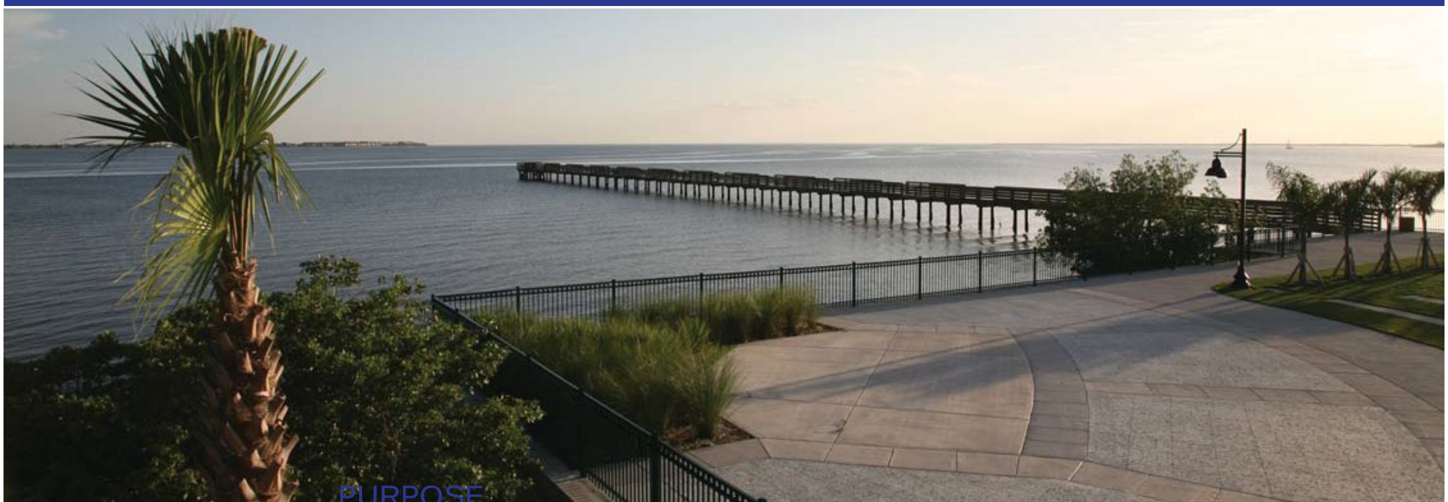
SEWER MASTER PLAN EXECUTIVE SUMMARY

City of Punta Gorda Utilities Department | 2018

JonesEdmunds

WHY IS A SEWER MASTER PLAN NEEDED?



PURPOSE

The water quality in Charlotte Harbor, Peace River, and Myakka River has a significant impact on our community. A regional effort is underway to improve and protect this crucial natural resource that impacts ecosystems, fisheries, marine and wildlife habitats, beaches, coastal wetlands, our tourism industry, home values, and overall quality of life.

As a part of this effort, the City of Punta Gorda and the Charlotte County Board of County Commissioners (BOCC), respectively, developed the 2040 Comprehensive Plan and the Blue Water Strategy to sustain the quality of natural water resources to provide safe water supply, nurture a recreational haven, and protect the environmental resources.

In accordance with the City's Comprehensive Plan, City of Punta Gorda Utilities (PGU) contracted Jones Edmunds & Associates, Inc. to prepare a Sewer Master Plan to reduce pollution by converting septic to sewer (S2S) for the Utilities' service areas.

OVERVIEW

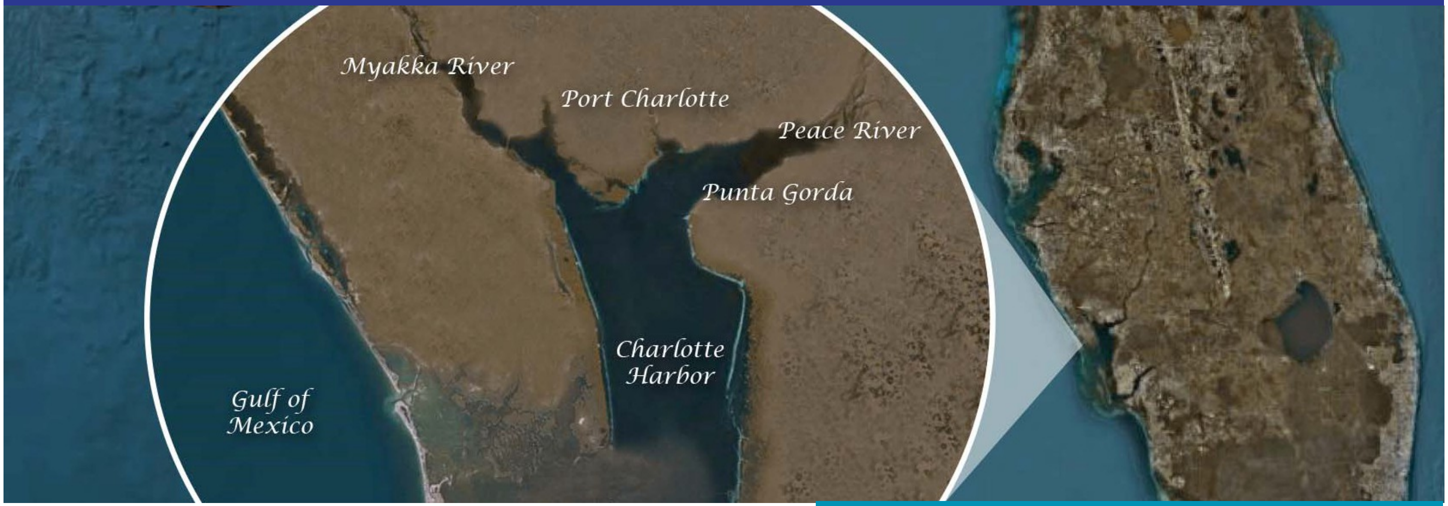
Charlotte Harbor's rich historical and aesthetic features have been key to attracting businesses and residents to the area. However, population increases have impacted our water quality.

