ 35,506.00	\$ 35,506
SUBTOTAL					\$ 1,679,256

Subtotal Construction Cost

\$ 1,679,256

Contingency

12%

\$ 201,511

Total - Construction Cost

\$ 1,880,767

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 169,269
\$ 56,423
\$ 18,808
\$ 18,808

Project Total - (Year of Opinion)

\$ 2,144,074

COST PER NEW REU

\$ 19,144

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 19,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 37,615	2%
c	Full width roadway overlay	- lf	\$ 12.00	\$ -	
Abandon existing septic tank & connect (private property house connections)					
d		5 ea	\$ 3,500.00	\$ 17,500	

Subtotal potential costs: \$ 74,115

CONVENTIONAL SEWER

BASIN NO. 20

Year of Opinion: 2018

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 0
EXISTING REU 147
TOTAL LOTS 147 X
RECEIVES FROM OTHER BASINS

		DAILY FLOW
245 GPD =		36,015 GPD
Basin 22		228,455 GPD
		0 GPD
TOTAL		264,470 GPD
AVERAGE DAILY FLOW	1440 (min)	184 GPM
PEAK FLOW	250%	459 GPM

Notes:

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main		lf	\$ 115.00	\$ -
2	Sewer Manhole		ea	\$ 4,600.00	\$ -
3	Well Pointing/Dewatering		lf	\$ 15.00	\$ -
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	\$ -
6	Long Double Service on Public ROW		ea	\$ 2,500.00	\$ -
7	Short Double Service on Public ROW		ea	\$ 1,750.00	\$ -
8	Roadway Repairs		lf	\$ 40.00	\$ -
9	Pump Station		ea	\$ 450,000.00	\$ -
10	2-1/2" Force Main		lf	\$ 25.00	\$ -
11	Connect to Manhole		ea	\$ 5,000.00	\$ -
12	Bore Road		ea	\$ 7,500.00	\$ -
14	Mobilization/Demobilization	1	ls		
15	Traffic Control	1	ls		
16	Erosion Control	1	ls		
17	Restoration	1	lf		
18	Relocation of Utilities	1	ls		
SUBTOTAL					\$ -
Subtotal Construction Cost					\$ -
Contingency 12%					\$ -
Total - Construction Cost					\$ -
Engineering / Survey / Permit / Design 9%					\$ -
Bidding and Construction Administration 3%					\$ -
Legal / Platting 1%					\$ -
Administrative 1%					\$ -
Project Total - (Year of Opinion)					\$ -

COST PER NEW REU

#DIV/0!

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum		
b	Public meetings/outreach	1 ls	Lump Sum	\$ -	2%
c	Full width roadway overlay	- lf	\$ 12.00	\$ -	
Abandon existing septic tank & connect (private property house connections)					
d		1 ea	\$ 3,500.00	\$ 3,500.00	
Subtotal potential costs:				\$ 3,500.00	

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. G

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 149

EXISTING REU 11

TOTAL LOTS 160 X

RECEIVES FROM OTHER BASINS

DAILY FLOW
245 GPD = 39,200 GPD

(Basin F) 32,095 GPD

TOTAL 71,295 GPD

AVERAGE DAILY FLOW 1440 50 GPM

PEAK FLOW 250% 124 GPM

Note: New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	8,800	lf	\$ 115.00	\$ 1,012,000
2	12" Diameter Main		lf	\$ 75.00	\$ -
3	Sewer Manhole	40	ea	\$ 4,600.00	\$ 184,000
4	Sewer Manhole for 12" Main		ea	\$ 4,000.00	\$ -
5	Well Pointing/Dewatering	4,400	lf	\$ 15.00	\$ 66,000
6	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
7	Short Single Service on Public ROW		ea	\$ 1,500.00	
8	Long Double Service on Public ROW	54	ea	\$ 2,500.00	\$ 135,000
9	Short Double Service on Public ROW	26	ea	\$ 1,750.00	\$ 45,500
10	Roadway Repairs	2,400	lf	\$ 40.00	\$ 96,000
11	Pump Station	1	ea	\$ 450,000.00	\$ 450,000
12	4" Force Main	950	lf	\$ 30.00	\$ 28,500
13	Connect to Manhole	1	ea	\$ 5,000.00	\$ 5,000
14	Bore Road	2	ea	\$ 7,500.00	\$ 15,000
16	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
17	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
18	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
19	Restoration	8,800	lf	\$ 12.00	\$ 105,600
20	Relocation of Utilities	1	ls	\$ 45,093.00	\$ 45,093
SUBTOTAL					\$ 2,205,693

Subtotal Construction Cost

\$ 2,205,693

Contingency

12%

\$ 264,683

Total - Construction Cost

\$ 2,470,376

Engineering / Survey / Permit / Design

9%

\$ 222,334

Bidding and Construction Administration

3%

\$ 74,111

Legal / Platting

1%

\$ 24,704

Administrative

1%

\$ 24,704

Project Total - (Year of Opinion)

\$ 2,816,229

COST PER NEW REU

\$ 18,901

Potential Costs

a	Land and easement acquisition	1	ls	Lump Sum	\$ 26,000	
b	Public meetings/outreach	1	ls	Lump Sum	\$ 49,408	2%
c	Full width roadway overlay	2,600	lf	\$ 12.00	\$ 31,200	
d	Abandon existing septic tank & connect (private property house)	11	ea	\$ 3,500.00	\$ 38,500	

Subtotal potential costs: **\$ 145,108**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN NO. H

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 102
EXISTING REU 10
TOTAL LOTS 112 X
RECEIVES FROM OTHER BASINS

DAILY FLOW
245 GPD = 27,440 GPD

71,295 GPD
TOTAL 98,735 GPD

AVERAGE DAILY FLOW 1440 (min) 69 GPM
PEAK FLOW 250% 171 GPM

Note: New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	6,700	lf	\$115.00	\$770,500
2	Sewer Manhole	35	ea	\$4,600.00	\$161,000
3	Well Pointing/Dewatering	3,350	lf	\$15.00	\$50,250
4	Long Single Service on Public ROW	1	ea	\$2,300.00	\$2,300
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	20	ea	\$2,500.00	\$50,000
7	Short Double Service on Public ROW	36	ea	\$ 1,750.00	\$63,000
8	Roadway Repairs	950	lf	\$40.00	\$38,000
9	Pump Station	1	ea	\$450,000.00	\$450,000
10	6" Force Main	825	lf	\$ 50.00	\$ 41,250
11	Mobilization/Demobilization	1	ls	\$5,000.00	\$ 5,000
12	Traffic Control	1	ls	\$10,000.00	\$ 10,000
13	Erosion Control	1	ls	\$3,000.00	\$ 3,000
14	Restoration	6,700	lf	\$12.00	\$ 80,400
15	Relocation of Utilities	1	ls	\$35,068.00	\$ 35,068
SUBTOTAL					\$1,759,768

Subtotal Construction Cost

\$1,759,768

Contingency 12% \$211,172.16

Total - Construction Cost \$1,970,940

Engineering / Survey / Permit / Design 9% \$177,385

Bidding and Construction Administration 3% \$59,128

Legal / Platting 1% \$19,709

Administrative 1% \$19,709

Project Total - (Year of Opinion) \$2,246,872

COST PER EXISTING REU

\$20,061.36

Potential Costs

a	Land and easement acquisition	1	ls	Lump Sum	\$ 19,000	
b	Public meetings/outreach	1	ls	Lump Sum	\$ 39,419	2%
c	Full width roadway overlay	2,700	lf	\$ 12.00	\$ 32,400	
	Abandon existing septic tank & connect (private property house connections)	10	ea	\$ 3,500.00	\$ 35,000	

Subtotal potential costs: **\$ 125,819**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN I

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 24
EXISTING REU 1
TOTAL LOTS 25 X
RECEIVES FROM OTHER BASINS

245 GPD =
DAILY FLOW
6,125 GPD
GPD
TOTAL 6,125 GPD
AVERAGE DAILY FLOW 1440 (min) 4 GPM
PEAK FLOW 250% 11 GPM

Note: 1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	3,800	lf	\$ 115.00	\$ 437,000
2	Sewer Manhole	21	ea	\$ 4,600.00	\$ 96,600
3	Well Pointing/Dewatering	1,900	lf	\$ 15.00	\$ 28,500
4	Long Single Service on Public ROW	9	ea	\$ 2,300.00	\$ 20,700
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	27	ea	\$ 2,500.00	\$ 67,500
7	Short Double Service on Public ROW		ea	\$ 1,750.00	
8	Roadway Repairs	1,600	lf	\$ 40.00	\$ 64,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	Bore Road	5	ea	\$ 7,500.00	\$ 37,500
11	6" Force Main	525	lf	\$ 50.00	\$ 26,250
12	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
13	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
14	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
15	Restoration	3,800	lf	\$ 12.00	\$ 45,600
16	Relocation of Utilities	1	ls	\$ 25,107.00	\$ 25,107
SUBTOTAL					\$ 1,116,757

Subtotal Construction Cost

\$ 1,116,757

Contingency

12%

\$ 134,010.84

Total - Construction Cost

\$ 1,250,768

Engineering / Survey / Permit / Design

9%

\$ 112,569

Bidding and Construction Administration

3%

\$ 37,523

Legal / Platting

1%

\$ 12,508

Administrative

1%

\$ 12,508

Project Total - (Year of Opinion)

\$ 1,425,875

COST PER NEW REU

\$ 59,411

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 33,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 25,015	2%
c	Full width roadway overlay	1,800 lf	\$ 12.00	\$ 21,600	
Abandon existing septic tank & connect (private property house connections)					
d		1 ea	\$ 3,500.00	\$ 3,500	

Subtotal potential costs: \$ 83,115

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN J

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	73				
EXISTING REU	3				
TOTAL LOTS	76 X				
RECEIVES FROM OTHER BASINS		245 GPD =		18,620 GPD	
		Basin I		6,125 GPD	
		Basin H		98,735 GPD	
		TOTAL		123,480 GPD	
AVERAGE DAILY FLOW	1440 (min)			86 GPM	
PEAK FLOW	250%			214 GPM	

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	2,400	lf	\$ 115.00	\$ 276,000
2	Sewer Manhole	41	ea	\$ 4,600.00	\$ 188,600
3	Well Pointing/Dewatering	1,200	lf	\$ 15.00	\$ 18,000
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	9	ea	\$ 2,500.00	\$ 22,500
7	Short Double Service on Public ROW	15	ea	\$ 1,750.00	\$ 26,250
8	Roadway Repairs	400	lf	\$ 40.00	\$ 16,000
9	Pump Station	1	ea	\$ 450,000.00	\$ 450,000
10	6" Force Main	900	lf	\$ 50.00	\$ 45,000
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	5	ea	\$ 7,500.00	\$ 37,500
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	2,400	lf	\$ 12.00	\$ 28,800
17	Relocation of Utilities	1	ls	\$ 20,765.00	\$ 20,765
	SUBTOTAL				\$ 1,152,415

Subtotal Construction Cost

\$ 1,152,415

Contingency

12%

\$ 138,289.80

Total - Construction Cost

\$ 1,290,705

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 116,163.43
\$ 38,721
\$ 12,907
\$ 12,907

Project Total - (Year of Opinion)

\$ 1,471,403

COST PER NEW REU

\$ 20,156

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 84,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 25,814	2%
c	Full width roadway overlay	1,700 lf	\$ 12.00	\$ 20,400	
	Abandon existing septic tank & connect (private property house connections)	3 ea	\$ 3,500.00	\$ 10,500	

Subtotal potential costs: **\$ 140,714**

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN K

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	79				
EXISTING REU	19				
TOTAL LOTS	98 X	245 GPD =	24,010 GPD		
RECEIVES FROM OTHER BASINS			0 GPD		
		TOTAL	24,010 GPD		
AVERAGE DAILY FLOW	1440 (min)		17 GPM		
PEAK FLOW	250%		42 GPM		

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,700	lf	\$ 115.00	\$ 655,500
2	Sewer Manhole	28	ea	\$ 4,600.00	\$ 128,800
3	Well Pointing/Dewatering	2,850	lf	\$ 15.00	\$ 42,750
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	29	ea	\$ 2,500.00	\$ 72,500
7	Short Double Service on Public ROW	20	ea	\$ 1,750.00	\$ 35,000
8	Roadway Repairs	1,300	lf	\$ 40.00	\$ 52,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2.5" Force Main	40	lf	\$ 25.00	\$ 1,000
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	9	ea	\$ 7,500.00	\$ 67,500
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,700	lf	\$ 12.00	\$ 68,400
17	Relocation of Utilities	1	ls	\$ 28,245.00	\$ 28,245
SUBTOTAL					\$ 1,424,695

Subtotal Construction Cost

\$ 1,424,695

Contingency

12%

\$ 170,963.40

Total - Construction Cost

\$ 1,595,658

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 143,609
\$ 47,870
\$ 15,957
\$ 15,957

Project Total - (Year of Opinion)

\$ 1,819,051

COST PER NEW REU

\$ 23,026

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 1,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 31,913	
c	Full width roadway overlay	1,100 lf	\$ 12.00	\$ 13,200	
	Abandon existing septic tank & connect (private property house connections)	19 ea	\$ 3,500.00	\$ 66,500	

2%

Subtotal potential costs:

\$ 112,613

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN L

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	79				
EXISTING REU	13				
TOTAL LOTS	92 X	245 GPD =	22,540 GPD		
RECEIVES FROM OTHER BASINS			0 GPD		
		TOTAL	22,540 GPD		
AVERAGE DAILY FLOW	1440 (min)		16 GPM		
PEAK FLOW	250%		39 GPM		

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,200	lf	\$ 115.00	\$ 598,000
2	Sewer Manhole	33	ea	\$ 4,600.00	\$ 151,800
3	Well Pointing/Dewatering	2,600	lf	\$ 15.00	\$ 39,000
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	21	ea	\$ 2,500.00	\$ 52,500
7	Short Double Service on Public ROW	25	ea	\$ 1,750.00	\$ 43,750
8	Roadway Repairs	900	lf	\$ 40.00	\$ 36,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2.5" Force Main	1,100	lf	\$ 25.00	\$ 27,500
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	8	ea	\$ 7,500.00	\$ 60,000
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,200	lf	\$ 12.00	\$ 62,400
17	Relocation of Utilities	1	ls	\$ 28,610.00	\$ 28,610
SUBTOTAL					\$ 1,372,560

Subtotal Construction Cost

\$ 1,372,560

Contingency

12%

\$ 164,707

Total - Construction Cost

\$ 1,537,267

Engineering / Survey / Permit / Design

9%

\$ 138,354

Bidding and Construction Administration

3%

\$ 46,118

Legal / Platting

1%

\$ 15,373

Administrative

1%

\$ 15,373

Project Total - (Year of Opinion)

\$ 1,752,485

COST PER NEW REU

\$ 22,183

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 35,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 30,745	
c	Full width roadway overlay	1,450 lf	\$ 12.00	\$ 17,400	
	Abandon existing septic tank & connect (private property house connections)	13 ea	\$ 3,500.00	\$ 45,500	

2%

Subtotal potential costs:

\$ 128,645

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN M

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	86
EXISTING REU	2
TOTAL LOTS	88 X
RECEIVES FROM OTHER BASINS	

	DAILY FLOW
245 GPD =	21,560 GPD
Basin L	22,540 GPD
Basin J	123,480 GPD
TOTAL	167,580 GPD
AVERAGE DAILY FLOW	1440 (min)
PEAK FLOW	250%
	116 GPM
	291 GPM

