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14.0 Water

This chapter describes the overall water context in Santa Fe, including topics such as supply and demand, an inventory of existing facilities and systems, wastewater, and stormwater management.

14.1 Key Findings

The mission of the City's Public Utilities Department is to provide a safe, reliable, and resilient water supply to meet Santa Fe's needs. This is demonstrated by the consistent trend of water demand reductions over the last 30 years, thoughtfully and sustainably planning for increasing and diversifying water supplies and being a leader in innovative conservation strategies. The Department has worked diligently over the last several years to diversify and enhance water sources, as well as develop and maintain the water and wastewater infrastructure needed to serve the citizens of Santa Fe. Because of those efforts, Santa Fe is well positioned to deal with climate change impacts to surface water supplies while ensuring that groundwater is not overused and depleted.

The General Plan Update planning horizon is the year 2050. In contrast, the Public Utilities Department has developed a long-term water resource plan extending out to 2100, from which information on nearer horizons can be extracted as needed. The process will inform long-range planning and capital project spending prioritization, including water and wastewater masterplans that guide expansion and maintenance investments. In addition, the Department is investing in technologies to ensure physical assets, such as pipes, pump stations, and treatment plants, are maintained, or replaced if necessary in a timely and efficient manner. Another key element of the sustainability plan is the Department's Water Conservation program, which has been very successful at reducing water consumption.

The planning process is intended to be ongoing and adaptive; such that new information can be incorporated as available, and plans modified as needed to reflect the latest scientific developments, current conditions, and public values. Because the City has a comprehensive planning process requiring review and updates every five years, the projections can be refined and adaptive strategies developed and implemented before actual water shortages occur.

Below is a summary of the key findings from this assessment:

- **Water Supply:** The City's access to both surface water and groundwater supplies provides tremendous operational flexibility and the opportunity to develop a sophisticated resilience strategy. In addition, the City is currently working on a wastewater reuse program that will potentially double the current available water supply.
- **Potable Water Demand Projection:** The City's current potable water demand projection for the years 2050 to 2100 are based on assumptions regarding potential reductions in GPCD from future technological innovations for domestic water use and expansion of the City's Water Conservation initiatives. This Baseline projection is approximately a 20 percent less than current water use. While the process used to estimate future water demand is reasonable and based on

data, it is not a conservative estimate. An overly optimistic estimate could lead to a water supply gap between 2050 and 2100. A High estimate was included in this estimate to show the range of potential water demands, and a review of water supply estimates show that the City's current water supply is adequate to meet the High demand through the year 2050.

- **Water Conservation:** The City's Water Conservation program is very effective and has significantly reduced demand by 45% from 1995 to 2023. Going forward the program should put increased emphasis on additional reductions in outdoor consumptive water use.
- **Wastewater Treatment - Staffing:** Staffing of the wastewater treatment and maintenance division should be a critical priority for the City in the short term. The City is currently operating with [PLACEHOLDER for confirmation of number of staff and licensed treatment operators]. The City plans to implement a large wastewater reuse project in the near future to augment raw water supplies. It will be critical for the wastewater plant to consistently operate within compliance limits to ensure the estimated quantity of wastewater assumed to be available for full San Juan-Chama return flow credits. Sufficient, well-trained, and experienced staff are required to ensure the plant functions efficiently, produces compliant effluent, and minimizes plant upsets.
- **Capital Investments:** Current City plans call for significant capital investments on the order of \$125 million for major water projects and several hundred million dollars for a new advanced wastewater treatment plant. The City has a plan in place to fund these projects, but given the current uncertainty with grant funding this is a risk that could significantly impact the ability to meet future water demands. The City is currently considering rate hikes for water, wastewater, and Water Bank fees in an effort to prepare for these expenditures. Other capital investment projects include keeping existing infrastructure in a state of good repair, upgrades to existing asset, asset replacement at the end of lifecycles, and installing new assets.
- **Stormwater Management:** The responsibility for managing stormwater is currently split between three departments, which each addressing a different aspect of the overall stormwater management effort. These divisions include the Water Conservation Division in the Public Utilities Department, Land Use Technical Review in the Planning and Land Use Department, and the Complete Streets and Rivers and Watersheds Divisions in the Public Works Department. The fragmentation of roles and lack of effective stormwater management policies and requirements needs to be addressed in a holistic and coordinated manner such that all four groups are working together. The potential benefits include increased water conservation, a more livable environment for residents, an increase in recharge of shallow aquifers that support the Santa Fe River, and a reduction in erosion and flooding problems.
- **Resilience:** Santa Fe is well positioned to deal with climate change impacts to surface water supplies while ensuring that groundwater is not overused and depleted. This resilience is partly due to the City's diligent efforts to diversify and enhance water sources, as well as develop and maintain the water and wastewater infrastructure.

14.2 Context

Santa Fe has a rich history of life and abundance, with initial settlement in this region heavily tied to the availability of surface water provided by the Santa Fe River. The Santa Fe River is part of the Santa Fe Basin, a 285-square-mile subbasin of the Rio Grande. Santa Fe River flows are primarily driven by snowfall in the Sangre de Cristo Mountains east of the city, and this single source has historically provided drinking and irrigation water to Santa Fe residents. When the city of Santa Fe was settled by the Spaniards more than four hundred years ago, the Santa Fe River had year-round flow. Adjacent springs and marshlands provided shallow groundwater to sustain riparian habitat and naturally replenish the river. There is evidence that from 1610 through the 1700s and 1800s, the river flow was occasionally interrupted by irrigation diversions. However, regular dewatering of the Santa Fe River was not common until the late 1940s, when the city's water demand increased above the available yield from the reservoirs upstream and demand increased due to population growth. Today, the city's water comes from four sources: the Santa Fe River and San Juan-Chama waters, the City Well Fields (CWF), and the Buckman Well Fields (BWF).

Santa Fe, New Mexico, is located in the high desert near the southern end of the Rocky Mountains, and the availability of surface water supplies is highly dependent on seasonal snowpack. Groundwater aquifers recharge slowly and experience significant drawdown from long term continuous pumping, such as happened with the use of the Buckman Well Field from the 1970's to 2010. Drought and other climate change impacts also pose serious risks to system resiliency.

In addition to these regional threats, there are also local considerations, such as reductions in groundwater recharge caused by increases in impervious surface areas associated with new development, aging supply wells, and the requirement for sustaining flows in the Santa Fe River as part of the Living River Ordinance. However, the city's population continues to grow; therefore, the needs of the community and the demand for water supplies continue to expand in tandem. In response, the City has consistently strived to provide a safe, reliable, and resilient water supply system through diversification of sources, conservation, and innovative supply strategies.

The Water Division has a long-term water resource plan that extends to the year 2100 (Water 2100). This plan is intended to inform capital spending prioritization and development of associated water and wastewater master plans that guide expansion and maintenance efforts. The Water and Wastewater Divisions are also investing in technology to identify required maintenance and replacement of physical assets.

14.3 Water Supply and Demand

14.3.1 Water Demands

14.3.1.1 Current and Projected Potable Water Use

Water demand for municipalities is calculated as total treated water divided by the city population. The metric is typically reported as Gallons Per Capita per Day (GPCD). To project future demand, an estimate of future population is multiplied by an estimate of the future GPCD. Although more than half of the GPCD usage is residential (inside the home) use, other water uses such as outdoor landscaping and commercial use (restaurants, hotels, car washes, manufacturing) are also included in the metric. The other uses are estimated to account for approximately 35 percent of the total potable water use. In addition, not all of the City's water is treated. Examples of this use component are the Living River Ordinance and Acequia agreements.

Demand projections should not be regarded as a precise statement about future conditions, but rather as a basis for planning that can be used to examine potential vulnerabilities. Going forward, this demand baseline can be used to help understand changing conditions and adapt City actions as necessary. It is anticipated that as data are collected and new information becomes available these demand projections will be refined.

The city's average GPCD water use in 2023 which is the most recent estimate currently available, was 97 GPCD. This was a 10 GPCD increase from the previous year, as shown in Figure 14-1 below.¹ The 10-year average GPCD (2014 to 2023) is 91.4 with a variation year to year of +/- 5 percent. The 2023 value is thought to be the consequence of a very dry summer compounded by WWTP malfunctions, resulting in a significant increase in use of potable water instead of WWTP effluent for golf course irrigation.

Current water demand projections for the city were developed in 2022 by Hazen and Sawyer, a national consulting firm with a water and wastewater focus. Their methodology combined City population information, historical estimates, and modified projections of Santa Fe County populations using a University of New Mexico Bureau of Business and Economic Research report. A detailed description of the methodology can be found in the *Development of Water Demand Projections for the City of Santa Fe Memo (Demands Memo)*, dated November 2022. The results are summarized in Figure 14-2, in which the city population is projected to grow to just over 130,000 in 2100. This projection was used as the baseline population for this assessment report.

These population projections align with a slowly decreasing annual population increase between 2025 and 2050, dropping from the 0.76 percent annual increase projected this year to 0.52 percent per year in 2050, and then a steady 0.5 percent annual growth increase from 2050 to 2100, the end of the

¹ The National average GPCD use in the United States is 82 GPCD, as published by the United States Geologic Survey in 2015, with high use ranges from 100 to greater than 157 GPCD. GPCD in the western United States is more typically in the range of 110 to 157 GPCD. Santa Fe's average GPCD use in 2023 may be anomalous due to dry summer conditions and wastewater treatment plant issues that required use of potable water for parks and golf courses, instead of effluent. A 10-year average GPCD for Santa Fe is approximately 91.

current Water Division planning horizon. As stated in Chapter 3.0, Demographic Profile, the most likely “middle-growth” forecast scenario for the city of Santa Fe calls for growth of 6,357 residents from 2025 through 2050, with 2050 population reaching 98,298 compared to the 2050 population projection of approximately 101,000 in the 2022 Demands Memo.