Creating an affordable, reliable and efficient wastewater collection and treatment system is key to sustainable population growth, economic development, and the health of the City's natural resources and landscape.

This Sewer Master Plan is a local and regional collaborative effort to improve and protect the region's water quality in an affordable, sustainable, efficient, and reliable manner.

In accordance with the 2040 Comprehensive Plan and the Blue Water Strategy, the primary goal of this project is to collaboratively develop an initial 9-year plan to implement an affordable, reliable, and efficient wastewater collection and treatment system for a sustainable environment.

HISTORY AND IMPACT OF GROWTH ON CITY OF PUNTA GORDA



BACKGROUND

The City of Punta Gorda traces its roots back to the landing of Ponce de Leon and Hernando DeSoto in the early 1500s. The name Punta Gorda means “fat point” in Spanish, referring to the City’s geographic position that protrudes out into Charlotte Harbor. Colonel Isaac Trabue purchased 30 acres on the east shore of Charlotte Harbor and established the Town of Trabue in1884. In 1887, the town was renamed and incorporated as City of Punta Gorda.

Real change started in 1886 when the Florida Southern Railroad arrived, connecting the area to the rest of the state and attracting industries that propelled its initial growth. As the century ended, Punta Gorda became an important port for Cuban cattle shipments, and the harbor served as a fishing resource for mullet, Spanish mackerel, and channel bass. Construction of the Punta Gorda airfield to train aircrews during World War II spurred further growth as the real estate market began to boom. Punta Gorda's next intense growth phase started in 1959 with the creation of neighborhoods of canal-front homesites, providing these homes direct access to Charlotte Harbor and Gulf of Mexico.

Today, the City of Punta covers 21 square miles with approximately 6 square miles of water bodies, and a 2017 population estimate of 18,838.

WATER QUALITY & ENVIRONMENTAL CHALLENGES

Growth took off after emergence of railroad, trade, and real estate development industries, leading to social development and economic boom. Attracted by the beautiful rivers, beaches, estuaries, and resources of Charlotte Harbor, the population grew rapidly and increased from fewer than 2,000 in 1950 to more than 18,000 residents today.

Population growth has impacted the City of Punta Gorda and Charlotte County’s water bodies and rivers. The harbor’s historically pristine waters and thriving ecology are being threatened by excess nutrients, bacteria, viruses, lack of dissolved oxygen, toxic organic compounds, harmful algae blooms, and decreasing water clarity.

The Peace and Myakka Rivers, which discharge into Upper Charlotte Harbor and Charlotte Harbor, are now listed as impaired by the US Environmental Protection Agency.

OVERVIEW OF PUNTA GORDA SANITARY SEWER SYSTEM

In the early 1900s, the common sewage disposal method in Florida consisted of outhouses or privies. Human waste collected via cart and mule was transported to a cesspit west of the City for dewatering. The solids were then land-applied on sand flats to dry and merged with the soil. However, the high groundwater in the coastal areas of Charlotte Harbor prevented sewage from drying and generated odors. In 1913, the City began installing collection systems to convey sewage away from the City and address odor conditions.

