CHAPTER 6

INFRASTRUCTURE

INTRODUCTION

Infrastructure systems serve as the physical backbone of a community and provide households and businesses with the basic requirements to function on a daily basis. The City's infrastructure consists of several systems, including transportation, communications, utilities, water, wastewater, and drainage. Roadways and transportation are addressed in the Transportation & Mobility Chapter, and therefore this Chapter focuses on water, wastewater, and drainage systems. Master plans for all these elements are complete or are underway, and their findings and assumptions are incorporated into this Comprehensive Plan. The preferred growth scenario and recommended development patterns in Chapter 3 Land Use, Growth & Development, serve as the basis for the Future Land Use Map, balance accommodating growth with resource protection and promote the efficient use of infrastructure, water conservation and stormwater best management practices. This Chapter expands on those concepts.

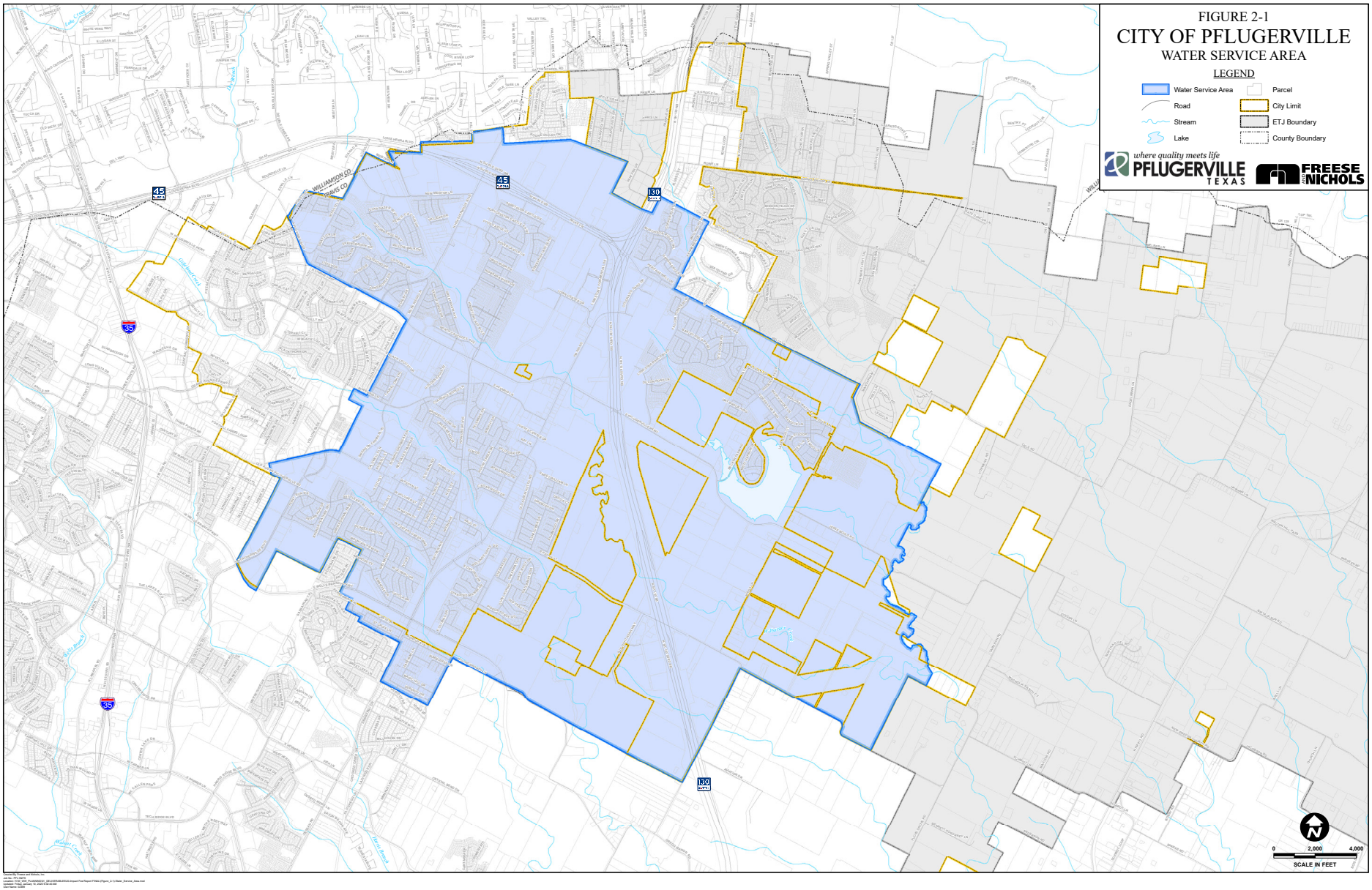
WATER SUPPLY AND SYSTEM

The success of a municipal water system is measured in terms of volume, pressure, and quality. Sufficient water must be available to provide daily service during the summer season with sufficient reserves to fight a major fire event. Consistent pressure ensures that water flow is satisfactory to residents, but it also reduces strain on the delivery system and reduces the opportunity for bacteria to form. Treatment of water prior to entering the system allows the water that residents drink to maintain a healthy and tasty quality.

Pflugerville provides water service to over 20,000 connections, with forecasts to add more than 15,000 connections in the next 10 years and almost 50,000 connections at buildout. This will require strategic, well-timed capital investments and policies to accommodate this growth in an efficient and effective manner, while also ensuring proactive maintenance of existing water system assets to meet the needs of people that already call Pflugerville home. Map 6.1 depicts the Pflugerville water service area. The water service area and city limits do not completely match, and the wastewater service area, discussed later in this Chapter, is much larger.

Wastewater Treatment Facility

Map 6.1. Water Service Area Map



Source from page 2-2 of the Water Master Plan

WATER SOURCES

The City of Pflugerville currently supplies its utility customers with a mixture of surface water and groundwater. The City has a contract with the Lower Colorado River Authority (LCRA) to utilize up to 12,000 acre-feet per year of surface water from the Colorado River, which equates to 10.71 million gallons per day (MGD). The groundwater comes from an unregulated portion of the Edwards Aquifer, and therefore the City is entitled to as much water from that source as they are able to pump. The City's two active groundwater pumps have a combined tested capacity of 4,300 gallons per minute (gpm), or 6.19 MGD according to the Texas Commission on Environmental Quality (TCEQ). The City has indicated reliability issues with the wells in the past, and therefore has not considered them as available supply beyond 2029 for planning purposes.

The City has adequate water supply to meet demands through 2029 when including the existing groundwater supply, but if the groundwater supply is no longer considered beyond that timeframe, the City must secure an additional 5.63 MGD (6,306 acre-feet per year) of surface water rights to meet 2029 average daily (AD) demands. By buildout, the City will require an additional 20.85 MGD (23,355 acre-feet per year) in surface water rights. The 2016 Region K Water Plan identifies the following potential sources for additional water supply for Pflugerville:

- Direct reuse
- Drought management – demand reduction
- Expansion of current groundwater supplies – Edwards-BFZ Aquifer
- LCRA – Lane City Reservoir
- LCRA – Mid Basin Reservoir
- Municipal conservation – demand reduction

If the City plans to discontinue use of the current groundwater supply sources, a detailed water supply and reuse evaluation should be conducted in the next five years to allow for adequate lead time to secure additional water rights and augment the City's current reuse infrastructure.

WATER SYSTEM OVERVIEW

The City of Pflugerville's water distribution system consists of four pressure zones (PZ), a network of water lines ranging in diameter from 2 inches to 36 inches, eight ground storage tanks (GST), four elevated storage tanks (EST), four pump stations (PS), two active groundwater wells, and a surface water treatment plant (WTP). Raw water is pumped from the Colorado River by the City's River Intake PS to Lake Pflugerville. The Lake PS pumps water from Lake Pflugerville to the Surface WTP, where the raw water is treated to drinking water standards.

