WRIGHT-PIERCE
Engineering a Better Environment

Memorandum

Date: **10/19/2022**

Project No.: **21129**

To: **Raymond Page, Francisco Pavez**

From: **Kelly Wehner, PE, Don McCullers**

Subject: **Tarpon Springs Bayshore Drive Septic to Sewer Evaluation**

Introduction and Objective

Wright-Pierce (WP) is assisting the City of Tarpon Springs (the City) with an evaluation for providing a cost-effective solution to transition homes along Bayshore Drive from onsite sewage systems (septic tanks) to the City's wastewater collection network. This area is considered a priority for septic to sewer conversion because of the proximity to environmentally sensitive surface waters including Kreamer Bayou and the Anclote River, the age of the septic tanks, and the soil conditions. Septic tank systems have a negative impact on the environment and can introduce increased nutrient loadings to natural water bodies. Conversion to either a gravity sewer system or a low-pressure sewer system (LPSS) would reduce the likelihood of additional nutrient loading reaching the surrounding water bodies.

The City would like to expand the wastewater collection system into two sections of Bayshore Drive shown in Figure 1. The first section, referred to as the north section, includes 36 parcels and extends east along the Anclote River and Kreamer Bayou. The second section of Bayshore Drive, referred to as the south section, includes 24 parcels and is located along Kreamer Bayou between De Soto Way and Sunset Drive. The sewer expansion in both of these areas will connect into the adjacent sewer collection system that ultimately flows to the Bayshore Heights Lift Station (LS).

Sewer Alternatives

This technical memorandum (TM) presents an evaluation of LPSSs and gravity sewer systems for the Bayshore Drive areas. The main difference between a LPSS and a gravity sewer system is the method of conveying the wastewater. For an LPSS, each homeowner pumps their own sewage via a small pump station located on their property. For a gravity sewer system, the wastewater flows by gravity from the house to manholes that direct the flow to a centralized downstream lift station.

Low-Pressure Sewer

Two types of LPSSs include the effluent pump system and the low-pressure grinder pump. Neither requires any modification to plumbing inside the house. In the effluent pump systems, wastewater flows into a conventional septic tank to capture solids. The liquid effluent from the septic tank flows to a separate holding tank containing a pump and control devices. The effluent is then pumped and transferred to a downstream collection system or treatment system. Retrofitting existing septic tanks in areas served by septic tank/drain field systems would seem to present an opportunity for cost savings, but a large number, and often the majority, of the tanks must be replaced or expanded over the life of the system because of insufficient capacity, deterioration of tanks, or leaks. In addition, the tanks still must have solids removed by a pumper truck on a routine basis.


North Bayshore Study Area
South Bayshore Study Area
N
WW City Lift Station
WW Manhole
LPSS Connection
WW System Valve
WW Gravity Main
WW Pressure Main
Bayshore Drive Septic to Sewer Evaluation
Tarpon Springs, Florida
PROJ NO: 21129
DATE: 8/22/2022
WRIGHT-PIERCE
Engineering a Better Environment
FIGURE: 1
Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

In a LPSS, sewage flows to a basin where a grinder pump grinds the solids and discharges the sewage into a pressurized pipe system that discharges to either a downstream manhole or lift station. These units typically pump wastewater to the discharge system three or four times each day. A LPSS grinder pump station is expected to last 15-20 years, on average.

Although retrofitting existing septic tanks in areas served by septic tank/drain field systems with effluent pump systems would seem to present an opportunity for cost savings, a large number, and often the majority, of the existing tanks must be replaced or expanded over the life of the system because of insufficient capacity, deterioration of tanks, or leaks. In addition, the tanks still need to have solids removed by a pumper truck on a routine basis. In addition, as previously mentioned, the City has an existing LPSS that serves a portion of Bayshore Drive. For these reasons, effluent pump systems were removed from further analysis, and our evaluation only includes the LPSS and conventional gravity sewers.

Several advantages of implementing a LPSS include less construction and restoration costs by means of shallower trenches, less dewatering, and smaller pipe sizing, which equates to a lower overall cost to install the force main network. The installation time for each grinder pump station is relatively quick. LPSSs have little to no infiltration which saves on wastewater treatment and disposal costs. LPSS can be used for both flat and steeply sloping terrain, and the installation does not depend on the natural topography of the area to convey wastewater, which simplifies the sewer alignment and installation. One of the disadvantages of LPSSs is the pumping unit is typically purchased, installed and maintained by the homeowner.

Grinder pump selection is essential to reducing O&M and equipment replacement costs. There are various manufacturers of grinder pumps and associated equipment for LPSSs. Equipment manufactured by E/One was the basis of design for this analysis because of the company's history, prevalence, and performance in the low-pressure sewer industry. Although the analysis was based upon the E/One model WH101F with a wet well / storage capacity of 70 gallons, there are larger capacity options available. According to E/One, the WH101F unit can manage flow from an average single-family home and has a maximum operational capacity of 700 gallons per day. All E/One packages utilize the same 1 horsepower, 240-volt, progressing cavity pump for easy replacement and maintenance, and the housing and components are made of stainless steel and thermoplastic construction for corrosion resistance. A typical E/One grinder station is shown in Figure 2, while an installed grinder station with flood proof cover and vent is shown in Figure 3.