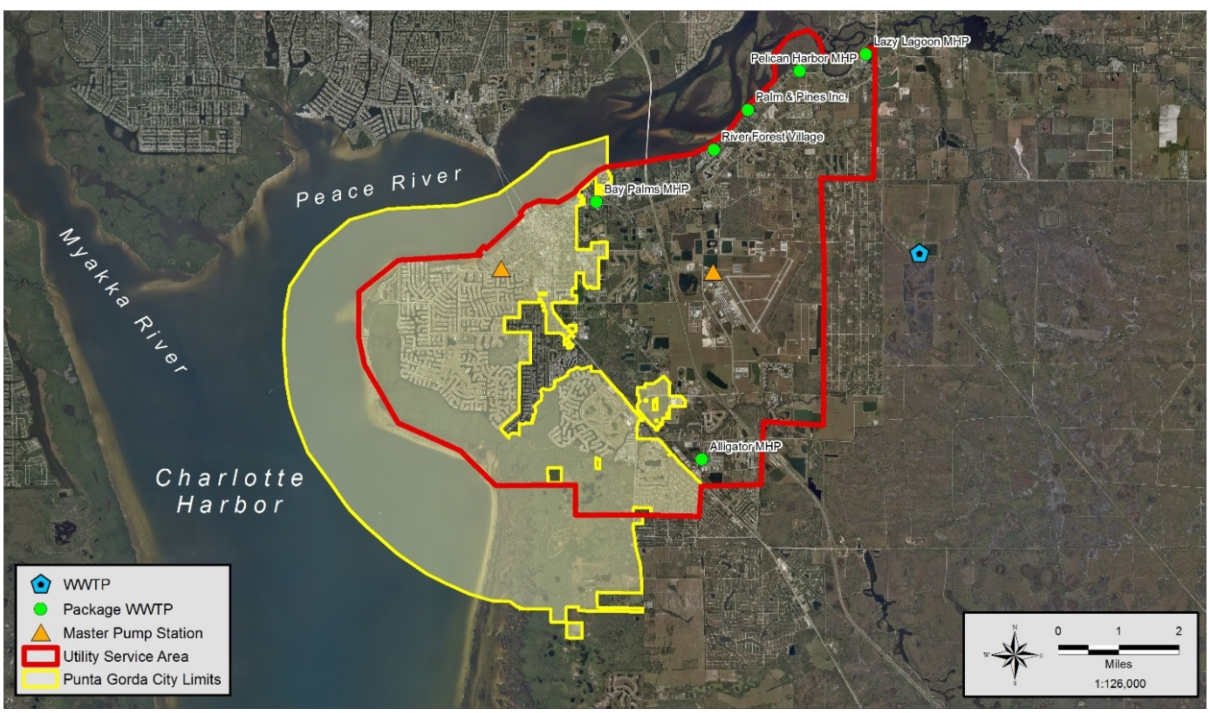
By the mid-1900s, the City had constructed a new sewage plant and rehabilitated the out-of-service Army sewage plant at the airport. By 1966, the City had eight lift stations in operation, a sewage plant with increased design capacity to 260,000 gallons per day (gpd), an estimated 1,000 connections, and 490 mobile home connections. Eventually, two original wastewater treatment plants (WWTPs) were converted to pump stations and used to convey flows to a new treatment facility constructed at the Cecil Webb 884-acre site, 7 miles east of Punta Gorda.

In 1984, the City adopted a wastewater service area that included incorporated Punta Gorda and a neighboring unincorporated area of the County as agreed on in the 1978 Agreement with the Charlotte County Regional Wastewater Authorities District. The agreement established responsibilities for construction and maintenance of new wastewater facilities in the region, construction and maintenance of collection and transmission systems, and an implementation plan for phasing out local package WWTPs.

The City's service area currently covers 30 square miles and includes a network of 129 miles gravity sewer mains, lift stations, manholes, and a 4-MGD capacity WWTP serving nearly 16,667 residents.

In 1988, the City obtained a federally-funded grant to install new transmission mains in the unincorporated south portion of the service area. As a condition for continuous funding, the grant required connecting package WWTPs to the City's centralized system.

Today, all package WWTPs within the City's incorporated service area are connected to the City system. The remaining package WWTPs that are not connected to the City's system are located throughout the unincorporated portion of the utility service area as shown in figure below.



A SCIENTIFIC LOOK AT SEPTIC SYSTEMS AND THEIR IMPACT ON THE HARBOR'S WATER QUALITY

The deteriorating water quality in City of Punta Gorda has been largely attributed to nutrient and bacteria loads originating from on-site treatment and disposal systems, more commonly referred to as septic systems (CHEC, 2003). The majority of City of Punta Gorda's septic systems were installed in the 1970s and 2000s. Currently, there are approximately 2,700 septic systems within the City's service area and more than 45,000 septic systems County-wide (Utilities, 2010).

Recent studies conducted by the Harbor Branch Oceanographic Institute at the Florida Atlantic University Marine Ecosystem Health Program have shown that the presence of fecal coliform and concentrations of chlorophyll-a in Charlotte Harbor have increased over the years. The increased levels of sewage tracers are strongly correlated to the increase in population and septic system installations.

Fecal coliform bacteria concentrations in the City's waterways exceed the limits of surface water quality criteria established by the Florida Department of Environmental Protection (FDEP) in the Florida Statutes; not meeting the standard needed to protect the health of swimmers and other recreational uses.

Increasing levels of nitrogen, fecal coliform, and chlorophyll-a reveal that the level of treatment provided by septic systems within the City is not sufficient to protect the water quality of receiving water bodies.

