Existing Conditions Report

Utilities

November 22, 2021

CITY OF PETALUMA
GENERAL PLAN UPDATE

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Introduction and Setting

Purpose and Overview

The City of Petaluma, its roughly 62,000 residents and those in unincorporated land surrounding the City are supported by a network of utilities that provide for the commercial, residential, municipal, and industrial needs of the community. The City provides Water, Sewer Service, and operates the Stormdrain system for City residents and some surrounding areas, while Electricity, Gas, Telecom and Waste Services are provided by multiple private utilities. The physical and economic growth of the City is dependent on the capacity and maintenance of this network. Looking to the future, it is important to recognize the potential for changes in the needs of the residents as well as the necessary adaptations to the changing climate, including increased flood risk, extreme heat events, wildfire, water supply challenges, and clean energy resilience.

The City's utility infrastructure varies in age. The City owns and operates their own water, sewer, and storm drain infrastructure. Pacific Gas and Electric (PG&E) is a private, investor-owned utility that supplies electricity (in coordination with Sonoma Clean Power, a public agency) and natural gas to the City.

The California Public Utilities Commission (CPUC) regulates all privately owned public utilities companies in the state of California. The Commission establishes service and safety standards as well as utility rate changes. Municipal utilities are not subject the CPUC authority on rate regulation. However, all utilities, municipal or private, must follow the CPUC guidelines on rate change processes and components of safety operations. Sonoma Clean Power, as a Community Choice Aggregator, is not subject to the same regulations.

The report summarizes the Public and Private systems serving the City, and focuses on identified capacity and distribution issues, active and ongoing projects, and opportunities for improvement to advance the sustainability and resiliency of the City's infrastructure systems. This report was developed with the following objectives:

- Summarize the utilities which support the City
- Describe existing reports which evaluate the vulnerabilities and capabilities of utility services
- Assist decision makers and community members in understanding the context of the General Plan Update, including past, current and future trends, issues and opportunities for improvement
- To understand responsibilities of the City and associated agencies in regards to operations, maintenance, and expansion of infrastructure

Existing Planning Efforts and Goals

The city has committed to many goals which will drive planning regarding infrastructure. The City adopted the Zero Waste Resolution in 2020 setting the goal of reducing 90% of all material from landfills by 2030[1]. The City Council adopted the Climate Emergency Framework at its January 11, 2021 special meeting, directing staff to incorporate the Framework's goals into future planning, policy, and action to help Petaluma be carbon neutral by 2030. This includes strategies like solar installations at city facilities, Biomass to Biogas, powering City facilities on local renewable power, a prohibition on new gas stations, LED streetlight conversion, and a building code update to prohibit installing natural gas appliances in newly constructed buildings[2]. In May 2021 the State Water Board established the Petaluma River Watershed Total Maximum Daily Load (TMDL), which stated that the River was impaired by elevated fecal indicator bacteria. The River is also listed on the Clean Water Act 303(d) list as being impaired due to excessive algae growth caused by high nutrient levels. The Regional Water Quality Control Board San Francisco Bay states on its Petaluma River Bacteria TMDL Website that "Potential anthropogenic nutrients and bacteria sources in the watershed include livestock, municipal stormwater runoff, septic systems, sanitary sewer systems, pet waste, and vessel marinas." A Bacteria TMDL will require the City to utilize adaptive management strategies related with stormwater management, land use, and waste treatment systems within the City.

Key Findings

Existing Utilities are for the most part currently providing sufficient services to the City. Factors such as Climate Change and new regional and State influences on the rate and type of development need to be considered in how they may effect the reliability and efficacy of City Utilities.

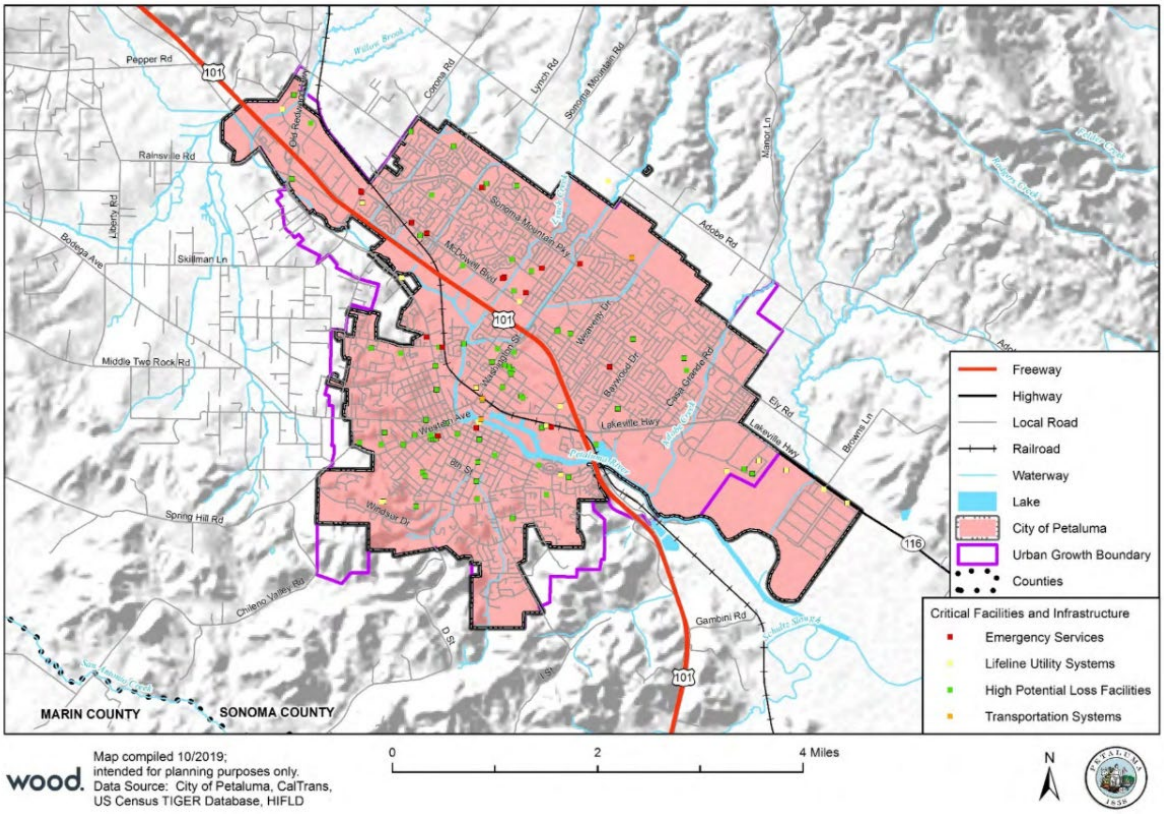
- The City projects meeting potable water demands for normal water years through 2045. For single dry water years through 2030, the City may reduce its potable demands and supply groundwater as needed to meet shortfalls. Significant mandatory water restrictions as a result of the 2021 Drought call into question the current understanding of water supply reliability.
- The City's wastewater system plan was found to be mostly satisfactory with only few minor concerns identified in a 2020 audit. The municipal waste treatment plant is currently operating under peak daily capacity.
- In addition to water quality concerns in the River, there remain significant portions of the City which are underserved by existing stormwater infrastructure and are prone to flooding. Deferred maintenance costs continue to grow each year, and the City continues to lose valuable stormwater management green space and floodplains.
- The City has experienced both Public Safety Power Shutoffs and Rolling blackouts in recent years, highlighting the need for improvement of grid resilience and backup energy options. Natural gas systems are meeting City demands.
- The Redwood Landfill which disposes of solid wastes from the City has a scheduled operational lifespan until 2025.

[1] Sonoma County Zero Waste Guide
[2] Petaluma Climate Ready 2030

Infrastructure Capacity & Improvements

Petaluma's critical infrastructure systems interface with a unique set of climate and environmental challenges. The conveyance and proper management of natural and engineered systems across the City is dependent on a holistic approach to proactive management and integrated systems thinking. The City of Petaluma, and its urban growth boundary, host a uniquely functioning system of transportation corridors, wet and dry utility distribution, stormwater drainage, potable water treatment and conveyance. Special consideration must be given to critical infrastructure and facilities, including emergency services, lifeline utility systems, high potential loss facilities, and transportation systems. The City has assessed the potential vulnerabilities to these systems as part of the Local Hazard Mitigation Plan (LHMP) efforts, summarized herein. Infrastructure vulnerabilities to these systems include loss of water supply, inundation due to flooding, loss of power due to high winds and wildfire, among others as discussed in this report. As factors such as Climate Change drive extreme weather events, Sea Level Rise and other factors, the Utility infrastructure must be hardened. Other factors such as changes to regional development pressures, or State impacts to locally controlled development restrictions may alter the base assumptions which long term utility strategies were built upon.

Figure 1: Critical and City Facilities by Overall Category

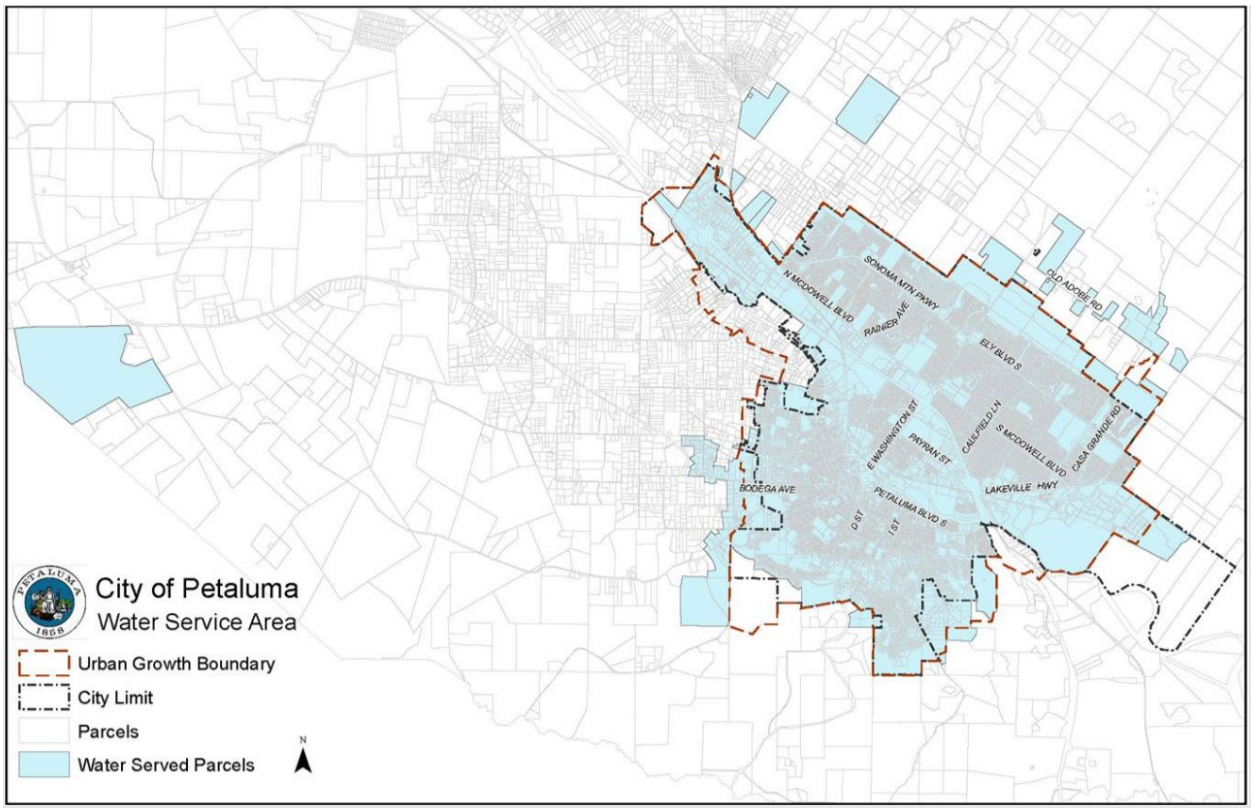


Source: City of Petaluma LHMP. Figure 4-1.

Potable Water System

The City of Petaluma receives potable water via two methods: purchased from Sonoma Water and pumped groundwater from City-owned municipal wells. The City does not have a self-supplied surface water source. Some potable usage within the City's potable water service area has been replaced by recycled water provided by the Ellis Creek Water Recycling Facility (ECWRF), further elaborated in Section 2. The City's water service area is generally coterminous with City limits, as shown below in Figure 2.