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,100	lf	\$ 115.00	\$ 586,500
2	Sewer Manhole	26	ea	\$ 4,600.00	\$ 119,600
3	Well Pointing/Dewatering	2,550	lf	\$ 15.00	\$ 38,250
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	28	ea	\$ 2,500.00	\$ 70,000
7	Short Double Service on Public ROW	16	ea	\$ 1,750.00	\$ 28,000
8	Roadway Repairs	1,300	lf	\$ 40.00	\$ 52,000
9	Pump Station	1	ea	\$ 450,000.00	\$ 450,000
10	6" Force Main	1,125	lf	\$ 50.00	\$ 56,250
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	8	ea	\$ 7,500.00	\$ 60,000
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,100	lf	\$ 12.00	\$ 61,200
17	Relocation of Utilities	1	ls	\$ 30,930.00	\$ 30,930
SUBTOTAL					\$ 1,575,730

Subtotal Construction Cost

\$ 1,575,730

Contingency

12%

\$ 189,088

Total - Construction Cost

\$ 1,764,818

Engineering / Survey / Permit / Design	9%	\$ 158,834
Bidding and Construction Administration	3%	\$ 52,945
Legal / Platting	1%	\$ 17,648
Administrative	1%	\$ 17,648

Project Total - (Year of Opinion)

\$ 2,011,892

COST PER NEW REU

\$ 23,394

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 138,000	2%
b	Public meetings/outreach	1 ls	Lump Sum	\$ 35,296	
c	Full width roadway overlay	1,700 lf	\$ 12.00	\$ 20,400	
d	Abandon existing septic tank & connect (private property house connections)	2 ea	\$ 3,500.00	\$ 7,000	

Subtotal potential costs:

\$ 200,696

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN N

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU 86
EXISTING REU 7
TOTAL LOTS 93 X
RECEIVES FROM OTHER BASINS

		DAILY FLOW	
	245 GPD =	22,785 GPD	
Basin M		167,580 GPD	
Basin O		30,165 GPD	
TOTAL		220,530 GPD	
AVERAGE DAILY FLOW	1440 (min)	153 GPM	
PEAK FLOW	250%	383 GPM	

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,600	lf	\$ 115.00	\$ 644,000
2	Sewer Manhole	28	ea	\$ 4,600.00	\$ 128,800
3	Well Pointing/Dewatering	2,800	lf	\$ 15.00	\$ 42,000
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	18	ea	\$ 2,500.00	\$ 45,000
7	Short Double Service on Public ROW	29	ea	\$ 1,750.00	\$ 50,750
8	Roadway Repairs	800	lf	\$ 40.00	\$ 32,000
9	Pump Station	1	ea	\$ 700,000.00	\$ 700,000
10	8" Force Main	3,300	lf	\$ 65.00	\$ 214,500
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	9	ea	\$ 7,500.00	\$ 67,500
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,600	lf	\$ 12.00	\$ 67,200
17	Relocation of Utilities	1	ls	\$ 45,189.00	\$ 45,189
SUBTOTAL					\$ 2,059,939

Subtotal Construction Cost

\$ 2,059,939

Contingency

12%

\$ 247,193

Total - Construction Cost

\$ 2,307,132

Engineering / Survey / Permit / Design
Bidding and Construction Administration
Legal / Platting
Administrative

9%
3%
1%
1%

\$ 207,642
\$ 69,214
\$ 23,071
\$ 23,071

Project Total - (Year of Opinion)

\$ 2,630,130

COST PER NEW REU

\$ 30,583

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 204,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 46,143	
c	Full width roadway overlay	700 lf	\$ 12.00	\$ 8,400	
	Abandon existing septic tank & connect (private property house connections)	7 ea	\$ 3,500.00	\$ 24,500	

2%

Subtotal potential costs: \$ 283,043

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN O

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	57				
EXISTING REU	8				
TOTAL LOTS	65 X				
RECEIVES FROM OTHER BASINS		Basin P			
		TOTAL			
			245 GPD =	15,925 GPD	
				14,240 GPD	
				30,165 GPD	
AVERAGE DAILY FLOW		1440 (min)		21 GPM	
PEAK FLOW		250%		52 GPM	

Notes:

1. New pump station

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	5,500	lf	\$ 115.00	\$ 632,500
2	Sewer Manhole	22	ea	\$ 4,600.00	\$ 101,200
3	Well Pointing/Dewatering	2,750	lf	\$ 15.00	\$ 41,250
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	8	ea	\$ 2,500.00	\$ 20,000
7	Short Double Service on Public ROW	25	ea	\$ 1,750.00	\$ 43,750
8	Roadway Repairs	400	lf	\$ 40.00	\$ 16,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2" Force Main	1,600	lf	\$ 20.00	\$ 32,000
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	8	ea	\$ 7,500.00	\$ 60,000
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	5,500	lf	\$ 12.00	\$ 66,000
17	Relocation of Utilities	1	ls	\$ 27,271.00	\$ 27,271
SUBTOTAL					\$ 1,312,971

Subtotal Construction Cost

\$ 1,312,971

Contingency

12%

\$ 157,557

Total - Construction Cost

\$ 1,470,528

Engineering / Survey / Permit / Design

9%

\$ 132,347

Bidding and Construction Administration

3%

\$ 44,116

Legal / Platting

1%

\$ 14,705

Administrative

1%

\$ 14,705

Project Total - (Year of Opinion)

\$ 1,676,401

COST PER NEW REU

\$ 29,411

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 1,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 29,411	2%
c	Full width roadway overlay	- lf	\$ 12.00	\$ -	
	Abandon existing septic tank & connect (private property house connections)	8 ea	\$ 3,500.00	\$ 28,000	

Subtotal potential costs:

\$ 58,411

CONVENTIONAL SEWER

Year of Opinion: 2018

BASIN P

T&H Job No.: J-27294.0000

DESIGN DATA

NEW REU	38		
EXISTING REU	14		
TOTAL LOTS	52 X	245 GPD =	DAILY FLOW
RECEIVES FROM CITADEL BEACH HOUSE			12,740 GPD
			1,500 GPD
			14,240 GPD
AVERAGE DAILY FLOW	1440 (min)		10 GPM
PEAK FLOW	250%		25 GPM

Notes:

1. New pump station
2. New Force main to Basin O

OPINION OF PROBABLE COST

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	8" Diameter Main	6,000	lf	\$ 115.00	\$ 690,000
2	Sewer Manhole	27	ea	\$ 4,600.00	\$ 124,200
3	Well Pointing/Dewatering	3,000	lf	\$ 15.00	\$ 45,000
4	Long Single Service on Public ROW		ea	\$ 2,300.00	\$ -
5	Short Single Service on Public ROW		ea	\$ 1,500.00	
6	Long Double Service on Public ROW	11	ea	\$ 2,500.00	\$ 27,500
7	Short Double Service on Public ROW	15	ea	\$ 1,750.00	\$ 26,250
8	Roadway Repairs	500	lf	\$ 40.00	\$ 20,000
9	Pump Station	1	ea	\$ 250,000.00	\$ 250,000
10	2" Force Main	1,350	lf	\$ 20.00	\$ 27,000
11	Connect to Existing Manhole	1	ea	\$ 5,000.00	\$ 5,000
12	Bore Road	7	ea	\$ 7,500.00	\$ 52,500
13	Mobilization/Demobilization	1	ls	\$ 5,000.00	\$ 5,000
14	Traffic Control	1	ls	\$ 10,000.00	\$ 10,000
15	Erosion Control	1	ls	\$ 3,000.00	\$ 3,000
16	Restoration	6,000	lf	\$ 12.00	\$ 72,000
17	Relocation of Utilities	1	ls	\$ 28,921.00	\$ 28,921
SUBTOTAL					\$ 1,386,371

Subtotal Construction Cost

\$ 1,386,371

Contingency 12% \$ 166,365

Total - Construction Cost \$ 1,552,736

Engineering / Survey / Permit / Design 9% \$ 139,746

Bidding and Construction Administration 3% \$ 46,582

Legal / Platting 1% \$ 15,527

Administrative 1% \$ 15,527

Project Total - (Year of Opinion) \$ 1,770,118

COST PER NEW REU

\$ 46,582

Potential Costs

a	Land and easement acquisition	1 ls	Lump Sum	\$ 61,000	
b	Public meetings/outreach	1 ls	Lump Sum	\$ 31,055	2%
c	Full width roadway overlay	- lf	\$ 12.00	\$ -	
d	Abandon existing septic tank & connect (private property house connections)	14 ea	\$ 3,500.00	\$ 49,000	

Subtotal potential costs: \$ 141,055



Sewer Master Plan Update
Isle of Palms, SC
Opinion of Probable Cost



Conventional Sewer
2018 Unit Costs Used

Unit Costs Used in Estimates of Sewering Unsewered Areas (unit costs include contractor mark-ups for their general conditions, sales tax, overhead, profit and the cost of bonds and insurance.

Description	Cost	Unit	Name
8" diameter main	\$ 115.00	lf	_8_diameter_main
sewer manhole	\$ 4,600.00	ea	sewer_manhole
Well Pointing/Dewatering	\$ 15.00	lf	_6_lateral
long single service connection	\$ 2,300.00	ea	long_single_service
short single service connection	\$ 1,500.00	ea	short_single_service
long double service connection	\$ 2,500.00	ea	long_double_service
short double service connection	\$ 1,750.00	ea	short_double_service
roadway repairs	\$ 40.00	lf	road_repairs
pump station	\$450,000.00	ea	pump_station
Contingency	12%	%	
Engineering/Survey/Permit/Design	9%	%	
Legal and Platting	1%	%	
Administrative	1%	%	
Peak Factor	250%	%	
Bore Road	\$ 7,500.00	ea	
Small Capacity Pump Station	\$ 250,000.00	ea	
2" Force main	\$ 20.00	lf	
2-1/2" Force Main	\$ 25.00	lf	
6" Force Main	\$ 50.00	lf	
8" Force Main	\$ 65.00	lf	
10" Force Main	\$ 75.00	lf	
4" Force Main	\$ 30.00	lf	
Bidding and Construction Administration	3%	%	
Large Pump Station	\$700,000.00	ea	



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ATTACHMENT 2

SEWER MASTER PLAN UPDATE SUPPORT

BASIS OF ESTIMATES

WASTEWATER TREATMENT PLANT (WWTP)

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

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TABLES

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APPENDIX

FEMA Grant	Appendix A
Forest Trails Balance	Appendix B

1.0 PURPOSE OF ESTIMATES

The purpose of the Cost Estimate is to establish an Engineer's Opinion of Probable Cost, including estimated construction costs, design costs, permitting costs, bidding costs, construction administration costs, and other soft costs at the planning level for the wastewater treatment plant work needed to treat the sewer generated on the Island. Estimates of the construction costs are design development level estimates.

2.0 GENERAL PROJECT DESCRIPTION

The City of Isle of Palms is in the process of updating its Sewer Master Plan. Thomas & Hutton has been requested to aid in cost estimating for the master planned sewer system improvements, including sewer conveyance systems, pump station improvements, and improvements at the Forest Trails Wastewater Treatment Plant. This baseline opinion of probable cost is to provide estimates for consolidating wastewater treatment at the Forest Trails plant site.

3.0 SCOPE OF WORK

The estimates consist of the following key components at the WWTP site:

- Hauling offsite disposal of excess soil.
- Installation of sewer piping, including 1 foot of stone bedding material and native backfill for the remaining trench.
- Lines installed with a minimum of 3 feet of cover.
- Dewatering cost.
- Pipe material is 8-inch, 10-inch, or 12-inch PVC SDR 26 or DIP.
- Use 5-foot diameter manholes at force main connections.
- Plant components sized for:
 - AADF 1.5 to 1.8 mgd
 - PMF 2.3 to 2.7 mgd
 - PWF 2.7 to 3.3 mgd
- Opinions of cost are split between 1) those associated with the FEMA grant application and 2) the balance of all components desired by the IOPWSC for the complete related scope.

4.0 MARK-UPS

These mark-ups are based on general assumptions about how the project will be contracted. Actual mark-up percentages may vary from those shown in Table 1.

TABLE 1 CONTRACTOR MARK-UPS	
Component	Mark-up on Direct Costs (%)
Contractor General Conditions	8
Sales Tax on Material	6
Contractor Overhead	12
Contractor Profit	8
Bonds/Insurance	Included in contract prices

5.0 ESCALATION RATE

The estimates are presented in current 2018 dollars. No escalation is included in the base figures.

6.0 ESTIMATE CLASSIFICATION

The estimates are prepared based on limited information where preliminary engineering is from 5% to 25% complete. Examples of estimating methods used would include scale-up factors, vendor supply quotes, and historical prices from similar projects. The expected accuracy ranges for these types of estimates are -10% to -20% for the low range side and +10% to +50% on the high range side. The estimates are prepared based upon scope details and construction industry activity available at the time they are produced. Estimates represent a snapshot in time of what is known and occurring in this region. Therefore, estimates should be viewed in that light and re-evaluated after 180 days.

7.0 ESTIMATE METHODOLOGY

The cost estimates are mostly generated by using prices from vendors/suppliers and from historical comparative projects. The estimates include allowances and costs for certain components of the estimate.

8.0 COST RESOURCES

The following are the various cost resources consulted to develop the estimates:

- R.S. Means.
- Thomas & Hutton historical bid data.
- Vendor quotes on equipment and materials where appropriate.
- Estimator judgement.

9.0 MAJOR ASSUMPTIONS

Estimates assume that the work will be done on a competitive bid basis and the Contractor will have a reasonable amount of time to complete the work. We assume that the Contractor will have a reasonable project schedule, no overtime, and is under a single contract. The estimates should be evaluated for market changes after 180 days from the issue date. It is assumed that much of the following equipment will be shipped from the mainland United States:

- Dewatering required.
- MBR equipment shall be from Ovivo or Kubota.
- Concrete shall be cast-in-place.
- Construction shall be similar to the existing plant.
- Construct structures/basins to projected ultimate needs (buildout) flows.
- Put in membranes with initial phase for 1.5 mgd AADF.
- Use UV for disinfection.
- 12% contingency included.
- Improved flooding proof doors are added to the existing building to provide enhanced and quicker protection.
- Cost for demolishing Wild Dunes WWTP is not included because it is a separate project.

- Cost for a new master pump station at the Wild Dunes plant site is not included. This is a future Capital Project.
- Cost to clean (or whichever other means is selected) the existing force mains between Forest Trails and Wild Dunes plant sites is not included.
- Cost to upgrade existing Pump Station 18 is not included. This is a future Capital Project.
- Cost to replace existing 8-inch outfall line with new 12-inch outfall line to the Intracoastal Waterway (ICW) is not included. This should be a future Capital Project.
- Drainage improvements on Sparrow Drive are not included.
- Landscaping & Irrigation Modifications are not included.
- These components will be included as "Optional Items" or as items "Not Included in Prior Scope"
 1. Add EQ storage of 135,000 gallons
 2. Replace existing Vulcan primary screen with new RotoSeive screen for redundancy
 3. Provide a new centrifuge and new centrifuge building.
 4. New Blower Building to Replace Existing Building.