Figure 2 Simplex Grinder Pump Station

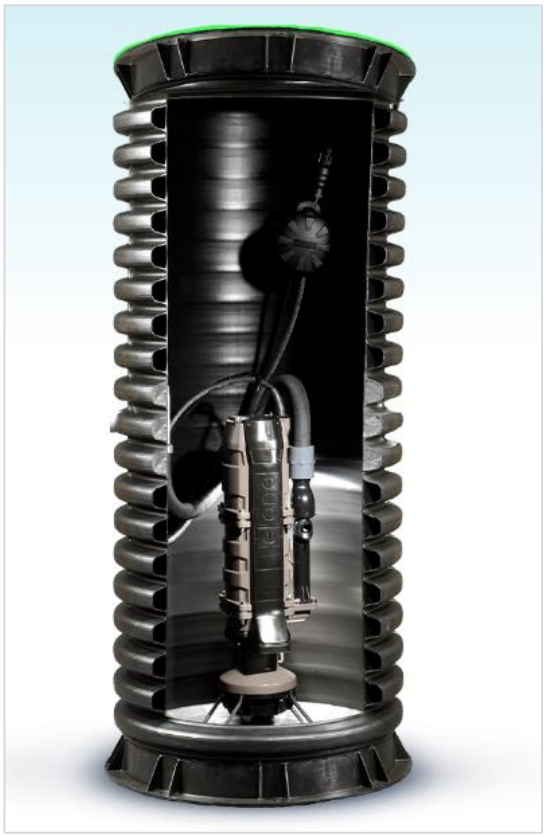


Figure 3 Grinder Pump Station Flood Proof Cover and Vent

Gravity Sewer

The most traditional method of wastewater transference is the use of gravity sewers. The wastewater flows from the house through a lateral pipe that is sloped to allow consistent flow out to the larger gravity sewer. The gravity sewer then transports the wastewater to a lift station via interconnected manholes. Once the flow reaches the lift station, it is pumped downstream to the next sewage collection basin, and ultimately the City's Advanced Wastewater Treatment Facility.

The majority of the advantages of a gravity sewer system are related to the minimal upkeep and maintenance needed after construction is completed. Gravity sewer systems can be installed with costs borne by the governing entity or assessments to property owners can be implemented to offset costs. For gravity sewer systems, the homeowner pays for, installs, and maintains the lateral pipe, which is generally 4-inches in diameter and connects to the public sewer system at the right-of-way (ROW) or property line.

Some of the disadvantages of gravity sewer systems can be the high capital cost from the initial construction, and larger pipe sizes used. In areas where there is limited natural slope, deeper manholes are required to keep the slope; as a result, excavation cost can be relatively high. Deeper trenches are required to install pipes and manholes that must be a minimum of three feet below grade. Due to the constant slope of the piping, the depth of each manhole increases with length. With deeper trenches comes increased dewatering and restoration costs. In Florida gravity systems also require lift stations, which is an additional expense for the land, design, and construction. The stations are generally located in the lowest points of the system, which may not always be a feasible or ideal location. Although gravity sewers have no mechanical parts and usually have low operation and maintenance (O&M) costs, in some cases the gravity system may require several lift stations to convey the flow to a master lift station or treatment plant, which increases the O&M costs for the utility.

Description of Existing Conditions

Existing utilities, flood elevations and roadway conditions were examined for both areas of Bayshore Drive. The location of wastewater, potable water and stormwater facilities are based upon City Geographic Information System (GIS) data, while electric and cable facilities are based upon street view maps and field observations.

North Bayshore

South of the intersection with W Bayshore Drive on the west side of Bayshore Drive, is the termination point of an existing LPSS. According to City GIS data, the system includes a 4-inch PVC force main that travels south to connect into the manhole at Bayshore Drive and De Soto Way. Existing potable water facilities in the project area include a 6-inch cast iron (CI) water main traveling from the south, which crosses Bayshore Drive on the east side at the intersection of West Bayshore Drive. The 6-inch cast iron main turns east and continues on the north side of Bayshore Drive until it passes 919 Bayshore Drive, where it crosses to the south side and continues to the end of the road. The pipe then reduces to a 4-inch diameter asbestos cement pipe that loops to the south to connect to the 4-inch piping along Casamia Circle. The project area includes fire hydrants located just south of the Bayshore Drive and W Bayshore Drive intersection, east of Casamia Circle, and at the end of Bayshore Drive.

From the City's GIS, there are two stormwater inlets on the street, one located on the north side of the road by 949 Bayshore Drive and one directly south between 944 and 948 Bayshore Drive. Both inlets drain to the south through an 18-inch reinforced concrete pipe that discharges to Kreamer Bayou.

Power and network cables appear to be aerial, mainly on the north side of the street, until crossing to the south side of the street west of the private gated area.

The Bayshore Drive Road ROW is 60 feet wide for the majority of the project limits. However, the ROW on Casamia Circle condenses to 50 feet, as well as the section of Bayshore Drive east of Casamia Circle. The overall condition of the roadway appears fair and is visibly old and weathered with cracks and patches. The number of driveways on each side of the street is roughly equal.

According to the Federal Emergency Management Agency (FEMA) Panel dated August 24, 2021, the north section of Bayshore Drive includes areas located within Zone AE (100-year flood) and Zone X (500-year flood). Zone AE includes a base flood elevation of 9. In addition, there is a small area at the intersection of Bayshore Drive and W Bayshore Drive located outside of the flood hazard areas. Elevations within the limits of the north section range from 4 to 15 feet.