Figure 2: Water Service Area

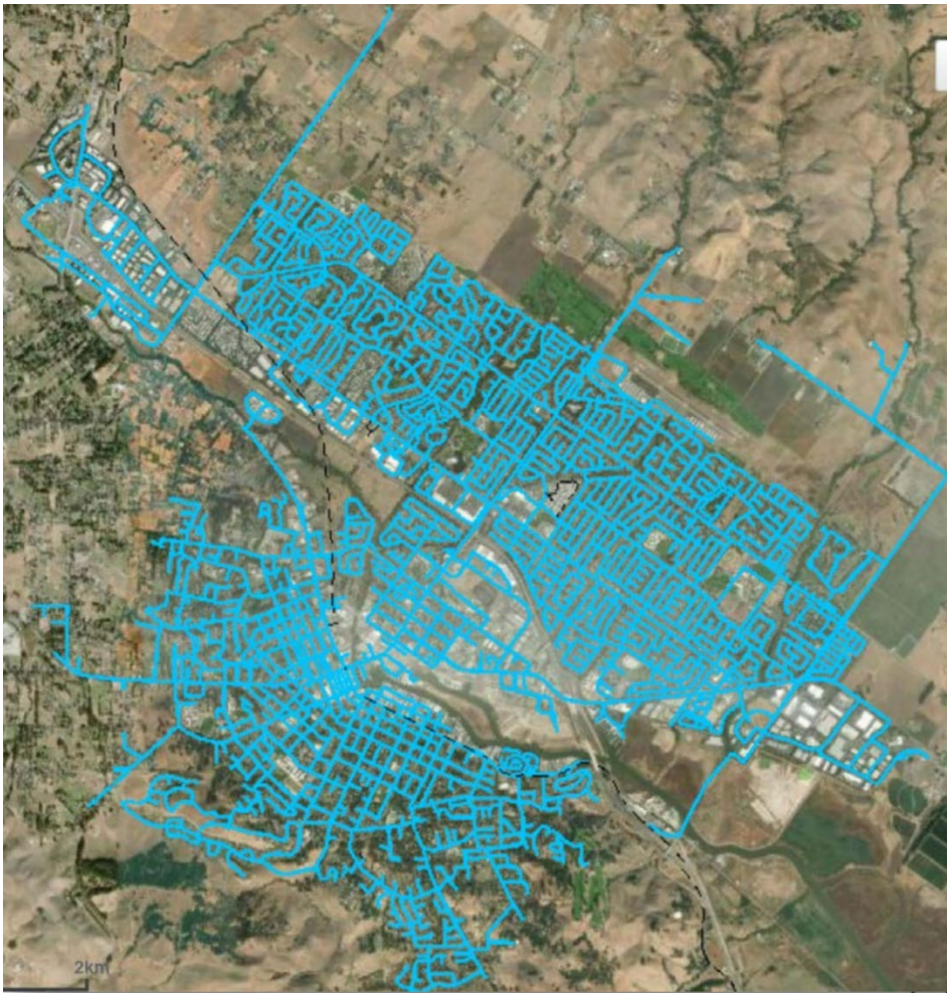


Source: 2020 UWMP page 3-2 (page 29 of 105).

The City's potable water system consist of 225 miles of water mains, 9 pump stations, and 10 water tank sites. The average age of water mains is 51 years. Figure 3 below shows water mains throughout the City. The City's primary connection to Sonoma Water is the Petaluma Aqueduct. With a diameter of 33 inches the maximum delivery capacity of the aqueduct is 116.6 AF (38 million gallons) per day flowing at 10 feet per second[3]. Fire Hydrants are pressurized with the same water mains and storage tanks as the domestic supply.

[3] Petaluma Urban Water Management Plan

Figure 3: Water Mains Serving the City of Petaluma



Source: City of Petaluma Infrastructure Workshop – Segment 1. Page 4 of 17.

Via Sonoma Water

The City purchases 95% or more of its potable water supply from Sonoma Water. Sonoma Water provides potable water to the City from reservoir storage along the Russian River, augmented by controlled water diversions from the Eel River watershed and Groundwater Pumping in the Santa Rosa Plain. The Russian River watershed does not receive runoff from Sierra Nevada snowmelt. Per its agreement with the City, Sonoma Water is not obligated to provide the City with more than 13,400 Acre Feet (AF) per year (or 21.8 MGD as an average daily rate during any one month).

Total potable water and recycled water use from 2016 to 2020 is listed in Table 1 below. The water use in Table 1 is based on actual potable and recycled water consumption and does not factor in the losses experienced in the distribution systems prior to the water reaching the consumer. The City projects an increase in total water demand (including both potable and non-potable) through 2045. Table 2 below shows projected potable water demands through 2045. These projected Potable demands through 2045 factor in water losses.

Table 1: Historical Total Water Demand in Petaluma

Year	Historical Total Water Demand (acre-feet)*
2016	8,182
2017	8,761
2018	8,845
2019	8,345
2020	9,497**

Notes:
*2016-2019 demands reflect total potable and recycled water demand. Recycled water use includes both urban and ag uses. Ag uses outside the City's water service area are not considered potable offset.
**2020 potable water demand was 7,731 AF. 2020 urban recycled water demand was 651 AF, and ag recycled water demand outside potable water service area in 2020 was 1,115 AF
Sources: 2020 Urban Water Management Plan, Table 4-1, Page 4-3.

Table 2: Projected Potable Water Demand in Petaluma

Year	Projected Potable Water Demand (acre-feet)*
2025	8,705
2030	8,870
2035	8,974
2040	9,255
2045	9,577[1]

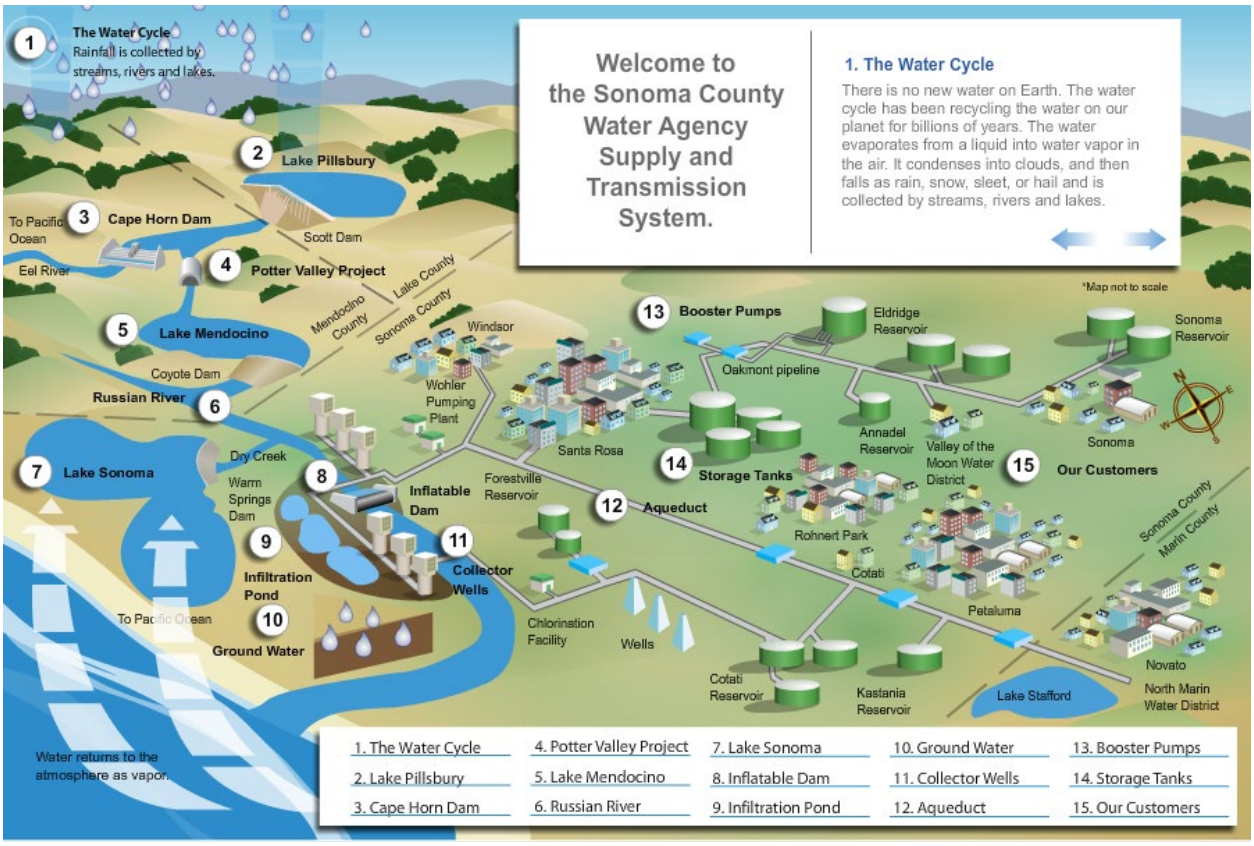
Notes:
*Potable water demand projections only. Recycled water demand are not reported in this table.
[1]24% increase in potable water demand compared to actual 2020 potable water use.
Estimates reflect total potable water demand with transmission losses.
Sources: 2020 Urban Water Management Plan, Table ES-1, Page ES-2.

Water losses experienced along the distribution system between the time water enters the system and the time water reaches the consumer vary each year. System losses for 2015 to 2019 are shown in Table 3 below.

Table 3: Historical System Losses in Petaluma

Year	Historical System Losses (acre-feet)
2016	742
2017	453
2018	828
2019	305
Sources: 2020 Urban Water Management Plan, Table 4-5, Page 4-7.	

Figure 4: Sonoma Water System

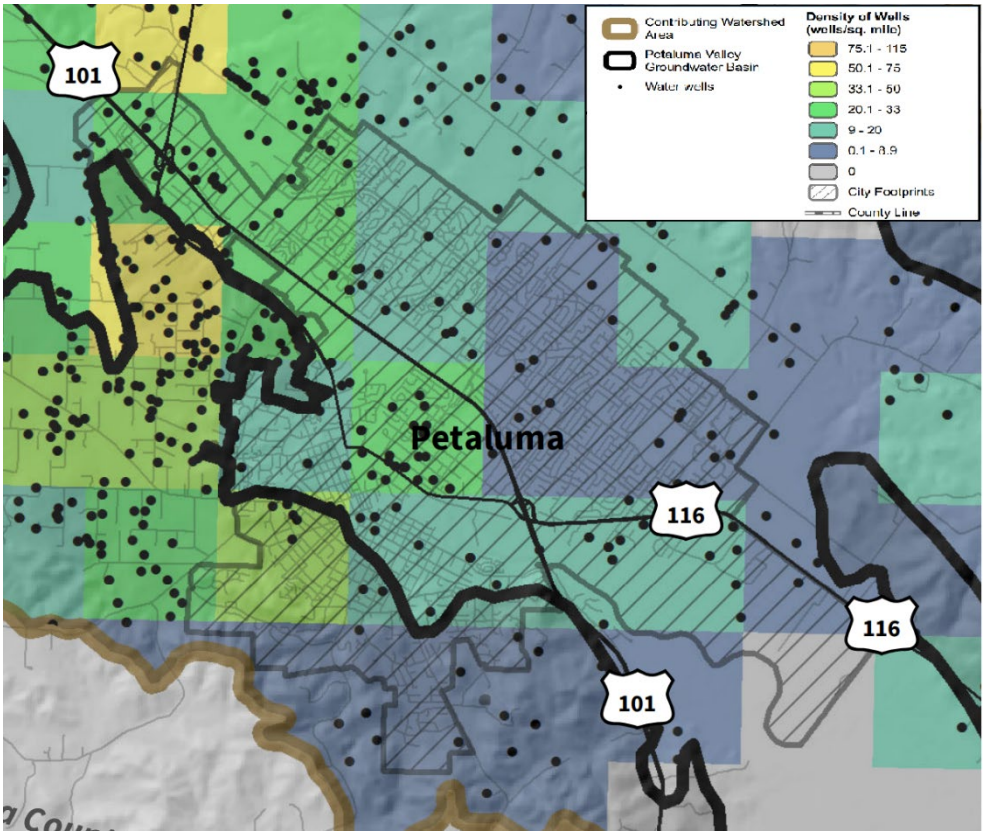


Source: Sonoma Water

Via Groundwater

The City manages 21 groundwater wells which supply potable water for emergency uses, to meet peak demands, or for other short-term scenarios. This makes up the remaining ~5% of total water demand. Groundwater wells pump from the Petaluma Valley Basin and are monitored for California Title 22 requirements. Nitrate contamination has been identified in northwestern portions of the Basin due to previous land use practices. No saltwater intrusion has been identified in the City's wells but has been observed in private shallow wells located near the tidal influence portion of the Petaluma River. Projected rise in sea levels induced by climate change could cause changes in observed levels of saltwater intrusion.[4] There are also a significant number of privately owned wells in the City. The City is exploring developing new wells. Known well locations are shown below in Figure 5. There are private wells providing groundwater within the City, including schools. The City does not meter these extractions. The County oversees all permits for wells within the City.