Figure 14-1. Historic Average Water Consumption – Gallons per Capita per Day

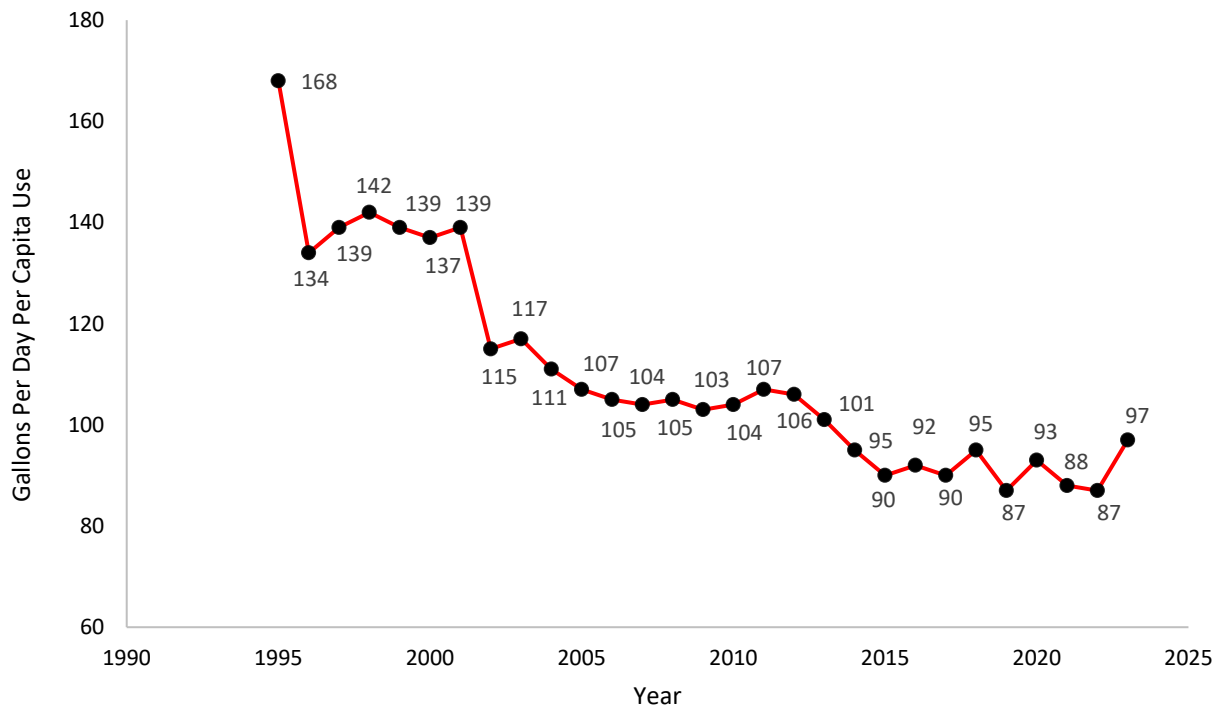
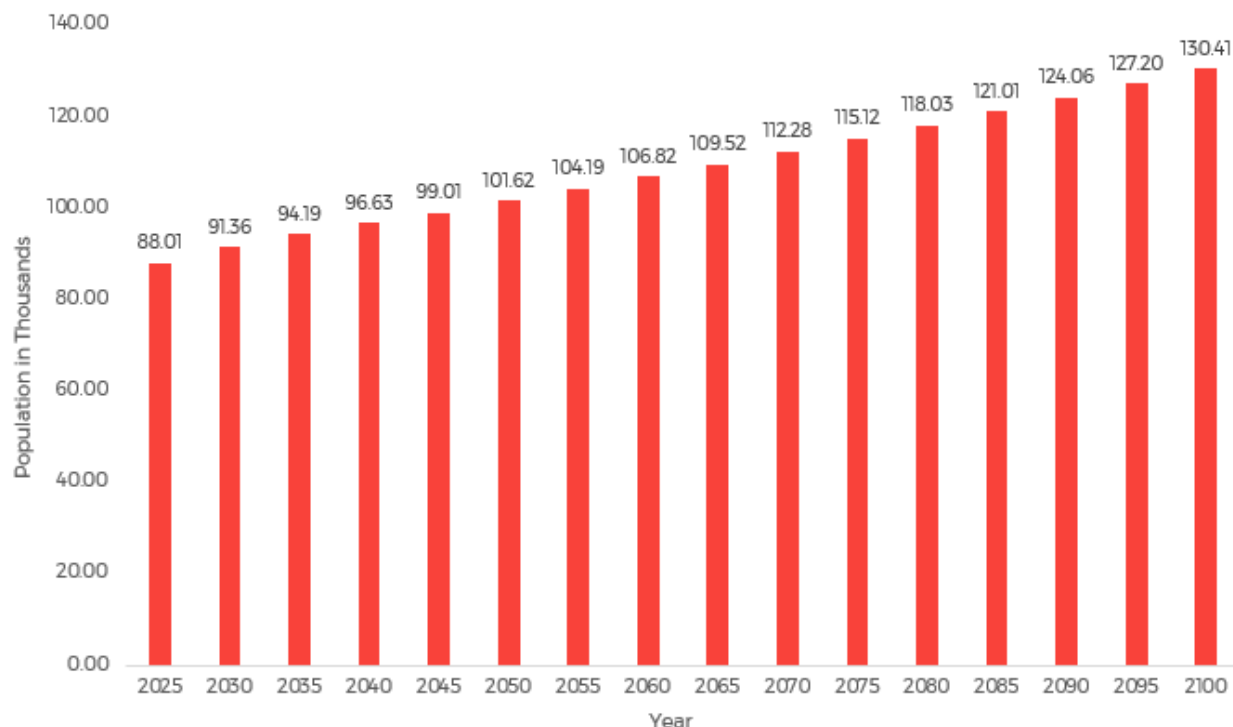


Figure 14-2. City Population Projections through 2100



Combining this population projection with an estimate of GPCD generates the projected potable water demand for this system. These projections assume that prices (inflation adjusted only) remain constant and that weather conditions reflect historical averages. The 2022 Demands Memo methodology produced an estimated GPCD value for all potable city water use of 79.3 GPCD in 2025 to 72.5 GPCD in 2035 and onward. This “Baseline” projection was used as the lower bounds for this assessment. An upper bounds GPCD value of 90.4 based on the most recent 10-year average of record data, was also developed as the “High” projection for this assessment. The resulting high and low use projections represent the expected range of potable water use for the City thru 2100.

This assessment report will consider three water demand projections. Methods 1 and 2 are the same from 2040 through 2100 and are considered the “Baseline Use” projection. Method 3 assumes water use (GPCD) stays constant from 2023 through 2100 and is considered the “High Use” projection

The City does not plan to expand user base or demand on the non-potable water system, which provides irrigation water and is supplemented with reclaimed wastewater. Therefore, non-potable production was assumed constant in the 2022 Demands Memo’s demand projection assessment, at 1,374 AFY, equal to the 2021 usage. This assessment uses the same assumption and a constant year over year demand from non-potable usage. This additional volume must be added on top of the total GPD estimates to get a total system demand presented below.

The Baseline projection results in a demand of 9,627 ac-ft per year for 2050, and 11,964 ac-ft per year for 2100. The High projection is 11,665 ac-ft per year for 2050 and 14,579 ac-ft per year for 2100. Results from this comparative assessment are presented in Table 14-1 below.

Table 14-1. Comparative Assessment of GPCD Impacts on Projected 2100 Water Demand

Year	GPCD ESTIMATES		NON-POTABLE DEMAND ³ (AC-FT Per Year)	TOTAL DEMAND PROJECTION (AC-FT/YEAR) ⁴	
	Baseline ¹	High ²		Baseline	High
2025	79.3	90.4	1,374	9,192	10,286
2030	73.2	90.4	1,374	8,865	10,625
2035	72.5	90.4	1,374	9,023	10,912
2040	72.5	90.4	1,374	9,221	11,158
2045	72.5	90.4	1,374	9,415	11,400
2050	72.5	90.4	1,374	9,627	11,665
2055	72.5	90.4	1,374	9,835	11,924
2060	72.5	90.4	1,374	10,049	12,191
2065	72.5	90.4	1,374	10,268	12,464
2070	72.5	90.4	1,374	10,493	12,744
2075	72.5	90.4	1,374	10,723	13,031
2080	72.5	90.4	1,374	10,959	13,325
2090	72.5	90.4	1,374	11,449	13,937
2095	72.5	90.4	1,374	11,704	14,254
2100	72.5	90.4	1,374	11,964	14,579

¹ Baseline estimates follows the method used in the 2022 Demand Memo by Hazen and Sawyer which shows a steady 72.5 GPCD usage from 2035-2100.

² The High estimate uses the average annual GPCD for the last 5 years, 90.4 GPCD, each year through 2100.

³ The non-potable demand is equal to the 2021 usage rate of 1,374 AC-FT to provide irrigation water. This value is added to the Potable Demand obtained by multiplying the GPCD estimates for each method by the population projection for that year.

⁴ Total Demand is the Non-Potable Demand plus the Potable Demand obtained by multiplying the GPCD estimates for each method by the population projection for that year.

14.3.1.2 Other Water Use Agreements/Commitments

Like many municipalities, Santa Fe Water has customers that fall outside of city boundaries. For Santa Fe, these additional users are captured through the following agreements:

- The Water Service Area Boundary Extension (WSABE) Agreements
- Acequia Agreements
- The Santa Fe County Agreement
- The Living River Ordinance

Water Service Area Boundary Extension (WSABE) Agreements

The WSABE agreements require that the City supply the entire water demand of any development within the WSABE. The maximum flow rate to be supplied to each WSABE is not specified in the agreements, but water users within the WSABEs are metered and billed individually.

The City has implemented offset requirements for new developers who want to construct within the water service boundary. This is the Water Bank Program; also applicable to new development within the city limits, which requires that developer provide new water rights as part of the approval process to ensure there is limited impact on the existing system. This was implemented to support the City's sustainable growth goals and has helped to create a self-regulating system for sustainable population growth. The program includes an option for small developers to pay In-Lieu fees rather than provide water rights. Because of the complications of water rights transfers and the development of the San Juan-Chama Return Flow project, the City is considering a policy change wherein developers would pay a fee supporting the Return Flow project instead.

Acequia Agreements

The City has agreements with two of the Acequias that divert water from the Santa Fe River between the Nichols Dam and Patrick Smith Park. The City has an agreement to deliver a total of 95 AFY to three agriculture irrigation canals that run through the city. These are the Acequia Madre Upper Canal, Acequia Madre Lower Canal, and Cerro Gordo Canal. There is no gauge or formal delivery requirement for Acequia Muralla, which diverts available flows when Acequia Madre is not taking water. Table 14-2 lists annual Acequia diversions from the Upper Santa Fe River.

Table 14-2. Annual Acequia Diversions from the Upper Santa Fe¹

ACEQUIA	ANNUAL PROJECT DELIVERY REQUIREMENT (AF)	ANNUAL FARM DELIVERY REQUIREMENT (AF)
del Llano	Not Defined	46.4 ²
Cerro Gordo	11.08	5.54
Madre ³	82.40	41.2
Muralla ⁴	Not Defined	15.07
Total	93.48	108.21

¹ Information provided by the City's 2023 Annual Water Report

² Farm Delivery Requirement is based on 17.2 acres in a 1977 Hydrographic Survey, multiplied by 2.7 feet.

³ The Acequia Madre diverts river water near the corner of Alameda and Canyon Road, and the acequia effectively ends above Railyard Park. Most of the water associated with the PDR belongs to a farm near Agua Fria village that can no longer be practicably served by water diverted near Alameda and Canyon Road.

⁴ Acequia Muralla is not metered so diversions are estimates only. Farm delivery requirement is estimated based on 14.5 acres in a 1977 Hydrographic Survey multiplied by 2.7 feet.

While the City has contractual requirements to fulfill these Project Delivery and Farm Delivery Requirements, the volume required relative to annual service area use is small. The City currently diverts flows from the Santa Fe River, past the McClure and Nichols Reservoirs, to serve the raw water needs of these Acequias, as well as the requirements of the Living River Ordinance (as discussed below). It is assumed that operations of the canals will remain the same in the future.

Santa Fe County Agreement

The City has a third agreement with Santa Fe County. During standard operations, the County will supply most of its demand with the water it owns from their share of the BDD plant, a joint venture project. In the infrequent event that BDD is out of service, the County would likely rely on the City water system to supply County demands. Additionally, much of the BDD water owned by the County must pass through the City system prior to delivery. As a result, the City transmission system must have capacity to deliver the County's maximum daily demand (MDD) to the master meter stations, in addition to the City's demands.