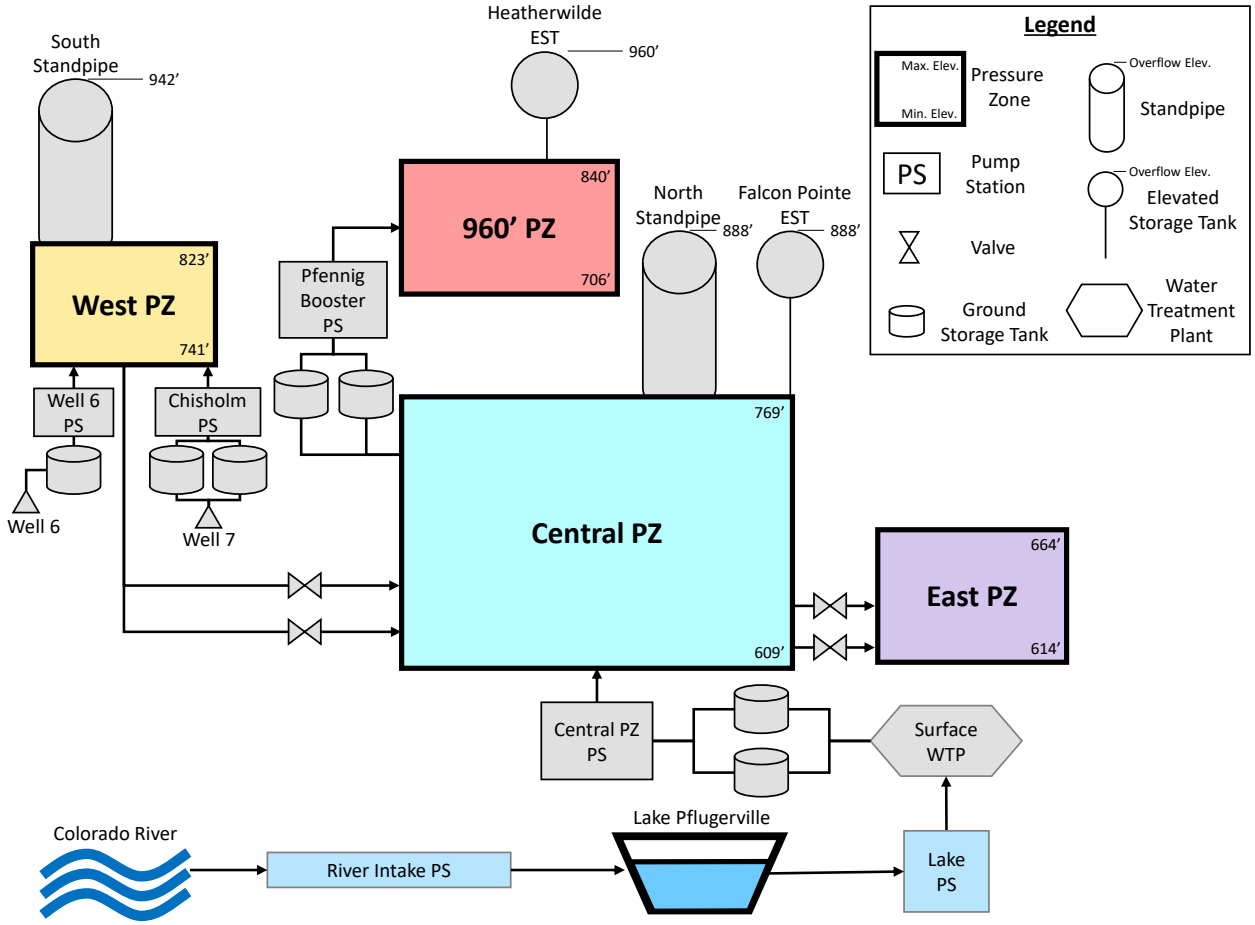
The Central PZ includes roughly half of the area encompassed by the city limits, straddling State Highway 130. The Surface WTP is located in the Central PZ, and serves the zone through the Central PZ PS. Currently, the North Standpipe and Falcon Pointe EST serve the Central PZ. Both Manville WSC and Manor are served wholesale water through valves from the Central PZ. The East PZ serves the area northeast of Lake Pflugerville through two pressure reducing valves (PRV), which are fed by the Central PZ. The West PZ serves a neighborhood south of West Pecan Street between South Heatherwilde Boulevard and 10th Street. Well 6 and Well 7 provide water supply to the West PZ through the Well 6 PS and Chisholm PS, respectively. The South Standpipe provides elevated storage capacity for the West PZ. The 960' PZ serves the area north of the West PZ and west of the Central PZ near Heatherwilde Boulevard bounded by East Wells Branch Parkway to the south and State Highway 45 to the north. The 960' PZ is served via the Pfennig Booster PS, which receives supply from the Central PZ. Elevated storage in the zone is provided by the Heatherwilde EST. The City provides wholesale water supply to Windermere from the 960' PZ by pumping water into a GST located on West Pecan Street. Manville provides water supply within portions of the City as a pass-through.

A PZ is an area served by the same elevated storage tank. Waterlines cannot connect across boundaries because it would cause elevated storage tanks to overflow or drain. It may be beneficial to combine West, Central and Heatherwilde pressure zones based on similar ground elevations. It is also critical to include utility investigations as part of development feasibility with the City to avoid connection between PZs.

It is critically important to plan for average daily demand, maximum day demand and peak hour demand, beyond simply meeting TCEQ minimums, in order to meet community expectations and avoid future issues. Water demand projections should be conducted by pressure zone. As part of this, the City should continue to use extended period simulations to understand operational issues, such as available fire flow at any point in the water model. Likewise, frequent model updates can help avoid TCEQ violations, particularly elevated storage requirements.

Soils with high plasticity ind-exes in the area make Pflugerville's system more susceptible to pipe breaks, a notable issue as Pflugerville's relatively new water infrastructure begins to age.

Figure 6.1. Water System Graphic



Source from page 4-3 of the Water Master Plan

2020 WATER MASTER PLAN AND 2021 UPDATE

In 2018, Pflugerville initiated preparation of a Water Master Plan in order to evaluate the integrity of the existing water system and recommend a phased capital improvement plan through buildout of the service area. The recommended improvements from the plan serve as a basis for the design, construction, and financing of facilities required to meet the City's water capacity and system renewal needs.

Most of the system is able to meet the Texas Commission on Environmental Quality (TCEQ) minimum pressure requirement of 35 pounds per square inch (psi), but the area just south of East Pecan Street in the Central PZ near the boundary with the West PZ show modeled pressure below 35 psi. TCEQ requires a minimum residual pressure of 20 psi be maintained while delivering the fire flow demand. Most of the system can provide at least 1,500 gpm fire flow at 20 psi, and only a few small areas are unable to provide at least 500 gpm due to small-diameter lines. As a public water utility, the City of Pflugerville must comply with the rules and regulations for public water systems set forth by the TCEQ in Chapter 290, Public Drinking Water. The City is currently meeting or exceeding all TCEQ minimum pumping and storage requirements except for elevated storage capacity in the Central Pressure Zone. The deficiency was addressed through short-term capital improvements under the 2020 Water Master Plan.

The Water Master Plan, which included a risk-based assessment of all water pipelines and certain storage tanks was conducted to assist in the prioritization of recommended operations and maintenance improvements. The assessment was based on the condition and criticality of existing water system infrastructure, and led to a scoring system to provide an analytical and quantitative method to evaluate the condition and criticality of each water pipeline and storage tank. The result was a rehabilitation capital improvements plan.