Figure 5: Groundwater Well Locations in the City (City Owned not Highlighted)



Source: Petaluma Valley Sustainable Groundwater Agency, Draft GSP Section 3 Figure 2-6

[4] *Sonoma County. "Climate Action 2020 and Beyond – Sonoma County Regional Climate Action Plan" (page 355 of 370)*

Since 2015 the City has recorded an general decrease in its groundwater usage and has only used groundwater during short-term scenarios such as local fires, aqueduct repair and water supply shortage.[5] In the City's 2020 Urban Water Management Plan (UWMP), the City projects zero groundwater use through 2045 until a more robust understanding of long-term yield, water quality, and treatment requirements becomes available. Beginning July 1, 2021, the City began pumping local groundwater to augment a reduced Sonoma Water supply due to drought conditions. In July 2021 the City used 97 AcreFt (AF) of local well water for supply, 93 AF in August, 89 AF in September, and 91 AF in October 2021. According to City Public Works, the City will continue to pump groundwater through the current drought to augment imported water supply as need and for as long as groundwater resources are available. A Petaluma 360 Article in July 2021 stated that the City was pumping roughly 2.1 AF (700,000 gallons) of groundwater per day from municipal owned wells as of July 21st, 2021.[6] The average through the fall was closer to 3 AF (1,000,000 gallons per day).

Table 4: Groundwater Pumping from City Wells

Year	Groundwater Extractions (acre-feet)
2016	325
2017	104
2018	0
2019	6
2020	45
2021	370*
Notes: *July 1 to Nov 1 ***Sources: City Correspondence, Nov 2021.***	

The City is evaluating the potential for expansion of the groundwater well system and currently working on the development of a new well at Oak Hill Park.[7]

The City of Petaluma is a member agency of the Petaluma Valley Groundwater Sustainability Agency (GSA). As required by the 2014 Sustainable Groundwater Management Act (SGMA), the Petaluma Valley GSA is developing a 20-year Groundwater Sustainability Plan (GSP) that will be finalized by January 31, 2022. The GSP will establish a standard for sustainability of groundwater use and management and will outline how the Petaluma Valley Basin will achieve sustainability. The GSP underwent public review in October 2021 and will be submitted to the State following revisions. The State has not yet reviewed and approved the GSP as a guiding plan which will protect the multiple beneficial users (human and ecological) of groundwater in the Basin The energy burden of delivering water to the City in 2019 was estimated in the 2020 UWMP to be 47.1 kwh/AF.

[5] *2020 UWMP page 6-7 (page 53 of 105)*

[6] *Petaluma 360, Will North Bay Water Crisis Persist*

[7] *2020 UWMP page 6-13 and 6-14 (pages 60 & 61 of 105)*

Other Potential Sources

The City of Petaluma does not have the following types of water sources in its urban water supply portfolio:

- Surface water rights. The City does not have any self-supplied surface water.
- Stormwater. The City does not currently divert stormwater for beneficial reuse.
- Desalinated water. The City does not operate any Desalination Plants.
- Water exchanges and transfers. The City does not engage in water transfers outside of the Sonoma Water system.

The City has not identified current opportunities for desalination, nor opportunities for water exchanges or transfers.

The City owns the 227 acre-ft Petaluma Reservoir (also known as the Lawler Reservoir) which was abandoned as a water supply source in 1992 following concerns of seismic instability.

2021 Drought Impacts

The following is a summary of correspondence with the City Staff in November 2021.

To preserve water in Lake Sonoma, Sonoma Water filed a Temporary Urgency Change Petition (TUCP) with the State Water Resources Control Board (Water Board) on May 14, 2021. The SWRCB approved the TUCP which reduced the minimum instream flow requirements in the lower Russian River, allowing for less water to be released from Lake Sonoma. In return, the SWRCB ordered Sonoma Water and its water contractors, including Petaluma, to reduce Russian River diversions by 20 percent from July 1, 2021-October 31, 2021 compared to 2020 water use. The City of Petaluma has had reduced allocations from its water Supplier Sonoma Water since July 1, 2021.

In response to the reduced Sonoma Water deliveries, the City of Petaluma implemented its Water Shortage Contingency Plan (WSCP) beginning May 3, 2021 to address water shortage conditions. On May 3, 2021, the City implemented voluntary Stage 1 of its WSCP, requesting a 20% reduction following Sonoma Water's WAC resolution asking water customers to conserve 20% compared to the same period from 2020. In preparation of mandatory reductions from Sonoma Water beginning July 1, 2021, the City implemented mandatory Stage 3, 20% reduction on June 7th. Stage 3 limited outdoor irrigation to 3 days a week, along with several other demand reduction actions including those carried over from Stage 1. Sonoma Water allocations decreased with each month, from July to October, so Petaluma entered mandatory Stage 4, with a 30% reduction target on September 13th in order to meet October allocations. The City is currently in Stage 4 of the WSCP, which limits outdoor irrigation to 2 days a week and imposed a moratorium on landscape installations that require water, in addition to several other demand reductions. The City plans to stay in Stage 4 through the winter months to prepare out water supply for likely drought conditions in 2022.

Regarding the discrepancy between 2020 UWMP Drought Risk Assessment (DRA) and 2021 Drought restrictions, the City summarized:

The Drought Risk Assessment (DRA) is a new requirement for UWMPs. The DRA is an evaluation of local water supply availability assuming the next five years (2021-2025) are hydrologically equivalent to the driest five consecutive years on record (1987-1991). The City's 2020 UWMP DRA evaluates the availability of supply for each Contract Water, Groundwater, and Recycled Water for 2021-2025, under the assumption that this five-year period is equivalent to 1987-1991. The City relied on Sonoma Water for

its analysis of Contract Water supply for the DRA. Contract Water was projected to be less than normal but not result in a water shortage condition if 2021-2025 is equivalent to 1987-1991. The City is working closely with Sonoma Water through the current drought. If the water shortage conditions trigger the need for Sonoma Water and its contractors to update their 2020 Urban Water Management Plans, the City will work with Sonoma Water on the updated DRA analysis for Contract Water.

Management and Improvements

The Water Services Replacement Project, completed in July 2021, involved the replacement of approximately 180 brittle and failing polybutylene (PB) pipes with new high-density polyethylene (HDPE) pipes. Repairs occurred in residential areas, along North McDowell Boulevard from Sunrise Parkway to Old Redwood Highway, Creekside Circle, Eastside Circle, Del Oro Circle, and Del Sol.[8] The City is continuing this Water Main Replacement program which replaces failing and undersized piping throughout the city.

Future Considerations

As a part of its climate change assessment, the 2020 Local Hazard Mitigation Plan (LHMP) for the City of Petaluma considered water demand, water supply, water quality, sea level rise, flooding, , ecosystem, habitat vulnerability, and hydropower. The LHMP lists the following concerns related to climate change:

- Increase in average temperature may cause an increase in demand from industries that require cooling or process water in industries. The City does not have significant major industries that require cooling water. (It is not clear if the Cities multiple breweries or poultry processing facilities utilize water for cooling).
- Increase in average temperature is expected to increase outdoor water use. The City's recycled water and conservation efforts to encourage residents to implement demand reduction measures should reduce irrigation-related water demand.
- Increase in average temperature may cause an increase in demand from agriculture. The City does not have significant supply connections to agriculture beyond its Recycled Water Program, though some dairies do source water from the City through truck haulers connecting to Metered City hydrants.
- Areas with more demands may be vulnerable to droughts and may become more dependent on groundwater, which the City currently uses for emergencies and other episodic events only. Although groundwater levels have recovered from the 2012-2016 drought, the 2020 Urban Water Management Plan (published June 2021) remarks that Spring 2021 groundwater levels had not yet recovered from Fall 2020.

The 2020 UWMP also outlines the three following potential impacts of climate change on water supply:[9]

- Future changes in climate modelling may affect future projections for climate, water demands, and water purchases. Sonoma Water is currently investigating alternate climate models that specifically analyze the regions in Sonoma Water's service area and related watersheds.
- Climate change can affect the availability and yield from groundwater aquifers. The City only relies on groundwater for short-term events and is currently coordinating with the Petaluma Valley GSA as the GSA develops the Groundwater Sustainability Plan (GSP.
- Climate change may reduce the amount of wastewater created, thus decreasing the amount of recycled water produced by the ECWRF. The recycled water production capacity of the ECWRF

[8] *City of Petaluma. Water Services Replacement Project.*

[9] *City of Petaluma. 2020 UWMP page 6-16 (page 62 of 105)*

is much greater than the existing and projected recycled water demand from urban offset users within the service area, and it is expected that recycled water impacts due to climate change will be minimal.

Future water system planning can also consider the following from the 2020 UWMP:[10]

- The City's water supply does not rely on snowmelt, coastal aquifers, or imports from the Delta, Colorado River, or other climate-sensitive areas.
- Sonoma Water's water supply does not have difficult storing carry-over water from year-to-year, and current stores can meet the water demands for several years.
- City has implemented an aggressive water conservation program over the past 25 years and has one of lowest per capita water uses among Sonoma Water customers.
- The City is not an Upper Russian River water user; not directly affected by any potential Lake Mendocino supply restrictions.

The 2020 UWMP outlines a Water Service Reliability and Drought Risk Assessment. Below is a summary of the reliability of the City's water service to its customers through 2045 (Reliability Assessment timeframe):

- Normal Water Years: City projects meeting demands in normal years thru 2045
- Singly Dry Water Years: City projects experiencing a shortfall in imported water from Sonoma Water by 2030 in a single dry year that is hydrologically equivalent to the driest water year on record (1977). The City does not project a shortfall in recycled water or groundwater supply in a single dry year, and may decide to reduce its potable water demand and supplement supply with local groundwater.
- 5 Consecutive Dry Yearr Periods: City projects having adequate water supplies for a period that matches 5 driest years on record (1987-1991) to meet demands until 2045. From the UWMP

  "An update to the water supply reliability analysis will be included in Sonoma Water's 2020 UWMP. In the City's past UWMPs, the reliability analysis showed that no impact to the City's water supplies would occur during drought years. Sonoma Water's model results indicate up to 19 percent reduction in wholesale water supply during Single-Dry years by 2045."
- The City's Drought Risk Assessment (DRA) shows the City anticipates having adequate supplies to meet estimated demand if 2021-2025 are equivalent to the driest 5-year period on record. City Staff have discussed the possible need to update the DRA and UWMP in response to the current drought.

It should be noted, Urban Water Management Plans, though reviewed Pro Forma by DWR to ensure they meet the requirements of the Water Code, they are not significantly reviewed by the State or other Third Party. According to the California Governor's Office of Planning and Research, UWMP's are not subject to the CEQA review process.