Cape Coral, FL

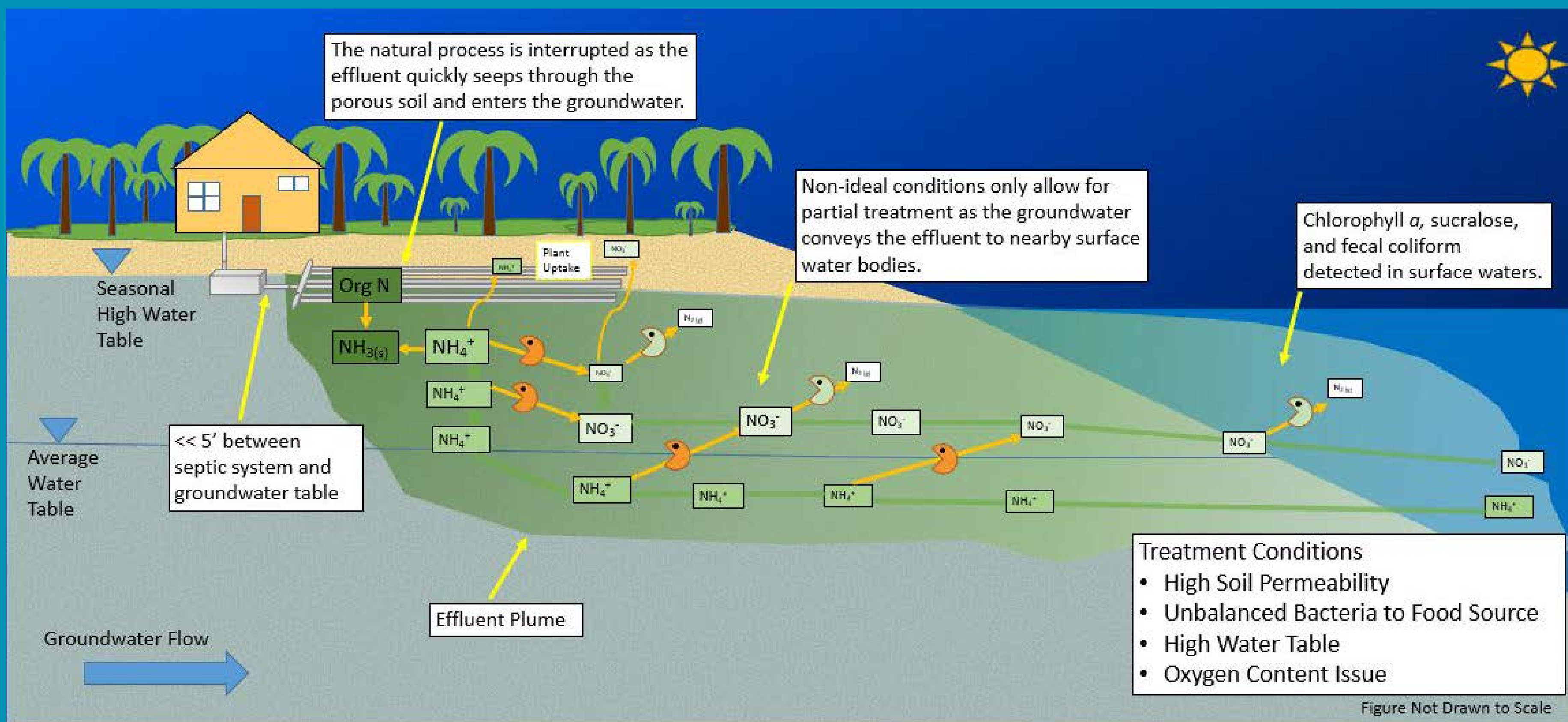
Excessive amounts of nitrogen promote excess algae growth within the waterways – contributing to and sustaining the formation of harmful algae blooms. Harmful algae blooms can lead to aquatic hypoxia causing red tide events and significant ecological destruction (Gilbert P., 2009; GCOOS, 2013).

All septic systems release nitrogen and phosphorus to the subterrain from their drainfield. In a properly operating system, nitrifying bacteria in the upper portions of the drainfields convert ammonia to nitrate in the presence of oxygen above the groundwater table.

Ideally, as the wastewater percolates deeper into the ground, another group of bacteria, denitrifiers, converts the nitrate to nitrogen gas, which escapes to the atmosphere. This denitrification process occurs under conditions without oxygen present. However, in many coastal regions of Florida, such as the City of Punta Gorda, the soil is very porous and high groundwater levels exist. The porous soil and high groundwater table do not provide the correct conditions for the natural decomposition of the sewage. As a result, the denitrification process is unable to complete its course. Sewage is only partially treated, and nitrogen levels increase in the soil, further deteriorating water quality.

Groundwater flow models show that groundwater in and around the City flows to Charlotte Harbor or to connecting surface waters. Therefore, nearly all of the City's septic system effluents are ultimately conveyed to Charlotte Harbor once it enters the groundwater.

HOW DO SEPTIC SYSTEMS WORK IN AREAS WITH HIGHLY POROUS SOILS?



Maintaining Charlotte Harbor's estuary water quality is critical to the future of the community.

Charlotte Harbor is known as a world-class destination for recreational fishing. The majority of visitors are drawn to the area for the harbor and local beaches, which generates an estimated economic impact of $526 million at local restaurants, hotels, and attractions (Research Data Services, 2016).

Reducing pollutants entering the water bodies translates into fewer beach closures and improved fishing and recreational opportunities, which improves the quality of life for residents and tourists enjoying these activities.

The harbor's health impacts not only fishing, retail, and travel industries, but also the real estate market and home values. Modeling studies have been used to estimate the impact of water quality on real estate value. Michael et al. (1996) found a 1-meter improvement in water clarity resulted in average property value increases ranging from $11 to $200 per linear foot of water frontage along lakes. Considering total water frontage within the study area, this translates to tens of millions of dollars in improved property prices.