10.0 ALLOWANCES

The estimates include allowances for the following work that is not sufficiently detailed at this time:

- Mobilization/demobilization allowance.
- Design, engineering, survey, and permit allowance.
- Bidding and construction administration allowance.



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**OPINION OF PROBABLE COST
FOREST TRAILS WWTP CONSOLIDATION
WASTEWATER TREATMENT PLANT**

APPENDIX A
FEMA GRANT

J – 27294.0000

December 2018

Forest Trails WWTP Consolidation

Isle of Palms, Charleston County, SC

MBR Treatment Process

Treatment Consolidation at Forest Trails

4241 HMGP Project 69 / IOPWSC FEMA Grant



OPINION OF PROBABLE CONSTRUCTION COST

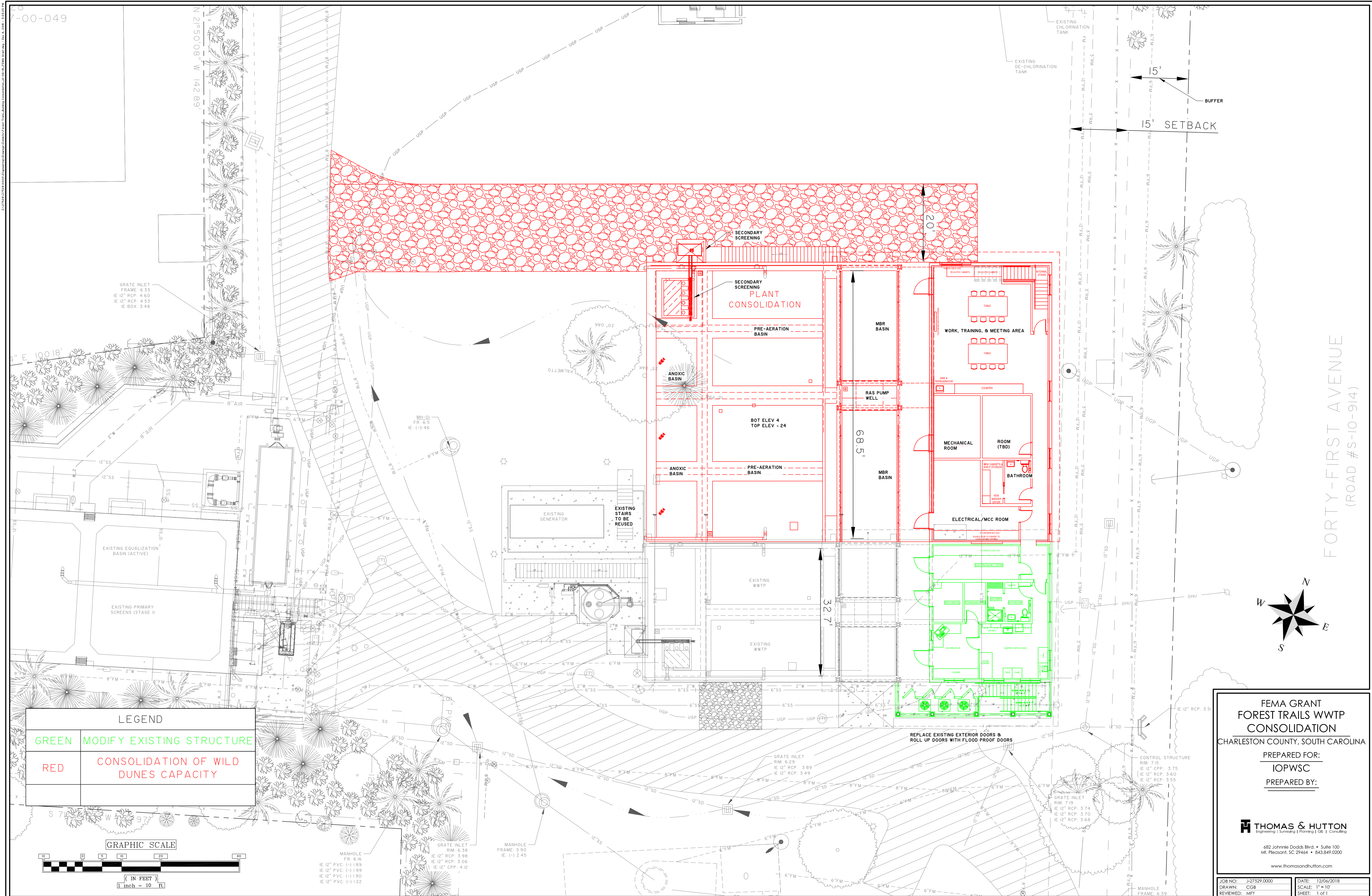
Prepared: Dec 12, 2018	Revised
BASIS FOR ESTIMATE	
(No design completed- Budgetary Numbers)	
XXX	(Design Development)
(Final design)	

OPINION OF PROBABLE CONSTRUCTION COST

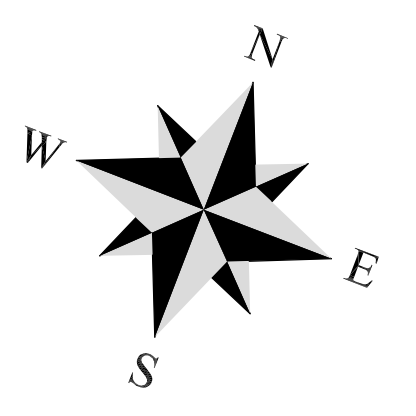
Since the Engineer has no control over the cost of labor, materials, equipment, over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Opinions of Probable Construction Costs provided for herein are made on the basis of his experience and qualifications. These opinions represent his best judgment as a design professional familiar with the construction industry. However, the Engineer cannot and does not guarantee that proposals, bids, or the construction cost will not vary from Opinions of Probable Construction Costs prepared by him.

4241 HMGP Project 69 / IOPWSC FEMA Grant

ITEM	DESCRIPTION	QUANTITY		PROJECTED COST	
		UNITS	UNIT MEASURE	PER UNIT	TOTAL COST
	IDENTIFICATION				
1	Process Tank Basins	1	job	\$ 3,915,408	\$ 3,915,408
2	Secondary Screens - Installation	1	job	\$ 25,200	\$ 25,200
3	Bldg. Area Lower Level	1	job	\$ 788,816	\$ 788,816
4	MBR Process equipment installation (mixers, permeate pumps, blowers, aeration, instrumentation, etc.)	1	job	\$ 323,400	\$ 323,400
5	MBR Process Equipment-pumps, piping, control computer, valves, meters, instruments, etc. from MBR supplier)	1	job	\$ 2,371,600	\$ 2,371,600
6	Slide Gates to control flow and isolate basins	1	job	\$ 106,400	\$ 106,400
7	Install Flood Panel on Existing Roll-up door	1	job	\$ 24,640	\$ 24,640
8	Install Flood Double Door on New Structure	1	job	\$ 32,480	\$ 32,480
9	Install Flood Man-Door on Existing Structure	1	job	\$ 21,840	\$ 21,840
10	Install Flood Man-Door on New Structure	1	job	\$ 17,080	\$ 17,080
11	Electrical and Instrumentation & Control	1	job	\$ 537,600	\$ 537,600
		HARD CONSTRUCTION SUBTOTAL			\$ 8,164,464
a	Soft Costs -Engineering, Permitting, Bidding, Construction,			10%	\$ 816,446
	TOTAL PROJECT COST (2018 dollars)				\$ 8,980,910
				USE	\$ 8,990,000



FORTY-FIRST AVENUE
(ROAD #S-10-914)



FEMA GRANT
FOREST TRAILS WWTP
CONSOLIDATION
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
IOPWSC
PREPARED BY:



THOMAS & HUTTON
Engineering | Surveying | Planning | GIS | Consulting

682 Johnnie Dodds Blvd. • Suite 100
Mt. Pleasant, SC 29464 • 843.849.0200

www.thomasandhutton.com

JOB NO: J-27529.0000	DATE: 12/06/2018
DRAWN: CGB	SCALE: 1" = 10'
REVIEWED: MFY	SHEET: 1 of 1

DATE:	12/06/2018
SCALE:	1" = 10'
SHEET:	1 of 1



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**OPINION OF PROBABLE COST
FOREST TRAILS WWTP CONSOLIDATION
WASTEWATER TREATMENT PLANT**

APPENDIX B
FOREST TRAILS BALANCE

J – 27294.0000

December 2018

Forest Trails WWTP Consolidation

OPINION PROBABLE CONSTRUCTION COST

Isle of Palms, Charleston County, SC
MBR Treatment Process
Treatment Consolidation at Forest Trails
Forest Trails Balance

Prepared: Dec. 12, 2018	Revised
BASIS FOR ESTIMATE	
(No design completed- Budgetary Numbers)	
XXX	(Design Development)
	(Final design)



OPINION OF PROBABLE CONSTRUCTION COST

Since the Engineer has no control over the cost of labor, materials, equipment, over the Contractor's methods of determining prices, or over competitive bidding or market conditions, the Opinions of Probable Construction Costs provided for herein are made on the basis of his experience and qualifications. These opinions represent his best judgment as a design professional familiar with the construction industry. However, the Engineer cannot and does not guarantee that proposals, bids, or the construction cost will not vary from Opinions of Probable Construction Costs prepared by him.

Forest Trails Balance

ITEM	DESCRIPTION	QUANTITY		PROJECTED COST	
		UNITS	UNIT MEASURE	PER UNIT	TOTAL COST
	IDENTIFICATION				
1	Mobilization	1	job	\$ 168,000	\$ 168,000
2	Performance Testing for piping, equipment, treatment	1	job	\$ 33,600	\$ 33,600
3	New Generator	1	job	\$ 408,800	\$ 408,800
4	Odor Control	1	job	\$ 461,440	\$ 461,440
5	Bldg. Area - Upper Level	1	job	\$ 719,757	\$ 719,757
6	Sludge Holding Basin, pumps & blowers	1	job	\$ 918,400	\$ 918,400
7	Disinfection System (UV for 2.5 mgd)	1	job	\$ 761,600	\$ 761,600
8	Bldg. - Upper Level Existing to New Access	1	job	\$ 39,200	\$ 39,200
9	Effluent Wet well (structure only)	1	job	\$ 526,400	\$ 526,400
10	Effluent Pumps & Piping	1	job	\$ 134,400	\$ 134,400
11	Protective Coatings	1	job	\$ 313,600	\$ 313,600
12	Civil / Site Work / New Transfer Pumps	1	job	\$ 252,000	\$ 252,000
13	Onsite Drainage to meet stormwater regs.	1	job	\$ 56,000	\$ 56,000
14	Electrical and Instrumentation & Control	1	job	\$ 1,232,000	\$ 1,232,000
15	Plumbing	1	job	\$ 56,000	\$ 56,000
16	HVAC to condition electrical & Dewatered Material Holding area	1	job	\$ 123,200	\$ 123,200
		HARD CONSTRUCTION SUBTOTAL			\$ 6,204,397
a	Soft Costs-Engineering, Permit, Construction			10%	\$ 620,440
	SUBTOTAL COST (2018 dollars)				\$ 6,824,836
				USE	\$ 6,900,000

OPTIONAL ITEMS

1	New Blower Bldg. to Replace Existing Bldg.	1	job	\$ 324,800	\$ 324,800
HARD CONSTRUCTION SUBTOTAL					\$ 324,800
a	Soft Costs-Engineering, Permit, Construction			10%	\$ 32,480
Subtotal Cost (2018 dollars)					\$ 357,280
				USE	\$ 400,000

NOT INCLUDED IN PRIOR SCOPE

1	EQ Basin	1	job	\$ 1,005,200	\$ 1,005,200
2	Centrifuge Bldg.	1	job	\$ 728,000	\$ 728,000
3	Centrifuge	1	job	\$ 538,720	\$ 538,720
4	Replace Exist Vulcan Screen with new RotoSeive	1	job	\$ 164,080	\$ 164,080
HARD CONSTRUCTION SUBTOTAL					\$ 2,436,000
a	Soft Costs-Engineering, Permit, Construction			10%	\$ 243,600
Subtotal Cost (2018 dollars)					\$ 2,679,600
				USE	\$ 2,700,000

SUBTOTAL OPTIONAL ITEMS & NOT INCLUDED IN PRIOR SCOPE

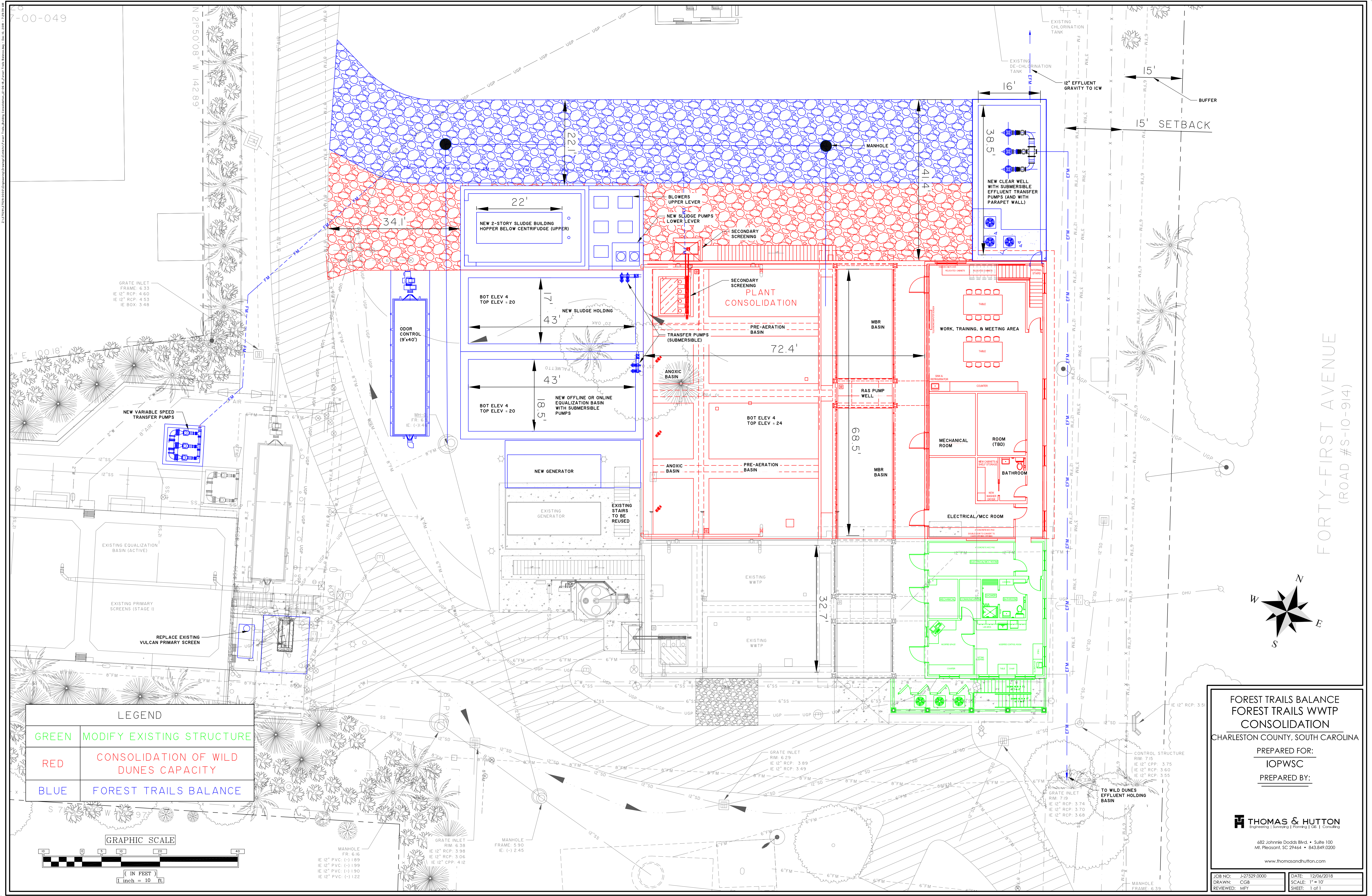
\$ 3,100,000

GRAND TOTAL

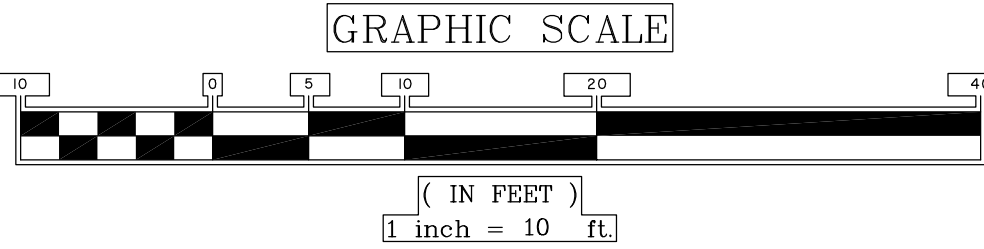
\$ 10,000,000

NOTES

- Master Pump Station at Wild Dunes is already a CIP and is not included in the estimate.
- Drainage Improvements on Sparrow Drive are not included.
- Cost to demolish existing Wild Dunes WWTP is not included.
- Cost to upgrade existing pump station 18 is not included.
- Cost to clean existing force mains between WWTP's is not included.
- Replace Effluent Outfall line to ICW should be a future CIP/Not included in costs herein.
- Landscaping and irrigation modification.