The Living River Ordinance

The Living River Ordinance is the fourth agreement discussed in this section. In 2012, the Living River Ordinance in the city of Santa Fe passed, dedicating up to 1,000 AFY to a "Living River" to support the Santa Fe River's riparian corridor, enhancing the river and a living ecosystem, and to help meet minimum target flows in the river. The amount of water released each year depends on the amount of water held in upstream reservoirs, as well as runoff forecasts for the spring.

14.3.1.3 Impact of Water Conservation Initiatives

Individual water use has a large impact on demand and production requirements. Although the population of Santa Fe continues to increase, total water use has gone down. Since 1995, population served has increased by 25 percent, but the community has reduced water use by 45 percent between 1995 (168 GPCD), when the Santa Fe Water Division took over water system operation, and 2024 (93 GPCD).² A large part of this noticeable reduction is due to the efforts of the Santa Fe Water Conservation Office, which was established in 1997, and is recognized nationally for its innovative water conservation efforts.

The City has already seen a significant impact from pilot scale conservation projects, with nine completed since 2018. City staff are currently developing the 2026 Conservation Plan, which will highlight and analyze each of these initiatives. These pilot studies have been neighborhood focused, prioritizing community outreach, education, and incentivizing conservation, specifically on outdoor water use.³

In addition to efforts related to outreach and education, the City is also pursuing innovative, technology-based solutions to help manage conservation. The Santa Fe Irrigation District has implemented an Automated Metering Program, which was designed to provide accurate, real-time usage data using wireless technology. Not only can the City monitor water use accurately, and detect leaks and high consumption quicker, but customers can also access their usage data online, using apps like EyeOnWater. These technology-based solutions help minimize leaks and save water. This type of data is also being used to create Supply and Demand Dashboards and a new STEWARDS model, which allows the City to pursue more data-driven water conservation targets and simulate different demand projections under various climate and risk scenarios. This year the Conservation Office will strive to align efforts with upcoming Water 2100 Plan and the continuously updated Long-Range Water Supply planning effort.

Water Conservation

The Santa Fe Water Conservation Office, which was established in 1997, is recognized nationally for its innovative water conservation efforts. Although the population of Santa Fe continues to increase, water use has gone down; since 1995, population served has increased by 25%, but the community has reduced water use by 33%.

² Research has found that urban water use among cities and towns in the Colorado River Basin dropped by about 30% from 2000 to 2020. This reduction is largely due to effective water conservation and efficiency efforts. <https://watercalculator.org/news/news-briefs/southwestern-united-states-water-use/>, accessed May 7, 2025.

³ In an interview with City Staff, they provided a case study of a particular neighborhood with high outdoor water use. This pilot program provided a tree giveaway, door hangers with water consumption education points, and education on the existing rebate programs the City had which provide incentives for installing water-efficient indoor appliances or water saving outdoor equipment. This pilot program resulted in a 40% increase in rebate applications from residents of this neighborhood, and associated reductions in water consumption (data on quantity of water saved to be provided in the 2026 Conservation Plan Pilot Project Highlights).

14.3.2 Water Supply

14.3.2.1 Existing Source Water Supplies

The City has developed alternative water sources to reduce reliance on the Santa Fe River. Today, the city's water comes from four sources. These include the Santa Fe River and the San Juan-Chama surface waters, and two groundwater sources - the City Well Fields (CWF) and the Buckman Well Fields (BWF).

The Santa Fe River typically provides one-third of the city's drinking water, supplied through the McClure and Nichols Reservoirs, which are located in the foothills to the east, and upstream. This was the first water source for the city.

The CWF was the second water source developed in the 1950s. This is a groundwater source that provides an average of 5 to 10 percent of the total annual water demand through seven active wells located within city limits. These wells are connected to the aquifer beneath Santa Fe. This well system is permitted to pump 4,865 acre-feet per year (AFY). The permitted capacity of these wells is the limiting factor in production. Each of these City Wells has its own disinfection line serviced from an on-site sodium hypochlorite generation system.

The BWF was the third water source for the city, established in the 1970s. This groundwater source also supplies an average of 5 to 10 percent of the city's potable water through 13 wells drilled along the road to the historic Buckman townsite, located approximately 15 miles northwest of the city. These wells are hydraulically connected to the Rio Grande River Basin, so usage of these wells can impact the availability of water in the Rio Grande. Water from these wells is disinfected in a single storage tank before distribution. The Buckman Wells do have offset requirements from state regulators, as well as high transmission costs due to their location, some arsenic exceedance issues and high mineral content.

The Buckman Direct Diversion (BDD) project was completed in 2011 to help reduce demand on groundwater supplies and supplement the City's raw water portfolio. The San Juan-Chama Project diverts water from the San Juan River Basin, a tributary of the Colorado River, to the Rio Grande watershed. Water from the Rio Grande is then diverted at the BDD for city use. Water is stored in three reservoirs for this source, the Heron, El Vado, and Abiquiu, which can release flow downstream and into the Rio Grande, where it can be diverted at the BDD to provide the fourth and final source of raw water for the city. This additional surface water source has helped the City to manage and balance use of the Santa Fe River and groundwater supplies for sustainable utilization.

The City relied extensively on the two groundwater sources from the 1990's to 2010 because of extremely limited surface water availability. Approximately 60% of the City's water was groundwater with most of that drawn from the BWF. This caused water levels to drop so much that the long-term viability of these sources became a concern. In 2011, when the BDD system was brought online, the City was able to shift from predominately groundwater to predominately surface water source utilization. The increased flexibility provided from the usage of Rio Grande River flows has allowed the City to develop a plan for long-term aquifer management, which prioritizes the use of available surface water

Santa Fe Water Sources

The City's water comes from four sources:

Santa Fe River

San Juan Chama Project

City Well Fields

Buckman Well Fields

over groundwater, allowing the aquifer to recover and ensure a sustainable water source in the event of a drought or other supply disruptions. Current estimates for the sustainable use of groundwater are 2,000 AFY for the CWF and 2,500 AFY for the BWF. In 2023, the City used surface water to meet 87 percent of demand, with 52 percent from the Santa Fe River and 35 percent from the BDD, while only 13 percent of water came from well sources. Table 14-3 summarizes the available yield from each of these sources, as determined by the City’s available permits.

Table 14-3. Source Water Permit Limits

Water Source	One-year Permit Limit (AFY)	10-year Permit Limit (AFY)
Santa Fe River	5,040	5,040
City Well Fields	4,865	3,507
Buckman Well Fields	10,000	10,000
San Juan-Chama	6,407	5,125
Total	26,312	23,672

Note: AFY=acre-foot per year

14.3.3 Comparative Assessment of Water Supply versus Demand

14.3.3.1 Potable Water Supply Augmentation and Security

Water supply augmentation and security is not a new concept to the City. Over Santa Fe has multiple planning initiatives, conducted in parallel, to address concerns related to supply scarcity, impacts of demand, and climate change risks. Current documentation on supply augmentation and security includes the Conservation Plan, Santa Fe Basin Study, Resolution 2019-56, and Water 2100 (currently under development).

The City’s Conservation Plan is a living document, historically updated for the state every five years. This plan outlines the City’s goals and objectives related to conservation, and tracks GPCD usage; the newest revisions of the Conservation Plan will be submitted in 2026, covering a 10-year planning cycle.

In 2015, Santa Fe also completed a Basin Study in a combined effort with the Bureau of Reclamation, which used climate data and modeling to identify potential shortages in water supply and options for adaptation strategies to meet those demands. This study identified potential water shortages as significant as 9,323 acre-feet by 2055. In 2019, Resolution 2019-56 was created as a result of the 2015 Basin Study and associated results. This plan directed City staff to develop 40-year and 80-year water plans to maximize the City’s existing water supplies and determine how to implement adaptation strategies to help close the supply gap.

Water 2100 is part of an ongoing City that will create a long-term (80-year) plan and lay out the framework for how to develop and implement various adaptation strategies. Water 2100 will include discussion on the City’s current and future water supply portfolio. This document is currently scheduled

to be completed at the end of 2025, and will be evaluated, refined, and repeated every 10 years or as necessary in future years.

The City's resilience strategy for water supply has evolved over the last 20 years to take advantage of access to both surface and groundwater sources. During years with "normal" precipitation, water production relies primarily on surface water, with minimal use of groundwater supplies. During "drought" years, water production shifts to groundwater sources. The strategy prioritizes use of surface water (a "renewable" supply), and keeps groundwater use in reserve so that it will be available when needed.

Because there are numerous variables involved in determining demand versus available supply, the City has and continues to perform numerous simulations of various scenarios looking at demand (different population growth projections and reductions in demand resulting from conservation initiatives) and supply as well as catastrophic supply disruptions, such as watershed wildfires, widespread drought, and equipment failures. These simulations are developed using the STEWARD model, which allows the City to analyze individual as well as combinations of various supply and demand components of the system. The results of these analyses show that the City can meet projected 2050 demand of 11,655 AFY with available water supply of 14,665 AFY.

14.3.3.2 Potable Water Supply Threats

As previously noted, the City of Santa Fe Water Division (CoSFW) must also consider catastrophic supply threats that would reduce the available yield of any of their four sources. In a 2019 update to the 2015 Santa Fe Basin Study, the impact analysis was extended and found that without changes to current water supplies or operations, shortages greater than 1,000 AFY may be expected in 10 percent or more of years in the Santa Fe Basin by 2030 under high growth and hotter-drier climate change scenarios. The Santa Fe Basin Study 2019 update notes that this large range of uncertainty is difficult to avoid over this assessment horizon, due to the large role of future human behavior in the actual shortages. Results from the Basin Study models have been used as inputs into the City's Water Management and Planning Simulation Model (WaterMAPS) to help determine specific supply and demand imbalances possible under climate-change-impacted future conditions.

The Santa Fe Basin Study 2019 update recommended that the City improve their understanding of drivers of local demographic and per-capita water use trends to help focus conservation outreach efforts. It was also recommended that the City update the water supply and demand projections every five years, as more routine intervals of assessment will help to iron out unknowns, limit assumptions, and refine these estimates.⁴ Although the City strives to decouple growth opportunities with water

⁴ The Santa Fe Basin Study 2019 update used high and low population growth rate scenarios to provide a range of potential demands, with 0.4% on the low end of annual growth and 1.5% on the high side of annual growth, to represent a historical average. This Assessment Report utilized a single population projection from the City's more recent 2022 Demands Memo, which has a range of 0.5-0.76%, starting higher and tapering down to 0.5% annually in 2052 and remaining at constant growth from there. The Santa Fe Basin Study 2019 update did utilize a higher GPCD estimate at 90 GPCD, which is just under this Assessment Report's Method 3 consumption rate. However, Method 3 projects a usage of 90.4 GPCD consistently each year until 2100, whereas the Santa Fe Basin Study 2019

management through innovative code and development requirements, such as the requirement to offset any new water demands on the system, the Santa Fe Basin Study 2019 update does note that there is a direct tie to water demand growth and population growth, no matter how small the GPCD estimate.

The 2022 Demands Memo created for the City also looked at supply threats from climate change. This report used a regression model to generate projections for assumed values of temperature and precipitation. One hundred and twelve different model runs were consolidated into three scenarios of temperature change over the memo's planning horizon. The median climate change adjustment resulting from these models suggests that projections of total demands would be about 16 percent higher than the historical normal climate projection by the end of the planning horizon.