Similarly, increases in nitrogen loadings that cause poor water clarity could decrease home values by an average of $10,000 for non-waterfront property and up to $21,000 for waterfront property.

The Sewer Master Plan provides an affordable community solution that addresses the common goal of improving and restoring water quality in the Charlotte Harbor Estuary and enhancing the community's quality of life.

To protect land and home values, the community must invest more into the future – the future of the harbor, rivers, aquifer, beaches, and estuaries, as well as the underlying groundwater, depend on it.

SEWER MASTER PLAN OBJECTIVES

- Summarize the need to reduce nutrient and bacteria discharges.
- Review and compile historical data on the sewer system, water reclamation facilities, water quality, and flows.
- Summarize the private sewer utilities in the City service area.
- Model and predict system growth.
- Develop detailed consumer and wastewater flow estimates through buildout.
- Review existing wastewater collection and transmission systems.
- Review existing wastewater reclamation facilities and prepare an infrastructure assessment.
- Develop capital improvement plan recommendations based on existing infrastructure needs and guiding principles.
- Perform a financial analysis and develop funding programs and options for the City to implement the recommended capital improvement plans.

Together, we work toward achieving community goals through these guiding principles:

- Affordability – Each project identified in the Sewer Master Plan focuses on developing affordable solutions for residents and business owners.
- Sustainability – The Sewer Master Plan incorporates a balanced approach to prioritize septic system replacements to maximize environmental benefits and provide long-term reductions in nutrient loadings in a manner that is affordable to residents and business owners.
- Efficiency – The Sewer Master Plan considers existing utility infrastructure and implements efficient construction methods to decrease costs on road trenching and repair.
- Reliability – The Sewer Master Plan considers existing wastewater treatment and conveyance infrastructure and identifies which components will require updating to provide a reliable product to the County's residence and businesses.

HOW DO WE REDUCE POLLUTANTS AND IMPROVE THE HARBOR'S WATER QUALITY FOR FUTURE GENERATIONS?

We begin at the source of the problem – by identifying which areas in the City have the greatest effect on the harbor's water quality and how severe their impact is on the environment.

Historical data, including population trends, property information, land use documents, building permit records, and septic effluent loadings, were compiled and reviewed to assess the current impact of nutrient pollution in the City. At a workshop, participants drawn from the City of Punta Gorda government, PGU, and Jones Edmunds used the data to identify 147 potential project areas that would benefit the most from sewer improvements.

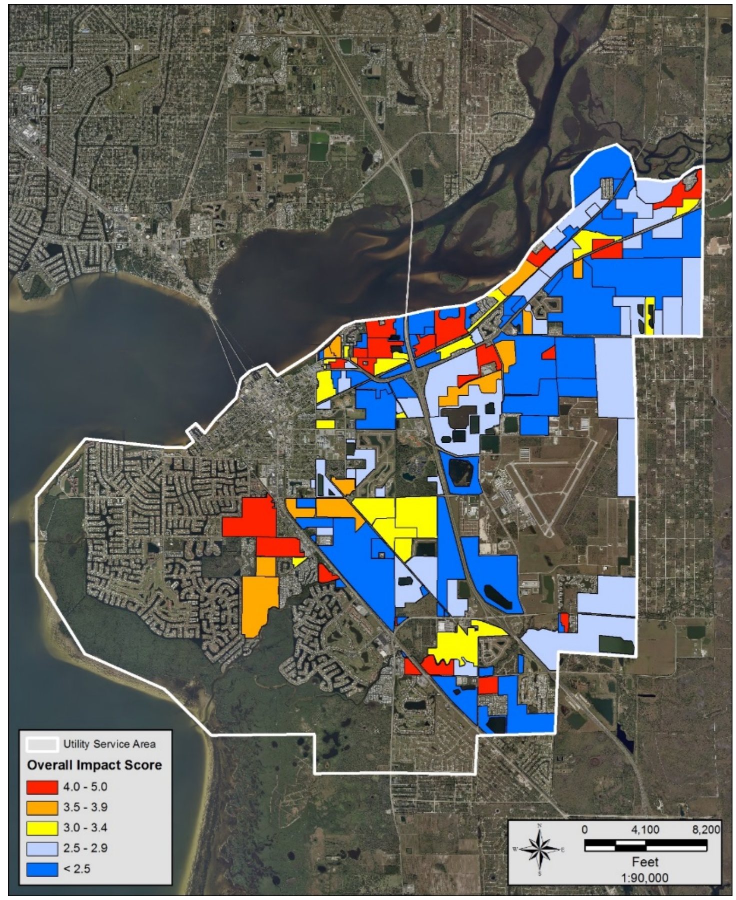
Environmental scoring criteria were developed to prioritize the importance of converting septic systems to sewer for each project area.

The environmental scoring criteria included the age of septic systems within the project area, the project area's proximity to surface waters, and the nitrogen loading from septic systems within the project area. Septic system age has a significant impact on the system's functionality and effectiveness. Although newer septic systems can be more effective at treatment in the right conditions, all septic systems discharge to drainfields.