A technical memo updated the Water Master Plan in 2021 to address updated growth patterns and revised service plans, including an update to the timing of anticipated 5-year developments and revised cost estimates for proposed CIP projects. During the development of the Water and Wastewater Master Plans, parcels expected to develop in the 5-Year planning period were assigned development percentages of 15%, 50%, or 100%. Parcels that had been assumed to be 15% developed in the 5-Year planning period in the master plans should instead be assumed to be 5% developed in the 2021-2025 planning period. Similarly, parcels that had been assumed to be 50% developed in the 5-Year planning period in the master plans should instead be assumed to be 30% developed in the 2021-2025 planning period. FNI updated the 5-Year Development map initially included in the Water and Wastewater Master Plans based on this data.

The Water Service Area is expected to grow by 7.91% by the end of 2026 and by 7.64% between 2027 and 2031.

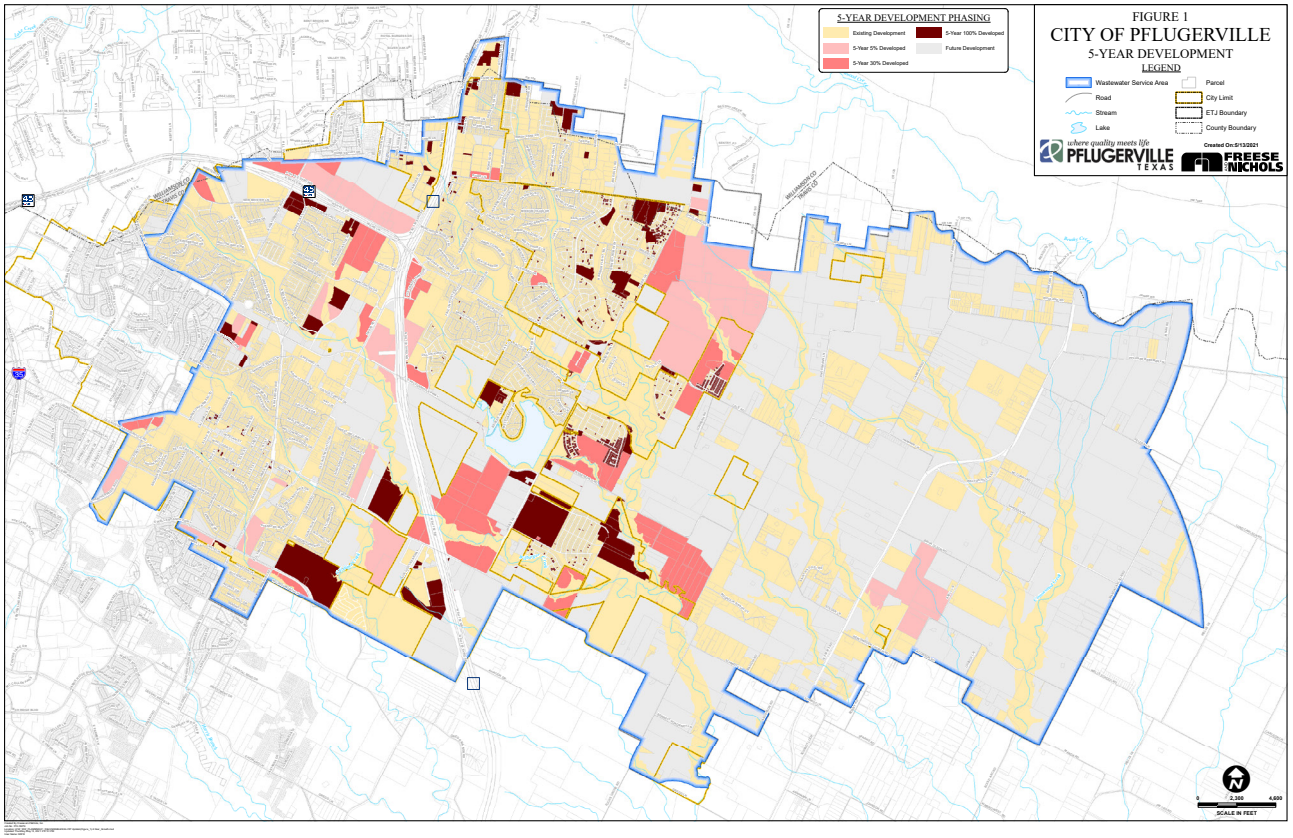
Figure 6.2. Water Service Area Projections

PLANNING YEAR	WATER CONNECTIONS	WATER CONNECTIONS ANNUAL GROWTH RATE
2021	20,449	-
2026	29,915	7.91%
2031	43,231	7.64%
Buildout	68,415	-

Source Water/Wastewater Master Plan Technical Update Memo

Water demands were projected for 2021, 2026, 2031, and buildout conditions for the City of Pflugerville Water Service Area. The design criteria developed as part of the Water Master Plan was used to project average day water demands. FNI utilized a design residential usage of 440 gallons per connection per day (gpCd), a design maximum day to average day peaking factor of 2.00, and a design peak hour to maximum day peaking factor of 2.00.

Map 6.2. 5-Year Development Map



Source Water/Wastewater Master Plan Technical Update Memo

Figure 3 shows the demand projections for 2021, 2026, 2031, and buildout for each pressure zone. Demands for Pflugerville customers currently served by Manville WSC were included, as these customers are planned to be served by the City in the future.