The 2020 Water Shortage Contingency Plan (WSCP) outlines the following Drought and Emergency Response Planning actions: Emergency Sonoma Water supply shutdown situation (e.g., if Russian River is contaminated)

  - City would rely on system storage facilities; determine existing storage supply, secure Kastania Storage Tanks, evaluate length of supply shut down, then determine which water storage stage to declare and follow corresponding procedures for that stage
- Power failure situation (e.g. area-wide electrical power failure)
  - City's pumping facilities could be impacted
  - Uninterruptible power supplies are used at Public Works and Utilities Building and each of the field sites to power the Supervisory Control and Data Acquisition (SCADA) system. Batteries provide 8 hrs of power (sufficient time to return power or connect generator; 3 portable generators are available and have been used in the past)

[10] *City of Petaluma. 2020 UWMP page 6-15 (page 61 of 105)*

    - Sonoma Water's facilities may be vulnerable but most which serve the City have back up power provision
- Earthquake:
    - Facilities built to earthquake standards but may still get damaged. Some tank sites do not meet current seismic standards.
    - City's multiple storage facilities and looped distribution pipelines allow damaged portions of water system to be isolated and repaired

The 2008 Biological Opinion issues by the National Marine Fisheries Service concluded that some water supply operations by Sonoma Water have substantial adverse effects on both the Coho salmon and steelhead populations in the Russian River Watershed. Sonoma Water has instigated projects to reduce these impacts. With uncertainty around the long term water diversions from the Eel River, and changes to water flows through the Potter Valley project, it is unclear what effects upper Russian River water flows will have on the availability of water supply to the City.

Table 5: Current and Proposed Water Supply CIP Projected Costs[11]

Well Construction	$3,168,000
Bodega and Webster Water Main Replacement	$2,667,000
Hardin and Manor Tank Recoating	$2,887,000
Copeland St. W Water Service Replacement	$1,470,000
Water Service Replacement FY 20-21 – FY 21-22	$1,900,000
Projected Water Service Replacement Program	$7,200,000
La Cresta Tank Replacement	$3,000,000
Oak Hill Tank Replacement, 2023-2025	$5,365,000
12" Santa Rosa Junior College Water Main	$875,000
Water Main Replacement Program	$6,500,000
Water Main Replacement at Washington at Hwy 101	$635,000
SCADA Upgrades	$4,360,000
Water Booster Pump Station Upgrades	$2,555,000
Payran Madison Water Replacement	$1,660,000
D Street Water Replacement	$2,305,000
Pressure Reducing Valve Resiliency Program	$915,000

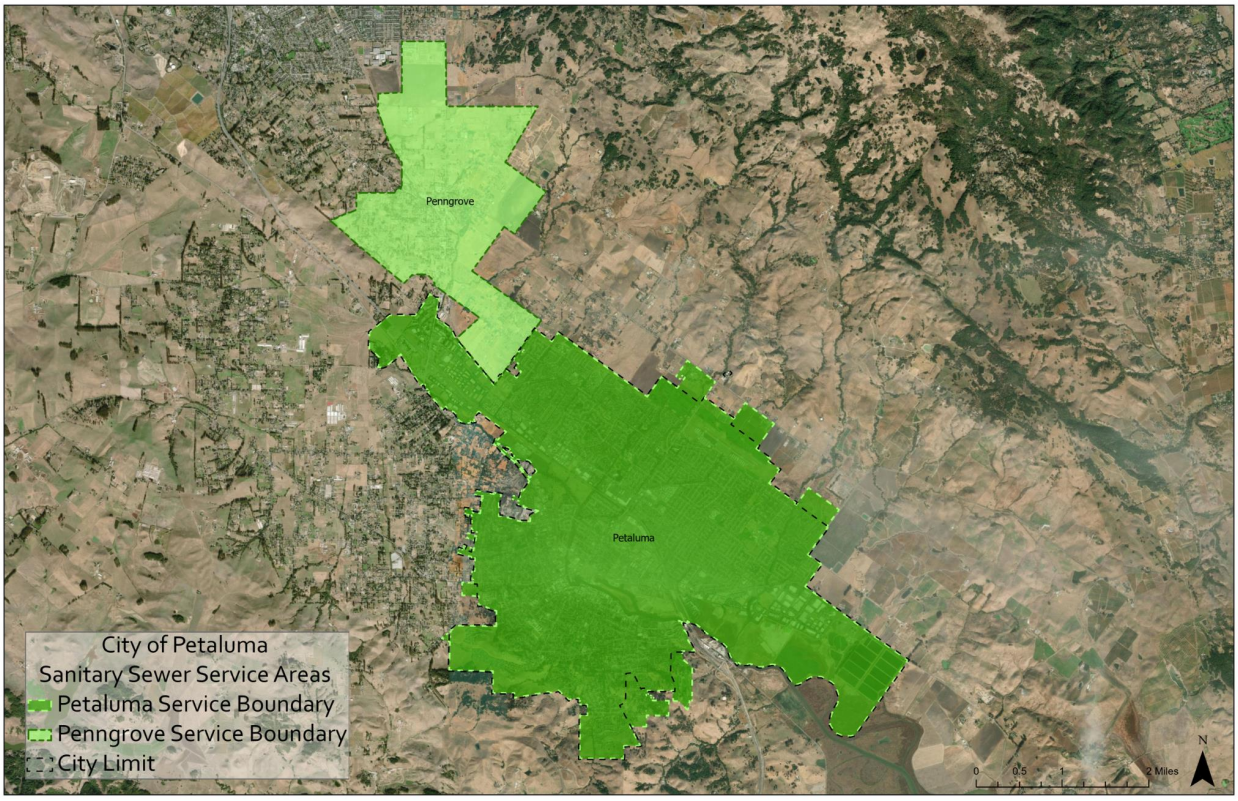
[11] Petaluma Capital Improvement Program 2021

Sewage and Wastewater

The City of Petaluma's sanitary sewer system provides 24-hour collection, treatment, and disposal and partial reuse of domestic, commercial, and industrial wastewater. The City's sewer system consists of approximately 3,740 manholes, 9 pumping stations, and approximately 197 miles of pipe at six to 54 inches in diameter.[12] This includes 193 miles of gravity sewer mains and 4 miles of sewer force mains. The average age of City sewer mains is 41 years.

In addition to Petaluma, the City's wastewater utility serves Penngrove and portions of unincorporated Sonoma County. Figure 6 below shows the area serviced by the Petaluma Sanitary Sewer System.

Figure 6: Sanitary Sewer Service Area



Source: City Of Petaluma, Nov 2021

A map of sewer mains throughout the entire City of Petaluma is also shown below in Figure 7. Portions of the City are serviced by forced mains, shown in dark green below.

[12] *City of Petaluma. 2021 Sewer System Management Plan (SSMP) Cover Page. Page 5 of 7*

Figure 7: Sewer Mains within the City of Petaluma

Source: Source: City of Petaluma Infrastructure Workshop – Segment 1. Page 6 of 17.

Wastewater Treatment and Water Recycling

Wastewater collected in the system is delivered to the City's Ellis Creek Water Recycling Facility (ECWRF). The ECWRF, operating since 2009, treats wastewater and produces high-quality recycled water using advanced treatment, filtration, and ultraviolet light disinfection.

The ECWRF accepts high strength wastewater (wastewater with large amounts of suspended solids, lipids, or biochemical oxygen demand) and processes industrial food products not permitted to enter the drainage system. As constructed, the facility meets goals set forth in Petaluma General Plan 2025, including considerations for sustainability practices and improving business-friendly practices for collection, treatment, and disposal of wastewater. Additionally, the ECWRF's boiler uses methane gas produced during the wastewater treatment process, reducing energy costs and greenhouse gas emissions. Integrated into the treatment process are the site's nearby wetlands, which naturally remove nutrients and metals from the facility's effluent. Effluent undergoes two stages of treatment prior to entering the wetland, followed by final release into Ellis Creek and the Petaluma River.[13] In Fiscal Year 2019 the system transported approximately 13.87 AF (4.5 million gallons) of wastewater per day, or a

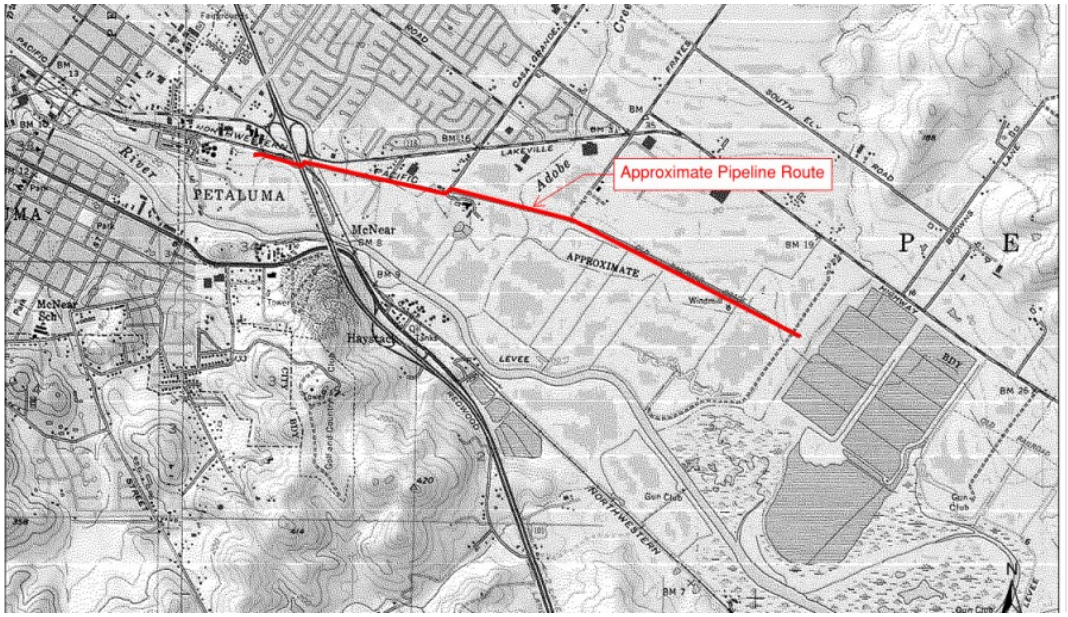
[13] *City of Petaluma. Ellis Creek Water Recycling Facility.*

total of 5739 AF (1.87 billion gallons) of wastewater to the ECWRF. The current capacity is 20.5 AF (6.7 million gallons) per day.

The C Street Pump Station which delivers wastewater from the southwestern quadrant of the City across the Petaluma River was found to be below capacity and causing overflow events. [14]

Influent to the ECWRF is provided by the Primary Influent Pump Station (PIPS), located along Hopper Street. The PIPS delivers sewage via a single 36-inch diameter, 2.5-mile-long concrete cylinder force main installed in 1973. The City is in the process of implementing a new 36-inch diameter force main parallel and adjacent to the existing force main. Beginning at the PIPS and the terminating at the ECWRF, the proposed adjacent pipeline route is in the existing right-of-way, is positioned along improved roadways, moves through open space and beneath Highway 101 and the SMART Train railway, crosses several creeks, and is adjacent to multiple commercial buildings and parking areas.[15] Construction of the force main is planned to begin in fiscal year 2021-22.

Figure 8: Approximate Force Main Route from the PIPS Facility to the ECWRF



Source: City of Petaluma. "PIPS Forcemain."