LEGEND	
GREEN	MODIFY EXISTING STRUCTURE
RED	CONSOLIDATION OF WILD DUNES CAPACITY
BLUE	FOREST TRAILS BALANCE



FOREST TRAILS BALANCE
FOREST TRAILS WWTP
CONSOLIDATION
CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
IOPWSC

PREPARED BY:

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JOB NO: J-27529.0000
DRAWN: CGB
REVIEWED: MFY

DATE: 12/04/2018
SCALE: 1"=10'
SHEET: 1 of 1



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ATTACHMENT 3 SEWER MASTER PLAN UPDATE SUPPORT

MASTER PLAN LAYOUT CRITERIA

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

MASTER PLAN LAYOUT CRITERIA

In this report, several main tasks were undertaken:

- a. Provide conceptual master plan layouts, outlining the gravity sewer collection system to serve unsewered areas.
- b. Develop conceptual layout for wastewater treatment plant (WWTP) expansion or consolidation needed to handle new wastewater from sewerage unsewered areas.
- c. Provide an Engineer's Opinion of Probable Construction Cost for each of the above.

DESIGN ASSUMPTIONS

The following engineering design assumptions were used in developing the conceptual layouts included herein:

TABLE 1 ENGINEERING DESIGN ASSUMPTIONS	
Average wastewater flow per home/REU	250 gpd/home (UCL)
8-inch PVC gravity sewer slope	0.40% min.
10-inch PVC gravity sewer slope	0.28% min.
Drop manhole provided	2 ft. or greater differential
Minimum manhole depth	5.0 ft.
Force main velocities (min)/(max)	2.5 fps/4.5 fps
Gravity line peaking factor	250%
Pump station peaking factor	250%
Single or double sewer service lateral	As required
Maximum gravity sewer trench depth	12 ft. in to pump station (target 10 ft. max.)
Gravity sewer line and manhole bedding	12-in. thick granite stone

The use of gravity sewers is usually the preferred option to provide sewer service to unsewered areas for many reasons. The gravity sewer pipes are straight and are installed on a specific horizontal and vertical alignment, with precast concrete manholes installed at a change in pipe direction and spaced no more than 300 feet to 400 feet apart on straight runs. The pipes are installed with a uniform slope, sufficient to allow for the flow of raw untreated sewage. The concrete manholes allow for access for inspection, cleaning, and repair. Construction of gravity systems within flat terrains requires deep excavations (4 ft. to 15 ft. below grade). Once a maximum allowable, or cost-effective depth is achieved, the wastewater is directed into a lift station to be pumped to another lift station or directly to the Wastewater Treatment Plant.

Some of the pros associated with gravity sewer are:

- Less maintenance required.
- Lower operation and maintenance (O & M) costs.
- More common construction method.
- High dependability/serviceability.
- Able to function even during power outages.

One challenge associated with a gravity sewer installation will be impacts to residents during construction. The trench depth, trench width, and dewatering needed for deep gravity sewer installation will consume much of the public right-of-way, resulting in inconvenience to residents, increased time for construction, and additional restoration.

The space required for gravity sewer installation on narrow rights-of-way such as portions of Hartnett Boulevard and Cameron Boulevard may be problematic, especially at greater depths. Therefore, this master plan update will endeavor to keep gravity mains shallow on the narrow road rights-of-way.

The wastewater from lift stations in the collection system will be pumped through a pressurized pipe, known as a wastewater force main, to the Forest Trails WWTP. New on-site lift or pump station(s) will consist of a concrete wet well with at least two (2) submersible non-clog sewage pumps. The operation of the pumps is controlled via level sensors within the wet well that monitor wastewater levels, activating the pump's on/off cycles. One pump can handle 100% of the needed flows while the other pump provides full redundancy.

It has yet to be determined if each resident will be responsible for abandoning their on-site septic tank and installing a new sewer lateral (PVC pipe) from their house to the edge of their property (right-of-way) for connection to the new gravity sewer system in the road right-of-way or if this work will be part of the overall project. Therefore, the associated cost is shown on the Opinions of Cost as "potential costs".

The installation of gravity sewers within an existing community is extremely disruptive, costly, and time intensive. The construction means and methods can vary from one contractor to the next, but typically all would have on-site large excavators for digging the trenches, loaders to move excavated material, dump trucks for hauling excess material off the Isle of Palms, and several support vehicles. In addition to this activity, the Contractor will need to manage the groundwater within the trench excavations. This is required in order to "dry up" (dewater) the trench excavations so that the manholes and gravity sewer pipe can be properly installed. This is done utilizing well points (shallow wells) and on-site diesel-powered generators and pumping systems. A typical dewatering operation photo is shown within **Figures A and B**.



Figure A – Typical Dewatering Operation

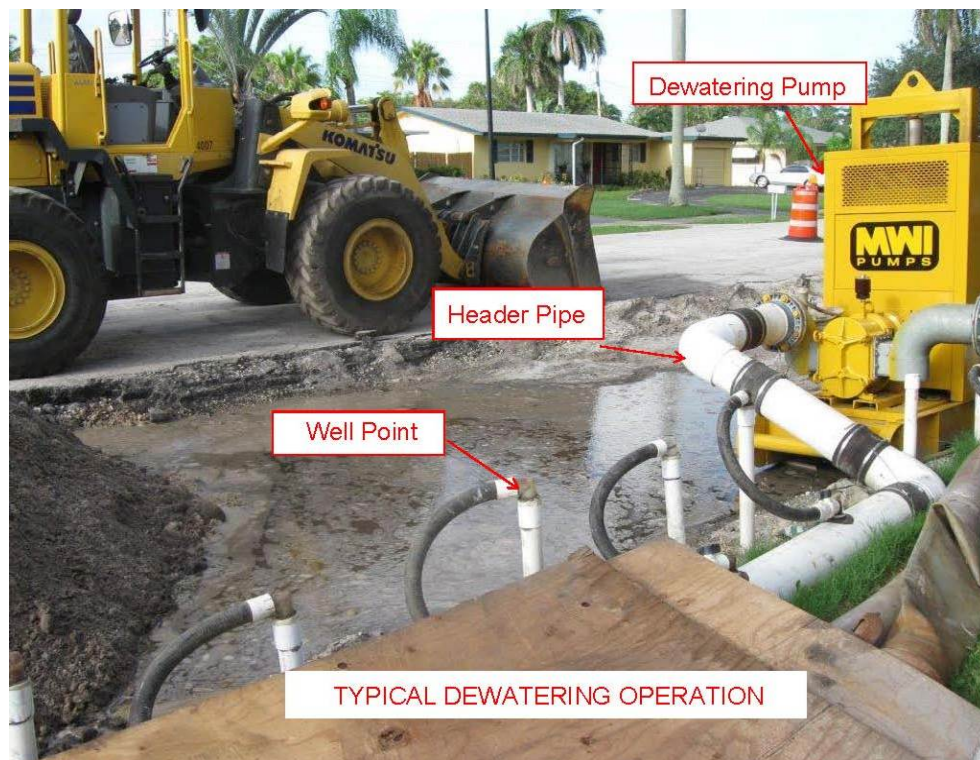


Figure B – Typical Dewatering Operation

Well points are a set of shallow small diameter wells that are typically spaced 2 feet to 6 feet apart alongside the excavation. The series of well points are connected to a common pipe header system and then to one or two engine driven pumps that remove subsurface water, thereby lowering the groundwater table within that immediate area. This dewatering operation then discharges the pumped groundwater to an acceptable point of discharge, away from the construction activities.

The dewatering operations may significantly slow down the construction progress due to the extra effort required and possible pump or header pipe failures, unanticipated extended pump times to dry up the trench and even residents shutting off the pumps in the evening, thereby stopping construction for the following day. It is a messy and noisy operation that the Island residents need to be aware of.

In order to maintain the excavations and install the gravity sewers at the proposed slopes, dewatering of the area around the construction zone is imperative in order to achieve a dry trench condition. Piping installed in wet trenches often cannot be properly bedded or cannot be placed at the proper slope, both of which result in long-term maintenance challenges. Due to the close proximity of groundwater to the surface on the Island, which is tidally influenced, dewatering is required throughout the project duration for gravity sewer installation. The dewatering operation is typically a 20-hour to 24-hour, 7-days per week operation in order to maintain groundwater levels for construction purposes. The nearby residents should be made aware that dewatering operations will result in noise impacts and some inconveniences in the handling of the dewatering waters.

Handling of the dewatered groundwater as referenced previously, will slow the construction progress and prolong the construction timeframe. In some locations, the Isle of Palms has a sparse, or even non-existent, storm drainage system with little to no swale system that could act as an outfall or as a filtrating/buffering system prior to discharge. The existing drainage system is, therefore, not conducive to consistent and convenient discharge of dewatering waters. An estimate of cost for dewatering using well points is included in the estimate in Attachment 1 "Basis of Estimates – Collection System".

An estimate of the needed equalization (EQ) storage at the plant site required for buildout flows follows this page.

Equalization (EQ) Tank/Basin Design Ultimate Conditions
Forest Trails WWTP

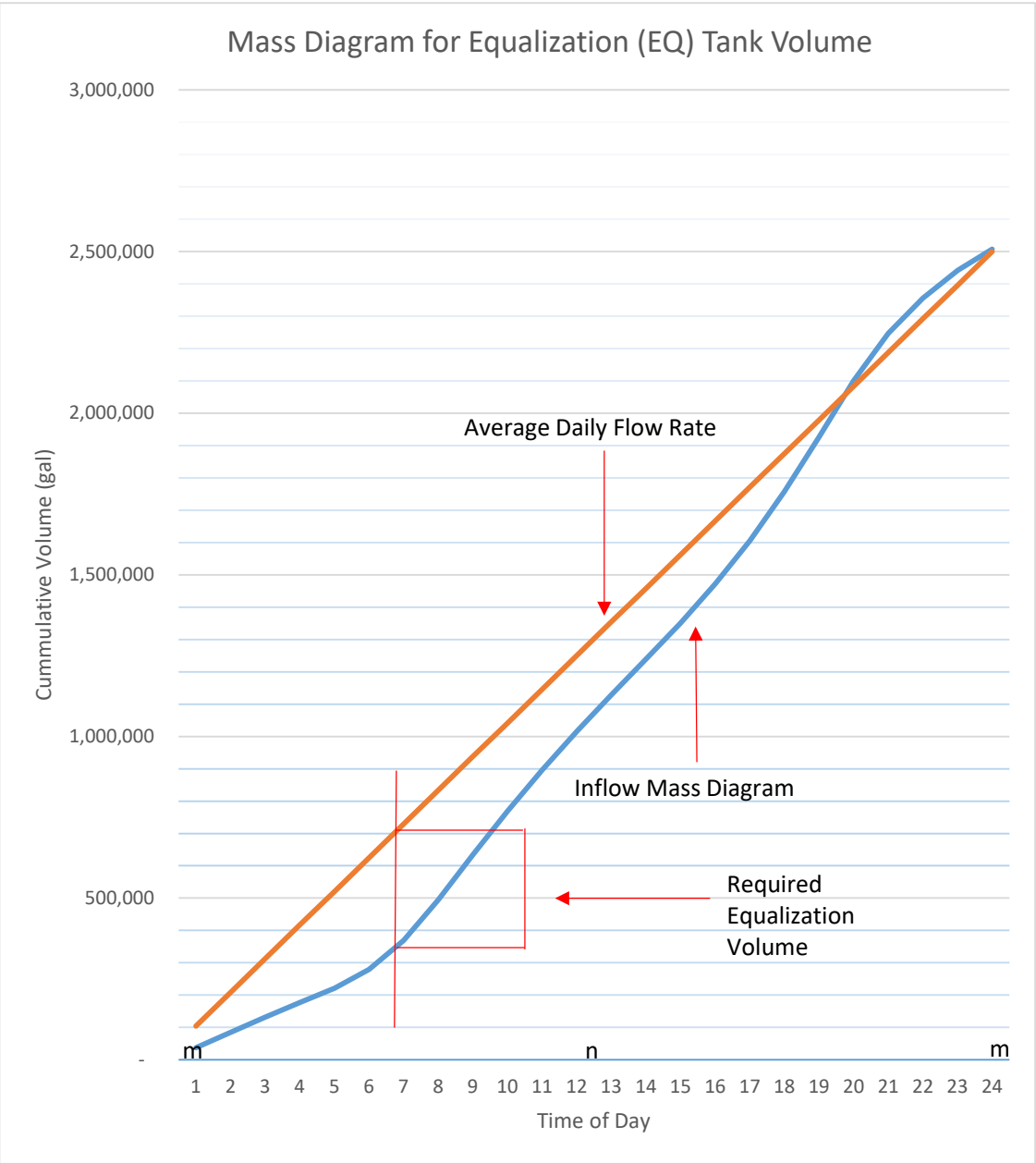
Time	Variable Flow Factor Option 1	Variable Flow Factor Option 2	Variable Flow Factor Option 3	Average of Options 1, 2 & 3	Base Flow	Hourly Flow (gal)	Cumulative Inflow	Cumulative Average Hourly Flowrate	Average Hourly Flowrate	Difference
Midnight	0.45	0.22	0.40	0.36	1.00	37,153	37,153	104165	104,165	67,012
1	0.43	0.56	0.38	0.46	1.00	47,569	84,722	208330	104,165	123,608
2	0.41	0.60	0.35	0.45	1.00	47,222	131,944	312495	104,165	180,551
3	0.42	0.52	0.35	0.43	1.00	44,792	176,736	416660	104,165	239,924
4	0.45	0.42	0.40	0.42	1.00	44,097	220,833	520825	104,165	299,992
5	0.53	0.67	0.50	0.57	1.00	59,028	279,861	624990	104,165	345,129
6	0.74	0.83	1.00	0.86	1.00	89,236	369,097	729155	104,165	360,058
7	1.02	1.13	1.45	1.20	1.00	125,000	494,097	833320	104,165	339,223
8	1.10	1.46	1.45	1.34	1.00	139,236	633,333	937485	104,165	304,152
9	1.09	1.48	1.35	1.31	1.00	136,111	769,444	1041650	104,165	272,206
10	1.04	1.41	1.20	1.22	1.00	126,736	896,181	1145815	104,165	249,634
11	0.98	1.35	1.10	1.14	1.00	119,097	1,015,278	1249980	104,165	234,702
12	0.90	1.30	1.05	1.08	1.00	112,847	1,128,125	1354145	104,165	226,020
13	1.02	1.19	1.00	1.07	1.00	111,458	1,239,583	1458310	104,165	218,727
14	1.13	1.07	1.00	1.07	1.00	111,111	1,350,694	1562475	104,165	211,781
15	1.27	1.11	1.10	1.16	1.00	120,833	1,471,528	1666640	104,165	195,112
16	1.45	1.20	1.20	1.28	1.00	133,681	1,605,208	1770805	104,165	165,597
17	1.70	1.28	1.40	1.46	1.00	152,083	1,757,292	1874970	104,165	117,678
18	1.97	1.37	1.55	1.63	1.00	169,792	1,927,083	1979135	104,165	52,052
19	2.10	1.29	1.60	1.66	1.00	173,264	2,100,347	2083300	104,165	(17,047)
20	1.55	1.16	1.50	1.40	1.00	146,181	2,246,528	2187465	104,165	(59,063)
21	0.97	0.97	1.20	1.05	1.00	109,028	2,355,556	2291630	104,165	(63,926)
22	0.72	0.77	1.00	0.83	1.00	86,458	2,442,014	2395795	104,165	(46,219)
23	0.54	0.64	0.7	0.63	1.00	65,278	2,507,292	2499960	104,165	(7,332)