In mid-2022, the City completed a Catastrophic Supply Disruption analysis to better understand and mitigate risks of low probability, high consequence events. The analysis explores scenarios where access to source supplies is limited or prevented by unpredictable conditions and the impacts of loss of supply were modeled and used to develop mitigation response actions, which have been integrated into the City's Emergency Response Plans.

One outcome of the Catastrophic Supply Disruption analysis is an increased emphasis on proactive wildfire mitigation actions in the Santa Fe River watershed. The City has been funding strategic fuel thinning efforts for several years, and is also considering how to minimize channel degradation by flash flooding and debris flows that frequently occur after a severe wildfire.

14.3.4 Enhancing Long-term Supply with Reuse

As previously noted, the City's current water supply is sufficient to meet demand through 2050. The City's Water Division staff is also actively working on a long-range planning effort (Water 2100) to ensure the viability of the City water system through the year 2100. Two key elements of this effort include prioritizing the use of renewable surface water so that groundwater use is available when needed in times of severe drought or other catastrophic supply disruptions, and significantly increasing the amount of water available to the City based on the Return Flow project.

In direct response to droughts experienced in 1996, 2000, 2002, and increasingly common reductions in annual precipitation and snowpack, the City partnered with Santa Fe County to construct the BDD surface water diversion project and treatment plant discussed above. This project, which came online in 2011, improves the overall supply reliability and reduces regional dependency on groundwater, while serving as a testing ground and a model for regional collaborative water resource management. The City's 2008 Long-Range Water Supply Plan and 2015 Santa Fe Basin Study both called for increasing reuse to help meet anticipated demands.

Santa Fe has already been reusing water for more than 50 years to help sustainably meet community water needs. But until now, Santa Fe's reuse program has been focused mainly on

update estimated an increase in consumption, assuming 114 GPCD as the average annual base water use rate for both Santa Fe City and County combined. These higher GPCD estimates were used in the Santa Fe Basin Study 2019 update to account for the known demand rise when there is an increase in maximum temperature coupled with a decrease in precipitation (climate change scenarios).

landscape irrigation. Looking ahead, there are limited opportunities available to expand irrigation and other non-potable reuse applications in Santa Fe. The Basin Study acknowledged one of the primary adaptation alternatives available to close the projected supply gap is to augment potable water supplies with reclaimed wastewater.

In 2012, the City assembled a citizen group to help update the Reclaimed Water Management Plan, resulting in the Santa Fe Reclaimed Wastewater Reuse Plan (RWRP), which was adopted by the Governing Body in 2013. The Basin Study, along with the RWRP, identified potential alternatives for implementing the utilization of reclaimed water as a supply source and helped the City to identify potential reclaimed water customers, many of whom have become reclaimed water customers in recent years. This push for reuse is reflected in updated City policy, with City Council Resolution 2013-55 directing City staff to pursue opportunities to evaluate and implement engineering and cost analysis associated with using reclaimed water alternatives to supplement supplies.

The City subsequently initiated the Santa Fe Water Reuse Feasibility Study to analyze the potential for reuse of treated wastewater effluent. The recommended option was Alternative 2 – Full Consumption of SJCP Water via Rio Grande Return Flow Credits. This alternative consists of construction of a new pipeline to convey reclaimed water from the Paseo Real WRF to the Rio Grande immediately downstream of the BDD site in order to obtain return flow credits for exchange. The exchange would allow the City to divert additional water through the BDD system on a one-for-one basis, thereby increasing the amount of water delivered and treated thru the existing BDD infrastructure to its capacity of 15 MGD.

As stated above, the existing Paseo Real WWTP process is sufficient for reuse, so no immediate additional wastewater treatment facilities are needed to implement the alternative. The project is presently underway, with the Feasibility Study completed in April 2017, and the Preliminary Design Report in January 2019. This design is moving forward with a capacity of 9.5 MGD and is currently at 75 percent completion. The City has the required state permit, is working on the federal permit, and expects to have the project operational by 2028.

14.3.5 Water Quality

14.3.5.1 Raw Water Contaminants and Treatment Requirements

The two groundwater sources, the CWF and BWF, both have relatively good water quality out of the ground, with only disinfection provided to treat for coliforms, *Escherichia coli* (*E. coli*), and to deactivate pathogenic cysts and viruses. The BWF raw water is also subject to occasional arsenic exceedance issues and consistently high mineral content in the raw water. It was reported by City operators that the high mineral content can cause operational issues of the pumps and reduces the service life of the well screens. Treatment for the BWF source is not currently being considered.

Santa Fe River surface water is treated at the Canyon Road WTP (discussed below). This is a conventional plant that targets common surface water constituents, such as natural organic matter, dissolved organic carbon, suspended solids, other particulates, viruses, and bacteria. City operations did not indicate any contaminants of concern at this facility during staff interviews for this assessment report.

San Juan watershed water from the BDD is treated at an advanced filtration plant designed to treat harder to remove constituents, such as arsenic, uranium, pharmaceuticals, and personal care products, as well as the standard constituents, such as organic matter, solids, viruses, and bacteria.⁵

During water operator interviews, the BDD was the only source water indicated to have quality concerns that impact treatment plant operation. High turbidity (i.e., primarily sediment in the water) at the BDD due to storm events has caused seasonal shutdowns on this plant. The operators reported that these shutdowns are typically less than 6 hours per event in July or August and only occur when there is sufficient water in storage to meet demands. While the incoming turbidity does not typically exceed the plants maximum treatment limit for turbidity, the operators choose to temporarily pause treatment when inlet raw water reaches those thresholds.

Water supply threats as discussed above can also impact the quality of the raw water entering the plant and can add constituents to the raw water that the treatment facility is not designed to remove. For example, wildfires can release high organic carbon and metal loadings that may have been sequestered inside of vegetative plants and wooded materials; these may exceed a facilities treatment threshold for heavy metals or impact treatment efficacy due to changes in organic loading. While these impacts can be difficult to quantify and plan for before they happen, like most water-related concerns, the City is taking an innovative and forward-looking approach to mitigate these risks. The City is working to manage and remove fuels from the forested areas above the Canyon Road WTP. The City is currently completing a modeling study to simulate supply risk scenarios related to events like wildfires. These scenarios look at events, such as taking the Canyon Road WTP offline for up to 10 years due to a catastrophic event, and how the City could manage that situation.

During City interviews, the long-term strategy to reduce reliance on groundwater to meet standard demands was further stressed, as the City would like to reserve groundwater to manage supply threat scenarios in situations where the two mechanical, surface water plants may need to come offline.

14.4 Inventory of Existing Water Treatment Facilities and Systems

14.4.1 Potable Water Treatment Facilities

The City operates a total of four water treatment facilities; two mechanical plants for surface water and two disinfection systems for groundwater. Each of which is designed to treat the different constituents of the four raw water sources to both U.S. Environmental Protection Agency (EPA) and state regulatory limits. The two mechanical treatment plants are the Canyon Road WTP and the Buckman Regional WTP.

⁵ The target constituents for the BDD were identified through pilot testing initiatives in the project's early design phase. During this testing, several primary constituents were measured at concentrations of 80 percent of the maximum containment level in at least one sample during pilot testing or historically: alpha particles, arsenic, beryllium, beta emitters, lead, radium 226/228, and turbidity. Additionally, the secondary constituents measured at or above 80 percent of the secondary standard included aluminum, color, iron, manganese, pH, and TDS. It was noted that many of these constituents showing elevated levels were only in samples collected during storm events, including arsenic, beryllium, lead, and radium 226/228.

The Canyon Road WTP is designed to treat surface water from the Santa Fe River and has a capacity of 8 MGD with a peak capacity of 12 MGD. The Canyon Road WTP has the lowest cost per unit water out of the City's four different raw water sources and treatment systems, as pumping is not required. This facility is currently experiencing some capacity concerns due to aging infrastructure and the need to replace the filter underdrain system and the filter media. The 2020 Asset Management Plan (AMP) for City water assets also identified the chemical feed process, rapid mixers, clear well injection system, and the polymer feed pumps for the residuals management process as High Priority assets based on their condition, likelihood of failure, and probability of failure.

The Buckman Regional WTP is designed to treat surface water from the Rio Grande and has a rated capacity of 15 MGD. This facility is owned by the City of Santa Fe and Santa Fe County, with shared use allocated to the Las Campanas residential development through limited partner rights for 17.58 percent of use. Despite only coming online in 2011, the City operators indicated that this facility has been unable to produce to the rated capacity of 15 MGD; this capacity reduction is the result of high-turbidity loading in the raw water, which is impacting pump performance and longevity. The City has funding in place to address these concerns and is hoping to get the facility back to its full production potential in the next three to five years. Due to the shared management of the BDD facility, this was not included in the scope of the City's 2020 AMP.

The City Wells in the CWF are disinfected and connected directly to the distribution system in Pressure Zone 5 (pressure zones discussed below). There are seven active wells in the CWF, which are the Osage, Alto, Agua Fria, Ferguson, St. Michaels, North West, and Torreon. During the 2020 AMP, the Alto and Agua Fria wells were identified as High Priority assets for rehabilitation or replacement.

The BWF consisting of 13 wells is located northwest of the city near the Rio Grande. Raw water supplied from these wells discharges to a transmission pipeline (BWF Supply Line) and is pumped through a series of in-line booster stations to the Buckman Tank. City staff report that the capacity of the transmission pipeline is limited by the capacity of the third and fourth booster stations in the pipeline and the maximum capacity of the BWF due to the transmission pipeline is 7,210 gallons per minute (gpm). Supply to the system from BWF is currently limited by the transmission system, not the production of the wells. While this is not a concern for normal operations, it could be an operational pinch point in a supply threat scenario, in which the City may need to supplement supply with the full available yield of the BWF. The City's 2020 AMP also identified the Buckman Supply Line, a 20-inch ductile iron water main, as a High Priority asset for rehabilitation or replacement.

14.4.2 Transmission and Distribution Systems

The City distribution system consists of five booster stations, ten pump stations, one hydroelectric generator, and nine storage tanks. The 10 pump stations in the system, apart from the Buckman Transfer Station and the Northwest Quad Pump Station, are used to convey water from the sources of supply to higher elevations in the system, for gravity distribution from an elevated storage tank. The system has 13 separate pressure zones.

14.4.2.1 Transmission and Distribution Linear Assets

Santa Fe Water has over 600 miles of water mains in the transmission and distribution systems with diameters ranging from less than 6 inches to 36 inches. The pipe materials include cast iron, ductile iron, asbestos-cement, high-strength plastic, copper, and galvanized steel. In addition to this extensive pipe network, the 2020 AMP also identified over 2,800 hydrants, 51 pressure reducing valves (PRVs), and approximately 8,400 isolation valves.

The transmission system, or raw water supply system, for CoSFW includes a network of 12-inch-diameter or larger transmission piping throughout the water system, which convey water from the supply facilities, booster stations, and tanks to the distribution mains. For the Canyon Road WTP, transmission of raw water starts upstream on the Santa Fe River at two raw water dams and reservoirs: the McClure Dam, McClure Reservoir, Nichols Dam, and Nichols Reservoir. For the Buckman Regional WTP, water from the San Juan River is stored in the Heron and Abiquiu Reservoirs (with some stored in the El Vado Reservoir at times to help with water operations on the Rio Chama); this water is released to flow downstream into the Rio Grande, where it can be diverted at the BDD to go to the Buckman Regional WTP. The well pumps for the CWF and BWF act as the transmission pumps to deliver the raw water through disinfection injection and directly into the distribution system.