Through the ECWRF, the City produces about 1841 AF (600 million gallons) of recycled water per year.[16] The City uses recycled water to offset potable water use for non-drinking purposes, such as landscape irrigation and agriculture. In 2020, the City used 651 AF of recycled water within its water service area and 1,115 AF outside its water service area. The City plans to expand its recycled water system to increase urban and agricultural use to 2,000 AF by 2025 and 2,540 AF by 2045. In 2045, the recycled water demand is projected to be 2,540 AF, a 40% increase from 2020.[17] Urban recycled water use occurs

[14] *City of Petaluma. Agenda Item ·3B Resolution Authorizing*

[15] *City of Petaluma Department of Public Works. PIPS RFP.*

[16] *City of Petaluma. 2021 SSMP. (Page 5 of 7)*

[17] *City of Petaluma. 2020 UWMP. Page 6-10 (page 56 of 105)*

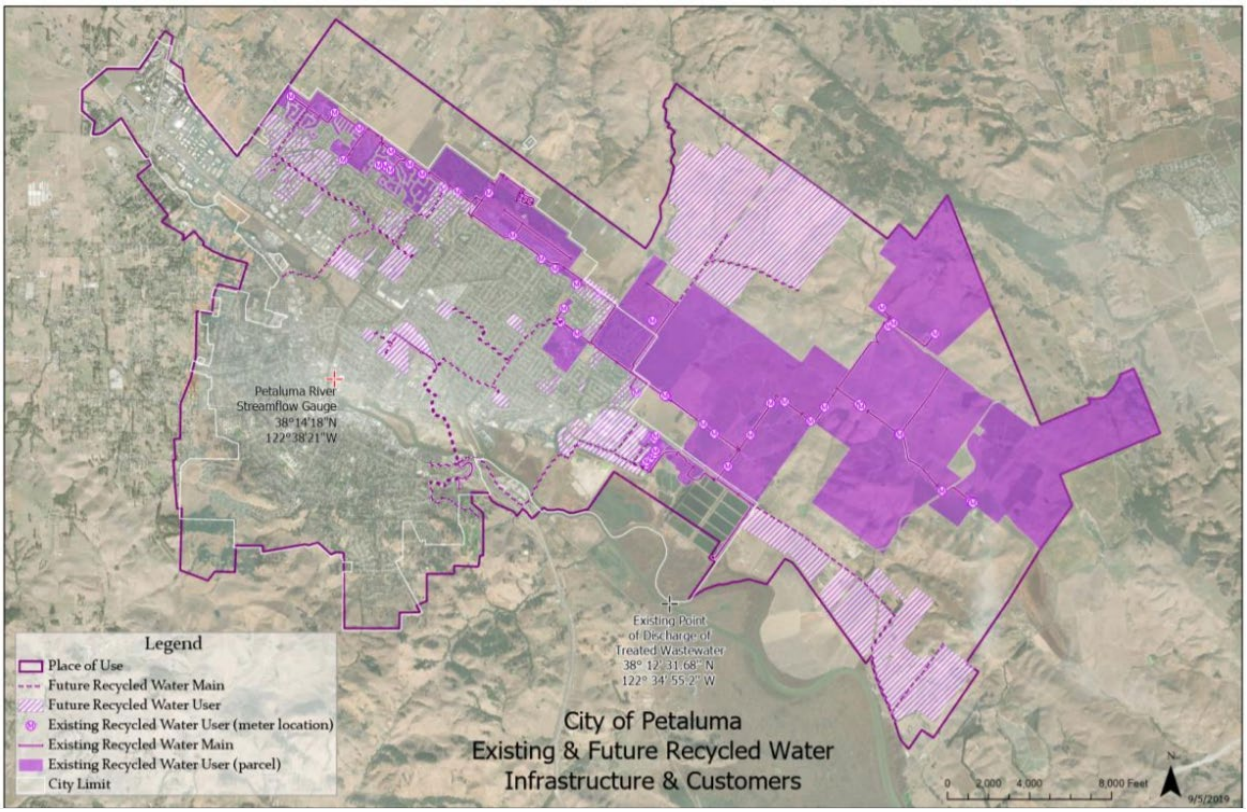
within the City's potable water service area, Agricultural recycled water use occurs outside the City's potable water service area. The expansion of the recycled water system within the service area can be separated into three separate efforts:

- Tertiary treatment expansion, which increases ECWRF tertiary treatment capacity of 14.36 AF per day to 20.86 AF per day (4.68 MGD by 2.12 MGD). This would provide a yield of 712 AFY of recycled water and prepares the City for increasing urban and agricultural demands.
- Urban pipeline expansion, which expands the urban distribution pipeline to provide 173 AFY of potable water offset for irrigation.
- Ag pipeline expansion, which expands agricultural distribution pipeline to provide 1,343 AFY of recycled water for irrigation.

Figure 9 below shows existing recycled water infrastructure and planned future expansion of the recycled water distribution system.

The water recycling program is currently limited by the availability of wastewater entering the facility, particularly with recent conservation and drought conditions. The program is not limited for a lack of customers. Many of the recycled water users are commercial enterprises located outside of the City limits. Some excess water production in the winter is stored in pond for later delivery, with excess flows being released into the River. A recycled water master plan is in process. No recycled water is currently supplying interior non-potable water uses such as cooling or toilet flushing. It is assumed that few buildings, including recently built structures, are dual plumbed for future use of recycled water. City development requirements do not mandate that dual plumbing be installed in new buildings for future connection. It is unclear if developments with large irrigation water demands are required or requested to utilize recycled water, or plan for its future use.

Figure 9: Existing and Future Recycled Water System



Source. 2020 UWMP. Page 6-13 (page 59 of 105).

In 2019, the ECWRF added an anaerobic digestion system. This upgrade addressed capacity and redundancy issues for biosolids processing that developed with the growth of the City's food and beverage industries, and provided capacity for future growth. This additional digester, and a nearly complete high strength waste receiving and gas processing facility when operating at full capacity will be able to produce 150,000 gasoline gallon equivalents (GGE) of renewable natural gas produced from food and beverage waste. This natural gas is used in the waste treatment facility, and some may be used as a fuel replacement for up to 19 diesel waste hauling trucks, replacing approximately 21,200 gallons of diesel annually.[18] According to the City Public Works Department, as of November 2021 the system was not yet producing.

Decommissioned Hopper Street Plant

The ECWRF replaces the Hopper Street Pollution Control Plant, which was built in 1936 and decommissioned in 2009 when ECWRF began operation. In 2019, the City began the process for the demolition of the facility, including the removal of its large concrete tanks. The site address remains in use as the Corporation Yard for the Public Works and Utilities Department and also serves Recology waste management company, the Petaluma Animal Shelter, and the COTS Mary Isaak Center Emergency Shelter for the homeless. While the wastewater treatment facility has been decommissioned, the site still is critical as the majority of the City's wastewater flows to the site's Primary Influent Pump

[18] *City of Petaluma. Biofuel facility at Ellis Creek.*

Station (PIPS) and then is pumped to the ECWRF. The site's long-term purpose is being explored through the Corp Yard Master Planning effort in Fiscal Year 2021[19]

Management and Improvements

As a part of the overall Sanitary Sewer Management Plan (SSMP), the City runs an Operations & Maintenance Program. This program involves the identification and prioritization of system defects using the City's computerized maintenance management system (CMMS). The City also has programs for inspecting manholes, identifying and addressing root intrusion in pipes, monitoring for high levels of grease build-up in five susceptible locations, and assisting homeowners in the replacement of laterals. The City inspects sewer lift stations annually and pump stations weekly, with the wet-wells inspected and cleaned on a three-year cycle. The closed-circuit television (CCTV) inspection program runs on a system-wide cycle of 6-years. Figure 10 below shows a sample of sewer mains that are likely to fail or have failed, as determined by the City of Petaluma's monitoring efforts.

[19] https://petaluma.granicus.com/MetaViewer.php?view_id=31&event_id=44551&meta_id=452563

Figure 10: Sample of Sewer Main Conditions

Failed or Likely to Fail within <5 years (red), 10 years (orange), and 20 years (yellow)

Source: City of Petaluma Infrastructure Workshop – Segment 1. Page 7 of 17.

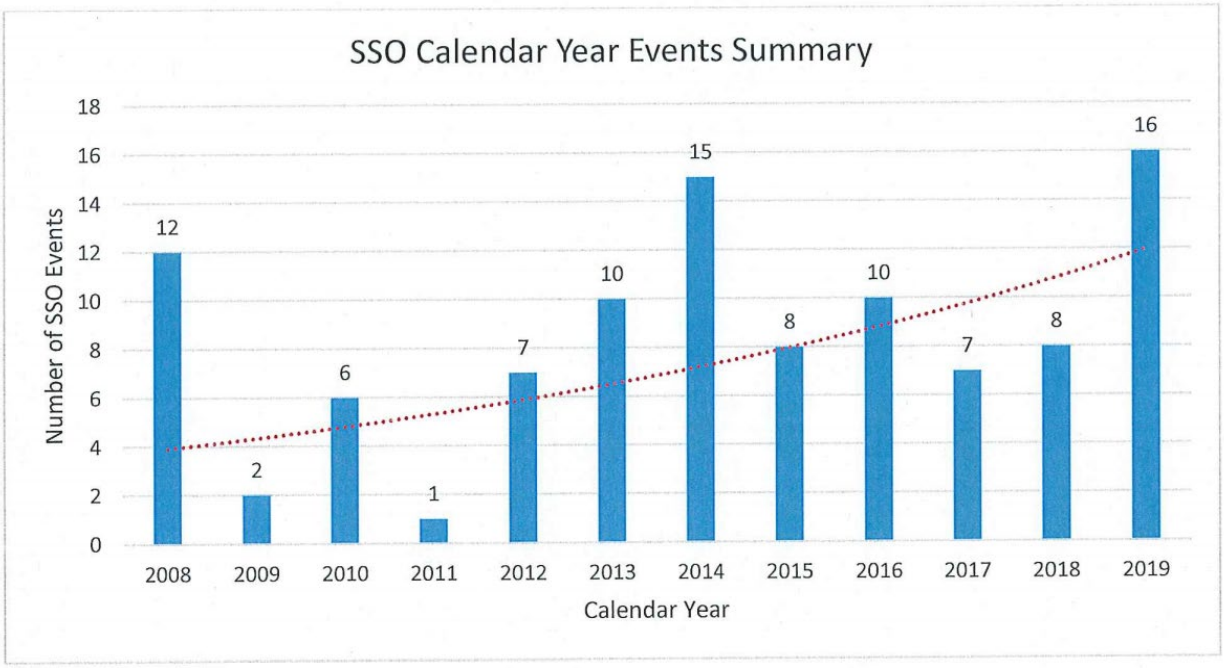
Major upcoming investments identified by the City include:

- Increasing preventative maintenance
- Forcemain replacement
- Recycled water expansion
- Sewer main replacement
- C Street pump station upgrades
- Focusing on resiliency and eliminating overflows
- Biosolid management
- Optimization of the ECWRF

Separate from the Operations and & Maintenance Program, the City maintains an Overflow Emergency Response Plan to address sanitary sewer overflows (SSOs) should they occur in the sanitary sewer system.[20] These are typically caused by rainfall infiltration, construction, roots, debris, fats/oils/grease, or structural issues. A generally accepted benchmark for a well-performing sanitary sewer system is maintaining a total spill rate of 3.0 or fewer SSOs per 100 miles of pipe. The 2018-2019 SSO spill rate for mains and lateral was lower than state and regional averages. The statistics listed below in Figure 11 displays the frequency and severity of SSO events since 2008.

Figure 11: Sanitary Sewer Overflow Events Summary

Year	SSO's	Total Volume
2013	9	228
2014	15	437,832
2015	8	189
2016	10	1,395
2017	7	8,624
2018	8	70.50
2019	16	4,014



Infiltration of stormwater into the sewer network may increase due to potential increased flooding from Climate Change induced changes to precipitation, or Sea Level Rise. The City conducts its System Evaluation and Capacity Assurance Plan to address long-term gradual replacement of City pipes, increases in pipe size, infiltration and inflow, certain pipe failures, increases and redundancy in pumping

[20] *City of Petaluma. 2020 SSMP Element 6: Overflow Emergency Response Plan.*

capacity, and storage facilities. The City also conducts a Fats, Oils, and Grease Control Program to manage lipid build up in sanitary sewer piping.

Two audits on the City's SSMP have occurred, in 2018 and 2020. The 2020 Audit found the City's SSMP to be mostly satisfactory.[21] The City maintains a goal of assessing 165,928 linear feet of piping per year. The 2020 Audit finds that 78,962 linear feet were inspected in 2018 and 95,197 linear feet in 2019. The City has established a recent goal of inspecting 225,000 linear feet per year to catch up to the 6-year inspection cycle goal outlined in the SSMP.

The city is currently revising its Hydraulic Model which studies the flow capacity of the primary "back-bone" systems (lines over 10" diameter). The previous capacity study was completed in 2009. The 2020 Audit remarks that the update will be incorporating a 25% expansion of the collection system. The 2020 Audit mentions that the spine of the model has an expected completion date of September 2018.