2,499,960

Projected Ultimate Flow (PMF)	2,500,000	gpd
Minimum EQ Volume Required	360,058	gallons
Contingency EQ Volume	72,012	gallons
Total EQ Volume	432,069	gallons
Total EQ Volume Needed	435,000	gallons
Less Existing EQ Volume	300,000	gallons
Ultimate New EQ Volume Needed	135,000	gallons

20%

Note
PMF is the average flow during the 4-highest month duration - Summer season
At 2.7 mgd need anohter 200,000 gallons of EQ (25% Contingency)
At 2.5 mgd need anohter 150,000 gallons of EQ (25% Contingency)





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ATTACHMENT 4 SEWER MASTER PLAN UPDATE SUPPORT

ABBREVIATIONS AND ACRONYMS

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

ABBREVIATIONS AND ACRONYMS

- Annual Average Daily Flow (AADF)=
 - Total flow during a 12-month period divided by 365 days.
- Peak Day Flow (PDF)=
 - Maximum flow received in a continuous 24-hour period.
- Peak Month Flow (PMF)=
 - Maximum flow received in the highest one month expressed on a daily basis.
- Peak Week Flow (PWF)=
 - Maximum flow received in a 7-day (1 week) period expressed on a daily basis.
- Average Flow of the 4 Highest Monthly Flows for the year (AMF High) =
 - Average of the 4 highly monthly flows expressed on a daily basis.
- Average Flow of the 8 Lowest Monthly Flows for (AMF Low) =
 - Average of the 8 lowest monthly flows expressed on a daily basis.

The following abbreviations or acronyms may be used in this document:

AA	Annual average
AADF	Annual average daily flow
ADF	Average day flow
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
CBOD	Carbonaceous biochemical oxygen demand
Cl ₂	Chlorine
COD	Chemical oxygen demand
EPA	United States Environmental Protection Agency
EQ	Equalization
FEMA	Federal Emergency Management Agency
FIRM	Flood insurance rate map
gal	Gallons
gpd	Gallons per day
gpm	Gallons per minute
hp	Horsepower
HRT	Hydraulic retention time
I&C	Instrumentation and controls
I/I	Inflow and infiltration
kWh	Kilowatt-hour
L	Liter
LF	Linear feet
MBR	Membrane bioreactor
MCC	Motor control center
MCL	Maximum contaminant level
MG	Million gallons
mg/L	Milligram per liter
mgd	Million gallons per day
MLSS	Mixed liquor suspended solids

mm	Millimeter
NPDES	National Pollutant Discharge Elimination System
PDF	Peak day flow
PF	Peaking factor
PMF	Peak month flow
PWF	Peak week flow
PS	Pump station
psf	Pounds per square foot
psi	Pounds per square inch
Q	Flow
RAS	Return activated sludge
SCADA	Supervisory Control and Data Acquisition
SF	Square foot
SS	Stainless Steel
SWD	Side water depth
TS	Total solids
TSS	Total suspended solids
UV	Ultraviolet
WAS	Waste activated sludge
WWTF	Wastewater treatment facility
WWTP	Wastewater treatment plant
YR	Year



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ATTACHMENT 5 SEWER MASTER PLAN UPDATE

FLOW PROJECTIONS

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

Isle of Palms Wastewater Flow Projections
Based upon Units

October 18, 2018

Based Upon Units at 250 gpd							
Description	Units	UCL (gpd)	ADF (gpd)	Hours of Operation	ADF (gpm)	PF	Peak Flow (gpm)
Existing Residential Accounts	3,075	250	768,750	24	534	2.5	1335
Existing Commerical Accounts	125	540	67,500	12	94	3.0	281
Unsewered Lots	1,346	250	336,500	24	234	2.5	584
REU's from master accounts	690	250	172,500	24	120	2.5	299
Wild Dunes PD Growth Remaining	340	250	85,000	24	59	2.5	148
Misc. Flow increases	150	250	37,500	24	26	2.5	65
Infill/Other Growth	160	250	40,000	24	28	2.5	69
TOTAL			1,507,750		1,094		2782

Notes

1. UCL is Unit Contributory Loading
2. Existing Commerical is based upon a UCL of 300 gpd with an Equivalent Residential Unit Factor of 1.8 or 540 gpd.
3. REU's from master accounts provide d by others from billing historical information

PROJECTED FLOW RANGES BASED UPON UNITS

Average Wastewater Flow Ranges				Based Upon Population		Averages - Rounded	
1,510,000	gpd	at 250 pgd/unit		1,535,000	gpd	at 250 gpd/unit	1,530,000 gpd
1,810,000	gpd	at 300 gpd/unit		1,892,000	gpd	at 300 gpd/unit	1,830,000 gpd
Average Wastewater Flow Ranges PMF Peak Month (PF 1.5)				Based Upon Population		Averages - Rounded	
2,265,000	gpd	at 250 pgd/unit		2,321,700	gpd	at 250 gpd/unit	2,300,000 gpd
2,715,000	gpd	at 300 gpd/unit		2,628,700	gpd	at 300 gpd/unit	2,700,000 gpd
Average Wastewater Flow Ranges PWF - Peak Week (PF 1.8)				Based Upon Population		Averages - Rounded	
2,718,000	gpd	at 250 pgd/unit		2,763,000	gpd	at 250 gpd/unit	2,740,000 gpd
3,258,000	gpd	at 300 gpd/unit		3,315,600	gpd	at 300 gpd/unit	3,300,000 gpd

Based Upon Units at 300 gpd							
Description	Units	UCL (gpd)	ADF (gpd)	Hours of Operation	ADF (gpm)	PF	Peak Flow (gpm)
Existing Residential Accounts	3,075	300	922,500	24	641	2.5	1602
Existing Commerical Accounts	125	650	81,250	12	113	3.0	339
Unsewered Lots	1,346	300	403,800	24	280	2.5	701
REU's from master accounts	690	300	207,000	24	144	2.5	359
Wild Dunes PD Growth Remaining	340	300	102,000	24	71	2.5	177
Misc. Flow increases	150	300	45,000	24	31	2.5	78
Infill/Other Growth	160	300	48,000	24	33	2.5	83
TOTAL			1,809,550		1,313		3339

Notes

1. UCL is Unit Contributory Loading
2. Existing Commerical is based upon a UCL of 360 gpd with an Equivalent Residential Unit Factor of 1.8 or 650 gpd.
3. REU's from master accounts provide d by others from billing historical information

Isle of Palms Wastewater Flow Projections
Wastewater Flow Projection Based Upon Population
December 18, 2018

Population (year-round)

2010 Census	4,133
2016 ACS Demographic Housing Estimate	4,320
Percent Change	4.53%
Change Per Year	32/year

Housing Units

	2010	2017	Change	Change/Year
Total Census	4,274	4,372	98	14
Occupied Housing Units	1,828	1,880	52	8
Vacant Housing Units	2,446	2,492	46	7
Persons per Unit	2.26			

Units Based Upon Accounts (2018)

Existing Residential Accounts	3,075
Unsewered Lots	1,346
Total	4,421

4,421 units x 250 gpd/unit = 1,105,250 gpd

500 units of growth x 2.26 gpd/unit = 1,130 persons (growth)

4,320 + 1,130 in growth = 5,450 x 250 gpd/unit = 1,362,500 gpd + master REUs (690 REUs x 250 gpd) = 1,535,000 gpd

5,450 x 300 gpd/unit = 1,635,000 gpd + master REUs (690 REUs x 300 gpd) = 1,842,000 gpd

Summer population increase (12,000 persons (estimated by IOP)-4,133 persons) = 7,867 persons
7,867 persons x 100 gpd/person = 786,700 gpd

Average Wastewater Flow Ranges

Low 1,535,000 gpd

High 1,842,000 gpd

Peak Month Wastewater Ranges (by population increase)

Low 1,535,000 gpd + 786,700 gpd = 2,321,700 gpd

High 1,842,000 gpd + 786,700 gpd = 2,628,700 gpd

Peak Month Wastewater Ranges (by multiplying by PMF)

Low 1,535,000 gpd * 1.5 = 2,302,500 gpd

High 1,842,000 gpd * 1.5 = 2,763,000 gpd

Peak Week Wastewater Ranges (by multiplying by PWF)

Low 1,535,000 gpd * 1.8 = 2,763,000 gpd

High 1,842,000 gpd * 1.8 = 3,315,600 gpd

Isle of Palms Wastewater Flow Projections

Period 2018 thru 2034

Assuming sewerage the unsewered areas occurs in 7 phases

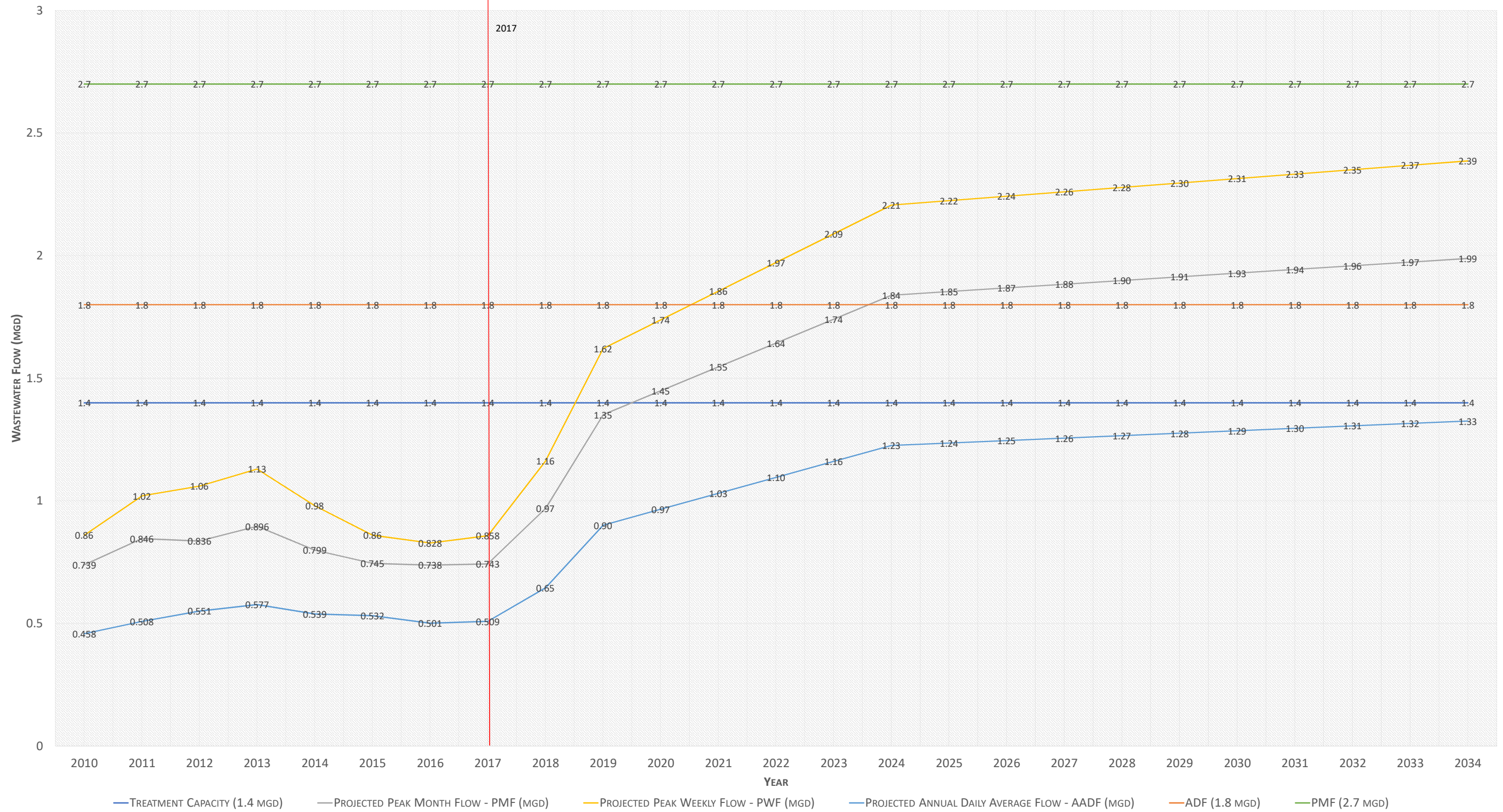
Year	Treatment Capacity	Projected Peak Day Flow - PDF (mgal)	Projected Peak Month Flow - PMF (mgd)	Projected Peak Week Flow - PWF (mgd)	Projected Annual Average Daily Flow - AADF (mgd)	ADF	PMF
2010	1.4	0.965	0.739	0.86	0.458	1.8	2.7
2011	1.4	1.113	0.846	1.02	0.508	1.8	2.7
2012	1.4	1.110	0.836	1.06	0.551	1.8	2.7
2013	1.4	1.220	0.896	1.13	0.577	1.8	2.7
2014	1.4	1.040	0.799	0.98	0.539	1.8	2.7
2015	1.4	0.948	0.745	0.86	0.532	1.8	2.7
2016	1.4	1.026	0.738	0.828	0.501	1.8	2.7
2017	1.4	1.286	0.743	0.858	0.509	1.8	2.7
2018	1.4	1.36	0.97	1.16	0.65	1.8	2.7
2019	1.4	1.89	1.35	1.62	0.90	1.8	2.7
2020	1.4	2.03	1.45	1.74	0.97	1.8	2.7
2021	1.4	2.16	1.55	1.86	1.03	1.8	2.7
2022	1.4	2.30	1.64	1.97	1.10	1.8	2.7
2023	1.4	2.44	1.74	2.09	1.16	1.8	2.7
2024	1.4	2.57	1.84	2.21	1.23	1.8	2.7
2025	1.4	2.59	1.85	2.22	1.24	1.8	2.7
2026	1.4	2.62	1.87	2.24	1.25	1.8	2.7
2027	1.4	2.64	1.88	2.26	1.26	1.8	2.7
2028	1.4	2.66	1.90	2.28	1.27	1.8	2.7
2029	1.4	2.68	1.91	2.30	1.28	1.8	2.7
2030	1.4	2.70	1.93	2.31	1.29	1.8	2.7
2031	1.4	2.72	1.94	2.33	1.30	1.8	2.7
2032	1.4	2.74	1.96	2.35	1.31	1.8	2.7
2033	1.4	2.76	1.97	2.37	1.32	1.8	2.7
2034	1.4	2.78	1.99	2.39	1.33	1.8	2.7