The location of the project area relative to surface water is relevant because the drainfield effluent eventually enters the groundwater, which flows through the soil and into the surface water. The porous Floridian soils and high groundwater table inhibit the treatment process and allow for partially treated sewage to enter the surface water.

Lastly, the population density and septic system use within each project area also have a significant impact on the amount of nitrogen that enters the environment.

Individual scores were determined for each criteria and each project area. The individual scores were used to develop an overall average environmental score for the project areas throughout the Utilities' service area.



The figure above displays the average environmental impact score for each sewer improvement project within the City's service area. Scores range from 0 to 5, with 5 representing the areas that have the most negative impact on the environment. These project areas were typically located near surface waters, contained older septic systems, and contribute large amounts of nitrogen into the environment.

WHAT TYPE OF SEWER COLLECTION SYSTEM IS SUITABLE AND HOW MUCH WILL IT COST?

The most common types of collection systems currently implemented in Florida include low-pressure STEP, low-pressure grinder pump, vacuum collection, and gravity collection systems. These four collection system types were evaluated to develop an economical centralized collection system for the PGU service areas based on constructability, reliability , ease of maintenance, capital costs and operation & maintenance (O&M) costs.

Low-pressure STEP systems use conventional septic tank systems with automatic pumps and control devices to convey the liquid in the septic tank to a pressurized collection system. The system consists of a tank located at each home on private property and connected to the collection system by a small-diameter (typically 2 inches) pressurized pipe.

A grinder pump low-pressure system consists of conventional drain, waste, and vent piping within the residence connected to the packaged grinder pump basin. The grinder pump basin is typically installed outdoors, below grade, and serves one residence. Sewage from the residence enters the basin and grinder pumps discharge a finely ground slurry into small-diameter pressure piping.

The vacuum sewer system includes a valve pit serving two to four homes, a vacuum collection system, and a vacuum collection station with pumps (vacuum and pressure). In a vacuum system, sewage flows by gravity from the homes/structures into a valve pit.

Gravity collection systems are a common and traditional method to collect wastewater for public utilities. Sewage exits the home through pipes installed at an angle so the sewage flows by gravity. These service laterals connect each home to the gravity sewer mains.

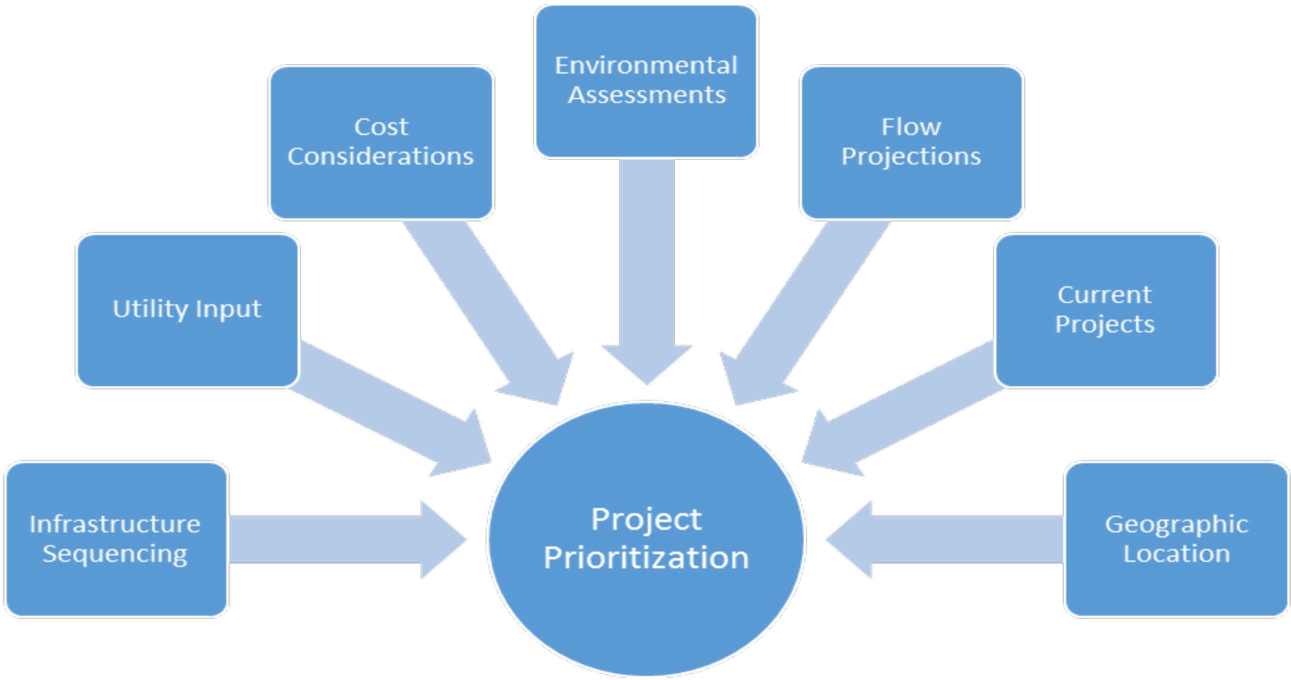
Tables below summarize capital and O&M costs per equivalent residential connection (ERC) for the four collection systems evaluated.