Table 6: Current and Proposed Wastewater CIP Projected Costs

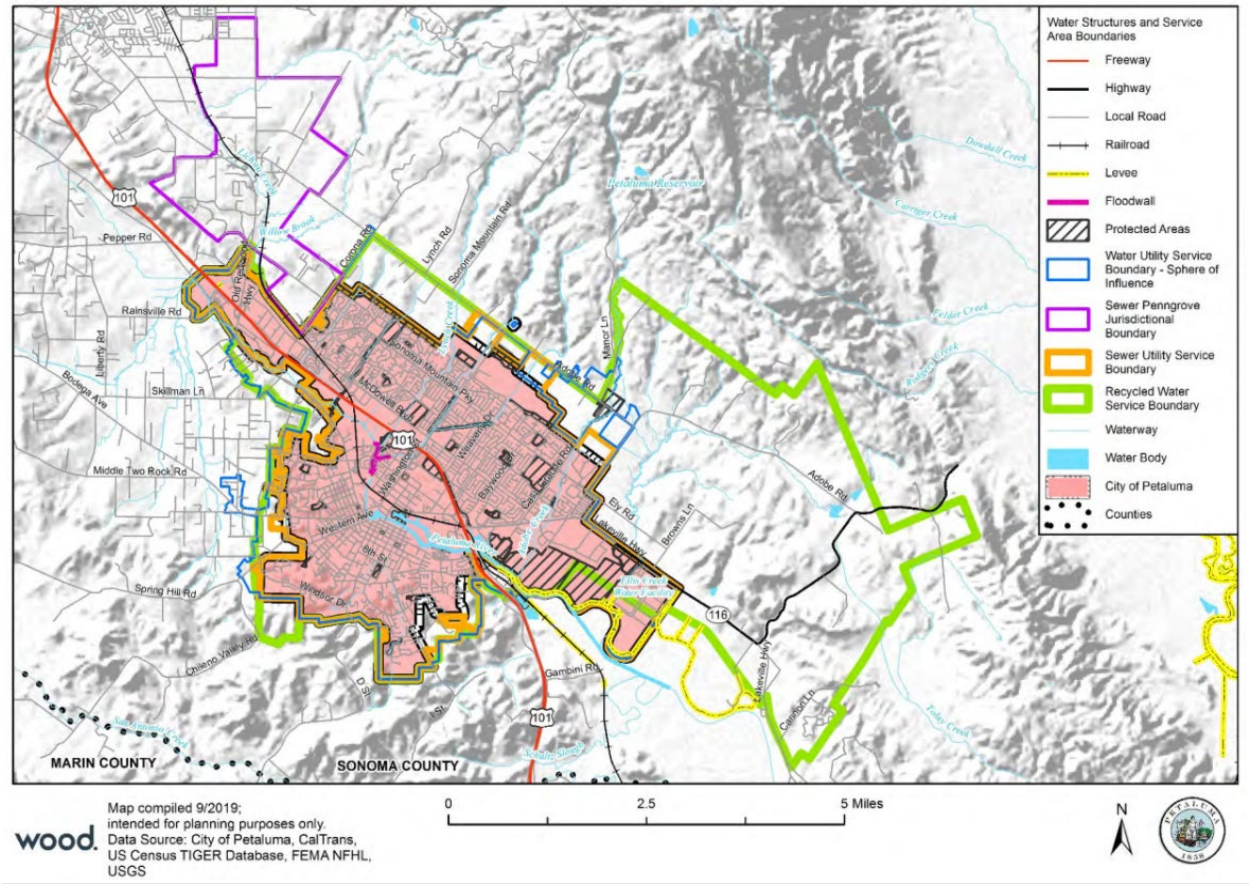
Tertiary Filtration System Expansion	$10,922,000
Recycled Water Turnout and Meter Replacements	$748,000
Recycled Water System Expansion for Agriculture	$5,555,000
Recycled Water System Expansion Phase 1/Maria Loop	$6,095,000
Manhole Rehabilitation	$1,561,000
Chemical System Upgrade at Ellis Creek	$5.607.000
Sewer Rehabilitation – Payran and Madison	$2,855,000
Sewer Main Replacement Future	$11,192,000
Oakmead, Redwood and Outlet Mall List Station Upgrades	$2,763,000
PIPS Forcemain Replacement	$13,849,000
Replace PIPS High Capacity Pumps	$2,900,000
Sewer Forcemain Replacement Program	$870,000
Ellis Creek Outfall Replacement	$2,096,000
C Street Pump Station and Collection Area Upgrades	$4,199,000
Corp Yard Tank Demo Phase II?	$1,067,000
Corp Yard Master Plan	$315,000

[21] *City of Petaluma. SSMP 2020 Audit.*

Stormwater

Stormwater is any precipitation that does not infiltrate into the surface or evaporate after falling onto land. Development of urbanized areas disrupts the natural flow of stormwater into waterways and groundwater, inhibiting infiltration or naturalized surface runoff. Impervious surfaces such as roofs, sidewalks, roadways, bare and compacted soil, or parking lots intensify the volume, velocity and contamination of stormwater runoff, posing a threat to both the built environment and local ecologic systems. Storm drain networks are designed to collect and convey this runoff away from infrastructure and into local basins, mitigating risks of flooding, erosion, and pollution. The placement and appropriate functioning of stormwater infrastructure plays a critical role for the resiliency of all water systems in Petaluma, ensuring that structures, lives and critical infrastructure continue to provide robust protection and services in the face of climate change impacts and development induced land changes. Critical built stormwater infrastructure is shown in Figure 12.

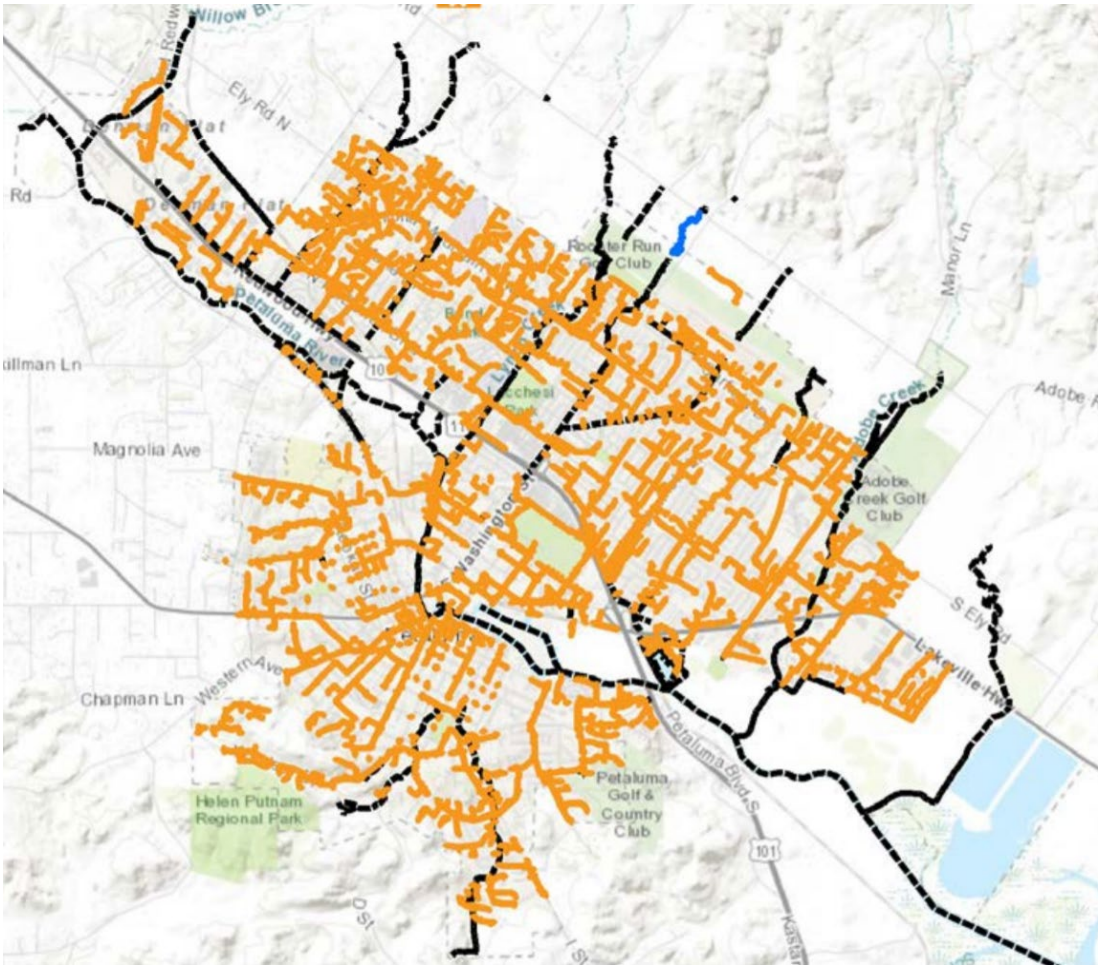
Figure 12: City of Petaluma Flood Control Structures



The City's stormwater drainage infrastructure consists of 119 miles of storm drains, 27 miles of creek or open channels, 4,383 inlets, 304 outfalls to river, 3 pump stations.[22] Figure 13 below illustrates the City's stormwater drainage system, including built infrastructure (orange) and associated waterways (black).

[22] *City of Petaluma Infrastructure Workshop. Page 8.*

Figure 13: City of Petaluma Stormwater Drainage System



Closed drainage systems (orange), open drainage systems (black)

Source: City of Petaluma Infrastructure Workshop – Segment 1. Page 9 of 17.

The City does not currently divert stormwater for beneficial use, and stormwater is not included in the City's urban water supply portfolio.[23] The City's stormwater drainage system is not a combined sewer system.

The Capital Improvement Plan through 2020 supported 9 local storm drain improvement projects to increase flow capacity and mitigate flood risks. Projects include Capri Creek re-grading, Phase III terracing project in the lower Denman reach, Kelly Creek improvements, Washington Creek Repair and Enhancement, and a range of surface water projects within creek beds.[24]

[23] *City of Petaluma. 2020 UWMP. Page 6-8 (page 54 of 105)*

[24] *City of Petaluma. 2015 Flood Management Plan (page 46)*

Hydrology

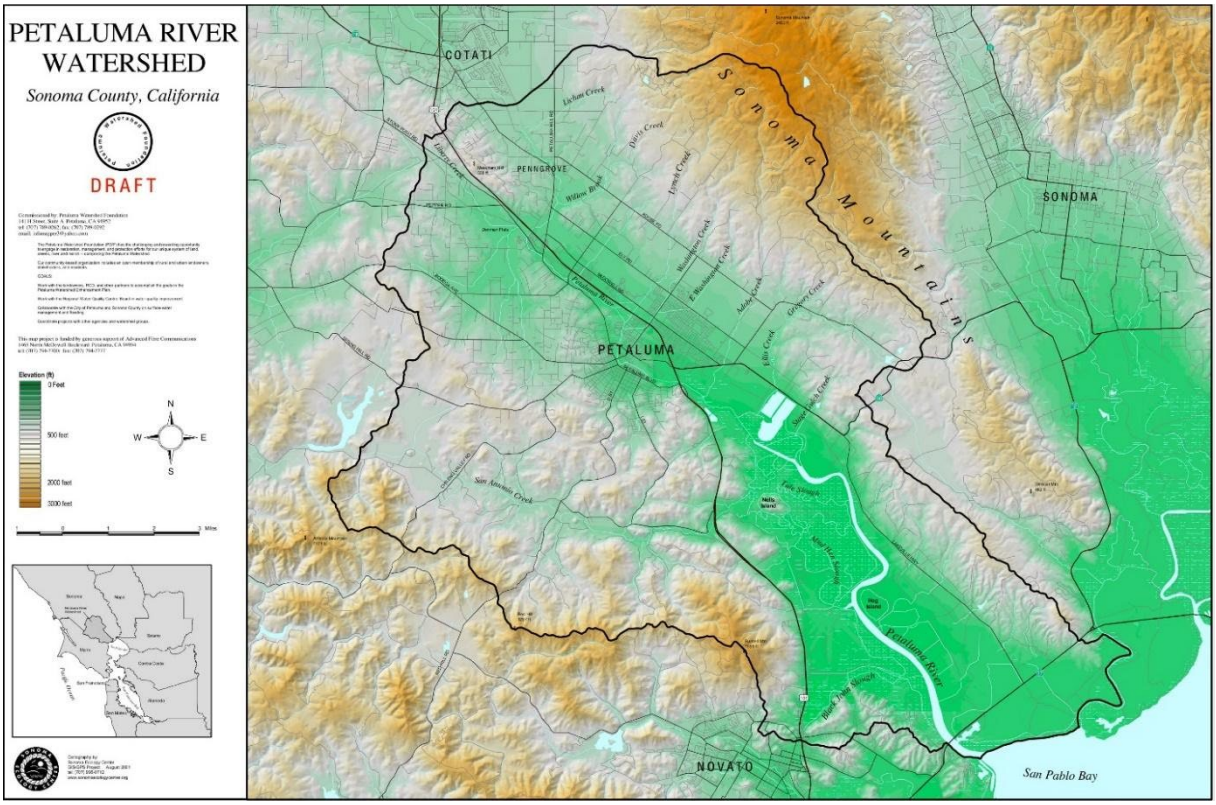
The City of Petaluma is situated in the Petaluma Valley, a fairly flat alluvial plain with elevation ranging from sea level along the Petaluma River, to over 400 feet in the nearby hills. This valley is characterized by a Mediterranean climate with long and dry summers, followed by cool and wet winters. The mean annual precipitation over the valley is approximately 26 inches. The main waterways in the City include the Petaluma River, Adobe Creek, Lynch Creek, Lichau Creek, and smaller branches or tributaries such as Willow Brook.