Isle of Palms Wastewater Historical Flows & Peak Factors (PF)

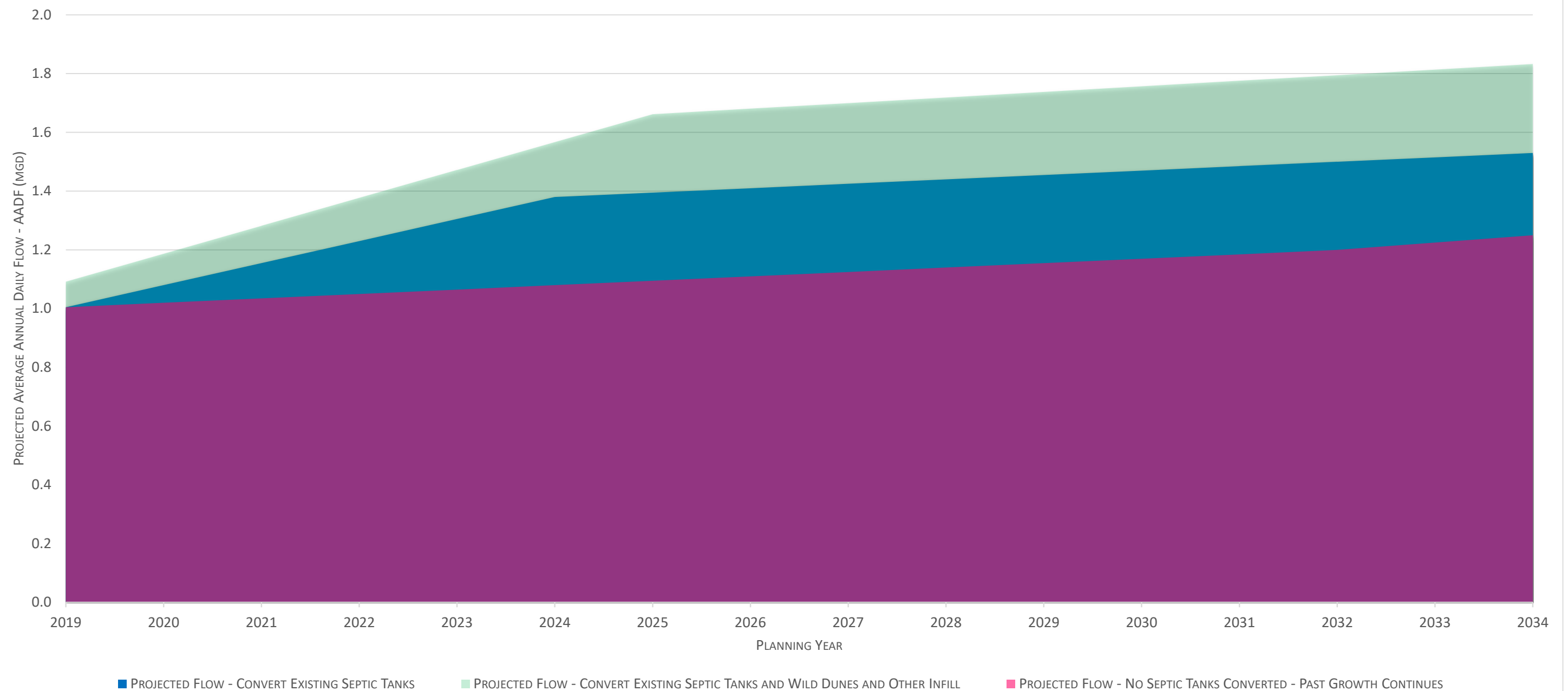
for the Period 2010 thru 2017

Year	Average Daily Flow for 8 Lowest Months - AMF low (mgd)	Peak Day Flow - PDF (mgal)	Peak Month Flow - PMF (mgd)	Monthly Average Flow for 4 Highest Months AMF high (mgd)	Peak Week Flow - PWF (mgal)	Peak Week Flow on Average Day Basis - PWF (mgd)	Annual Average Daily Flow - AADF(mgd)	PF Average Daily Flow for 8 Months	PF Peak Day Flow	PF Peak Month Flow	PF High Monthly Average Flow for 4 months	PF Peak Week Flow	PF Peak Week Flow on Average Day Basis
2010	0.382	0.965	0.739	0.609	6.031	0.86	0.458	0.83	2.11	1.61	1.88	13.17	1.88
2011	0.414	1.113	0.846	0.698	7.124	1.02	0.508	0.81	2.19	1.67	2.01	14.02	2.01
2012	0.403	1.110	0.836	0.719	7.443	1.06	0.551	0.73	2.01	1.52	1.92	13.51	1.92
2013	0.487	1.220	0.896	0.801	7.918	1.13	0.577	0.84	2.11	1.55	1.96	13.72	1.96
2014	0.465	1.040	0.799	0.688	6.825	0.98	0.539	0.86	1.93	1.48	1.82	12.66	1.82
2015	0.431	0.948	0.745	0.640	6.107	0.86	0.532	0.81	1.78	1.40	1.62	11.48	1.62
2016	0.437	1.026	0.738	0.631	5.796	0.828	0.501	0.87	2.05	1.47	1.65	11.57	1.65
2017	0.438	1.286	0.743	0.724	6.006	0.858	0.509	0.86	2.53	1.46	1.69	11.80	1.69
Average	0.43	1.09	0.79	0.69	6.66	0.95	0.52	0.83	2.09	1.52	1.82	12.74	1.82

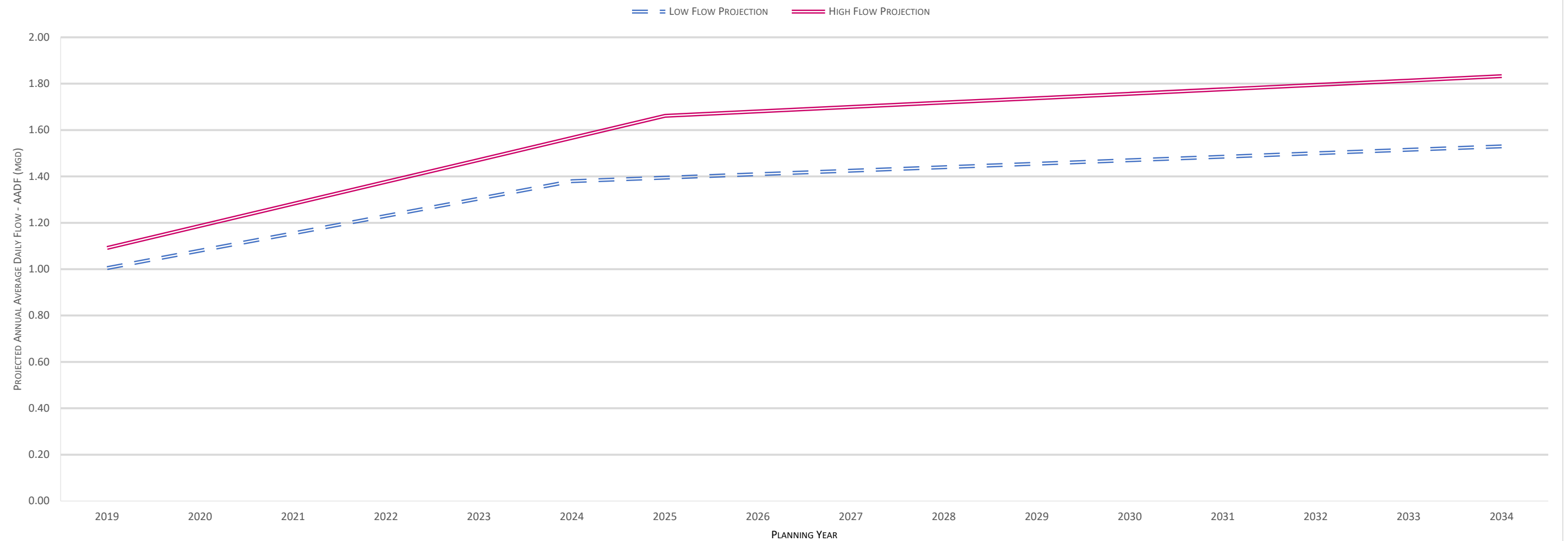
ISLE OF PALMS, SC
HISTORICAL AND PROJECTED WASTEWATER FLOWS



FOREST TRAILS WASTEWATER TREATMENT PLANT (WWTP) SEWER FLOW PROJECTIONS **PROJECTED AVERAGE ANNUAL WASTEWATER FLOWS** **SEWER UNSEWERED AREAS (SEWER EXTENSION PLANNING PERIOD)**



FOREST TRAILS WWTP
PROJECTED TOTAL SYSTEM AVERAGE DAILY FLOW VARIATION
SEWER UNSEWERED - SEPTIC TANKS CONVERTED





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ATTACHMENT 6

SEWER MASTER PLAN UPDATE

DRAWINGS

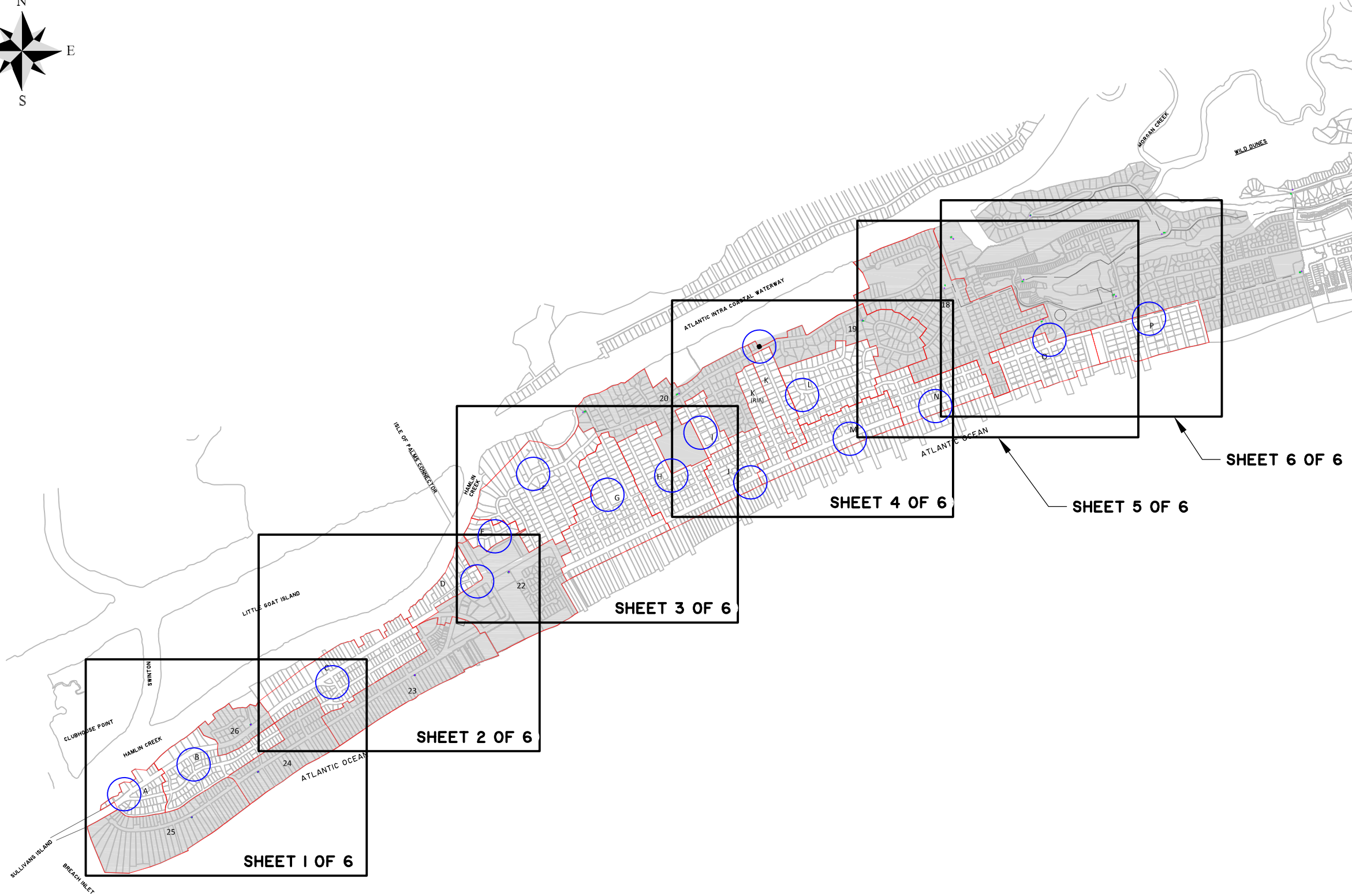
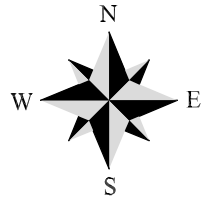
- a. Gravity Basin Exhibits (11"x17") Sheets 1-6
- b. Pump Station Schematic
- c. WWTP

Prepared for:
ISLE OF PALMS WATER & SEWER COMMISSION AND
THE CITY OF ISLE OF PALMS

J – 27294.0000

December 2018

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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER