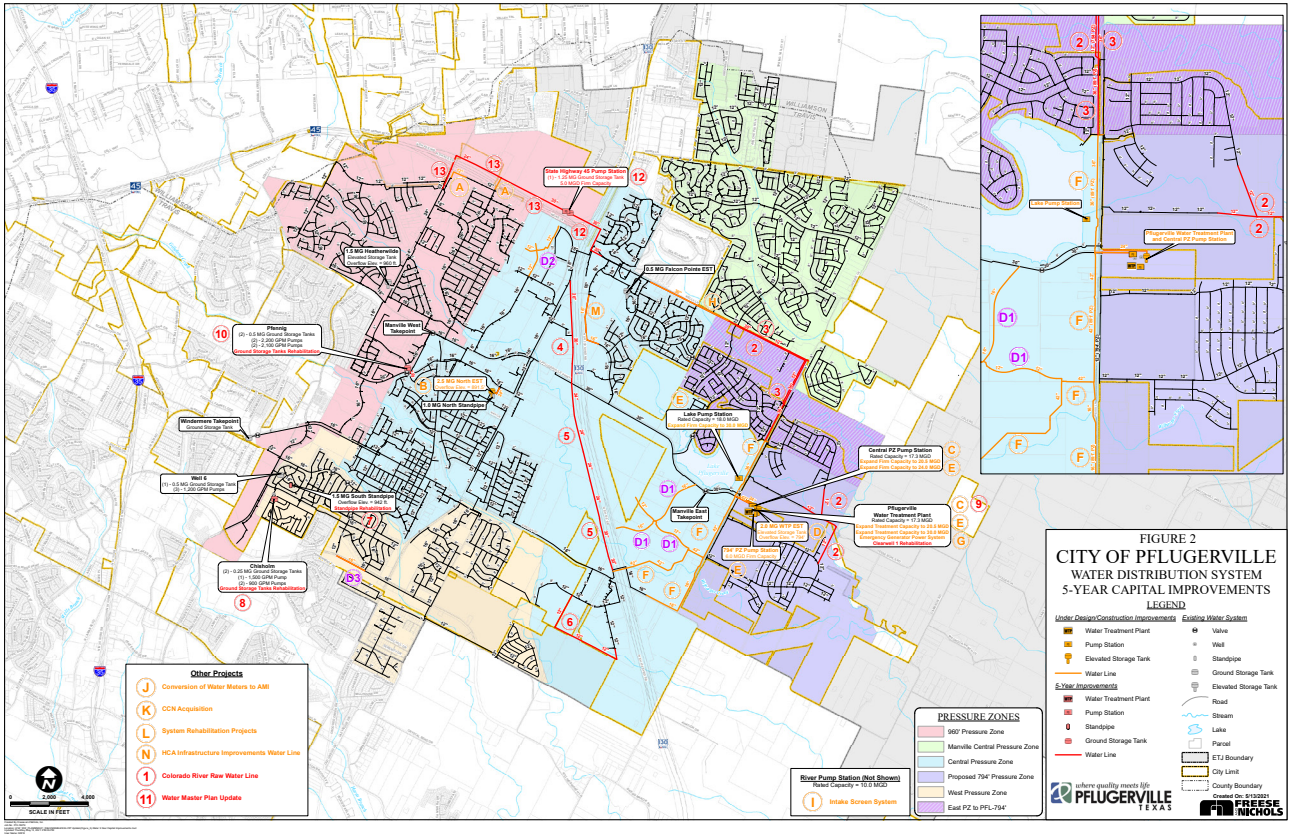
Figure 6.3. Demand Projections

Pressure Zone and Overflow Elevation	Number of Connections	Average Day Demand (MGD)[1]	Maximum Day Demand (MGD)[1]	Peak Hour Demand (MGD)
2021				
East Pressure Zone (850')	1,536	0.68	1.35	2.70
Central Pressure Zone (891')	7,639	4.37	7.97	14.69
West Pressure Zone (942')	1,332	0.59	1.17	2.34
960' Pressure Zone (960')	4,751	2.36	5.18	9.36
Pflugerville Subtotal	**15,258**	**8.00**	**15.68**	**29.10**
Manville Central Pressure Zone (900')	5,191	2.28	4.57	9.14
Manville Subtotal	**5,191**	**2.28**	**4.57**	**9.14**
Total	**20,449**	**10.28**	**20.25**	**38.24**
2026				
794' Pressure Zone (794')[2]	3,317	1.46	2.92	5.84
Central Pressure Zone (891')	13,118	6.78	12.79	24.34
West Pressure Zone (942')	1,332	0.59	1.17	2.34
960' Pressure Zone (960')	6,194	3.00	6.45	11.90
Pflugerville Subtotal	**23,960**	**11.82**	**23.34**	**44.42**
Manville Central Pressure Zone (900')	5,955	2.62	5.24	10.48
Manville Subtotal	**5,955**	**2.62**	**5.24**	**10.48**
Total	**29,916**	**14.45**	**28.58**	**54.90**
2031				
794' Pressure Zone (794')[2]	3,916	1.72	3.45	6.89
Central Pressure Zone (891')	22,533	10.92	21.08	40.91
960' Pressure Zone (960')[3]	10,812	5.03	10.51	20.03
Pflugerville Subtotal	**37,261**	**17.68**	**35.04**	**67.83**
Manville Central Pressure Zone (900')	5,971	2.63	5.25	10.51
Manville Subtotal	**5,971**	**2.63**	**5.25**	**10.51**
Total	**43,232**	**20.30**	**40.29**	**78.34**
Buildout				
794' Pressure Zone (794')[2]	7,556	3.32	6.65	13.30
Central Pressure Zone (891')	40,295	18.74	36.71	72.17
960' Pressure Zone (960')[3]	16,041	7.33	15.12	29.23
Pflugerville Subtotal	**63,892**	**29.39**	**58.47**	**114.70**
Manville Central Pressure Zone (900')[4]	4,523	1.99	3.98	7.96
Manville Subtotal	**4,523**	**1.99**	**3.98**	**7.96**
Total	**68,415**	**31.38**	**62.46**	**122.66**

(1) Demands for the Central Pressure Zone include wholesale demands for Manville and City of Manor, and the demands for 960' Pressure Zone include wholesale demands for Windermere.
(2) In 2026, the existing connections in the East Pressure Zone are consolidated into the 794' Pressure Zone.
(3) In 2031, the existing connections in the West Pressure Zone are consolidated into the 960' Pressure Zone.
(4) By Buildout, 596 of the existing Manville Central Pressure Zone connections are included in the 794' Pressure Zone totals.

The water system CIP developed as part of the 2020 Water Master Plan was updated in 2021 to reflect the changes that took place in the system since the master plan. It resulted in an ordered list of projects, but also noted the importance of being ready to shift with changes in development patterns. Because development demands are always evolving and changing, Pflugerville should continually update the water system model and evaluate the CIP annually to see if critical infrastructure needs require a shift in the schedule. In addition, the Water Master Plan includes a variety of recommendations above TCEQ minimums. This approach helps to avoid compliance issues and improves overall system performance, lowering risk.

Map 6.3. Water Distribution System Pressure Planes



WASTEWATER

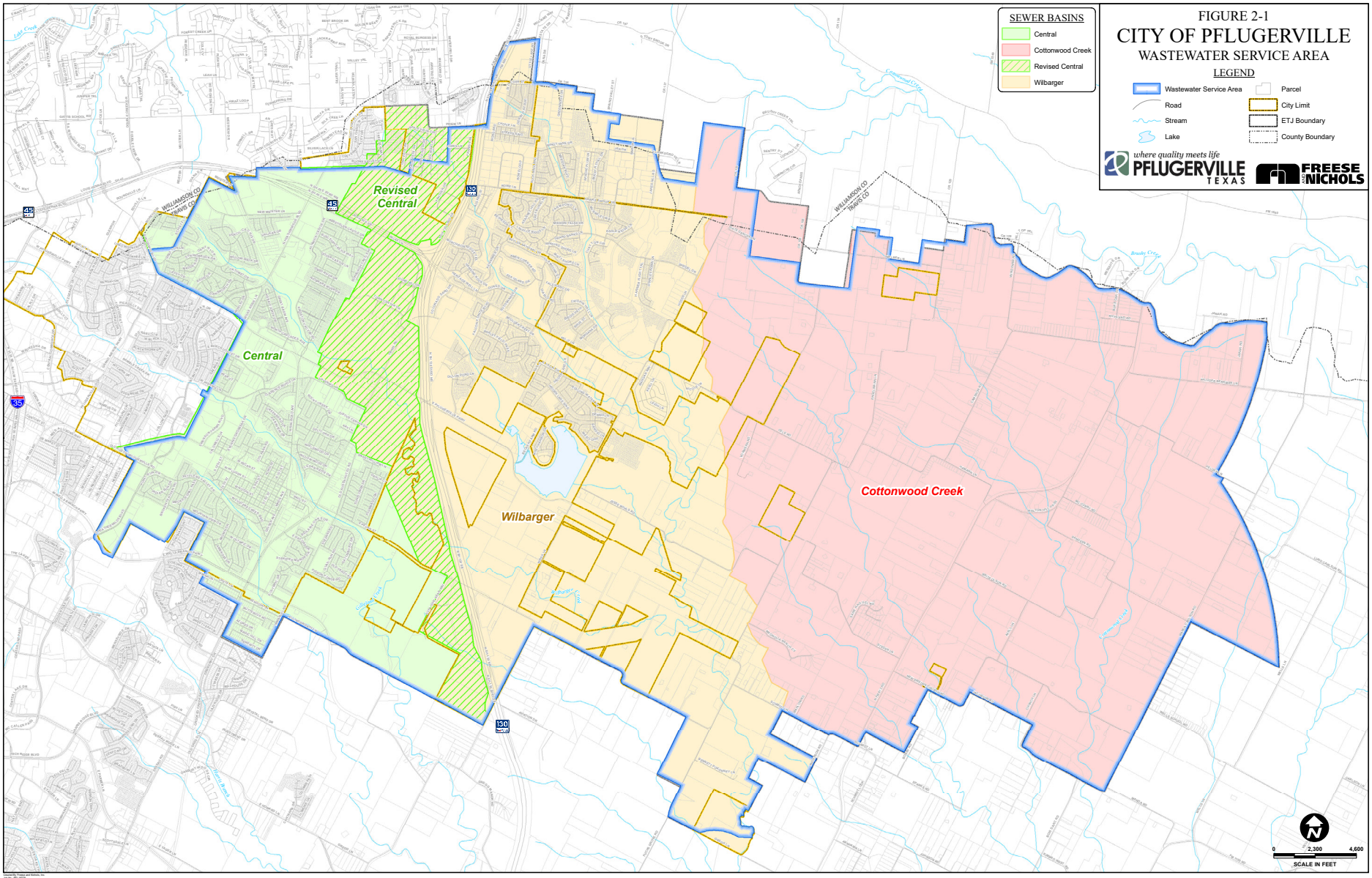
Wastewater is the contaminated water that is discharged as part of daily activities from every household and business, including the water and solids associated with toilets, sinks, showers, dishwashers, washing machines, and floor drains. Once discharged from a household or business wastewater is transported to the wastewater treatment plant in the City. The plant cleans and purifies the wastewater so it can be discharged safely back into the environment.