A 146 square mile basin contributes to the 19 miles of the Petaluma River, emptying into San Pablo Bay. The City sits near the center of the river stretch. The Petaluma River is historically important due to its key role in enabling exploration activities, settlement and the development of the Petaluma and San Pablo Bay watersheds. Over the years, multiple factors both natural and man-made have caused siltation of the streambed, which in turn has affected the water-carrying capacity and navigability of the waterway and has caused problems on surrounding communities.

Many of the watersheds natural creeks and drainages have been straightened or realigned to allow altered land uses. This includes connecting many eastern creeks such as Lynch, Washington and Adobe directly to the River. Many creeks, historically, did not reach the river but rather fanned out into freshwater wetlands and vernal pool systems. Current stormwater drainage infrastructure has drained nearly all of these habitats, and very little Riparian habitat or connected natural floodplains remain. This channelization has increased the flow intensity of creeks, by confining flood flows within their banks, rather than allowing stormwater to spread onto adjacent floodplains. Floodplains provide stormwater dissipation, water filtration, groundwater recharge and support some of the most bio-diverse habitat within the City.[25] Most of the Cities limited remaining riparian wetlands, riparian forest and vernal pools are located in these floodplains.

[25] *Philip Williams & Associates, Ltd., Petaluma River Flood Control Project Hydraulic Features: Denman and Willow Brook Reaches. March 1994*

Figure 14: Petaluma River Watershed



Source: Sonoma Ecology Center

Drainage Collection

All water that falls within the City of Petaluma eventually flows into the Petaluma River and finds its way to San Pablo Bay. Surface runoff, or precipitation that does not infiltrate directly into the ground, navigates into the river via surface ditches or naturalized or mechanized channels. This surface flow eventually leads to inlets that connect into the subsurface pipe and culvert networks. Storm drains either outfall directly into the Petaluma River or into the dendritic creeks that lead to the Petaluma River. Although the City does not have any combined sewer/storm drain systems, the water quality can become compromised by chemical pollutants or debris.

Water Quality Protection and Runoff Control Requirements

Stormwater runoff picks up and carries pollutants and sediment as it flows over impervious surfaces, into drainage networks, and into waterways. There is no centralized treatment system within the storm drain network that cleans or filters the water that it conveys. The water quality of the Petaluma River watershed determines the health and vibrancy of the freshwater habitats, fish spawning and migration, and preservation of rare and endangered species that call the region home. For this reason, it is important that runoff is directed into treatment measures before entering the Storm Drain network.

The Petaluma River is listed on the Clean Water Act 303(d) list of impaired water bodies for pathogens, nutrients, sediment, trash, and nickel contents. Total Maximum Daily Loads (TMDLs) define the maximum

amount of pollutant entering a body of water in order to maintain the required water quality standards. TMDLs for the Petaluma River are expected to be published by the end of 2021. Pollutants are frequently considered by the general public to be manmade products, but one of the greatest contaminant concerns in the River is sediment caused by natural and human induced erosion. Sediment transport to the River is exacerbated by the channelization and straightening of channels, and the loss of floodplains which capture sediments.

Under the federal Clean Water Act, the National Pollutant Discharge Elimination System (NPDES) requirements apply to all stormwater and urban runoff discharge in the City's Municipal Separate Storm Sewer System (MS4). The San Francisco Bay Regional Water Quality Board is the regulatory authority that has NPDES permit oversight for the City of Petaluma.

The MS4 Permit requires the institution of best management practices (BMPs) and low impact development (LID) requirements for commercial, industrial, municipal, and residential developments to alleviate pollutant loads in receiving waters. The City defers to the Bay Area Stormwater Management Agencies Association Handbooks, or equivalent manuals, to define the design, implementation, and installation of BMPs.

Management and Improvements

The City has no utility funds allocated for stormwater drainage maintenance. Deferred maintenance has been estimated at $37 million as of March 2020.[26] Stormwater maintenance is funded annually with $450,000 from the general fund, and supplemental funding from the Trash Capture fee paid by Recology. Alternative methods of funding are under investigation. Lack of funding has been attributed toward legal regulations that currently exempt the storm drainage system from existent public funding efforts.

Large storm events with heavy or rapid rainfall can exceed the capacity of natural and built drainage networks and cause flooding. The Flood Emergency Management Agency (FEMA) has identified 100- and 500- year floodplains in the south-southeast and north-northwest areas of the City, shown in Figure 15 below. FEMA floodmaps are backwards facing, predicting flood impacts based on historical climate data and existing development conditions. They do not consider the increased flood risk due to higher intensity storms expected under Climate Change, higher Sea Levels or the future increased runoff from upstream lands that are built upon. The Flood Management Design Manual (FMDM) provides design standards and procedures that inform hydraulic and hydrologic analyses to promote construction that will not exacerbate flood risk. The Upper Petaluma River Watershed Control Project, managed by Sonoma County Water Agency, seeks to better understand the hydrologic and hydraulic systems within the watershed. The models developed will inform planning to provide 100-year flood protection and increase groundwater recharge potential.[27] The need for updated flood modelling was highlighted by the flooding of residential homes in the East Court Area during a 6" rain event on October 24th 2021, an area which is not in the currently mapped 100 year Flood Plain.

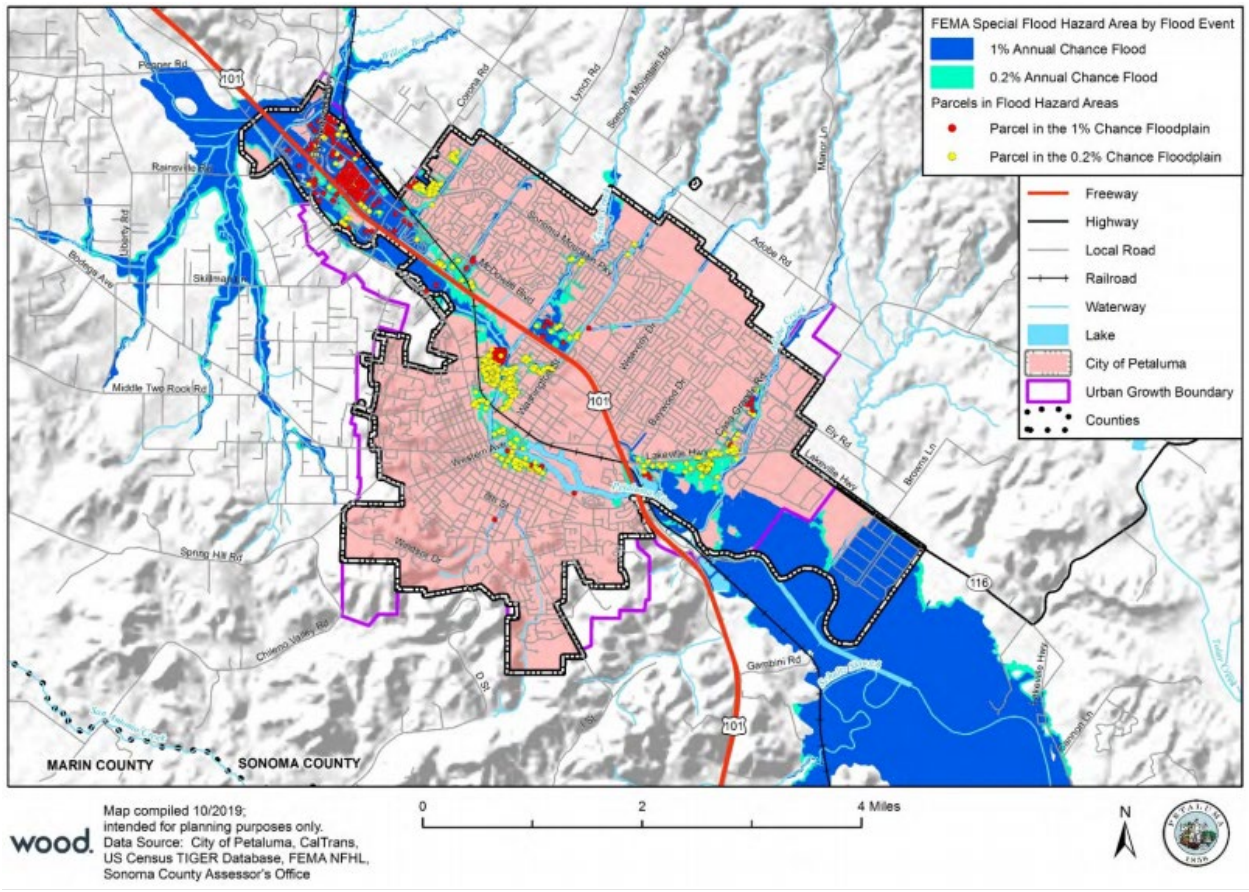
A critical component of the City's stormwater infrastructure are its floodplains and green spaces which provide significant flood protection benefit to downstream activities. Green spaces benefit the City stormwater infrastructure not merely by reducing the runoff compared to developed sites, but also provide opportunities for low-cost, multi-benefit stormwater capture and management projects. Floodplains that are adjacent to waterways, such as much of the Denman Flats and Liberty Valley area, provide substantial flood protection by temporarily retaining stormwater, while also cleaning and infiltrating some of it. For example, the Final Environmental Impact Report for Petaluma River Flood Control Section 205 stated that if the natural storage areas "in Denman Flats are ignored, it is expected that flood peaks in the

[26] *City of Petaluma Infrastructure Workshop. (Page 9)*

[27] *Sonoma County Water Agency. "Upper Petaluma Flood Control Project. SCWA Flood Control Zone 2A Update Presentation."*

project area [Payran Reach] would increase about 17 percent during the 100-year storm". Some floodplains are also described as Regulatory Floodways, defined by FEMA as the flow path of a watercourse required to discharge its flood flow without increasing flood elevation above a certain height. A floodplain that is not a floodway may still provide flood control benefit, both by allowing some volume of flood flow through it, but also by temporarily storing flood waters. A FEMA memo provided to the City in 1989 summarized that "limiting the placement of fill and structures in such "storage" areas is sound floodplain management". Many of the remaining floodplains in the City are slated for development, or zoned for future development.