PLAN UPDATE
BASIN EXHIBIT

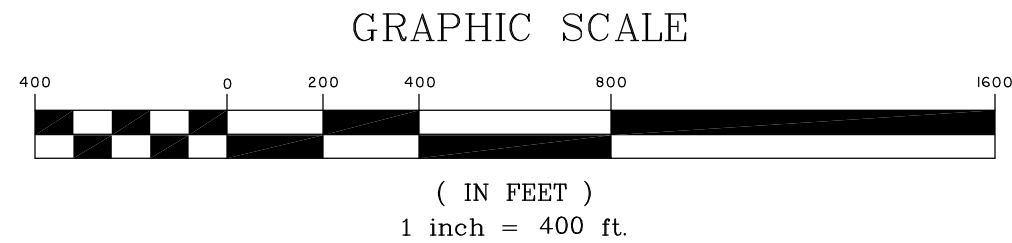
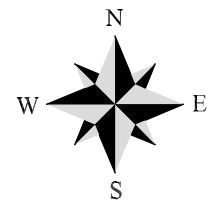
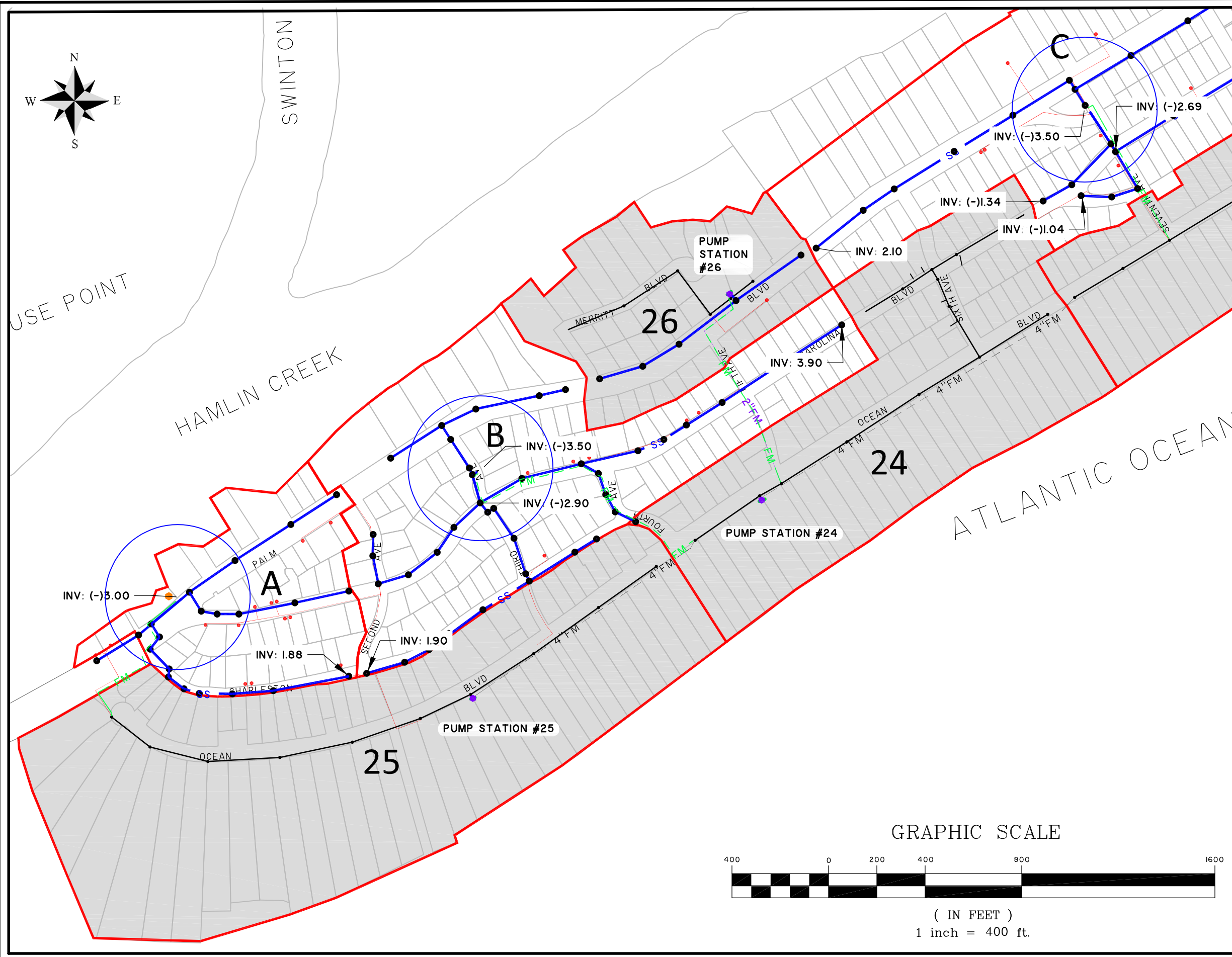
CLIENT:
IOPWSC

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: OVERALL LAYOUT
REVIEWED BY: MFY SCALE: 1" = 2000'



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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER

PLAN UPDATE

BASIN EXHIBIT

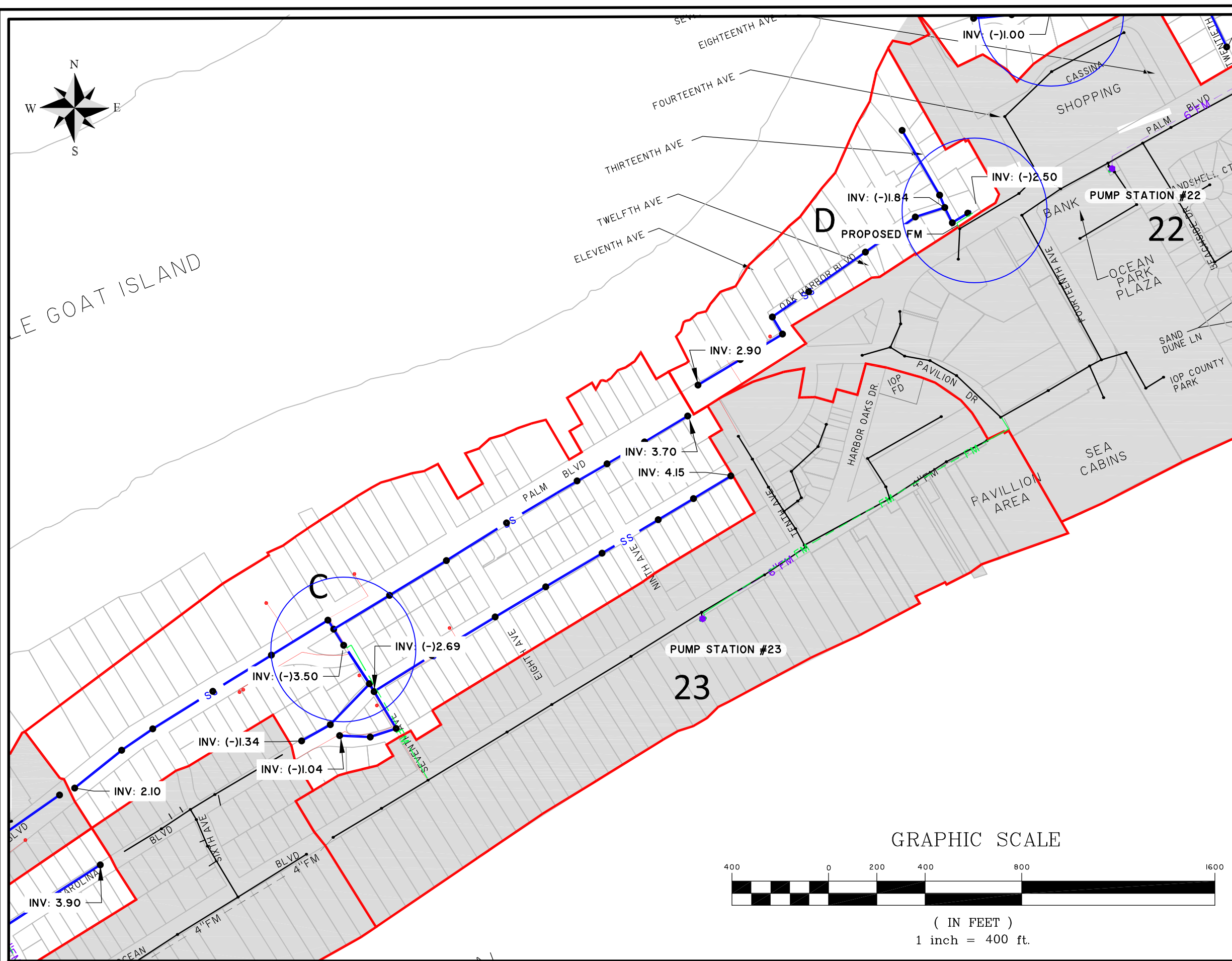
CLIENT:
IOPWSC

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: 1 OF 6
REVIEWED BY: MFY SCALE: 1" = 400'

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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER

PLAN UPDATE
BASIN EXHIBIT

CLIENT:

IOPWSC

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: 2 OF 6
REVIEWED BY: MFY SCALE: 1" = 400'

GRAPHIC SCALE



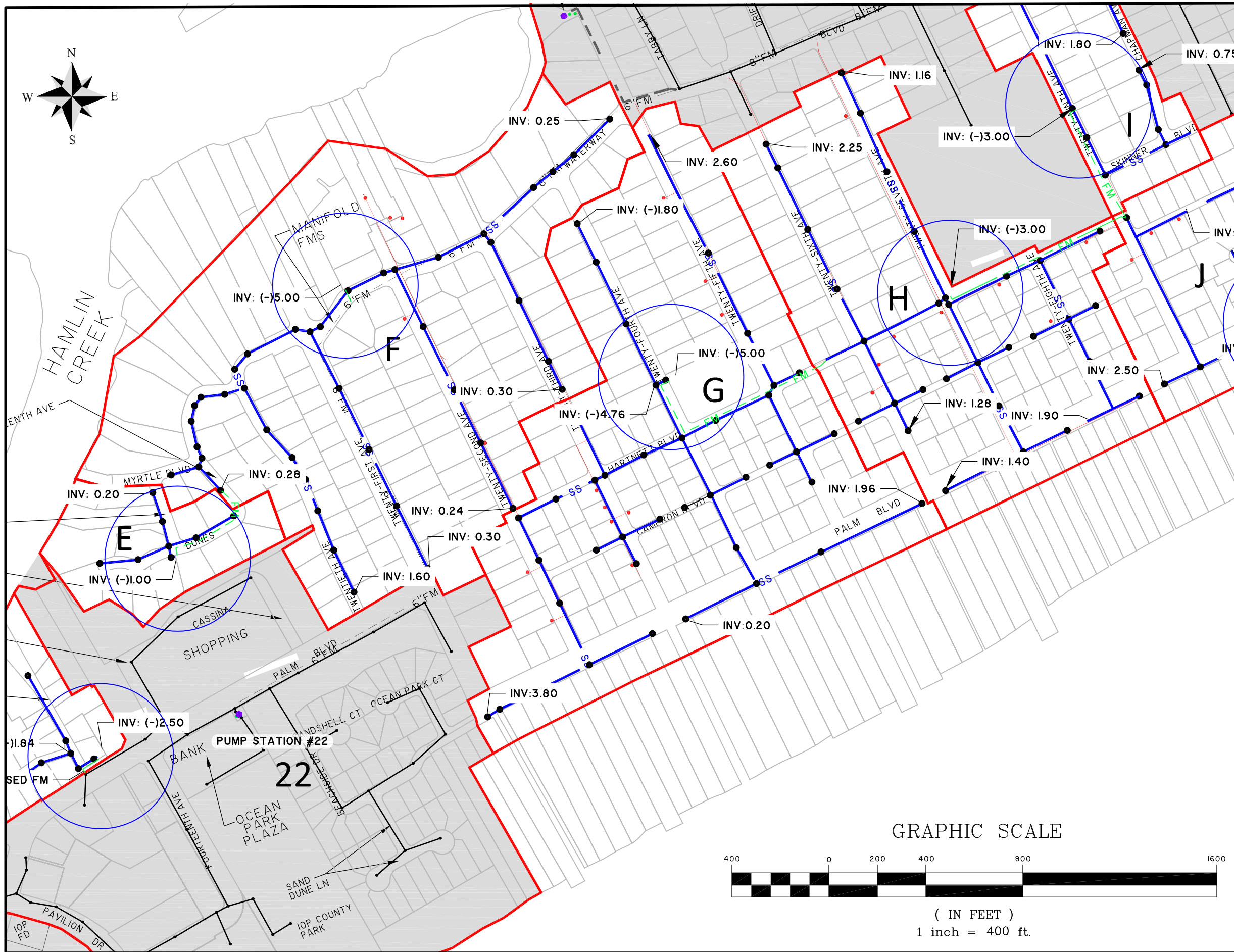
(IN FEET)
1 inch = 400 ft.

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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER
PLAN UPDATE
BASIN EXHIBIT

CLIENT:
IOPWSC

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: 3 OF 6
REVIEWED BY: MFY SCALE: 1" = 400'

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SEWERED AREA (HATCH)

EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN

EXISTING GRAVITY SEWER

EXISTING FORCEMAIN

EXISTING PUMP STATION

PROPOSED GRAVITY SEWER

PROPOSED FORCEMAIN

PROPOSED PUMP STATION VICINITY

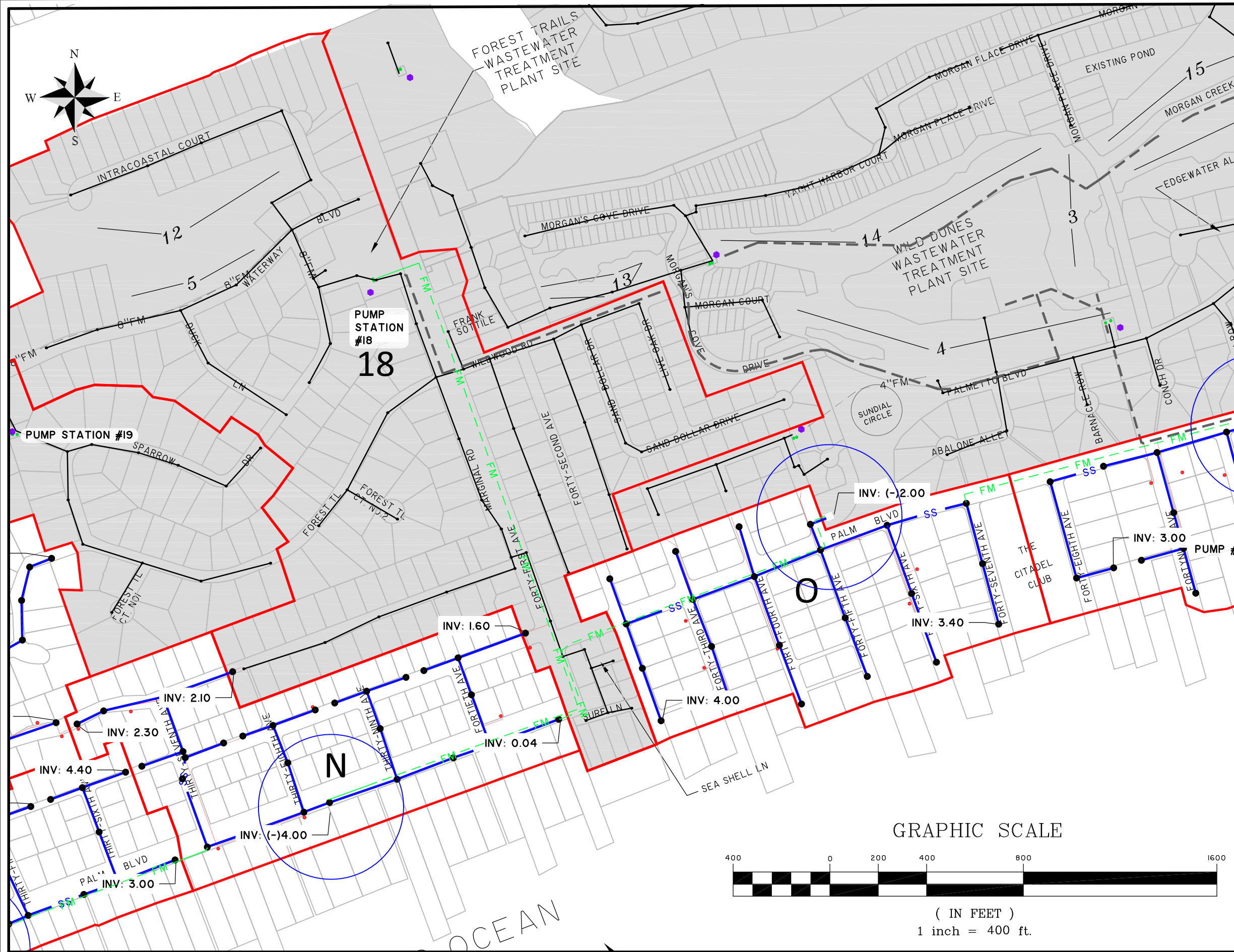
PS SERVICE AREA

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: 4 OF 6
REVIEWED BY: MFY SCALE: 1" = 400'



(IN FEET)
1 inch = 400 ft.