The wastewater system consists of a network of pipes that depend upon gravity to naturally move wastewater to the City's wastewater treatment plant for treatment prior to discharge (though a second plant is under design). Because of the City's limited slopes, multiple watersheds, and other physical barriers, the system is assisted by a number of lift stations located strategically throughout the wastewater network. Success of the system is dependent upon well-maintained pipes that are of sufficient size to support the anticipated amount of wastewater, as well as wastewater treatment stations with the capacity and technology to handle the anticipated volume of wastewater.

The quality of wastewater service delivery may be most dependent upon the maintenance of the system's infrastructure, particularly the network of pipes that draw wastewater to treatment facilities. Stormwater inflow and infiltration (I&I) into the wastewater system caused by cracks in pipelines and rare illegal stormwater connections by residents place an unnecessary burden on the system. Soils with high plasticity indexes in the area make Pflugerville's system more susceptible to I&I issues as constant movement causes pipe breaks.

The City currently provides wastewater service to over 20,000 customers. The population within the service area is projected to grow by over 22,000 connections in the next 10 years, and by almost 115,000 connections by buildout. This is substantially higher than the water system projections because the wastewater service area is much larger, encompassing the entire ETJ. Like the water system, a thoughtful approach to capital investments is essential to accommodate this growth as well as assure wastewater system assets to meet the needs of people already in Pflugerville. Map 6.4 depicts the Pflugerville wastewater service area.

Map 6.4. Wastewater Service Area - Sewer Basins



Source page 2-2 from Wastewater Master Plan

WASTEWATER SYSTEM OVERVIEW

The Wastewater Service Area is expected to grow by 8.16% by the end of 2026 and by 8.24% between 2027 and 2031.

WASTEWATER TREATMENT PLANT

Wastewater treatment plant analysis is based on the TCEQ "75/90 rule." The 75/90 rule states that when a plant exceeds 75 percent of its permitted annual average flow for three consecutive months, the facility must begin planning for its next expansion. In addition, the rule states that when a facility exceeds 90 percent of its permitted annual average flow, the facility must be in construction of its next expansion.

Pflugerville's exceptionally high and seemingly accelerating growth should prompt examination of design and construction triggers in order to allow sufficient time for design and construction, given the increased risk of permit violations resulting from growth outpacing the contemplated circumstances of the 75/90 rule.

Pflugerville currently operates one wastewater treatment plant (WWTP): the Central WWTP, located on Sun Light Near Way. The Central WWTP has a treatment capacity of 5.30 MGD, but it is currently undergoing an expansion project to increase the capacity. When Phase 1 of this project is completed, its treatment capacity will be 7.25 MGD. All flow from the Wilbarger Basin currently being treated at the Central WWTP will be treated at a new future Wilbarger WWTP instead. This reduction in flows at the Central WWTP will allow Pflugerville until 2032 before the 75% capacity level is reached. Based on flow projections, in 2032, planning for the Phase 3 expansion of Central WWTP to a treatment capacity of 10.00 MGD must begin, and construction must be finished by 2040. Flow projections also indicate that the Central WWTP will exceed the 10.00 MGD Phase 3 capacity in 2047. The Central WWTP cannot be expanded to a treatment capacity in excess of 10.00 MGD due to discharge permit limitations.

A second wastewater treatment plant is in design, preparing for construction beginning in 2022. The Wilbarger WWTP is proposed to be online in 2024 with a treatment capacity of 8.0 MGD. The 8.0 MGD planned treatment capacity is anticipated to be sufficient to handle the Wilbarger and Cottonwood basins until 2031, when Pflugerville must begin planning for implementation of the Phase 2 expansion to a permitted capacity of 16.0 MGD, to be constructed by 2034. Similarly, the Phase 2 treatment capacity will be sufficient to handle the Wilbarger and Cottonwood basins until 2044, when Pflugerville must begin planning for implementation of the Phase 3 expansion to a permitted capacity of 24.0 MGD, to be constructed by 2050.

Figure 6.4. Wastewater Connection Projections

PLANNING YEAR	TOTAL WASTEWATER CONNECTIONS	WASTEWATER CONNECTIONS ANNUAL GROWTH RATE
2021	22,879	-
2026	33,870	8.16%
2031	50,332	8.24%
Buildout	133,744	-

Source Water/Wastewater Master Plan Technical Update Memo

Pflugerville Central Wastewater Treatment Plant undergoing expansion

LIFT STATIONS

The City of Pflugerville contains some geographic characteristics that make it difficult in some locations for wastewater to flow to the Central WWTP by gravity. Pflugerville owns and maintains 14 lift stations throughout its wastewater collection system to pump flow to a location where it can flow by gravity to the WWTP. Figure 5.5 provides a summary of each lift station, including the wet well capacity and the existing firm and total pumping capacities. The total pumping capacity is the pumping capacity of all pumps at the lift station, while the firm pumping capacity is the capacity of the lift station with the largest pump out-of-service. Highland Park Lift Station has a firm pumping capacity equal to its total pumping capacity because all three pump slots are filled, and a fourth pump is kept on hand by the City of Pflugerville in case one of the three installed pumps goes out of service.

A lift station is considered to be under capacity if the projected peak flow is greater than the firm capacity. New or improved lift station firm pumping capacities should be sized to convey at least 125% of projected peak buildout flows. New interceptor improvements will allow nine lift stations to be decommissioned.

Figure 6.5. Lift Station Capacity

LIFT STATION	WET WELL CAPACITY (GALLONS)	PUMPING CAPACITY	
		FIRM (GPM)	TOTAL (GPM)
Blackhawk	3,384	126	252
Bohls Place	5,076	226	452
Boulder Ridge	11,468	226	452
Carmel	192,045	2,000	4,000
Club	8,272	200	400
Colorado Sands	7,053	1,640	3,280
Dunes	7,520	620	1,240
Falcon Pointe	9,400	334	668
Highland Park	27,919	2,499	2,499
Kelly Lane	79,903	1,750	3,500
Pfluger Crossing	21,151	950	1,900
Renewable Energy	13,219	1,640	3,280
Verona	18,507	368	1,104
Weiss Lane	165,240	2,700	5,883

Source page 4-3 of Wastewater Master Plan

COLLECTION SYSTEM

Pflugerville's existing wastewater collection system consists of about 257 miles of collector mains, interceptors, and force mains. Pipeline diameters range in size from 4 inches to 42 inches. The majority of the system is comprised of 8-inch wastewater lines that commonly serve subdivisions, neighborhoods, and small commercial areas throughout the system. Larger interceptors collect the flow from these smaller mains and convey it toward the Central WWTP.