South Bayshore

Just north of the South Bayshore project area at approximately 770 Bayshore Drive is the termination point of an existing LPSS. The system includes a 4-inch PVC force main that travels north along the east side of the street and crosses Bayshore Drive to connect into the manhole at De Soto Way. A 6-inch polyvinyl chloride (PVC) water main follows the east side of Bayshore Drive through the area and includes two hydrants. There are storm inlets in the vicinity but are located just north of the study area boundary. Overhead power and cable lines are mainly located on the east side of Bayshore Drive in this section.

The ROW is 60 feet wide for the length of the southern portion in consideration. The east side of the street has more driveways that could be impacted by construction. The overall state of the road appears fair and is visibly old and weathered with cracks and patches.

Most of the south section falls within FEMA Zone AE, with a base flood elevation of 9 feet. However, there is a slightly elevated area between 750 and 745 Bayshore Drive that is within FEMA Zone X, and a small inner point outside of the flood plain. Elevations within the limits of the south section range from 4 to 13 feet.

Design Flows

According to the United States Census Bureau, Tarpon Springs has 2.27 persons per household, which for the purposes of this calculation, have been rounded up to 2.5 persons per household. According to the *Recommended Standards for Wastewater Facilities* (Ten States Standards) and the Florida Department of Environmental Protection (FDEP), wastewater facilities should be sized utilizing an average daily flow of 100 gallons per capita per day. A peaking factor (PF) should then be applied to accommodate infiltration and inflow and other unknowns. For this analysis, the PF was calculated based upon the Harmon formula from the Ten State Standards to estimate the peak hourly flow rate for each section of Bayshore. The calculation below shows the estimated peak hourly flow rate in gallons per minute (gpm) for the north section of Bayshore. Table 1 summarizes the resulting flows for both sections of Bayshore.

$$Peak\ Hourly\ Flow = 36\ lots * \frac{2.5\ persons}{lot} * \frac{100\ gal}{cap/day} * 4.26\ \text{PF} = 38{,}340\frac{gal}{day} = 27\ gpm$$

Table 1 Estimated Flows for Bayshore Drive Sewer Expansion

Item	Number
North Bayshore Section	
Number of Lots / New Connections	36
Average Daily Flow per Connection (gallons per day)	250
Average Daily Flow (gallons per day)	9,000
Peaking Factor	4.26
Peak Hourly Flow (gpm)	27
South Bayshore Section	
Number of Lots / New Connections	24
Average Daily Flow per Connection (gallons per day)	250
Average Daily Flow (gallons per day)	6,000
Peaking Factor	4.3
Peak Hourly Flow	18

Bayshore Heights Lift Station

As previously mentioned, the Bayshore Heights LS will ultimately receive the additional flows from the Bayshore Drive sewer expansion. The LS is a 6-foot diameter duplex station that currently receives flow from the existing sewer connections along Bayshore Drive, De Soto Way, Cajeput Loop, and parcels along West Bayshore Drive north of Loquat Drive. The 2017 Bayshore Heights record drawings indicate the LS pumps have a design point of 180 gpm at 27.5 feet (ft) of total dynamic head (TDH). According to the City, the station was installed with the capacity to handle an additional 75 to 100 homes. A drawdown test was conducted at the LS on August 10, 2022 with City staff. Table 2 shows the results from the drawdown tests, where each pump was tested individually to determine the actual pumping rate and TDH. At the time of testing, the volume of water entering the wet well was not sufficient to test both pumps at the same time. The drawdown information is necessary to establish existing daily flows and anticipate the impact that connecting 60 additional residential properties will have on this downstream lift station.

Table 2 Bayshore Height LS Drawdown Test Summary

Pump No.	Test No.	Drawdown Rate (gpm)	Fill Rate (gpm)	Total Dynamic Head (ft)	Total Pumping Rate (gpm)
1	1	235	15.8	29	251
	2	219	9.7	29	229
	Average	**226.9**	**12.8**	**29**	**240**
2	1	176	8.7	29	185
	2	244	7.9	29	252
	Average	**210**	**8.3**	**29**	**218**

WP utilized the average pumping rates from the drawdown test with pump run time hours provided by the City to estimate average and maximum daily pump volumes from January 2021 through July 2022. Table 3 summarizes the existing estimated average and maximum flow per day pumped from the station during this time period.

Table 3 Bayshore Heights LS Existing Estimated Daily Flow

Item	Flow (gallons per day)
Average Daily Flow	7,227
Maximum Daily Flow	12,132

Based upon the observed drawdown pumping rates from Table 2, the estimated existing flows listed in Table 3, and the additional depth / storage volume built into the wet well shown in the record drawings, it appears the Bayshore Heights LS is capable of accommodating the flow from 60 additional sewer connections.