Figure 14-3 shows the location of City of Santa Fe water sources and transmission system. Figure 14-4 illustrates the City of Santa Fe water distribution system.

Figure 14-3. City of Santa Fe Water Sources and Transmission System

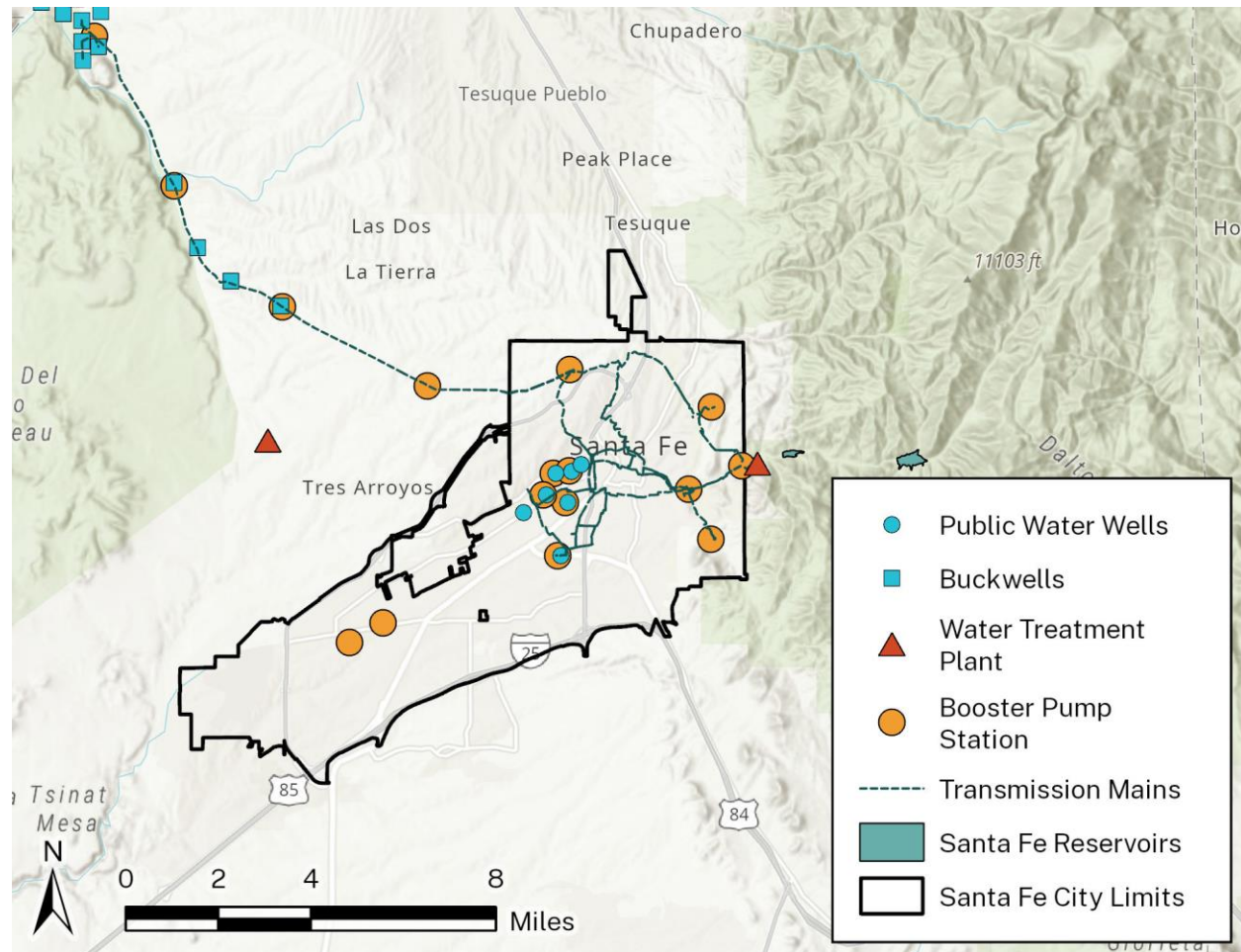
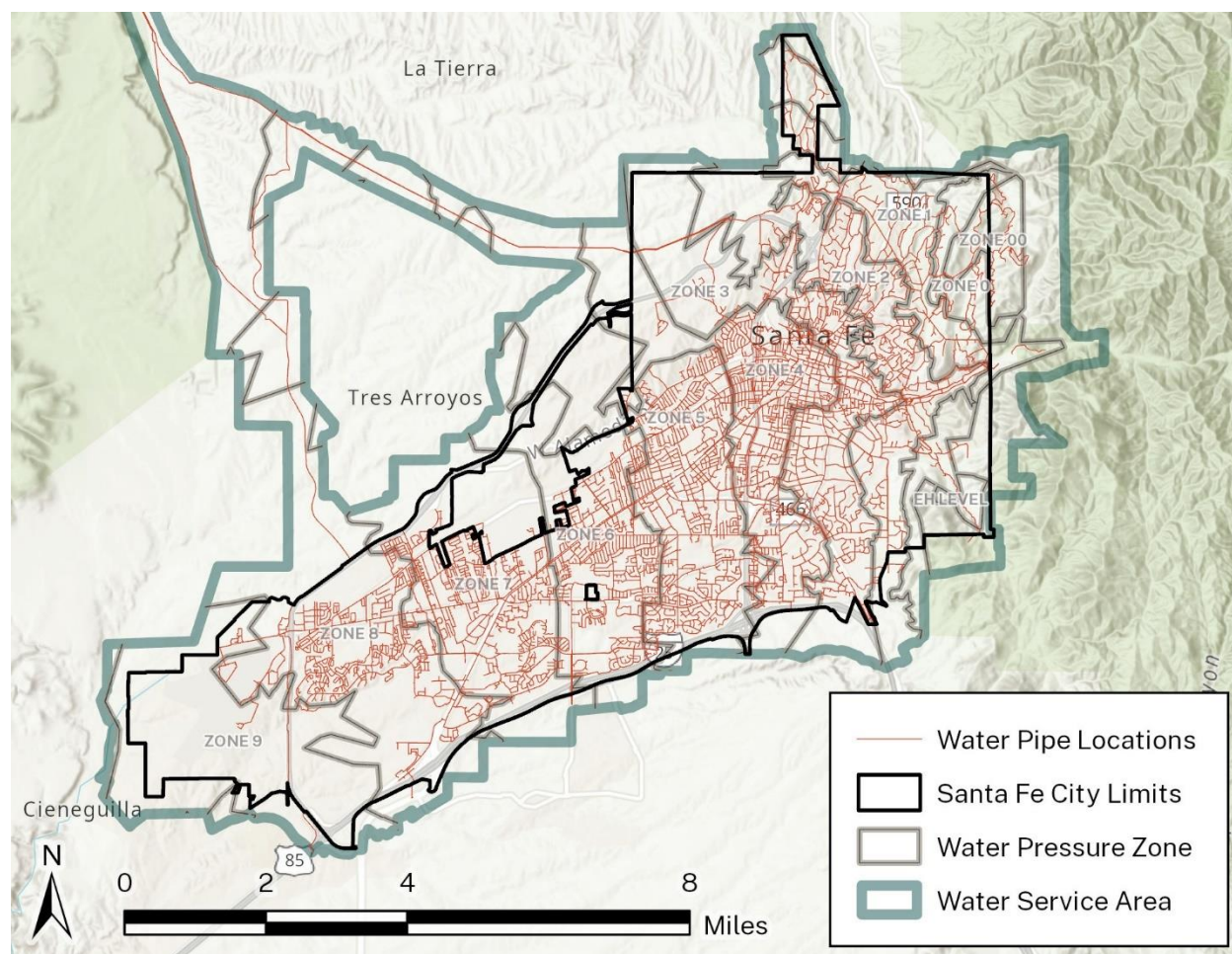


Figure 14-4. City of Santa Fe Water Distribution System



The City's 2020 AMP identified several linear assets under Critical or High Priority:

- 30-inch cast iron water main leaving the Canyon Road WTP
- 20-inch ductile iron water main (Buckman line)
- 20-inch cast iron water main along Buena Vista Street, between Galisteo Street and Old Santa Fe Trail
- 16-inch cast iron water main near De Vargas Park, along Alameda Street
- 8-inch asbestos cement water main along Hyde Park Road, between Camino de Las Trampas and Calle Ramon
- 6-inch cast iron water main along Griffin Street, between Rosario Boulevard and Catron Street

To help manage linear asset condition, the City currently has a priority line replacement program implemented; however, they are working to get a new predictive software product online that will help to use artificial intelligence to predict line breaks before they happen. The priority replacement program currently in place keeps track of break history and soil type of each pipe to help determine its condition. Based on experience in this system, the operators have found it more effective to monitor these parameters rather than just age, as there appears to be a more direct

correlation to service life. The new software will use this information and city determined trends to predict line breaks based on localized soil conditions and break history.

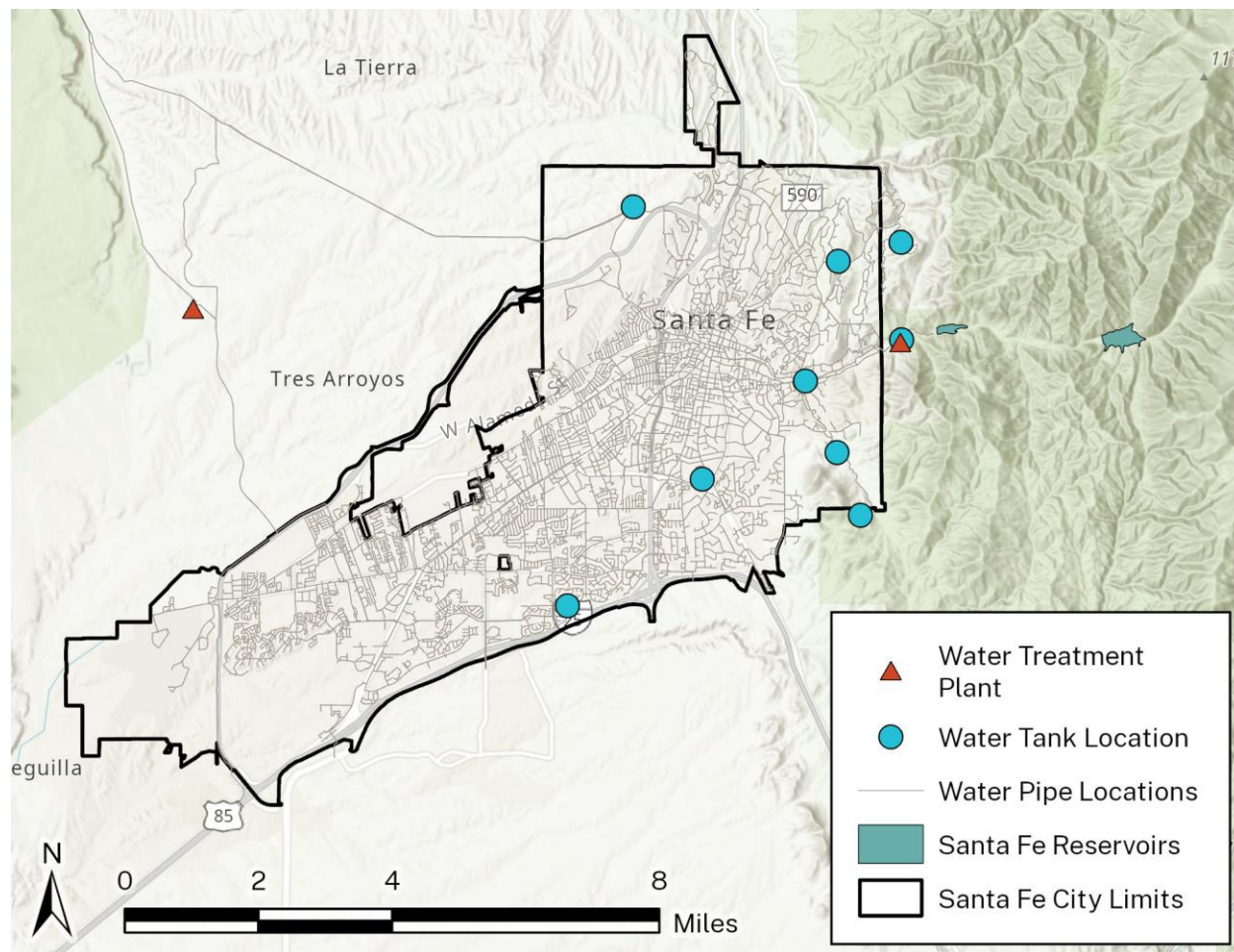
Since 2014, the City's annual average has been about 31 main breaks per 100 miles of pipe, but this has been trending downwards due to the priority program's predictive approach. *In 2023, there were 22 main breaks and 10 service lines, which equates to less than 4 main breaks per 100 miles of pipe, which is well below the average of 17 breaks per 100 miles of pipe average for water utilities of this size according to a 2018 Utah State Study. Non-revenue water in the system, an indication of water losses and leaks, is typically less than 10 percent each year.*