When determining the size of proposed wastewater lines, TCEQ design criteria (§217.53(l)(1)) dictate that gravity sewer lines shall be sized to maintain a minimum velocity of 2 ft/sec. Maintaining these velocities discourages the settling of solids. TCEQ design criteria (§217.67(a)) also state that force mains shall be sized to convey the lift station pumping capacity at a minimum velocity of 3 feet/second for duplex lift stations and 2 feet/second with one pump operating at a lift station with three or more pumps. When sizing lines for future wastewater loading, it is specifically stated in TCEQ Chapter 217 §217.53(j)(3) that "A collection system must be designed to prevent a surcharge in any pipe at the expected peak flow." Therefore, all proposed lines should be sized to convey peak flows without surcharge conditions. In addition, design criteria may require update since they call for peak wet weather flow to not use more than 75 percent

Utility line installation

of the line capacity, while the Wastewater master plan assumed using 100 percent of the capacity of the line since it anticipates buildout flows. Additionally, slopes for new lines serving undeveloped area should meet minimum slope requirements set by TCEQ.

2020 WASTEWATER MASTER PLAN AND 2021 UPDATE

In 2018, Pflugerville initiated preparation of a Wastewater Master Plan in order to evaluate the integrity of the existing system and recommend a phased capital improvement plan through buildout of the service area. The recommended improvements from the plan serve as a basis for the design, construction, and financing of facilities required to meet the City's wastewater capacity and system renewal needs.

Wastewater flows were projected for 2021, 2026, 2031, and buildout conditions for the City of Pflugerville Wastewater Service Area. The design criteria developed as part of the Wastewater Master Plan was used to project average day wastewater flows. FNI utilized a per-connection average day flow of 260 GPD for all wastewater flow projections. Figure 6.6 shows the flow projections for 2021, 2026, 2031, and buildout for each sewer basin.

Figure 6.6. Sewer Basins Projections

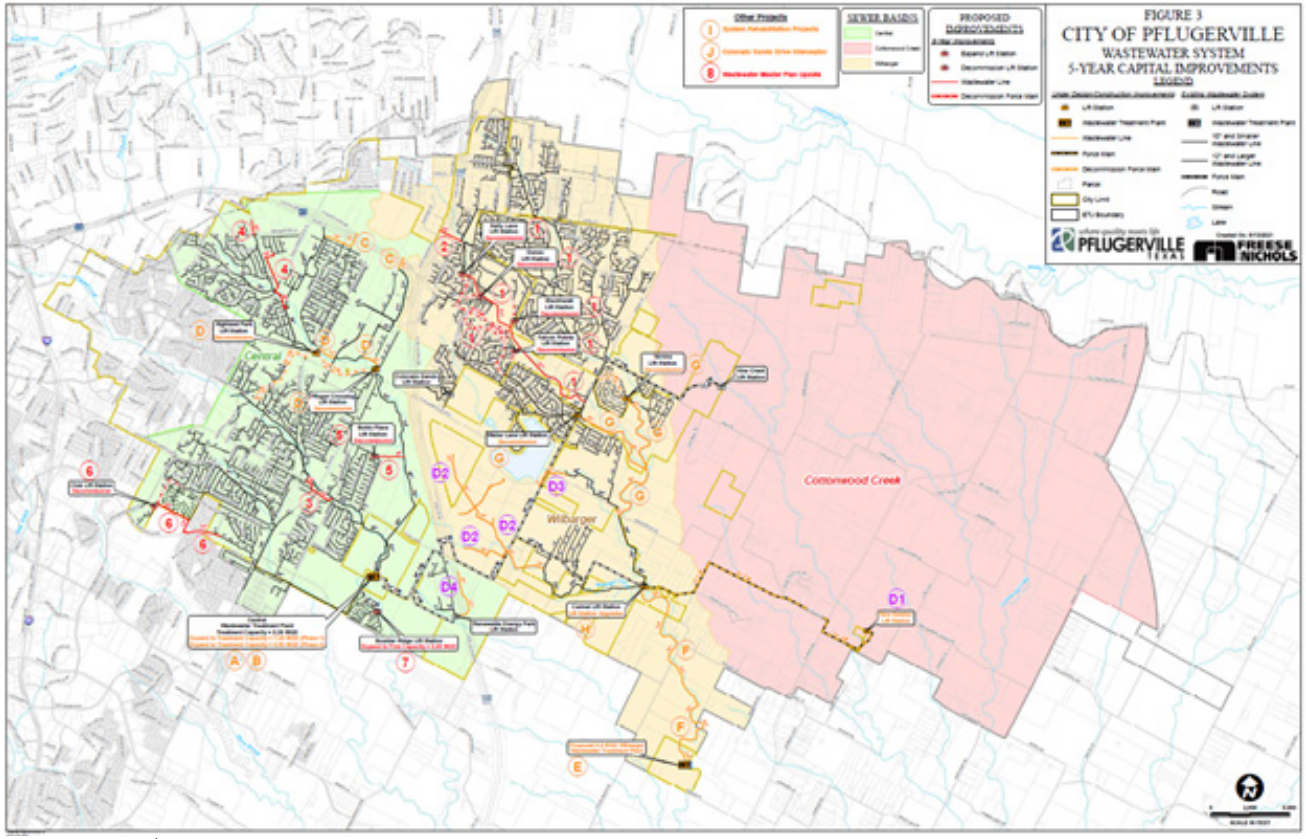
SEWER BASIN	NUMBER OF CONNECTIONS	AVERAGE DAILY FLOW (MGD)
2021		
Central	12,268	3.19
Wilbarger	10,582	2.75
Cottonwood	29	0.01
Total	22,879	5.95
2026		
Central	17,852	4.64
Wilbarger	15,355	3.99
Cottonwood	663	0.17
Total	33,870	8.81
2031		
Central	26,273	6.83
Wilbarger	21,009	5.46
Cottonwood	3,050	0.79
Total	50,332	13.09
BUILDOUT		
Central	41,929	10.90
Wilbarger	36,436	9.47
Cottonwood	55,379	14.40
Total	133,744	34.77

Source page 5 from 2021 Technical Memo

The Wastewater Master Plan, similar to its companion Water Master Plan, included a risk-based assessment of various assets to prioritize operations and maintenance improvements. The assessment was based on the condition and criticality of wastewater infrastructure, resulting in a scoring system like the Water Master Plan. This provided an analytical and quantitative method to evaluate the condition and criticality of each system element, resulting in a wastewater rehabilitation capital improvements plan.

Like the water system, the wastewater system CIP was updated in 2021 to reflect the changes that took place in the system since the 2020 master plan. It resulted in an ordered list of projects, with the same indications regarding the ability to shift opportunistically with new development. Pflugerville should continually update the wastewater system model to account for ever-changing development demands and circumstances. Likewise, mini-area studies can be performed, as has been done in Pflugerville using on-call consulting services.

Map 6.5. Wastewater System 5-Year Capital Improvements



Source Water/Wastewater Master Plan Technical Update Memo

WASTEWATER BENEFICIAL REUSE

Public water supplies are treated to drinking water standards. The reality, however, is that household potable use is only a portion of the overall potable water usage. Many uses like irrigation and industrial processes do not require water treated to drinking standards using this finite resource. Reclaimed water has become an increasingly common and accepted method to both manage treated effluent and make better use of potable supplies. In some cases, this becomes its own utility funding stream. This approach is governed by TCEQ's Chapter 210 Use of Reclaimed Water regulations. Authorization for the use of reclaimed water applied to an area of land for irrigation requires determination and documentation of typical irrigation demands for the proposed use based on the type of vegetation and land area to be irrigated. These are the most common uses. Type I reclaimed water use is allowed for unrestricted areas where the public may come into contact with the reclaimed water and may also be used for any Type II use. Designing WWTP's to meet Type I standards provides the City the greatest flexibility in effluent management.

