

City of Palacios

Master Water Plan Palacios, Texas 77465



July 2022



Matt A. Glaze
7/11/22

Prepared By:

URBAN ENGINEERING
TREF# F-160
Consulting Engineers
2004 N. Commerce St.
Victoria, TX 77901

INTRODUCTION

Urban Engineering was hired to update the City of Palacios' Master Water Plan. Significant changes were made to the public water system after the 2009 Master Plan, including construction of a new ground storage tank, drilling a new water well as well as plugging and abandoning Water Wells No. 2 and No. 3.

OBJECTIVE AND SCOPE

This study is an assessment of the City of Palacios' (COP) Water System. The objective of this assessment is to evaluate the existing water wells, pumping, storage and distribution systems of the COP and to propose cost effective plans for upgrading the system to meet future needs.

BACKGROUND

The City's water is supplied from the Gulf Coast Aquifer via wells. Water is then pumped to storage tanks, which is then pumped into the distribution system when needed. The system is currently served by two water wells, two ground storage tanks and two elevated tanks.

DEFINITIONS

The Texas Commission on Environmental Quality (TCEQ) established rules and regulations regarding public water systems in order to protect public health and safety. Title 30 of the Texas Administrative Code (30 TAC), Chapter 290 regulates public drinking water. 30 TAC, Chapter 290 provides definition to common terms with this report. These definitions are as follows:

1. **Connection** - A single family residential unit or each commercial or industrial establishment to which drinking water is supplied from the system. As an example, the number of service connections in an apartment complex would be equal to the number of individual apartment units. When enough data is not available to accurately determine the number of connections to be served or being served, the population served divided by three (3) will be used as the number of connections for calculating system capacity requirements. Conversely, if only the number of connections is known, the connection total multiplied by three (3) will be the number used for population served.
2. **Distribution System** - A system of pipes that conveys potable water from a treatment plant to the consumers. The term includes pump stations, ground and elevated storage tanks, potable water mains, and potable water service lines and all associated valves, fittings, and meters, but excludes potable water customer service lines.
3. **Elevated Storage Capacity (Tank)** - That portion of water which can be stored at least 80 feet above the highest service connection in the pressure plane served by the storage tank. Also known as a *water tower* or an *elevated tower*.
4. **Firm Yield Capacity** - The combined capacity of a group of pumps, all designed to perform the same function, assuming that the largest pump in the group is out of service.
5. **Ground Storage Capacity** - A tank for storing potable water that is connected to the distribution through a service pump. When a ground storage tank is located in conjunction with a treatment plant, it is often referred to as a *clearwell*.

6. **Peak Hourly Demand** – In the absence of verified historical data, peak hourly demand means 1.25 times the maximum daily demand (prorated to an hourly rate) if the public meets the minimum requirements for elevated storage capacity.
7. **Service Pump** - Any pump that takes treated water from storage and discharges to the distribution system.

SYSTEM REQUIREMENTS

In order to determine the requirements for a water system, the existing number of connections needs to be established. Per TCEQ, the number of connections is not only the number of residences, but also the number of RV park spaces, apartments and mobile homes. In addition, per TCEQ guidance, connections count on all RV and mobile home parks, but do not count on single family residential lots where houses are not constructed (for instance lots in Beachside without houses).

A. Urban Engineering used available data from the City’s billing department along with records from the public works department to determine the number of connections. Records indicate the city currently has 2,200 connections.

B. In addition, the development of the Beachside subdivision will have a significant impact to the City’s water system. Currently there are only 18 houses in the subdivision, but there are 514 lots developed and available for construction (See Beachside Map). In addition, the current section of Beachside (Phase 3) has layouts with an additional 395 lots. This development could add a total of 909 additional connections to the system.

SYSTEM FACILITY ANALYSIS

System Summary

The City of Palacios utilizes groundwater for their water supply. Water is pumped from two wells where it is chlorinated and pumped into nearby ground storage tanks. Booster pumps located near the ground storage tanks pressurize the water into distribution and fill the city’s two water towers.

Inventory

The TCEQ establishes minimum system requirements for water system facilities. Section 290.45 (D) provides requirements for community water systems with more than 250 connections. The TCEQ minimum standards were applied to the City’s facilities and the facility was evaluated on its ability to meet the minimum standards. In addition, the remaining available number of connections the facility will support was determined. A summary of the evaluation is provided below:

WELL CAPACITY					
DESCRIPTION	LOCATION	CAPACITY (gpm)	CONNECTIONS FACILITY WILL SUPPORT	TCEQ RULE	Available Connections
Well No. 4		650	1,083	0.6 gpm/conn	883
Well No. 6	7th	1,200	2,000		
TOTAL		1,850	3,083		