14.4.2.2 Water Storage

The storage tanks in the system are used to provide storage to serve daily fluctuations in demand (equalization storage), fire flow storage, and emergency storage. Many of the tanks also serve as suction storage for the booster stations. The combined capacity of the nine storage tanks in the system is 33 million gallons. The City's most recent Transmission and Storage Master Plan (2009) identified the need for additional storage capacity. This assessment recommended additional storage in the Dempsey and EHL Tank service areas, additional storage capacity in the Summit Tank service area, and the need for a larger suction reservoir at BS-3. The 2020 AMP identified the St. John's Tank, Summit Tank, Buckman Tank, Dempsey Tank, and Summit Tank – all as High Priority. Figure 14-5 shows the locations of City of Santa Fe water treatment and storage facilities.

Current capital projects for the City also include upgrades to the two dams on Santa Fe River: the McClure and Nichols Dams. Aging inlet works, which consist of a tunnel that carries water through each dam to regulate water flow from each reservoir into an "outlet conduit," were last updated between 2014 and 2016 to add dry access to the inlet works from the dams. Prior to this work, the inlet works were accessed through vertical towers in the reservoirs reached by boat. Investigation by CoSFW associated with the inlet work updates identified potential issues associated with seepage through the dams and into the outlet conduits. In 2019, based on this information, the Office of the State Engineer Bureau of Dam Safety downgraded the status of both dams from "Satisfactory" to "Poor." A contract was awarded in 2023 to address major renovations to both dams. The renovation project has started with the Nichols Dam, which is under construction. Upgrades to the McClure are currently under design.

Figure 14-5. City of Santa Fe Water Treatment Plants and Water Tanks



14.4.2.3 Booster and Pump Stations

The 2009 Transmission and Storage Master Plan identified all existing booster stations have capacity to supply 2030 MDD for their respective service areas, apart from three booster stations, which required additional emergency capacity. The Buckman Transfer Station conveys water from the Buckman Tank (10 MG, Pressure Zone 2 – Northwest Quadrant [NW Quad]) to the Hydro Tank (5 MG, Pressure Zone 2) during higher demand periods to keep the Hydro Tank from emptying. The NW Quad Booster is a closed-loop pump station that serves Pressure Zone 2 – NW Quad. Booster Stations 1, 2, 3, and 4 (BS-1, BS-2, BS-3, and BS-4) convey water from BWF to Buckman Tank; each of these booster stations has a small suction storage tank, not included in the nine storage tanks listed above.

These pump and booster stations deliver water to the different storage tanks that make up the various pressure zones. The 11 pressure zones were developed by the City to keep pressures within established limits; the established pressure zone boundaries also help inform design decisions when expansions to the water system are designed and constructed. The pressure zone boundaries, for the most part, are governed by elevation and are created either by physical

separation, PRVs, or closed isolation valves. Two of the pressure zones are subdivided: Zone 1 is subdivided into two zones, north and south, by physical separation; Zone 2 is also subdivided into two zones by physical separation with the northern portion referred to as the Northwest Quadrant (NW Quad). Apart from Pressure Zone 2 – NW Quad, the hydraulic grade of each pressure zone is governed by storage tank level and/or PRV settings. The hydraulic grade of Pressure Zone 2 – NW Quad is governed by the closed loop pump station supplying it.

14.5 Wastewater

The City of Santa Fe operates a single wastewater treatment plant, called the Paseo Real WTP, which has a service area of approximately 39,750 acres, or 62 square miles. This service area is defined by the boundary known as the Presumptive City Limits. The City also provides sewer service for the village of Agua Fria, a traditional community contained completely within the Presumptive City Limits, as well as other residential subdivisions located beyond those limits, including Vista Aurora, Thornburg, Aldea, Tessera, Old Las Vegas Highway, and the Santa Fe Brewery. The Presumptive City Limits boundary was created during a 2008 Settlement Agreement between the City of Santa Fe and Santa Fe County and includes all properties currently within the City's municipal limits and all properties within the County that are beyond the existing municipal City limits but are scheduled to be annexed into the City limits in the future. At this time, the City does not have active annexation plans for the village of Agua Fria. Under the terms of this Agreement, the City provides water and sewer service to those areas. The County provides water and sewer service to those areas outside of the Presumptive City Limits.

Wastewater

The Paseo Real WTP 62 square mile service area is defined by the Presumptive City Limits. The City provides sewer service for the village Agua Fria, a traditional village contained completely within the Presumptive City Limits, as well as other residential subdivisions located beyond those limits, including Vista Aurora, Thornburg, Aldea, Tessera, Old Las Vegas Highway, and the Santa Fe Brewery.

14.5.1 Current and Projected Influent Wastewater Flows

The most recently developed Wastewater Master Plan was created in 2016. This assessment contained population projections for the wastewater collection system. However, as stated above, the 2008 Settlement Agreement between the City and County established the area where the City provides water and wastewater servicing. For consistency, the population projection methods described above in Section 14.3, which align with the 2022 Demand Memo by Hazen and Sawyer, will be used in influent wastewater projections described in this section.

The City must provide the option for sanitary servicing for all populations within the Presumptive City Limits under the terms of the 2008 Settlement Agreement. Some residents are not connected to this sanitary system and have septic systems. Therefore, it is assumed that the actual service population of the system falls between the municipal limits population and the Presumptive City Limits population. In 2015, the average daily influent flow to the plant was 5.5 MGD. This equates to an average wastewater generation of 63 to 66 GPCD. Although non-seasonal water production

can be a useful proxy for estimates of wastewater generation, there are several reasons that water into a home may not directly equal wastewater out of the home into the municipal collection system.⁶ To quantify these differences, the 2016 Master Plan compared influent wastewater flow rates collected at the plant with the non-seasonal water production demands and found that there was a 4.1 percent observed difference, in which wastewater influent was larger than potable demand when accounting for non-revenue water losses equal to 7.9 percent of total production and deducting estimated non-seasonal water usage of homes on septic system (homes on septic systems accounted for 2.7 percent of potable water production in this assessment).

The following wastewater influent projections have been developed as shown on Table 14-4. The projections fall within that reported in the 2016 Wastewater Master Plan for year 2040 (planning horizon of the study). The 2016 Wastewater Master Plan projected 8.5 MGD average annual influent flow in 2040, whereas this assessment projects 7.3 to 8.9 MGD.

14.5.2 Existing Treatment and Collection Facilities

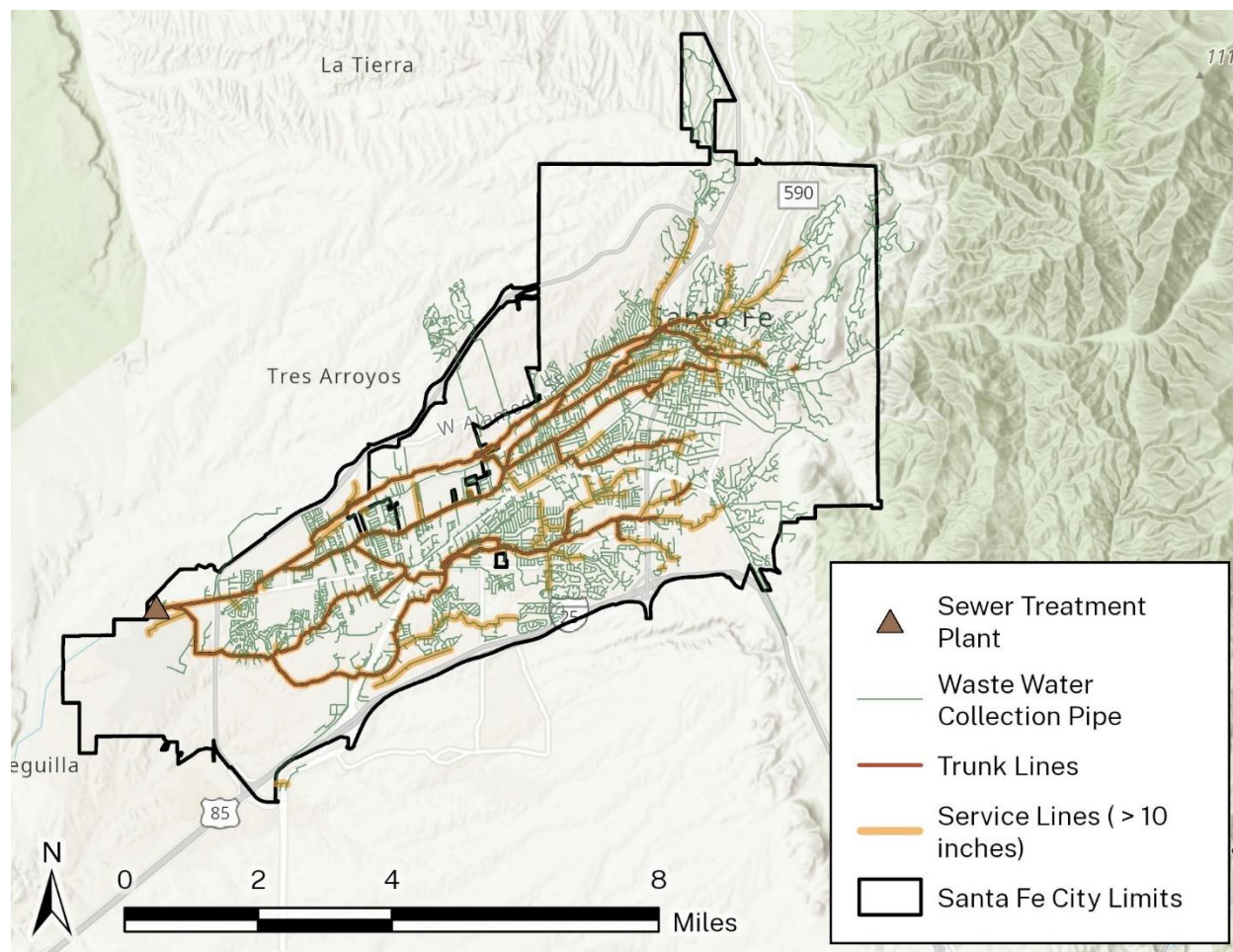
14.5.2.1 Wastewater Collection System

As shown in , the City operates an expansive sewage collection system consisting of collection lines, truck sewers, manholes, a low pressure system, and a lift station located at the Canyon Road WTP. There are two additional sewage lift stations, one in Las Campanas and one in Aldea, both of which are privately owned; however, the City manages their operation. There are no major pump stations conveying a majority portion of flows.