This is not as simple as "attach a pipe and water the grass." One of the obstacles in developing a reclaimed water system is balancing the demand for water with the limited and variable supply produced by a wastewater treatment facility. The flows demanded from the reclaimed water system are rarely constant and will vary significantly over a 24-hour period. Furthermore, the reclaimed water demands will fluctuate and vary greatly depending on the type of use and time of year. For example, typical irrigation demands are highest at night during the summer months when the air is cooler and the irrigation is most efficient. Since the reclaimed water supply is from a WWTP, the supply is also variable. The water that flows through a treatment facility will fluctuate throughout the day and the trend generally follows the non-irrigation domestic demand and use of potable water. Wastewater flows will often have two peaks with a crest in the morning and lower flows through the day and then another peak in the evening before tailing off during the nighttime hours. This means methods of storage and pressurization are needed.

The existing wastewater treatment plant supplies 90 million gallons annually to the nearby Travis County Northeast Metropolitan Park for irrigation purposes. Beneficial reuse of treated effluent could be expanded, with consideration of conversion of wastewater force mains to reclaimed water lines following completion of the Wilbarger wastewater treatment plant and related interceptors.

A 2015 plan by the City indicated significant opportunities to expand the beneficial reuse program, particularly within the SH 130 corridor with anticipated future uses.

Type I: defined by TCEQ under Texas Administrative Code Rule 210.32 as irrigation or other uses in areas where the public may be present during the time when irrigation takes place or other uses where the public may come in contact with the reclaimed water.

Type II: defined by TCEQ under Texas Administrative Code Rule 210.32 as irrigation or other uses in areas where the public is not present during the time when irrigation activities occur or other uses where the public would not come in contact with the reclaimed water.

STORMWATER

Stormwater management is often front-of-mind in Central Texas given the frequency and size of large storm events, resulting in flash flooding. Wildlife habitat often rises as a concern along natural waterways. But these same stormwater features, sometimes considered liabilities, can serve as assets.

In natural areas, stormwater is either slowly absorbed into the soil or gradually moves toward the lowest points and channels before reaching ponds, low-lying wetlands or waterways. In urban and suburban areas, a significant portion of the land surface is covered by buildings and pavement. When it rains these "impervious surfaces" do not allow water to soak into the ground.

PFLUGERVILLE'S STORMWATER ENVIRONMENT – A GREEN NETWORK

Pflugerville is blessed with fortunate topography that lends itself to lower flood risk compared to many peers in Central Texas, near the headwaters of Gilleland, Wilbarger, and Cottonwood Creeks. All three of these watersheds flow to the south and east, where they eventually meet the Colorado River. Pflugerville deploys underground pipes, drainage channels, and natural creeks to convey stormwater runoff. On-site detention ponds collect rainfall and gradually release it into the storm system to ensure that the location does not shed water at a rate or volume that could prove detrimental to surrounding areas. Nevertheless, heavy rainfall events can result in flooding in parts of the City due, at least in part, to location of development, the pattern of development and the approach to dealing with stormwater.

Soil and topography, along with ground cover, shape the role and performance of stormwater in Pflugerville. Pflugerville's soils feature a variety of clays with high plasticity, meaning they shrink and swell based on moisture content. This is most commonly understood to the general public as a cause for home foundation issues, but this soil trait also means the soil does not allow infiltration at high rates compared to other soils. Slopes above five percent are rare in Pflugerville, with most areas falling below two percent. Grasslands, such as those found in Pflugerville's Blackland Prairie area, are most common in natural corridors, with common riparian flora within floodplains. Urbanization is, however, shifting this pattern and thus risks changing stormwater performance.

The floodplains of the creeks and their tributaries have created a natural open space and recreation network, with most of the city within a 10-15 minute walk. Pflugerville has begun seizing upon this opportunity, incrementally building out what has become an extensive and beloved trail network primarily focused along and branching from this green network, connecting various neighborhoods and park facilities. This same attribute, however, has limited connectivity in some cases since roadway crossings of creeks are more expensive.

PFLUGERVILLE DRAINAGE MASTER PLAN

The City is currently preparing a Drainage Master Plan that recognizes drainage as a regional issue in which every change in development and drainage patterns can have a cascading positive or negative effect. The Drainage Master Plan takes a holistic and regional approach to stormwater management and includes best management practices, including the preservation of native habitats and riparian areas near creeks, and wetland and prairie creation. The Drainage Master Plan should be updated on a routine basis, much like the water and wastewater master plans.

NATURAL WATER QUALITY

Pflugerville's three creeks are naturally intermittent, but Gilleland Creek has changed over time to become more constant, a result of a half dozen wastewater treatment plant discharges located at various points in its basin west of Pflugerville. With the flow dominated by effluent, Gilleland Creek has become an impacted waterway under the Clean Water Act's 303(d) program. This has presented an opportunity for the City to work collaboratively with regional stakeholders. Testing trends, however, have indicated that nonpoint source pollution is more likely the cause than direct point sources.

Water quality is impacted by point and nonpoint source pollution. Point source pollution can be traced to specific points of discharge from wastewater treatment plants or industrial sites. Nonpoint source pollution typically originates from rainfall that moves over the ground and picks up natural and human pollutants and then deposits them into lakes, rivers, wetlands and coastal waters. Common examples of nonpoint source pollution include septic systems and petroleum-based runoff from parking lots as well as agricultural runoff.

Point source pollution is regulated through the National Pollutant Discharge Elimination System (NPDES) permit program. In order to meet the requirements of this program, the City adopted an ordinance regulating stormwater permits in July 2009. The ordinance regulates stormwater runoff from new development and redevelopment, construction activities, and industrial and high-risk facilities.

Nonpoint source pollution has emerged as a major contributor to water quality problems. Stormwater runoff is harmful to the environment as it often carries pollutants such as oil, dirt, chemicals, and lawn fertilizers directly to streams and rivers. Additionally, when runoff leaves the storm drains and empties into a stream, its excessive volume and power can damage streamside vegetation and aquatic habitat. To protect water quality, development should be designed and built to minimize increases in runoff through conservation of natural areas, cluster development, use of pervious surfaces, and other best management practices. These low-impact approaches are generally recognized as preferred versus engineered solutions.

Utilizing natural systems/processes and taking a comprehensive approach to managing water can help meet several of the community's goals, including improved water quality, water conservation, and flooding reduction. Natural systems including wetlands, native habitat areas, and waterways are often referred to as "green infrastructure." These natural systems are very important in managing stormwater and water quality along with built engineered solutions like curb and gutter. Managing stormwater occurs at the regional, community and site scale. Regional systems may include natural lands and waters, community scale elements include compact, mixed use development, urban forestry, reduction in impervious surfaces, and site solutions include trees, vegetation, porous pavement, green roofs, and rain barrels.

It is also critical to understand that "green infrastructure" extends to other aspects of the built environment. People of Pflugerville have repeatedly indicated their love for the City's parks and trails. Pflugerville's creeks and streams, and even thoughtfully-designed engineered channels, can and should be multipurpose whenever possible. This creates an important recreational network as well as alternative transportation corridors, along with respite from busy day-to-day life. While designed for water supply, Lake Pflugerville is a great example of green infrastructure serving multiple purposes—this philosophy should pervade infrastructure design in the future for Pflugerville.