TOTAL STORAGE					
DESCRIPTION	LOCATION	CAPACITY (gal)	CONNECTIONS FACILITY WILL SUPPORT	TCEQ RULE	Available Connections
Ground Storage 1	10th & Rorem	600,000	3000	200 gal/conn	5,050
Ground Storage 2	7th & Green	500,000	2500		
Tower 1	Rorem	150,000	750		
Tower 2	Craymer/7th	200,000	1000		
TOTAL		1,450,000	7,250		
BOOSTER PUMPS					
DESCRIPTION	LOCATION	CAPACITY (gpm)	CONNECTIONS FACILITY WILL SUPPORT	TCEQ RULE	Available Connections
Rorem 1	10th & Rorem	900	0	peak demand with firm yield	1,688
Rorem 2	10th & Rorem	722	2,124		
Green 1	7th & Green	300	-		
Green 2	7th & Green	300	882		
Green 3	7th & Green	300	882		
TOTAL		2,522	3,888		
PEAK HOUR CALCULATION					
	Peak Day (gal)	Peak Day (gpm)	Factor	Peak hour (gpm)	
Peak Day (7-29-2021)	871,000	605	1.25	756	
Per connection	396	0.27	1.25	0.34	
ELEVATED STORAGE					
DESCRIPTION	LOCATION	CAPACITY (gal)	CONNECTIONS FACILITY WILL SUPPORT	TCEQ RULE	Available Connections
Tower 1	Rorem	150,000	1500	100 gal/conn	1,300
Tower 2	Craymer/7th	200,000	2000		
TOTAL		350,000	3,500		

Water Wells

Section 290.45(D)(i) requires the water system to have two or more wells capable of producing 0.60 gallons a minute (gpm) per connection. Palacios has two water wells. The water well located at 10th and Rorem has a capacity of 650 gpm and the well located off 7th Street north of Henderson has a capacity of 1,200 gpm. Combined well capacity is 1,850 gpm, which will support 3,083 connections.

Total Storage

The city has two ground storage tanks and two elevated storage tanks. The water plant at 10th Street and Rorem has a 150,000-gallon elevated storage tank and 600,000-gallon ground storage tank. The water plant located near the intersection of 7th Street and Green Avenue has a 200,000-gallon elevated storage tank and 500,000-gallon ground storage tank. The combined total of all storage tanks is 1,450,000 gallons. TCEQ Section 290.45(D)(ii) requires 200 gallons of total storage per connection. The current facilities will support 7,250 connections.

Booster Pumps

Palacios has 5 booster pumps located at the water plants. Three pumps are located at the plant located at 7th Street and Green Avenue each capable of pumping 300 gpm. The plant at the intersection of 10th Street and Rorem Avenue has two pumps, with one capable of producing 900 gpm and one capable of producing 722 gpm. The city's firm capacity for booster pumps is 1,350 gallons per minute.

Booster pumps are required to produce 2.0 gpm per connection or have a total capacity of 1,000 gpm and pump peak hourly demands with the largest pump out of service. The pumps do not meet the 2.0 gpm, but combined they have a firm capacity of 1,000 gpm and can pump the peak hourly demand.

The peak hourly demand was calculated using the TCEQ definition for peak hour of 1.25 times the peak day prorated per hour. Based records provided by the public works department, the peak day for the city was 871,000 gallons per day or 604 gallons per minute on July 29, 2021. Therefore, peak hour is 756 gallons per minute, which equivalent to 0.34 gallons per minute per connection. Assuming no increased demand per connection, the booster pumps are capable of supporting 3,888 connections.

Elevated Storage

Section 290.45(D)(iv) requires systems to have elevated storage capacity of 100 gallons per connection. The city has towers of 150,000 gallons and 200,000 gallons. Combined, the towers will support 3,500 connections.

Emergency Power

Water systems over 250 connections that do not meet the elevated storage requirements must provide sufficient power to deliver 0.35 gallons per minute per connection. Palacios meets the minimum elevated storage requirements. In addition, both water plants have emergency generators on-site and at well 6.

DISTRIBUTION SYSTEM

The City's distribution system contains water mains, valves, fire hydrants and service connections. Water mains range in size from 12 inches down to 2 inches. The water system is in overall fair condition, but a large number of mains are constructed from cast iron and are prone to leaks and breaks. It is recommended that all of the cast iron mains be replaced with new poly vinyl chloride pipes (PVC). In addition, several areas of town contain 2-inch mains. TCEQ regulations allow for a maximum of 10 houses on a 2-inch main. Though not all mains are in violation, it is

recommended that the minimum main size be 4 inches, except for mains which only serve less than two houses.

Dead end mains create water quality problems, therefore TCEQ regulations require flush valves on all dead-end mains less than 2-inch. It is also recommended that dead-end mains be eliminated as much as possible to reduce the required flushing and increase circulation throughout the water system.

In addition, the City has several fire hydrants on 4-inch water mains, which do not provide enough capacity for firefighting.

CONCLUSIONS

TCEQ Capacity Recommendations

All of the City of Palacios' facilities meet the current standards required by the TCEQ. The first required improvement will be construction of a new water well after the addition of 883 additional connections. Given the current growth rate, this is not expected for the next 10 years.

Water well No. 4 was drilled in 1958 and rehabilitated in 2007. Given the age of this well, it is recommended that the condition of this well be assessed to ensure it is maintained in good condition to continue providing water to the system.

Distribution System Recommendations

It is recommended that all cast iron mains be replaced with PVC when funding becomes available. Emphasis should be placed on replacing mains that have been prone to leaking and causing disruption in service. When replacing mains, the minimum size should be 4 inches for mains without fire hydrants and 6 inches for mains providing fire service. Efforts should be taken to loop all dead-end mains when practical.

It is also recommended that fire hydrants located on 4-inch mains be marked to identify they do not provide sufficient flow. In addition, where fire hydrants are needed to provide adequate fire coverage, the mains should be replaced with a minimum 6-inch diameter.