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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER

PLAN UPDATE
BASIN EXHIBIT

CLIENT:

IOPWSC

LOCATION: CHARLESTON COUNTY, SC

DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529

DRAWN BY: CGB SHEET: 5 OF 6

REVIEWED BY: MFY SCALE: 1" = 400'



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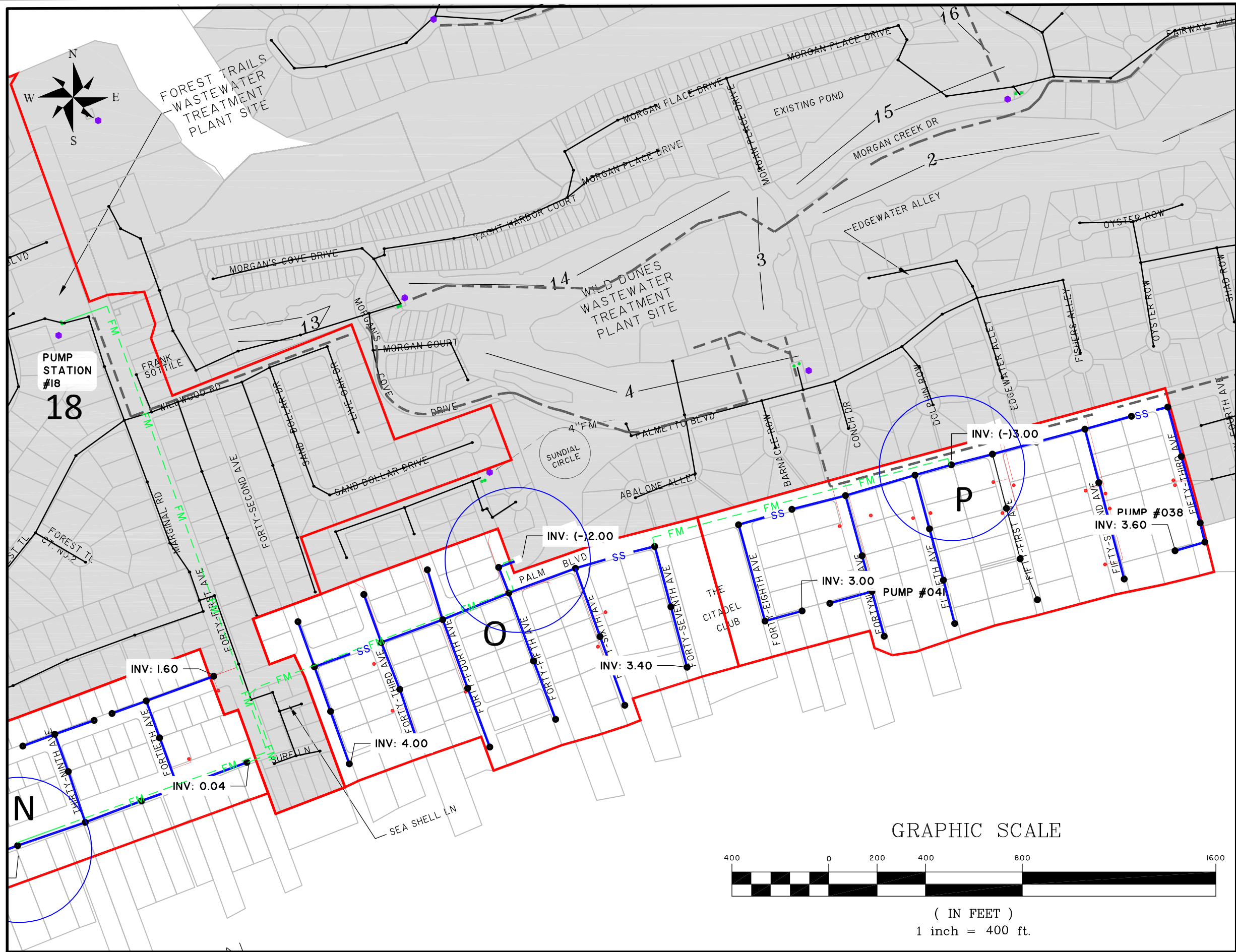
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GRAPHIC SCALE



(IN FEET)
1 inch = 400 ft.

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LEGEND

- SEWERED AREA (HATCH)
- EXISTING RESIDENTIAL / COMMERCIAL GRINDER PUMP SYSTEM INTO FORCE MAIN
- EXISTING GRAVITY SEWER
- EXISTING FORCEMAIN
- EXISTING PUMP STATION
- PROPOSED GRAVITY SEWER
- PROPOSED FORCEMAIN
- PROPOSED PUMP STATION VICINITY
- PS SERVICE AREA

IOPWSC SEWER MASTER

PLAN UPDATE
BASIN EXHIBIT

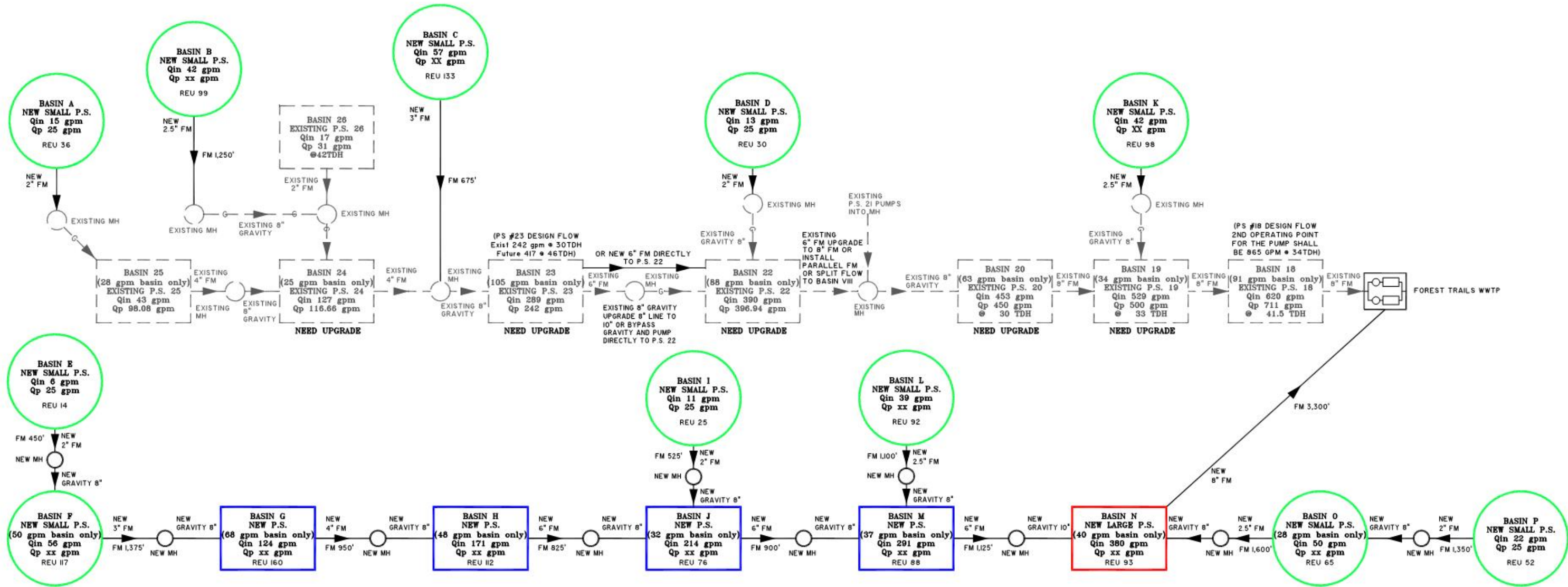
CLIENT:

IOPWSC

LOCATION: CHARLESTON COUNTY, SC
DATE: 12/19/18 Rev.01 JOB NUMBER: 27294/27529
DRAWN BY: CGB SHEET: 6 OF 6
REVIEWED BY: MFY SCALE: 1" = 400'



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SEWER MASTER PLAN UPDATE

ISLE OF PALMS, SC
PUMP STATION SCHEMATIC

CLIENT:
IOPWSC & CITY OF IOP

LOCATION: CHARLESTON COUNTY, SC
DATE: DECEMBER 2018
JOB NUMBER: J-27294

DRBY: CGB
RVWD: MFY
1 OF 1



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SMALL PUMP STATION
30' X 30' SITE
6' WETWELL

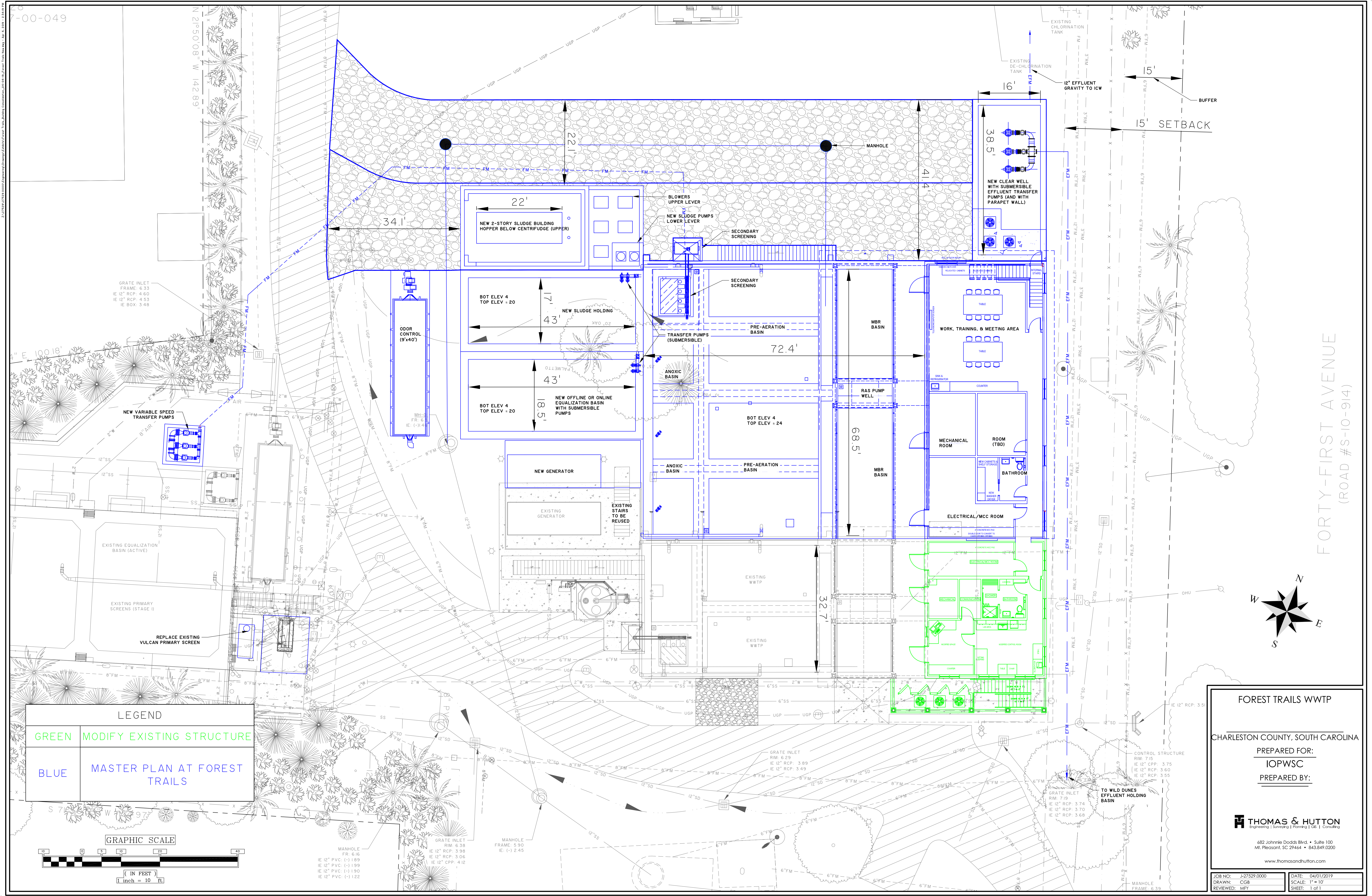


MEDIUM PUMP STATION
40' X 40' SITE
8' WETWELL



LARGE PUMP STATION
50' X 50' SITE
8' TO 10' WETWELL

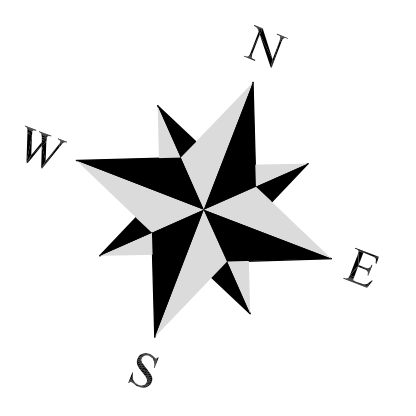
NOTE:
IOPWSC APPROVED UCL = 245 GPD



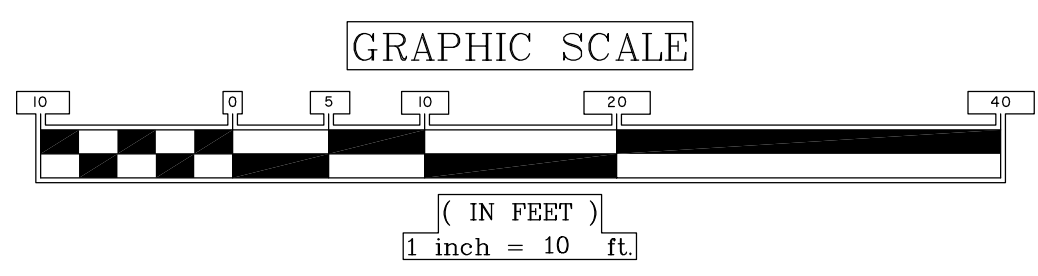
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FORTY-FIRST AVENUE
(ROAD #S-10-914)



LEGEND	
GREEN	MODIFY EXISTING STRUCTURE
BLUE	MASTER PLAN AT FOREST TRAILS



FOREST TRAILS WWTW

CHARLESTON COUNTY, SOUTH CAROLINA

PREPARED FOR:
IOPWSC

PREPARED BY:

THOMAS & HUTTON
Engineering | Surveying | Planning | GIS | Consulting

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JOB NO: J-27529.0000
DRAWN: CGB
REVIEWED: MFY

DATE: 04/01/2019
SCALE: 1"=10'
SHEET: 1 of 1