INFRASTRUCTURE GOALS, POLICY STATEMENTS, AND ACTION ITEMS

INFRASTRUCTURE GOALS

- Coordinate expansion of infrastructure systems with future growth and development.
- Encourage development patterns that recognize water as an asset and minimize the maintenance and cost of infrastructure systems.
- Promote efficient use and development/ redevelopment of land.
- Encourage a comprehensive approach to stormwater management and water quality protection that includes natural and built systems.
- Support conservation and reuse of water

INFRASTRUCTURE POLICIES AND ACTION ITEMS

1. Evaluate infrastructure needs as the City grows.

1.1. Concurrency requirements to reconcile growth needs against infrastructure capacity are encouraged to ensure that development does not outpace the growth of infrastructure.

1.2. All infrastructure should be considered a regional issue, including the possibility of shared systems for purposes of economies of scale, sustainability, emergency management and disaster recovery.

1.3. Proactive development of strategic infrastructure improvements to spur growth in a desired, cost-efficient, and responsible manner is preferable to major infrastructure improvements by the development community.

1.4. Developers should compensate the City for their portion of improvements such as off-site water and wastewater improvements, capacity improvements and regional detention, that would otherwise be borne on-site or near-site by developers.

1.5. Ensure infrastructure systems master plans account for all goals of the Comprehensive Plan.

1.6. Infrastructure master plans should undergo updates more frequently than the standard 5 year cycle due to shifting development patterns and pressures.

1.7. Water Control and Improvement Districts (WCID) and Municipal Utility Districts (MUD) should either be discouraged as tools that accelerate improvements to infrastructure beyond responsible growth through the municipality, or account for impacts via consent and strategic partnership agreements.

1.8. Development types and patterns should be encouraged that creatively reduce the amount of infrastructure to be maintained per connection.

1.9. Green technology and applications should be applied to new improvements and redevelopment projects at every appropriate opportunity.

1.10. All infrastructure projects, particularly projects that alter the physical or visual composition of an area, should apply context-sensitive solutions.

1.11. Utility infrastructure for new development should be extended “to and through” at the cost of the developer, with appropriate proportional participation from the City for oversizing to ultimate needs of the community.

1.12. Consider the consolidation of pressure planes and reduction in lift stations via wastewater interceptors to reduce the fail risk and lesson operating costs.

1.13. Proactively respond to data that identifies the need for significant infrastructure investments. Decisions should allow sufficient time for design and construction beyond TCEQ standards, given rapid growth.

1.14. Seek to reserve optimal land for key infrastructure, like pump stations and elevated tanks, seeking ideal locations rather than settling for lesser locations.

1.15. Review and update master plan CIPs, and related models, annually for growth-related changes.

1.16. Use oversizing agreements to construct ultimate infrastructure when possible.

1.17. Complete annual evaluation of engineering technical manuals to address the needs of a growing community.

1.18. Consider long-term goals when undertaking major infrastructure investments. For example, a major road reconstruction should consider the life-cycle of underground infrastructure and also whether any above-ground infrastructure may be relocated underground in the future.

1.19. Consider updates to impact fees more frequently than the state-required five-year intervals, as the past has shown the associated CIP may shift projects in and out of the calculation.

2. Evaluate and address water needs in the City.

2.1. Water supply should, to the extent possible, include a diversity of sources to ensure that the community is not fully dependent upon a single source.

2.2. Evaluate acquisition of the Manville system

2.3. Innovative sources of water, including water reclamation, should be explored and implemented to the fullest use practical.

2.4. Promote private use of rain barrels and cisterns for rain capture and reuse, particularly for use with lawn and landscape care and other outdoor activities.

2.5. New development should be required to install devices designed to reduce the amount of water used in a household or business, such as low-flush toilets.

2.6. All new community facilities should incorporate water conservation amenities.

2.7. Owners of existing structures should be strongly encouraged to install new equipment that more effectively uses water and in smaller quantities.

2.8. Consideration should be given to rewarding water customers that reduce use of water, including rate reductions or other creative methods.

2.9. Consideration should be given to providing grants to property owners for the purpose of installing water conservation measures including architectural improvements and site improvements.

3. Evaluate and address wastewater needs in the City.

3.1. Proactive maintenance and reduction of inflow and infiltration (I&I) into the wastewater system should be viewed as a critical tool to reduce capacity and energy requirements, particularly during storm events.

3.2. Septic systems should be strategically targeted for replacement with a tie into the municipal wastewater system.

3.3. Type I water reclamation infrastructure should be required in any new development involving irrigation activities, retention pond management and any other activity in which it is appropriate. Application for personal home sites may be an option if designed appropriately.

3.4. Wastewater conversion to drinking water, technically called direct potable reuse, should be considered as a creative and potentially necessary means of expanding the water supply needed for the growth of the community.

3.5. Continue expansion of the beneficial reuse program to divert unnecessary use of potable water to effluent reuse.

4. Evaluate and address stormwater needs in the City.

4.1. Regional stormwater detention is preferable to numerous, disconnected and poorly maintained on-site detention ponds.

4.2. Utilize large scale stormwater improvements as amenities, particularly for aesthetic or recreation purposes.

4.3. Encourage on-site stormwater improvements to be creatively integrated into site design.

4.4. Use stormwater wetlands at critical areas of the drainage system as a means of slowing and "scrubbing" stormwater prior to release into Pflugerville's waterways.

4.5. Rain gardens in parking areas should be promoted as an environmentally friendly and cost-effective alternative to raised landscape improvements while still meeting landscape requirements of the development code.

4.6. Implement on-site best management practices such as green roofs, rain barrels, rain gardens, pervious pavement, and other creative techniques as a means of maintaining the first inch of rainfall during a rain event on site.

4.7. Adopt practices and consider regulatory incentives to achieve enhanced stormwater runoff quality from new developments.

4.8. Actively promote (and to the extent possible, require) the use of offsite stormwater best management practices that positively impact the amount, speed and quality of stormwater prior to its entrance into area creeks, particularly Gilleland Creek. Example BMP's include bioswales, pervious pavement in all possible places, naturalized detention and retention basins at strategic locations, preservation or creation of stormwater wetlands, preservation and enhancement of the 100-year floodplain, naturalized drainage channels, use of tiered gabion blankets/ baskets rather than concrete, and other creative techniques.

4.9. Individual sites or development projects should be restricted from negatively impacting adjacent property owners through poor storm drainage.

4.10. Specific and cumulative impacts of development and redevelopment on natural drainage features should be fully considered during plan review.

4.11. Consider allowing stormwater detention to count for a certain percentage of open space requirements if certain standards and criteria are met, including successful and creative integration into the landscape, consideration of surrounding context, and ability to positively impact stormwater management.

4.12. Capital improvements associated with improving stormwater management during major storm events should be given strong consideration when selecting projects for incorporation into the Capital Improvements Program and in selecting projects for submission for nonlocal funding (including county, state and federal resources).

4.13. Consider integrating green infrastructure practices into standard roadway construction and retrofit design including use of swales, vegetated islands, rain gardens, pervious pavement etc. where maintenance obligations are minimized. Allow streets with green infrastructure to count towards stormwater requirements.

4.14. Consider minimizing impervious surface through efforts such as reduced street widths, incorporating sunken landscaped islands in the middle of cul-de-sacs, clustering development, preservation of natural areas, reducing parking requirements, and using pavers or porous pavement in parking overflow areas.

4.15. Allow and encourage stormwater reuse for irrigation and other outdoor activities.

4.16. Continue enforcement and updates to the stormwater pollution control ordinance.

4.17. Continue and enhance public educations programs for pollution prevention.

4.18. Continue following the Gilleland Creek implementation plan.

4.19. Detect and eliminate illegal disposal of wastes in the City's storm drainage system.

4.20. Inspect and repair wastewater lines near the creeks.

4.21. Enforce stormwater management control requirements for construction sites.