Gravity Sewer Alternative

South Bayshore

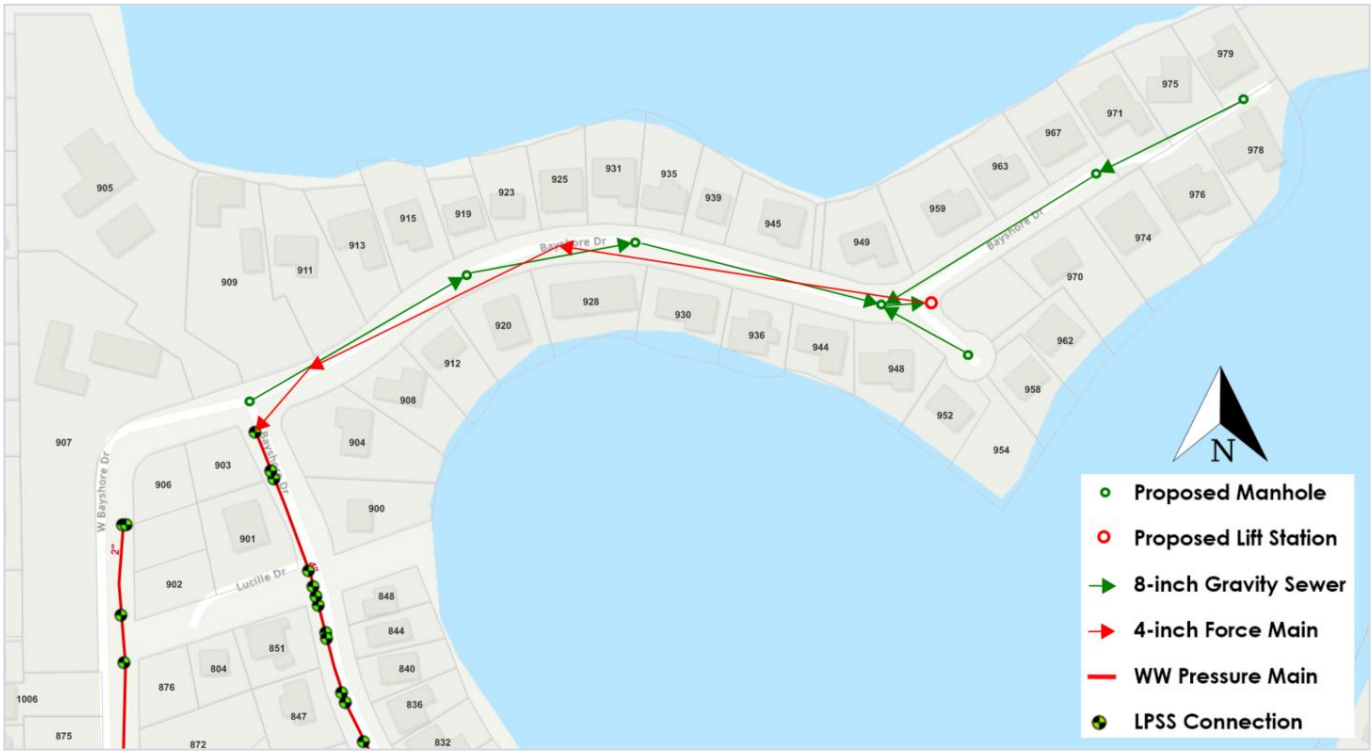
Connection to the gravity sewer network is not feasible for the south section of Bayshore Drive due to the insufficient depth of the existing manhole located between 721 and 717 Bayshore Drive. The required manhole depth for connection to all the parcels would be 9-feet, 5-inches deep, and the existing manhole is only 3-feet, 7-inches deep.

North Bayshore

For the north section of Bayshore Drive, the proposed gravity system includes 2,000 linear feet (LF) of 8-inch PVC pipe and 1,080 LF of 6-inch PVC lateral pipe (utilizing a lateral distance of 30 feet from the center of the ROW). The 8-inch gravity sewer pipe includes a minimum slope of 0.4 feet per 100 feet, to reach a minimum velocity of 2.0 feet per second (fps) when flowing full, according to Ten State Standards and Tarpon Springs Code of Ordinance. Seven manholes are proposed along the route, with one at every change in direction and at a maximum distance of 400 feet. Because of the topography, a lift station is required at the lowest elevation near the corner of Bayshore Drive and Casamia Circle. Because of the elevation at this location, the lift station control panel may need to be elevated for protection and access during flooding.

The force main extending from the proposed lift station will include approximately 1,300 LF of 4-inch PVC that will tie into the existing low-pressure force main located just south of the intersection at Bayshore and W Bayshore. A schematic of this proposed collection system is shown in Figure 4.