There are currently no capacity concerns reported in the system by City staff. The City is continuously working to upgrade and improve the sanitary collection system. For example, there is a pipe replacement projection going on currently to replace 1,900 feet of clay sewer pipes and to increase the pipe size from 10 to 12 inches.

⁶ This can include reasons, such as nonrevenue water losses or leaks in the system, which could inflate the per capita water demand and therefore the estimated wastewater flow, use of septic systems at homes connected to the potable water distribution network, evaporative indoor water losses, private recycling of indoor use, miscellaneous outdoor uses occurring in the low demand season (2016 assessment used non-seasonal water demands as to not inflate wastewater flow with irrigation demands), and sewer collection system losses.

Figure 14-6. City of Santa Fe Wastewater Collection System



14.5.2.2 Wastewater Treatment Plant

As stated above, the City operates a single wastewater treatment plant, the Paseo Real WWTP, located on the south side of town, near the airport. This facility includes primary, secondary, and tertiary treatment, as well as disinfection for the liquid stream and solids treatment using anaerobic digestion followed by biosolids composting. Water produced from this facility is either discharged to the Santa Fe River or reused as reclaimed water for irrigation purposes at public and private golf courses, recreational facilities, as construction water, or for other irrigation purposes.

There is treated effluent storage capacity on site in the form of storage ponds to help balance flows for reclaimed water use; when there is demand, water is pumped from these ponds for use. Reclaimed water from the plant is available year-round, as long as effluent is compliant, but the City reported that they usually only use this source during warmer months as irrigation demand increases. Stabilized solids from the facility are composted to create biosolids used by private and public users for fertilizer.

Table 14-4. Wastewater Influent Projections

Year	POTABLE DEMAND ESTIMATES (AC-FT/YR)		WASTEWATER INFLUENT PROJECTION (AC-FT/YR) ¹		WASTEWATER INFLUENT PROJECTION (MGD)	
	Baseline	High	Baseline	High	Baseline	High
2025	9,192	10,286	9,192	10,286	7.2	8.2
2030	8,865	10,625	8,865	10,625	7.0	8.5
2035	9,023	10,912	9,023	10,912	7.1	8.7
2040	9,221	11,158	9,221	11,158	7.3	8.9
2045	9,415	11,400	9,415	11,400	7.5	9.1
2050	9,627	11,665	9,627	11,665	7.7	9.3
2055	9,835	11,924	9,835	11,924	7.8	9.5
2060	10,049	12,191	10,049	12,191	8.0	9.7
2065	10,268	12,464	10,268	12,464	8.2	9.9
2070	10,493	12,744	10,493	12,744	8.4	10.2
2075	10,723	13,031	10,723	13,031	8.5	10.4
2080	10,959	13,325	10,959	13,325	8.7	10.6
2090	11,201	13,627	11,449	13,937	8.9	10.9
2095	11,449	13,937	11,704	14,254	9.1	11.1
2100	11,704	14,254	11,964	14,579	9.3	11.4

1. These influent projections are equal to the projected potable water production provided, minus non-revenue water losses estimated at 8% of total water production, minus the potable water demand estimated from homes on septic (2.7% of total production).

The WWTP facility operates under five permits through EPA and New Mexico Environment Department (NMED) for both the liquid and solids stream management. There is also a permit for subsurface sludge injection, DP-135. DP-289, a permit for effluent reuse, is currently under review.

The existing plant capacity of 13 MGD is sufficient to meet the projected average influent flow rates and peak flow rates. There are currently no process bottlenecks and the City does not see a correlation between peak influent flow rates and rain events, indicating that there is minimal inflow and infiltration in the system.⁷ The City has also noticed a trend of decreasing annual influent flows, which is believed to be a direct result of the water conservation initiatives the City has for potable water consumption.

During staff interviews, it was discussed that Santa Fe is considering downrating the plant in 2026, as their current peak flow is only approximately 8 MGD. Despite the trend towards gradually decreasing inlet flows, until long term planning to address aging infrastructure at the current facility is finalized the City might consider postponing down rating the facility since the excess capacity provides flexibility and redundancy for equipment repairs.

This facility was originally constructed in 1963 as a trickling filter plant, with the most recent process upgrades occurring in 1980. The present treatment process is 45 years old, and the City is currently working to update the facility Master Plan to help inform the need for upgrades or replacement.

In discussion with City staff, the following process concerns were identified:

- **City staff indicated the biggest concern right now is biosolids management.** The facility's land application permit expired, requiring treated sludge to be disposed of at landfills. However, staff reported that landfills are not keen to accept this waste product, as the current solids treatment process only dewateres to 15 percent. They are presently driving sludge throughout the state for disposal and contracting out this hauling effort. The City recently approved a contract to complete a biosolids process evaluation to help optimize solids stabilization, dewatering, and post-treatment use, which is intended to alleviate these concerns.
- It was reported that half of the aeration basin used in the biological treatment process is currently offline and requires rehabilitation.
- Due to the age of the UV disinfection system, the manufacturer has discontinued support (approximately 10 years ago), making maintenance difficult.
- The inlet headworks screens were also reported as aging infrastructure. The City is currently working to replace one of the two screens in the headworks.
- If a digester is taken offline, the City does not have adequate retention time to meet regulatory requirements. The City has other options including sludge holding tanks, lime stabilization, and drying beds to help manage the solids if needed for emergency purposes.

The most recently completed Master Plan recommended two new digesters be added for operational flexibility, increased residence time, and to allow maintenance and repair of the existing digesters which are 45 years old. The Master Plan recommended these additions within five years of the 2016 plan; this

⁷ Inflow and Infiltration - stormwater (inflow thru manholes) and groundwater (infiltration into sewer lines).

work is not yet completed. Both existing digestors have required emergency repair work. The current residence time inside the digestors is not anticipated to be sufficient with increased loading to meet anticipated regulatory shifts from the EPA 503 Regulations for biosolids. Third and fourth digestors were identified to provide sufficient operational flexibility and system redundancy to meet these limits.

Two other process-related upgrades to address foaming concerns and optimize the primary treatment and solids management process from the Master Plan were mentioned.

A recommendation to optimize the activated sludge process was a response to City reports of historically encountering a seasonal (winter months) increase of foaming in the aeration basins. Nutrient testing completed for the Master Plan provided a narrative related to the secondary treatment process. This narrative indicated that the aeration basin and oxidation ditch were performing simultaneous nitrification/denitrification for total nitrogen removal, but that the anoxic selectors downstream, intended to assist with total nitrogen removal, were instead acting as anaerobic selectors for biological phosphorus removal. While phosphorus removal in the process is effective, the high rate of removal is resulting in high sludge volume indices that were suspected to be impacting foaming. The Master Plan recommended modifying the mixed liquor return pump operation by halting return flows, isolating parts of the anoxic selector to reduce residence time and minimize phosphorous release, and monitor impacts on foaming with these changes.

The primary clarifiers were also identified to be underloaded and underperforming, with solids and organics capture below typical industry values; primary solids capture from July 2012 through 2014 was evaluated at 35-40 percent, while the industry standard is 55 to 60 percent removal. The Master Plan attributed this performance to the primary solids wasting strategy, suggesting that it is too infrequent. The dense primary solids blanket in the clarifier can ferment and result in hydrolysis of solids causing resuspension. However, it is important to note that improving the solids capture efficiency of the primary clarifiers may reduce the plant's ability to remove nitrogen as efficiently, as these solids in the activated sludge process are thought to be assisting total nitrogen removal. Due to these conflicting impacts, it was recommended that the City wait to optimize this part of the process until the aeration basins are nearing capacity. Once the aeration basins are at capacity, the Master Plan recommended optimizing the primary clarifiers for increased solids capture to free up capacity in the aeration basins to help delay the need to install a third basin; the need for a new aeration basin was estimated for 10 to 25 years out in 2016, or within the 15 years at the time of this assessment report.

Additionally, a few operational concerns were discussed with City staff, including:

- ***Maintenance at this facility has primarily been reactive rather than proactive, which makes it difficult to get out in front of preventive maintenance prior to failure.*** The City is hoping to become more proactive with maintenance once their new asset management software has been populated and is online, as that will help to predict failures before they happen and prioritize maintenance efforts.
- ***The City currently struggles to maintain staff, specifically experienced operators.*** During staff interviews, it was reported that the average operator age at this facility is higher than industry standard, which presents risks for insufficient resources to transition staff into retirement when they are ready. Adequate staffing was identified as the greatest issue with the current system.

14.5.2.3 Anticipated Regulatory Shifts - Effluent Quality

The current surface water discharge requirements for the Paseo Real WWTP facility were issued in 2010 by EPA and are documented in the National Pollutant Discharge Elimination System (NPDES) permit (Permit No. NM0022292). The City was issued a preliminary, proposed, NPDES permit update in 2015, which included nutrient limits of 3.1 milligrams per liter (mg/L) (30-day average) for phosphorus and 6.9 mg/L (30-day average) for nitrogen (Tier 1). This proposed permit is currently pending final discussions between the City, EPA, and NMED.

The City's WWTP performance is currently measured against existing effluent discharge requirements but has the capability to meet more stringent nutrient discharge limits for nitrogen and phosphorus. The EPA and NMED are considering revised nutrient effluent discharge limits of either:

- Tier 1:
 - 6.9 mg/L Total Nitrogen
 - 3.1 mg/L Total Phosphorus
- Tier 2:
 - 2.3 mg/L Total Nitrogen
 - 1 mg/L Total Phosphorus

The 2016 Master Plan looked at the facility's current ability to meet both sets of proposed limits and found that the Paseo Real WWTP is meeting the proposed discharge limits for Tier 1. During this study, the average effluent total nitrogen concentration was 2.3 milligrams of nitrogen per liter (mg N/L) and only periodically exceeded the 6.9 mg N/L level. The average effluent total phosphorus was 0.96 mg P/L and periodically exceeded 3.1 mg P/L. *Based on these values it was determined that there is little concern for the existing process to meet either set of discharge limits, if they were to be imposed.*⁸

To provide assurance that the facility will meet the Tier 1 and Tier 2 limits, without periodic exceedances that are currently observed, the 2016 Master Plan provided recommendations for operational and process improvements. These recommendations primarily focused on additional sampling, optimizing the activated sludge process used for secondary treatment, and optimizing the primary solids handling process.⁹

In addition to anticipated nutrient discharge limit reductions, the other regulatory shifts could include regulating the discharge of emerging contaminant of concern. For the scope of this assessment report, emerging contaminants of concerns are pharmaceuticals and/or personal care products. These compounds, or contaminants, are currently being discovered in watersheds at low concentrations

⁸ This study also examined other possibilities for nutrient effluent regulations, which considered limits of technology (LOT), to develop a more stringent total phosphorous limit of 0.02 mg P/L, a two order of magnitude reduction from the Tier 1 limit. While this limit is not considered practical or probable, the Master Plan's process evaluation indicated that through more chemical addition and adding a flocculation process prior to filtration, this plant may be able to achieve the ambitious 0.02 mg/L LOT limit, if ever proposed.