Out of the four main options, the City found the gravity collection systems as the most feasible and cost-effective alternative for majority of the PGU project areas.

ERC Range:	**100 to 350 ERCs**			
Item	Low-Pressure/ STEP	Low-Pressure/ Grinder	Vacuum Collection	Gravity Collection
On-Lot	$7,675	$10,390	$2,258	$2,258
Collection System Including On-Lot	$14,250–$17,700	$18,500-$22,000	$15,000–$23,800	$23,300–$26,000
Annual O&M	$980–$1,370	$770-$1,150	$540–$950	$380–$760
40-Year Present Worth	$33,700 – $44,800	$33,800-$44,900	$25,500 – $42,600	$30,900 – $41,200

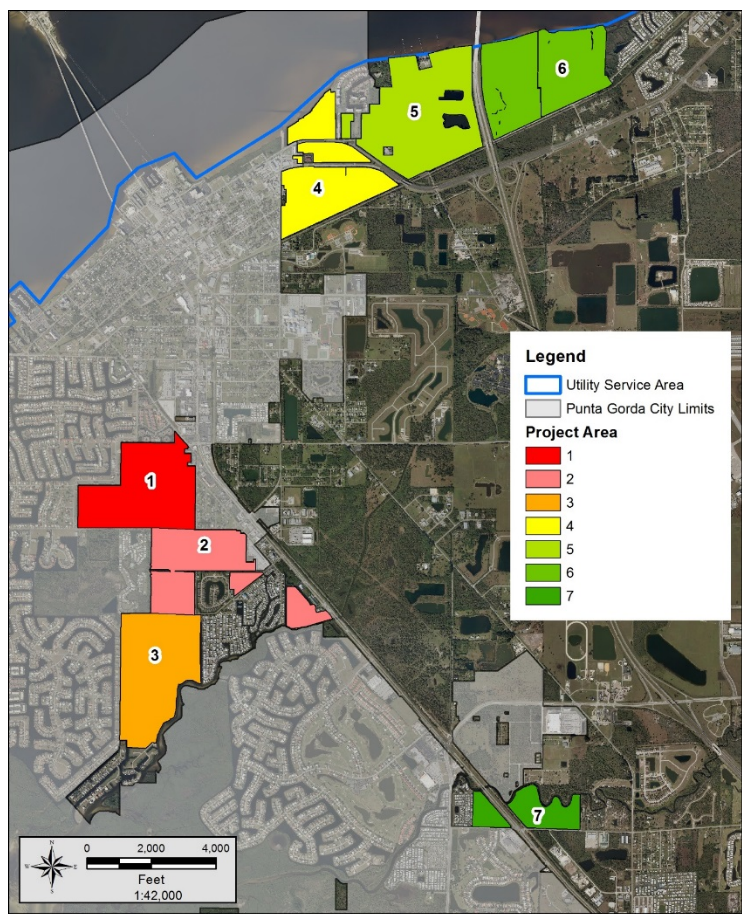
ERC Range:	**350 to 700 ERCs**			
Item	Low-Pressure/ STEP	Low-Pressure/ Grinder	Vacuum Collection	Gravity Collection
On-Lot	$7,675	$10,390	$2,258	$2,258
Collection System Including On-Lot	$13,200–$14,250	$17,500-$18,500	$13,200–$15,000	$20,000–$23,300
Annual O&M	$870–$980	$650-$750	$420–$540	$270–$380
40-Year Present Worth	$30,400 – $33,700	$30,500-$33,800	$21,100 – $25,500	$27,600 – $30,900

HOW WERE PROJECT AREAS PRIORITIZED UNDER THE SEWER MASTER PLAN?



A meeting involving staff from City of Punta Gorda government, PGU, Charlotte Harbor National Estuary Program (CHNEP), and Jones Edmunds culminated in developing a plan that includes converting 1,379 septic systems to sewer in 31 project areas. The areas were later consolidated into seven (7) priority-ranked major project areas as shown in the Figure below. In addition, the group developed a project prioritization plan that is flexible and provides a practical implementation sequence. As illustrated in the diagram above, several factors were considered in prioritizing projects to identify and develop 9-year and buildout improvement plans.

Affordability. Sustainability. Efficiency. Reliability. With these guiding principles in mind, we engaged with the community – listening to its needs through various public outreach and educational workshops.



The figure depicts project priority ranking, with red indicating high priority project area and deep green showing lowest priority

The Sewer Master Plan outlines the yearly capital improvement projects (CIPs) required for the specified period, including collection system, transmission system, utility connections, and wastewater reclamation facility improvements for each of these plans.

S2S conversions require not only installing collection systems for each project area, but additional infrastructure for conveyance and treatment.