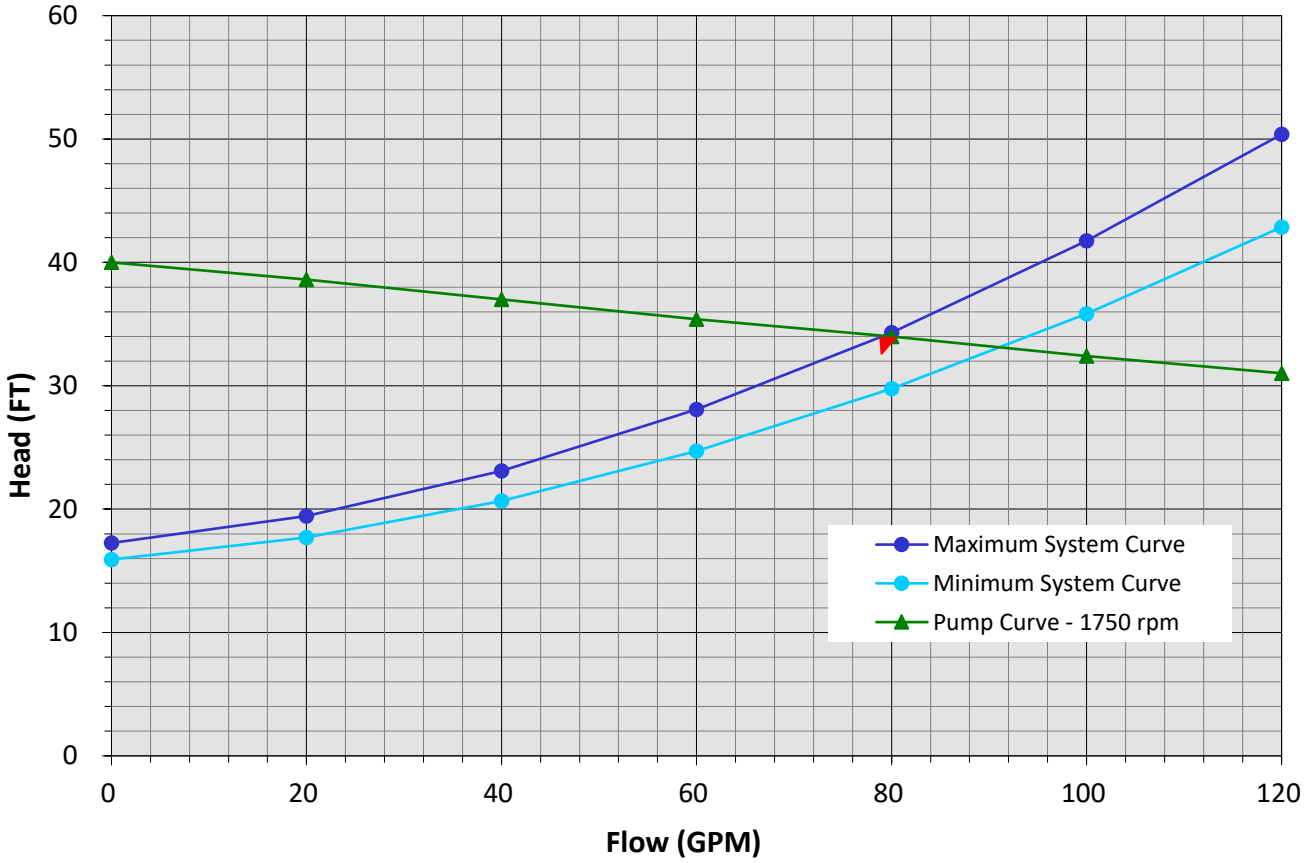
Figure 4 North Bayshore Gravity Sewer Schematic



The existing low-pressure force main includes approximately 760 feet of 4-inch PVC that discharges into the manhole at Bayshore Drive and De Soto Way. Hydraulic calculations with a design pumping rate of 78 gpm were completed utilizing the new and existing force main lengths, diameters and elevations based upon the City's GIS data. Although the peak hourly flow of 27 gpm was estimated for the area, a design pumping rate of 78 gpm was utilized to provide a minimum flushing velocity of 2.0 fps within the new force main. System curves were developed using Hazen-Williams C-factors of 120 and 135, with high and low wet well level conditions. According to the E/One Pressure Sewer System Design Manual, the estimated maximum number of grinder pumps operating simultaneously is 4 for systems with 10 to 18 connections. As a result, the analysis included four grinder pump stations in operation at a rate of 12 gpm each (48 gpm total) within the existing low-pressure force main. Figure 5 displays the system head curves for the two operating conditions and the selected pump curve.

Since the TDH resulting from the flow within the new force main from the lift station and the existing low-pressure force main is less than 185 ft (maximum head for the E/One grinder pump), the pressure and flow resulting from the new lift station connection should not cause any issues for the downstream system. In addition, the supplementary flow from the lift station may benefit the existing force main by providing higher velocities for flushing.

Figure 5 Flow vs. Head Curve for Proposed Lift Station



A preliminary pump was selected based upon the estimated system head curve. The design criteria of the chosen pump are summarized In Table 4.

Table 4 Selected Pump Specifications

Item	Description
Pump Type	Submersible, solids handling pumps
Number of Units	2 (1 duty, 1 standby)
Design Flow Capacity	78 gpm
Design Total Head	34 feet
Motor	3 HP; 1750 RPM; 230 Volt, 3 phase, 60 Hz
Constant / Variable Speed	Constant Speed
Manufacturer, Model	Myers 3WHVX (explosion-proof)
Wet Well	6-foot diameter, concrete with protective liner or coating

Item	Description
Control Type	Radar with backup floats
Emergency Power	Receptacle for emergency generator connection only

The required volume of the wet well was determined by using an average 10-minute pump cycle time (six starts per hour) and the design pumping rate of 78 gpm. The minimum working volume for each pump at the station is 196 gallons. For a 6-foot diameter wet well, that results in an operating depth of 0.93 vertical feet. The total depth from ground level to the bottom of the wet well is 11.2 feet. Table 5 lists the proposed operating levels for the wet well.

Table 5 Proposed North Bayshore Lift Station Wet Well Levels

Level	Elevation (feet)
Ground Elevation	6.25
Invert of Influent Sewer	-0.54
High Level Alarm	-1.04
Lag Pump On	-1.54
Lead Pump On	-2.04
All Pumps Off	-2.97
Low Level Alarm	-3.47
Bottom of Wet Well	-4.97

Low-Pressure Alternative

North and South Bayshore

Grinder pump packages intake far less infiltration than traditional gravity sewer systems. In the FDEP's Design and Specification Guidelines for Low Pressure Sewer Systems, an average flow generation of 70 gallons per capita per day (gpcd) is expected. To be conservative, however, the same 100 gpcd value that was used for the gravity sewer system will also be used for this flow estimation. Instead of a peaking factor, LPSSs use the maximum number of grinder pumps operating simultaneously to determine the flow within the system, based on how many total connections there are. According to the E/One Pressure Sewer System Design Manual, the estimated maximum number of grinder pumps operating simultaneously is six for systems with 31 to 50 connections (north section), and five for systems with 19 to 30 connections (south section).

