

# City of Palacios

## Master Wastewater Plan Palacios, Texas 77465



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Prepared By:



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## INTRODUCTION

Urban Engineering (U.E.) was hired to update the City of Palacios' Master Wastewater Plan. Significant changes were made to the domestic wastewater collection system after the 2009 Master Plan.

## OBJECTIVE AND SCOPE

This study is an evaluation of the existing conditions and capacities of the domestic wastewater collection system including the wastewater lift stations within the City of Palacios (CoP). The objective of this assessment is to evaluate the existing mains and wastewater lift stations of the COP and to propose cost effective plans for upgrading the system to meet future needs. This assessment also provides recommendations to improve the lift stations to meet Texas Commission on Environmental Quality (TCEQ) regulations and to improve capacity to meet current and future demands.

## BACKGROUND

The City of Palacios' domestic wastewater collection system is composed of approximately 182,000 linear feet of mains, 16 wastewater lift stations and one (1) wastewater treatment plant. See **Figure 1** titled "*Overall Wastewater System.*"

## DEFINITIONS

The Texas Commission on Environmental Quality (TCEQ) established rules and regulations regarding domestic wastewater systems in order to protect public health and safety. Title 30 of the Texas Administrative Code (30 TAC), Chapter 217 regulates domestic wastewater systems. 30 TAC, Chapter 217 provides definition to common terms with this report. These definitions are as follows:

1. **Collection System** – pipes, conduits, lift stations, force mains, and all other constructions, devices and appurtenant appliances used to transport domestic wastewater to a wastewater treatment facility.
2. **Firm Pump Capacity** – the maximum flow rate achievable, under design conditions, with the largest pumping unit out of service.
3. **Force Main** – a pressure-rated conduit that conveys wastewater from a lift station.
4. **Lift Station** – a structure that collects wastewater and uses pumps to raise it to a higher elevation. The term lift station applies to a structure in which the static head exceed the frictional head losses.
5. **Peak Flow** – the highest two-hour flow expected under any operational conditions, including times of high rainfall, based on a two-year, 24-hour storm or a prolonged period of wet weather.
6. **Pump** – a device that raises, transfers or compresses fluids by suction, pressure, or both.

## INVENTORY OF MAINS

The City of Palacios operates and maintains approximately 182,000 linear feet of wastewater gravity mains and force mains. The sizes of the existing gravity mains range from 6-inch to 27-inch and the sizes of the existing force mains range from 1.5-inch to 8-

inch. The sizes of the existing gravity and force mains are appropriately sized to serve the existing system.

The existing gravity mains are severely impacted by inflow & infiltration (I&I) during rainfall events. Smoke testing is a common method used to identify defects in the sanitary sewer system such as cracks in mains or structures, faulty connections, root intrusion in pipes, and missing or broken clean outs. These defects allow ground or stormwater to enter the sanitary sewer system which can lead to system overflows as well as higher demand at the wastewater lift stations and treatment plant.

Urban Surveying, Inc (USI) has completed smoke testing in the following lift station basins:

|                              |                    |
|------------------------------|--------------------|
| Commerce Street Lift Station | 215 leaks detected |
| Bayshore Drive Lift Station  | 23 leaks detected  |
| Bethany Park Lift Station    | 17 leaks detected  |
| Perryman Lift Station        | 16 leaks detected  |

Smoke testing in the remaining lift station basins should be completed to identify remaining leaks in the system. Repairing these leaks would significantly reduce the I&I and relive demand on the wastewater lift stations and treatment plant. In the future, routine smoke testing should be incorporated in the long-term maintenance schedule to continue to identify and repair leaks in the wastewater system.

## **INVENTORY OF LIFT STATIONS**

The City of Palacios operates 16 wastewater lift stations within their wastewater collection system to serve a population of approximately 6,300 persons. The locations of all lift stations are shown in **Figure 2** titled, “*Lift Station Map & Service Areas*”.

## **INVENTORY OF WASTEWATER TREATMENT PLANT**

The City of Palacios operates one wastewater treatment plant that is permitted to provide treatment to 800,000 gallons per day. The current dry weather flows are approximately 350,000 gallons per day. During rainfall events, I&I increases the flows to the wastewater collection system which ultimately is treated at the wastewater treatment plant.

Ongoing development projects, such as Beachside and Pelican Place, and potential demand from vacant lots within the city limits would increase these flows.

When the 3-month average daily flow reaches 75% of the wastewater treatment plant capacity, the CoP should initiate communications with the TCEQ about the increased flow and determine if an expansion plan is necessary. Based on these discussions, the CoP should be prepared to implement an expansion plan (if previously determined to be necessary) when the 3-month average daily flow reaches 90% of the wastewater treatment plant capacity.

## **FLOWS**

### **Average Flows**

Title 30 Texas Administrative Code (TAC) Chapter (Ch.) 217.32 estimating 100 gallons per person per day as the average flow for a wastewater collection system.

### **Peak Flows**

Wastewater collection systems, including lift stations, are required to convey peak flow to satisfy TCEQ requirements. Title 30 TAC Ch. 217.32 (a)(2) recommends using a peaking factor of 4.0, if site specific data are not available. The peak flow for each person is estimated to be 400 gallons per person per day as directed by the TCEQ.