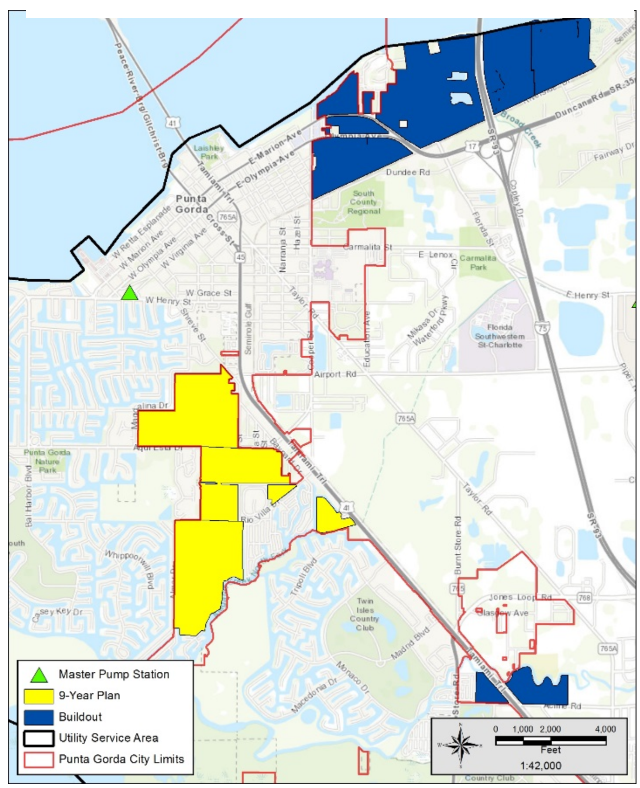
Once the flows are collected, lift stations are used to convey the wastewater through transmission mains to the wastewater reclamation facilities. Water reclamation facilities accept the higher flows and produce more reclaimed water for commercial customers. As more collection systems are added to the system, the flows at these facilities increase and additional treatment components are often required.

The figure to the left identifies the project areas for each improvement plan period. Three project areas are included for the 9-year plan, resulting in connecting 1,340 lots to the centralized sewered system. An additional four project areas have been identified for buildout, referring to the project areas that extend beyond the 9-year plan, but that could be implemented in the future planning.

The Improvement Plan includes the seven major project areas in the City's unincorporated service area. Table below presents lots within each project area and related proposed collection system information.

Area	Lots	Length of Gravity Mains (LF)	Number of Lift Stations
1	481	30,692	3
2	442	27,571	3
3	417	24,887	3
4	284	31,820	4
5	233	33,660	4
6	304	22,576	3
7	153	11,753	2

The Sewer Master Plan identifies the capital improvement projects for collections systems, transmission systems, utility connections, and wastewater reclamation for the first 9 years and future years.



The table below lists the seven S2S project areas identified in the 9-year Improvement Plan, including the project area names and estimated project costs. The project costs include the costs for on- and off-lot connections, collection piping, restoration, mobilization and general conditions (8%), contingency (20%), and professional services (20%).

Project Area	Years 1 – 3	Years 4 – 6	Years 7 – 9	Years 10 – 12	Years 13 – 15	Years 16 – 18	Years 19 – 21
1	$11,028,000	$ -	$ -	$ -	$ -	$ -	$ -
2	$ -	$9,952,000	$ -	$ -	$ -	$ -	$ -
3	$ -	$ -	$9,065,000	$ -	$ -	$ -	$ -
4	$ -	$ -	$ -	$10,455,000	$ -	$ -	$ -
5	$ -	$ -	$ -	$ -	$10,754,000	$ -	$ -
6	$ -	$ -		$ -	$ -	$7,885,000	$ -
7	$ -	$ -	$ -		$ -	$ -	$4,081,000
Total Collection System Costs	$11,028,000	$9,952,000	$9,065,000	$10,455,000	$10,754,000	$7,885,000	$4,081,000
Total Transmission System Costs	$3,308,400	$2,985,600	$2,719,500	$3,136,500	$3,226,200	$2,365,500	$1,224,300
Total S2S Costs	$14,336,400	$12,937,600	$11,784,500	$13,591,500	$13,980,200	$10,250,500	$5,305,300
Total Capital Cost	$82,186,000						

The 9-year Improvement Plan involving Project Areas 1, 2, and 3 will result in installing nine lift stations and constructing 83,150 linear feet of gravity mains.

PLAN COST

Phase 1 - $39,100,000

Buildout - $82,200,000

OUR HARBOR: PROTECTING THE HEART OF THE CITY

Charlotte Harbor is Florida's second largest open water estuary and is home to a large population of snook, tarpon, redfish, and spotted seatrout, as well as numerous species of aquatic organisms, plants, birds, and wildlife.

The harbor is a focal point of the City, and restoring it is a high priority for the local, state, and national officials.

The combination of unsuitable soils, high water tables, and aging septic systems allows untreated sewage to percolate through the soil. It enters the groundwater where it is conveyed to canals, rivers, Creeks, and estuarine shorelines – transporting high levels of nitrogen, phosphorus, fecal microbes, and organic sewage contaminants to the harbor. These contaminants decrease water clarity, contribute to excess algae growth, sustain harmful algae blooms, and lead to red tide events.

Removing the existing septic systems, installing a central sewer system, and connecting residential and commercial units within the service area will alleviate problems with the existing septic systems, protect the public health of the community, improve the water quality of surrounding water bodies, and promote economic growth within the community for current and future generations.

The result...
a cleaner harbor,
healthier lifestyle,
and a sustainable future.