The typical semi-positive displacement grinder pump operates with low discharge rates (8-12 gpm) and high head (150+ ft). For the system TDH estimation, it was assumed flow from the operating pumps was located the furthest away from the downstream discharge point (worst-case). The following additional information was utilized for the analysis:

- Low-pressure Force Main Size: 4-inch
- Hazen-Williams C-factor: 120
- Depth of Grinder Pump: 5 ft below grade
- Static Head of Grinder Pump: 3 ft
- Maximum Pumping Rate of Grinder Pump: 12 gpm, each
- North Section
  - Pipe Length: 2,000 LF
  - Total Connections: 50 (including existing connections)
  - Maximum Number of Grinder Pumps Operating Simultaneously: 6
- South Section
  - Pipe Length: 1,050 LF
  - Total Connections: 27 (including existing connections)
  - Maximum Number of Grinder Pumps Operating Simultaneously: 5

As shown in the hydraulic evaluation results in Table 6, the estimated system pressures are well below the 185 ft maximum TDH from the manufacturer.

Table 6 Estimated Grinder Pump Hydraulics

Area	Maximum Flow (gpm)	Maximum Velocity (fps)	Estimated Total Dynamic Head (ft)[1]
North Section	72	1.8	29
South Section	60	1.5	22

Note:
1. Lateral losses estimated at 5 ft not included

As part of the design, an air release valve is recommended at the high point along the low-pressure force main, which will be located at the connection to the existing LPSS, just south of the intersection of Bayshore Drive and W Bayshore Drive. In addition, flushing connections are recommended at branch ends, connections, and every 1,000 feet.

Conceptual-Level Opinion of Probable Construction Cost

For each alternative, a conceptual-level engineer's opinion of probable construction cost (EOPCC) was developed using standard cost estimating procedures consistent with industry standards utilizing conceptual layouts, budgetary quotes from equipment vendors and unit cost information from previous bids of similar projects. The project costs presented is in current dollars and is based on the July 2022 Engineering News Record (ENR) Construction Cost Index (CCI) of 13167. In addition, the EOPCC is based upon the American Association of Cost Engineering (AACE) Level 4, which includes an accuracy of -30% to +50%.

As shown in Table 7, the conceptual-level EOPCC for the gravity sewer alternative in North Bayshore is $1,932,700. This cost does not include any easement or land acquisition for the necessary lift station. The EOPCC for the low-pressure system in North Bayshore is $510,700 for the public infrastructure portion of the project, as detailed in Table 8. The EOPCC for the low-pressure system in South Bayshore is $308,900 for the public infrastructure portion of the project, as detailed in Table 9. The costs are summarized in Table 10 for comparison.

Table 7 North Bayshore Gravity System EOPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Mobilization/Demobilization (5%)	1	LS	$68,500	$68,500
8-inch PVC Sewer	2,000	LF	$150	$300,000
3 ft Depth Manhole	5	EA	$7,500	$37,500
4 ft Depth Manhole	1	EA	$8,500	$8,500
5 ft Depth Manhole	1	EA	$9,500	$9,500
Dewatering	1	LS	$30,000	$30,000
6-inch PVC Lateral to ROW	1,100	LF	$100	$110,000
4-inch PVC Cleanout at ROW	36	EA	$800	$28,800
6-inch x 8-inch Wye	36	EA	$150	$5,400
6-foot Diameter Wet Well and Top Slab	1	LS	$500,000	$500,000
Stone Bedding	1	LS	$7,500	$7,500
Submersible Pumps, Guide Rails, Hatches, and Instruments	1	LS	$100,000	$100,000
Lift Station Piping and Valves	1	LS	$7,500	$7,500
Concrete Driveway (6-inch-thick min.)	1	LS	$10,000	$10,000
Electrical Service	1	LS	$30,000	$30,000
Fencing and Gate	1	LS	$5,000	$5,000
4-inch C900 PVC Force Main, Restrained	1,300	LF	$100	$130,000
4-inch Gate Valve and Box	1	EA	$3,500	$3,500
Air Release Valve Assembly	2	EA	$4,500	$9,000
Connection to Existing Low-Pressure System	1	LS	$3,500	$3,500
Asphalt Restoration	120	TN	$250	$30,000
Type A Curb & Gutter	150	LF	$20	$3,000
Subtotal				**$1,437,200**
Design & Permitting	1	LS	$144,000	$144,000
Geotechnical Investigation	1	LS	$6,000	$6,000
Subsurface Utility Engineering (SUE) Locates & Survey	1	LS	$23,000	$23,000
Subtotal				**$173,000**
Contingency (20%)				$322,500
TOTAL (AND ROUNDUP)[1,2]				**$1,932,700**

Note:

1. Cost of existing septic tank abandonment or removal not included
2. Cost of land acquisition if required for new lift station not included