⁹ The data used to develop the latest Master Plan was scattered from July 2014 to June 2015, and suggested possible equipment issues in the headworks and primary clarifiers; the validity of these concerns as a process issue rather than an autosampler issue cannot be verified with that quantity of data. It was stressed in this assessment that accurate and valuable long term planning for process improvement takes accurate and timely data.

(e.g., ppb or ppt). These constituents have been found to be harmful, as some have been determined to be endocrine disruptors, while others have been found to mimic estrogen and, therefore, may disrupt the endocrine system of both animals and humans. Studies in the industry have researched and documented that as treatment plants improve treatment performance, specifically those that transition from secondary treatment for nitrogen removal, they also have the ability to remove these emerging contaminants of concern. However, like most target constituents, this removal efficiency is highly dependent on the contaminant of interest. There is uncertainty on which, if any, of these constituents will be regulated in the future. The existing treatment processes at the Paseo Real WWTP provides a relatively effective level of treatment for removing these types of compounds, such as the long solids residence time in the activated sludge process followed by filtration (currently removing N). Industry research teaches that longer solids residence times (SRT) for ammonia removal have been found to increase biomass concentrations on the surface area of the mixed liquor, and thus increases the number of enzymes that carry out nitrification. This enzyme, ammonia monooxygenase, has the ability to assist in the biodegradation of a wide-range of compounds such as pharmaceuticals and/or personal care products. *This plant is currently operating with a fairly high SRT that reliably nitrifies; therefore, the facility is more than likely already removing more of these emerging contaminants of concern than other plants that perform secondary treatment.*

14.6 Stormwater Management

The City has the legal authority to require implementation of stormwater management measures for new development. This authority is identified in three main chapters of the Santa Fe Code of Ordinances: Chapter 13, Stormwater Utility; Chapter 14, Land Development; and Chapter 25, Water. Principles and Guidelines. In addition, there is also Resolution No. 2016-25 supporting the use of infiltration through green infrastructure and low impact development controls on public and private lands, and which directed the City Manager to develop a stormwater management program updating the City's Policies in furtherance of the City's environmental protection and sustainability policy and goals. As a result of this resolution, the City developed a Stormwater Strategic Master Plan, which was intended to serve as a roadmap for decision makers to use to institutionalize a proactive, compliant, and sustainable stormwater management philosophy based on the infiltration model, and guide decision makers toward maintaining compliance and implementing policies that will not only protect but also enhance Santa Fe residents' quality of life.

14.6.1 Existing Stormwater Practices

The City has a diffuse program management structure that assigns significant stormwater program management responsibility to the River, Watershed, and Trails/Stormwater Section within the Engineering Division of the Public Works Department and distributes implementation responsibilities across multiple City departments. The four city offices that deal with or manage some aspect of stormwater for the City or as follows:

- **Design Review**, located in the Planning and Land Use Department, is responsible for review and approval of new development. *Overall, the Code contains inadequate active construction best management practices, post-construction stormwater management performance standards, and enforcement authority for stormwater management.* The

Code does not currently require development projects to meet a retention performance standard for post-construction stormwater management and makes no mention of water quality issues or requirements. The Code does not contain adequate enforcement actions to address stormwater management violations during active construction.

- **The Water Conservation Office** in the Public Utilities-Water Division works to reduce potable water use through multiple strategies, including more comprehensive use of stormwater for landscaping. The Office is working on an updated Water Conservation Plan to be completed in 2026. The Office also initiates and manages neighborhood and open space conservation focused pilot projects as well as outdoor landscaping projects for which rebates are available.
- **The Complete Streets Division** in the Public Works Department is responsible for design, construction, and maintenance of public infrastructure streets and drainage. The Division is currently working on a Complete Streets Manual, which will incorporate green stormwater design standards to reduce construction and maintenance issues.
- **The River and Watersheds Division (R&WS)** in the Public Works Department deals with citywide drainage, flooding, and erosion problems and water quality requirements for streams. R&WS has an annual budget from a stormwater utility fee imposed on new development, which funds the Division's operations and drainage and erosion mitigation projects. R&WS advocates for greater implementation of stormwater infiltration but has no direct influence over Land Use or Complete Streets. *Consequently R&WS, although responsible for the City Stormwater Management System, is not part of the process when changes to that system are made by private developers or City projects. There is a need for a better method of updating and refining the Stormwater GIS. A complete and more usable stormwater model would be helpful to quantify impacts of existing and new construction and develop appropriate mitigation. Proactively requiring green infrastructure/low impact development as retrofits for existing and mandate for new construction could minimize or even eliminate many of the problems.*

14.6.2 Stormwater Program Needs

As previously mentioned, the City has started multiple stormwater initiatives that have not been fully implemented over the last decade. The City does not have an internal stormwater management committee or organizational chart to identify staff responsible for various permit-required responsibilities.

Instead, the City has a diffuse program management structure that assigns significant stormwater program management responsibility to the River and Watersheds/Stormwater Section within the Engineering Division of the Public Works Department but distributes implementation responsibilities across multiple City departments.

In addition, although there is a stormwater utility fee that funds drainage and arroyo mitigation projects, it does not generate adequate revenue to meet the current needs.

The present rate of revenue generation by the Stormwater Utility Service Charge Fee (“utility fee”) is not sufficient to sustain the current scope of the stormwater program, and the scope of stormwater activities will necessarily expand to achieve regulatory compliance and meet other identified needs.

All of the city organizations that manage or have some role in stormwater management agree that the best strategy for the City going forward is to implement an infiltration model and increase the use of decentralized stormwater management system that encourages, incentivizes, and even requires on-site stormwater management rather than a storm drain-collection and conveyance system that discharges to an arroyo or channel.

To accomplish this objective, significant changes or additions are required for the Land Use Code and the Complete Streets Manual. Overall, the Code contains inadequate active construction best management practices, post-construction stormwater management performance standards, and enforcement authority for stormwater management. Additionally, design criteria, construction specifications, changes in the permitting and approval systems are needed to implement infiltration based approaches.

14.6.3 Stormwater Collection/Conveyance/Outfalls

In general, the City does not have an extensive storm drain system. Most of the stormwater conveyance from streets and local neighborhoods discharge to the nearest available arroyo. The major storm drain systems are typically associated with the arterial street system, including Saint Francis, Saint Michaels, Cerrillos, Paseo de Peralta, San Mateo, Zia, Rodeo, and Airport.

A citywide stormwater model covering the Santa Fe River and Arroyo de los Chamisos was prepared as part of the Stormwater Strategic Plan. As part of the model development, a GIS database was prepared showing storm drain and culvert outfalls to the Santa Fe River and various arroyos, but the GIS database is not completely populated. Consequently, the City has inadequate mapping and modeling of public stormwater management assets and the storm sewer system to ensure adequate maintenance and permit compliance.

The City’s GIS data includes the following stormwater system shapefiles: drop inlets, outfalls, channels, curb openings, storm drain inlets and outlets, storm water ponds, and embankments. None of the files cover the whole area of the watershed and the attribute tables are incomplete. shows the location of data that was provided by City staff. It is apparent that much of the city is not represented in the data. Field checks and review of aerial photography indicated that there is a large part of the stormwater system that is not represented in the existing data. Also, there are several files with the same type of information and they need to be accumulated and collected in one comprehensive database file. Missing (or incomplete) data for the proposed stormwater database includes: stormwater inlet and outlets, pipes, culverts, channels, manholes, and easement and cleanout locations.

The key concern and top priority should be collection of complete stormwater system data including a condition assessment of all surface and subsurface assets.

[PLACEHOLDER – Figure of Existing Storm Collection Infrastructure pending review of GIS data]

14.6.4 Program Benefits of Infiltration Model for Stormwater Management

Decentralized stormwater management which focuses on infiltration of rainwater into green infrastructure and low impact development stormwater controls, can provide numerous water-related benefits beyond preventing flooding and erosion mitigation such as water quality treatment and aquifer recharge. City leadership, staff, and the community have all expressed support for this approach as demonstrated by the process used to develop the Stormwater Strategic Master Plan as well as the City's ordinances and resolutions. Implementation of such a model would also provide long term cost savings resulting from reduced capital and maintenance costs for stormwater infrastructure. In addition, vegetation supported by infiltration of stormwater can be used in multifunctioning landscapes to:

- Encourage walking and biking by providing shade and traffic calming,
- Clean urban pollutants from the air,
- Reduce the urban heat island effect,
- Provide wildlife habitat and migration corridors,
- Improve residents' overall sense of well-being,
- Improve health outcomes of the ill,
- Increase property values; and
- Support commercial retail and restaurant businesses.

City leadership, staff, and the community have all expressed support for this approach as demonstrated by the process used to develop the Stormwater Strategic Master Plan as well as the City's ordinances and resolutions.

References:

<https://santafewatershed.org/the-watershed-overview/river-history/>

[City of Santa Fe Water](#)

<https://santafenm.gov/public-utilities/water/water-resources-1/buckman-wells>

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City of Santa Fe Water Transmission and Storage System Master Plan (sharepoint link: [City of Santa Fe General Plan Update - COSF MasterPlan FinalReport As Revised 090309.pdf - Details](#))

(reviewed up to PDF page 74, but then thought the value of their detailed improvements assessment was not yet required for our deliverable)

2019 Basin Study Update (sharepoint link: [City of Santa Fe General Plan Update - SF_Basin_Study_Update_Final.pdf - Details](#))

2015 basin study(SP link: [City of Santa Fe General Plan Update - 2015_City of Santa Fe Basin Study.pdf - Details](#))

Anerobic Digester Improvements TM (SP link: [City of Santa Fe General Plan Update - CSF Biogas Eval-Cogen DRAFT TM 5-19-17 \(2\).pdf - Details](#))

Water Asset Management Plan (SP link: [City of Santa Fe General Plan Update - FINAL AM Plan Report_04012020.pdf - Details](#))

WW master plan: [City of Santa Fe General Plan Update - Wastewater_Treatment_Facility_5_Year_Master_Plan.pdf - Details](#)

Reuse Info PDF: [5869](#)

Santa Fe Strategic Plan: [City of Santa Fe Water Strategic Plan December 2020.pdf](#)

Development of Water Demand Projection for the City of Santa Fe, Tech Memo, 2022: [Title of the Technical Memorandum](#)

City Land Use and Urban Design Study: [5058](#)