## **POPULATION ESTIMATION**

Population data was used to estimate the wastewater flows in the existing lift stations. Population for each service area was estimated by counting the numbers of houses, apartments, and recreational vehicle slots in each service area and applying an average of 2.84 persons per residence. This equates to an average flow of 284 gallons per day per residence and a peak flow of 1,136 gallons per day per residence.

## **LIFT STATION CAPACITY**

Lift stations were evaluated based on their rated capacity, which by TCEQ regulation is the firm pump capacity, as defined above. The rated capacity was then compared to the estimated peak flow of the service areas.

**Chart 1**, located below, shows the existing lift stations with corresponding population, average flows, peak flows, and firm pumping capacity.

| Lift Station    | Population Served | Cumulative Population Served | Average Flow (gpm) | Peak Flow (gpm) | Firm Pumping Capacity (gpm) |
|-----------------|-------------------|------------------------------|--------------------|-----------------|-----------------------------|
| Bethany Park    | 210               | -----                        | 15                 | 60              | 50                          |
| University      | 523               | 733                          | 51                 | 204             | 450                         |
| 2nd Street      | 1,997             | 2,962                        | 206                | 824             | 850                         |
| Yacht Harbor    | 233               | -----                        | 16                 | 64              | 100                         |
| 10th Street     | 389               | -----                        | 27                 | 108             | Unknown                     |
| Duson           | 6                 | -----                        | 0.5                | 2               | 50                          |
| Commerce Street | 2,000             | 2,005                        | 140                | 560             | 525                         |
| Main Street     | 40                | -----                        | 3                  | 12              | 33                          |
| Bayside RV      | 3                 | -----                        | 0.2                | 0.8             | 30                          |
| TB 3            | 3                 | -----                        | 0.2                | 0.8             | 40                          |
| Hilltop         | 17                | 23                           | 2                  | 8               | 40                          |
| Treatment Plant | 824               | 6,015                        | 418                | 1,672           | 2200                        |
| Perryman        | 82                | -----                        | 6                  | 24              | 300                         |

**\*\*Red text indicates over capacity lift station**

The Bethany Park and Commerce Street lift stations are operating over capacity.

The following section details the recommendations to meet current and future demands:

#### **Bethany Park Lift Station**

The Bethany Park lift station's current firm pumping capacity is 50 GPM with a peak flow of 60 GPM. U.E. recommends removing the existing pumps and installing two (2) 100 GPM pumps. The upgraded firm pumping capacity would be 100 GPM. This upgraded capacity would meet the current demand and provides additional capacity for future demand.

#### **Commerce Street Lift Station**

The Commerce Street lift station's current firm pumping capacity is 525 GPM with a peak flow of 560 GPM. U.E. recommends redirecting flow from approximately 200 houses to the 27-inch gravity main on Mosier Road.

Specifically, U.E. recommends installing a 15-inch gravity main with the upstream connection at the intersection of 9<sup>th</sup> Street and Morton Street and the downstream connection at the intersection of 12<sup>th</sup> Street and Mosier Road. The new peak flow for the Commerce Street lift station would be 400 GPM.

These upgrades, shown in **Figure 2**, would bring the lift stations into compliance with TCEQ requirements and would provide additional capacity for future growth.

**Chart 2**, located below, shows the Beachside development lift stations and the corresponding flows and pumping capacity based on a phased development.

| <b>Beachside Phases</b> | <b>Population Served</b> | <b>Cumulative Population Served</b> | <b>Average Flow (gpm)</b> | <b>Peak Flow (gpm)</b> | <b>Firm Pumping Capacity (gpm)</b> |
|-------------------------|--------------------------|-------------------------------------|---------------------------|------------------------|------------------------------------|
| Beachside Existing      | 15                       | -----                               | 3                         | 12                     | 1290                               |
| Beachside Phase 1       | 436                      | 451                                 | 89                        | 356                    | 1290                               |
| Beachside Phase 2       | 78                       | 529                                 | 105                       | 420                    | 1290                               |
| Beachside Phase 3       | 395                      | 924                                 | 182                       | 728                    | 1290                               |

**Figure 3** titled “*Beachside Phases*” shows the anticipated phased development of this area.

## **SUMMARY**

### **TCEQ Lift Station Recommendations**

The Bethany Park lift station should be upgraded to expand the capacity to meet current and future needs. The Commerce Street lift station should have flow redirected to the 27-inch gravity main on Mosier Road to alleviate the existing demand on the lift station and provide additional capacity.

### **Collection System Recommendations**

In addition, it is recommended that smoke testing be completed in the remaining lift station basins and that continued smoke testing be included as routine maintenance to identify leaks in the entire sanitary sewer system. As funding becomes available, these leaks should be addressed to reduce inflow and infiltration into the wastewater collection system.

### **Wastewater Treatment Plant Recommendations**

The City of Palacios should continue to monitor daily flows to the wastewater treatment plant. As the 3-month daily average increases to 75% of capacity, the City will begin communications with the TCEQ and when the 3-month daily average increases to 90% of capacity, the City will act in accordance with communications with the TCEQ. This may include increasing the wastewater treatment plant capacity via an expansion plan. As part

of routine maintenance, leaks in the system should be addressed to reduce inflow and infiltration which ultimately increases flow at the wastewater treatment plant.