Table 8 North Bayshore Low-Pressure System EOPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Mobilization/Demobilization (5%)	1	LS	$16,500	$16,500
4-inch PVC (or HDPE) Force Main	2,000	LF	$100	$200,000
2-inch PVC (or HDPE) Force Main	900	LF	$50	$45,000
Shutoff and Check Valve Assembly (316 SS) at ROW with box	36	EA	$750	$27,000
2-inch Corp Stop at Connection to Main	36	EA	$200	$7,200
Flushing Connection (connection to the main, riser, caps, and box)	2	EA	$5,000	$10,000
Air Release Valve Assembly	1	EA	$4,500	$4,500
Connection to Existing Low-Pressure System	1	EA	$3,500	$3,500
Asphalt Restoration	60	TN	$250	$15,000
Type A Curb & Gutter	150	LF	$20	$3,000
Restoration (sod, incidental, etc.)	1	LS	$12,000	$12,000
Subtotal				**$343,700**
Design & Permitting	1	LS	$60,000	$60,000
Geotechnical Investigation	1	LS	$2,500	$2,500
Subsurface Utility Engineering (SUE) Locates & Survey	1	LS	$19,000	$19,000
Subtotal				**$81,500**
Contingency (20%)				$85,500
TOTAL (AND ROUNDUP)[1,2]				**$510,700**

Note:

1. Cost of existing septic tank abandonment or removal not included
2. Cost of homeowner's grinder pump station and installation not included

Table 9 South Bayshore Low-Pressure System EOPCC

Item Description	Quantity	Unit	Unit Cost	Total Cost
Mobilization/Demobilization (5%)	1	LS	$10,000	$10,000
4-inch PVC (or HDPE)	1,100	LF	$100	$110,000
2-inch PVC (or HDPE) Lateral	720	LF	$50	$36,000
Shutoff and Check Valve Assembly (316 SS) at ROW with box	24	EA	$750	$18,000
2-inch Corp Stop at Connection to Main	24	EA	$200	$4,800
Flushing Connection (connection to FM, riser, caps, and box)	2	EA	$5,000	$10,000
Connection to Existing Low-Pressure System	1	EA	$3,500	$3,500
Asphalt Restoration	30	TN	$250	$7,500
Type A Curb & Gutter	100	LF	$20	$2,000
Restoration (sod, incidentals, etc.)	1	LS	$8,000	$8,000
Subtotal				**$209,800**
Design & Permitting	1	LS	$30,000	$30,000
Geotechnical Investigation	1	LS	$1,600	$1,600
Subsurface Utility Engineering (SUE) Locates & Survey	1	LS	$16,000	$16,000
Subtotal				**$47,600**
Contingency (20%)				$51,500
TOTAL (AND ROUNDUP)[1,2]				**$308,900**

Note:
1. Cost of existing septic tank abandonment or removal not included
2. Cost of homeowner grinder pump station and installation not included

Table 10 Bayshore Sewer Expansion Cost Comparison

North Section		South Section	
Gravity	**Low Pressure**	**Gravity**	**Low Pressure**
$1,932,700[1,2]	$510,700[2,3]	Not Feasible	$308,900[2,3]

Note:
1. Cost of land acquisition if required for new lift station not included
2. Cost of existing septic tank abandonment or removal not included
3. Cost of homeowner grinder pump station and installation not included

The estimated cost of the homeowner's grinder pump station including installation is listed in **Table 11**. These costs are based upon the E/One pump system model WH101F.

Table 11 Estimated Grinder Pump Package Cost per Parcel

Item Description	Grinder Pump Station Model WH101F
Equipment plus Installation Cost[1]	$13,500
Electrical Cost[2]	$1,500
Wet Well Capacity (gallons)	70
Rated for Flow (gallons per day)	700

Note:

1. Includes basin, grinder pump, alarm panel with generator receptacle and transfer switch, flood proof cover with check vent, stainless steel lateral kit assembly and 100 foot of 1 ¼-inch service lateral
2. Estimated cost for installation of new service panel for 30-amp breaker; actual cost may vary

Regardless of the chosen alternative, a sewer impact fee of $1,616 and a tap fee of $350 is required by the City for each homeowner to connect to the sewer system. Table 12 includes the cost comparison of each alternative including the impact fees and estimated installation cost of $15,000 for the grinder pump station and associated electrical panel at each parcel.

Table 12 Bayshore Sewer Expansion Cost Comparison Including Impact Fees and Grinder Pump Package Costs

North Section		South Section	
Gravity	**Low Pressure**	**Gravity**	**Low Pressure**
$2,003,500[1,2]	$1,121,500[2]	Not Feasible	$716,100[2]

Note:

1. Cost of land acquisition if required for new lift station not included
2. Cost of existing septic tank abandonment or removal not included

Permitting Requirements

Permits anticipated to be required for the construction of the sewer expansion project include the following:

- Florida Department of Environmental Protection (FDEP) Application for Constructing a Domestic Wastewater Collection/Transmission System
- FDEP Request for Approval to Place a Domestic Wastewater Collection/Transmission System into Operation

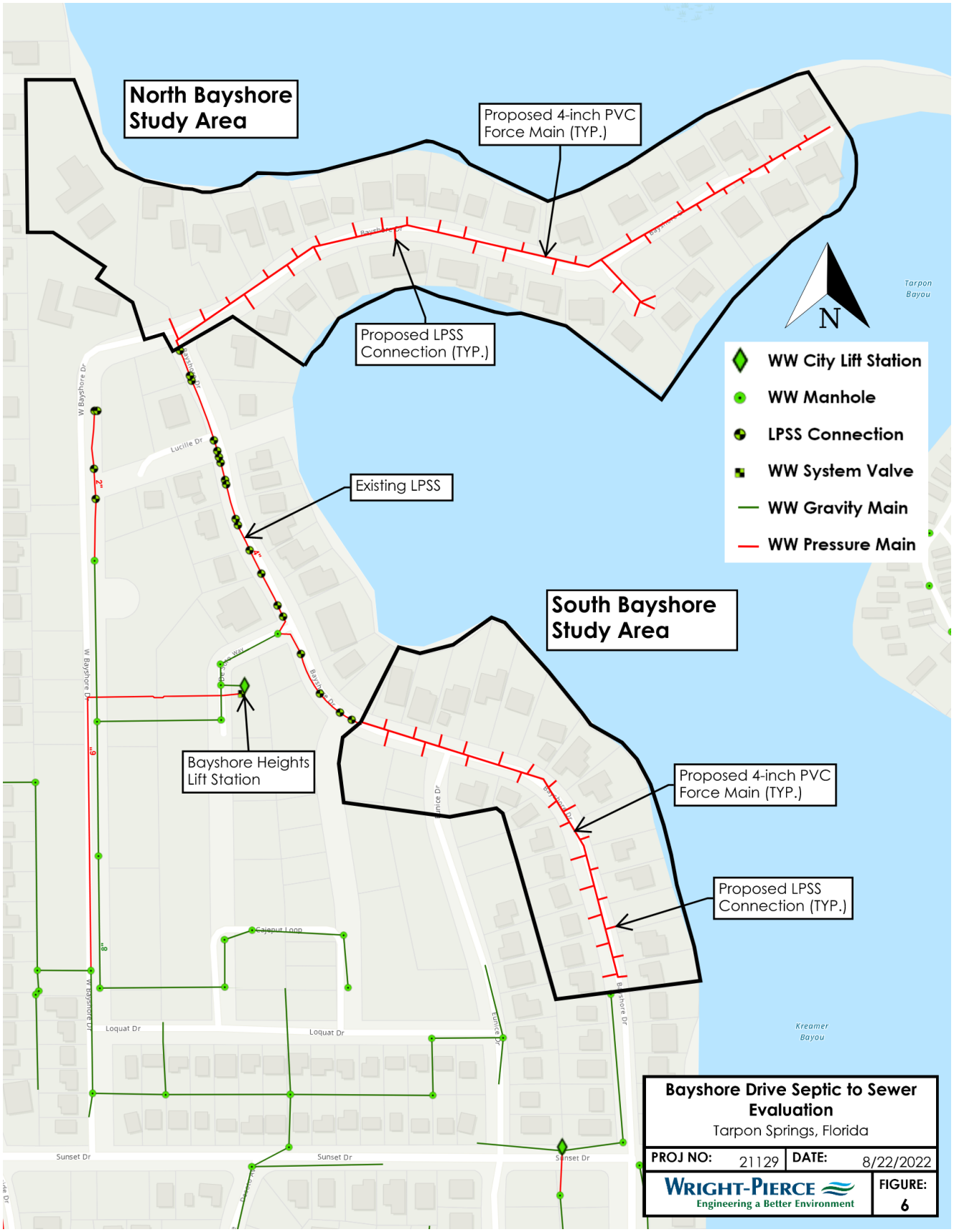
Recommendations

The advantages and disadvantages for the LPSS and the gravity sewer system alternatives are summarized in Table 13.

Table 13 Comparison of Bayshore Sewer Expansion Alternatives

Low-Pressure Sewer System		Gravity Sewer System	
Advantages	**Disadvantages**	**Advantages**	**Disadvantages**
Corresponds with existing LPSS installation on Bayshore Drive that can be expanded	Homeowner typically purchases, installs, and maintains	Low O&M cost for homeowner	Highest capital cost
Smaller pipes, narrower trenches	Power outages: 70 gallons of storage with larger capacities available	30-50 year life expectancy of pipes, manholes, wet well, etc.	Larger pipes, deeper manholes
Easier to install in high groundwater areas, reducing the cost of dewatering	15-20 year life expectancy of grinder pump; service calls expected every 3-5 years		Requires a lift station, associated land, elevated control panel, and O&M cost: 15-20 year life expectancy of pumps
Less capital cost			Longer construction time
Shorter construction times			Higher potential for infiltration
Little to no infiltration, flood proof pump station lid and vent			More disruption during construction
Better containment of odors			

Based upon the comparison of alternatives, installation of the LPSS is the recommended method for expanding the sewer system. The LPSS will provide a more cost-effective solution as compared to conventional gravity sewer for transitioning the Bayshore Drive homes from septic tanks to the City's wastewater collection system. From Table 12, the total estimated cost for the LPSS including impact fees and installation of grinder pump stations is $1,837,600. When compared to a conventional gravity sewer system, the implementation of LPSS should involve less construction time, restoration effort, and cost. Furthermore, the new systems will be able to connect into the City's existing LPSS along Bayshore Drive as shown in Figure 6.


North Bayshore Study Area
Proposed 4-inch PVC Force Main (TYP.)
Proposed LPSS Connection (TYP.)
N
Tarpon Bayou
WW City Lift Station
WW Manhole
LPSS Connection
WW System Valve
WW Gravity Main
WW Pressure Main
Existing LPSS
South Bayshore Study Area
Bayshore Heights Lift Station
Proposed 4-inch PVC Force Main (TYP.)
Proposed LPSS Connection (TYP.)
Kreamer Bayou
Bayshore Drive Septic to Sewer Evaluation
Tarpon Springs, Florida
PROJ NO: 21129
DATE: 8/22/2022
WRIGHT-PIERCE Engineering a Better Environment
FIGURE: 6