Figure 15: City of Petaluma Floodplain Map



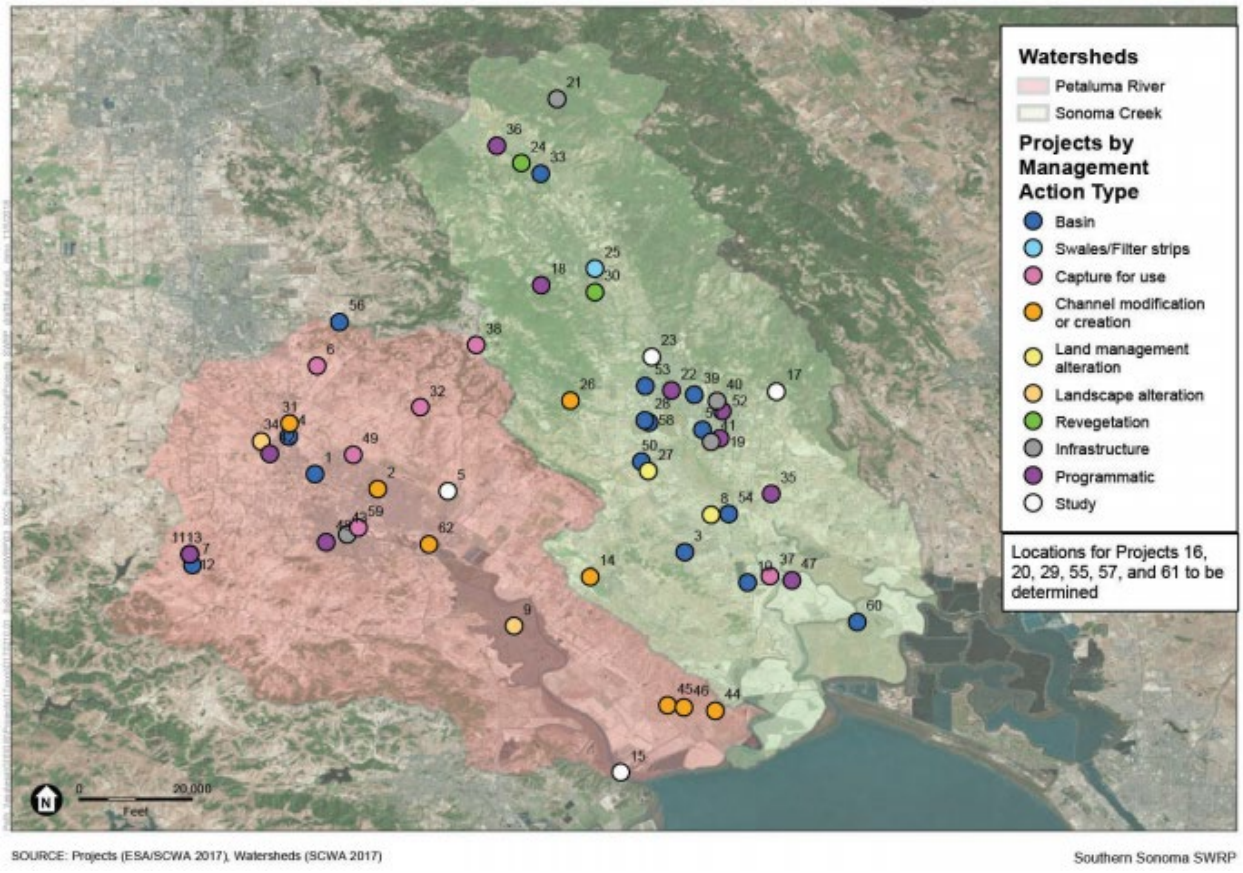
1% Annual Chance Flood describes the 100-year floodplain. The 0.2% Annual Chance Flood describes the 500-year floodplain.

Source: City of Petaluma LHMP. Figure 4-32.

The Southern Sonoma County Storm Water Resources Plan, published in May 2019, identified, and analyzed opportunities for projects within the Petaluma Watershed that would support stormwater capture, recharge, and reuse.[28] The map in Figure 16 lays out the potential projects noted in the plan. These projects exist only at the concept level and have not progressed further into design or construction. Projects upstream of the city limits still have the opportunity to alleviate flooding issues within the city.

[28] *Southern Sonoma County Storm Water Resource Plan. May 2019.*

Figure 16: Southern Sonoma SWRP Project Locations



Source: Southern Sonoma SWRP (Page 101 of 156).

The 2020 Petaluma Local Hazard Mitigation Plan (LHMP) assesses infrastructure and utility vulnerabilities related to the impacts of flooding and sea level rise. Current FEMA flood maps for the 100 and 500 year flood events describe five "lifeline" utility systems (utilities related to water management, oil, natural gas, electrical power, communications, and other important functions) as being within this combined area: two electrical substations, and three water facilities.[29] These represent critical facilities that are currently underserved by stormwater infrastructure, and at risk from increased storm flooding caused by the loss of impervious spaces and natural hydrology.

In its sea level rise assessment, the LHMP finds that the majority of potential impacts occur within the 6.6 feet of sea level rise scenario—a high-risk aversion scenario that may occur by 2100, recommended for the design of critical infrastructure, long-lifespan projects, and projects with little opportunity for future adaptation to sea level rise.[30] When considering the occurrence of a 100-year storm surge in addition to the 6.6 feet scenario, the LHMP identifies 383 parcels with a total value of $588,432,146 at risk to

[29] *City of Petaluma. 2020 LHMP (page 4-111)*

[30] *City of Petaluma. 2020 LHMP (page 4-121)*

flooding. Of these parcels, two lifeline utility systems are affected: Petaluma Electrical Substation C and the Hopper Street Primary Influent Pumping Station. The LHMP assigns a “medium” overall significance to FEMA floodplain hazards and flood hazards related to sea level rise, and notes that the effects of climate change may continue to increase the projected severity of flood events.

Table 7: Current and Proposed Stormwater CIP Projected Costs

Old Corona Road Water Quality Mitigation	$1,408,000
Storm Drain Trash Capture Device Pilot	$563,000
Edith Street Drainage Improvement	$110,000
Wilson Stormwater Pump Station Upgrades	$505,000
Corona Creek Restoration	$552,000

Solid Waste Collection

The private contractor Recology Sonoma Marin provides curbside services to single-family residential, multi-family residential, and commercial customers in the City of Petaluma, including

- Trash collection and trash disposal
- Recycling service
- Compost service
- Bulky item pick-up
- Street sweeping
- Residential used oil collection
- Debris box service
- Natural gas vehicle usage

Residents have access to recycling separation, hazardous waste drop-off, and garbage disposal at the Central Disposal Site located north-west of the city. All of the City’s municipal solid waste collected by Recology is deposited at the Redwood Landfill near the City of Novato in Marin County. The City does not operate a municipal landfill. The Redwood Landfill has a target closure date of 2025[31]. The City adopted the Zero Waste Resolution in 2020 setting the goal of reducing 90% of all material from landfills by 2030.

Management and Improvements

The City has committed to zero waste production (carbon neutral) by 2030. Efforts to realize this commitment are included in the City’s Climate Ready 2030 initiative.

State Law, SB 1383, sets goals to reduce landfilled organic waste by 75% in 2025. Regulations require the City of Petaluma to adopt ordinances and put policies into place to facilitate organic waste reduction by January 1, 2022.

In 2017, waste collection services in Petaluma were transferred from Petaluma Refuse and Recycling to Recology when Recology purchased all of Petaluma Refuse and Recycling’s assets. .

[31] *CA Regional Water Quality Control Board Bay Area Region, 2008*

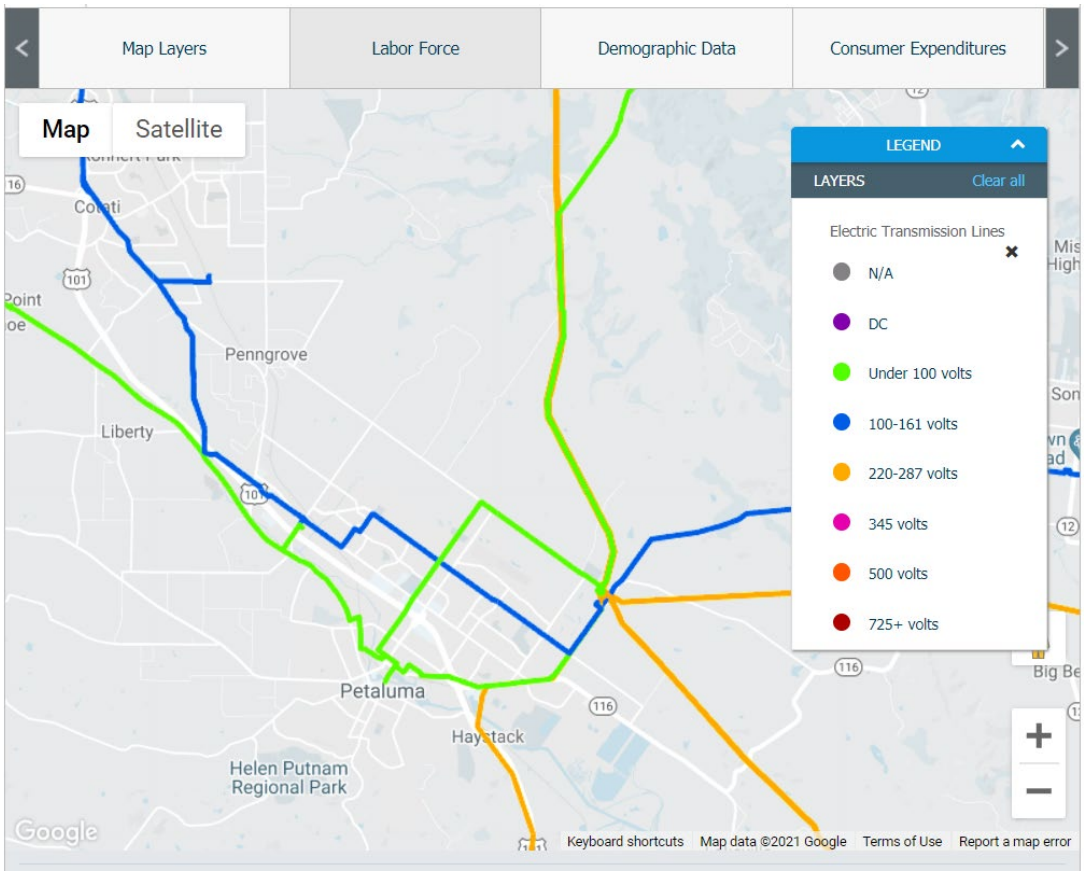
Electrical

Electrical Distribution Network

The City's electrical grid is managed by PG&E, an investor-owned utility agency. Residents in Sonoma County, including Petaluma, may choose to have electricity generated via PG&E or Sonoma Clean Power (SCP), a local Community Choice Aggregator (CCA) public electricity provider which uses PG&E's electrical distribution system. One of SCP's programs, EverGreen, provides energy through a 100% renewable power portfolio sourced primarily from local geothermal facilities and the remainder from local solar. SCP's other option is CleanStart, which is 93% carbon free and sourced from renewable electricity, carbon-free large hydroelectric power, and general system power[32]. As clarified by the CPUC Energy Division in their Community Choice Aggregation En Banc Background Paper "the statute does not require the CPUC to set CCA rates or regulate the quality of its services". As consumers increasingly start producing their own energy from sources like onsite solar, this reduces the income to Utility providers who are still expected to maintain distributions systems. This report does not consider the possible vulnerabilities to the reliable and economical supply of electrical power to City residents of these market changes, or of CCA providers not being subject to the same price setting regulation and oversite as CPUC regulated utilities.

[32] Sonoma Clean Power Sources

Figure 17: PG&E Electric Transmission Lines, Labeled in kilovolts



Source: PGE Economic Development Site Tool

Management and Improvements

Power Outages

The California Independent System Operator (ISO) orders utility agencies to implement planned outages when state energy reserves dip below 1.5%. PG&E divides its electrical grid into 14 outage blocks that can be individually powered off during planned outages and emergencies. Block 50 supplies power to essential services exempt from planned outages, such as the Petaluma Valley Hospital, City Hall, many Emergency Services Stations, and several utility locations. Residential and commercial parcels located nearby each of these essential services may or may not also be powered through Block 50.

PG&E has not released maps of its outage block areas to the public. A website that supplies outage block information on a per-address basis is available on the PG&E website.[33] Infrastructure listed within the 2020 LHMP that is powered by Block 50 includes, but is not limited to:

- Emergency services:
    - Petaluma Valley Hospital

[33] *PG&E. Rotating Outages.*

    - Residential and commercial parcels within several street blocks of the hospital
    - Petaluma City Hall
    - Petaluma Police Department
    - Petaluma Emergency Equipment Management
    - Sunrise of Petaluma (assisted living facility)
    - Muir Wood Memory Care (assisted living facility)
    - Petaluma Senior center
    - COTS Mary Isaak Center (homeless shelter)
- Significant utilities:
    - Two water towers on La Cresta Ridge and Ravine, near 601 Hayes Ave
    - Facility at 1450 Petaluma Blvd S
    - Petaluma Substation A
    - Hopper Street wastewater facility (decommissioned)
    - Transportation Department at 611 Payran St
    - City of Petaluma Public Works & Utilities Dept.
    - PG&E facility at 210 Corona Rd
    - Facility near 2374 Petaluma Blvd N
- Transportation:
    - Buildings near Petaluma SMART Train Station

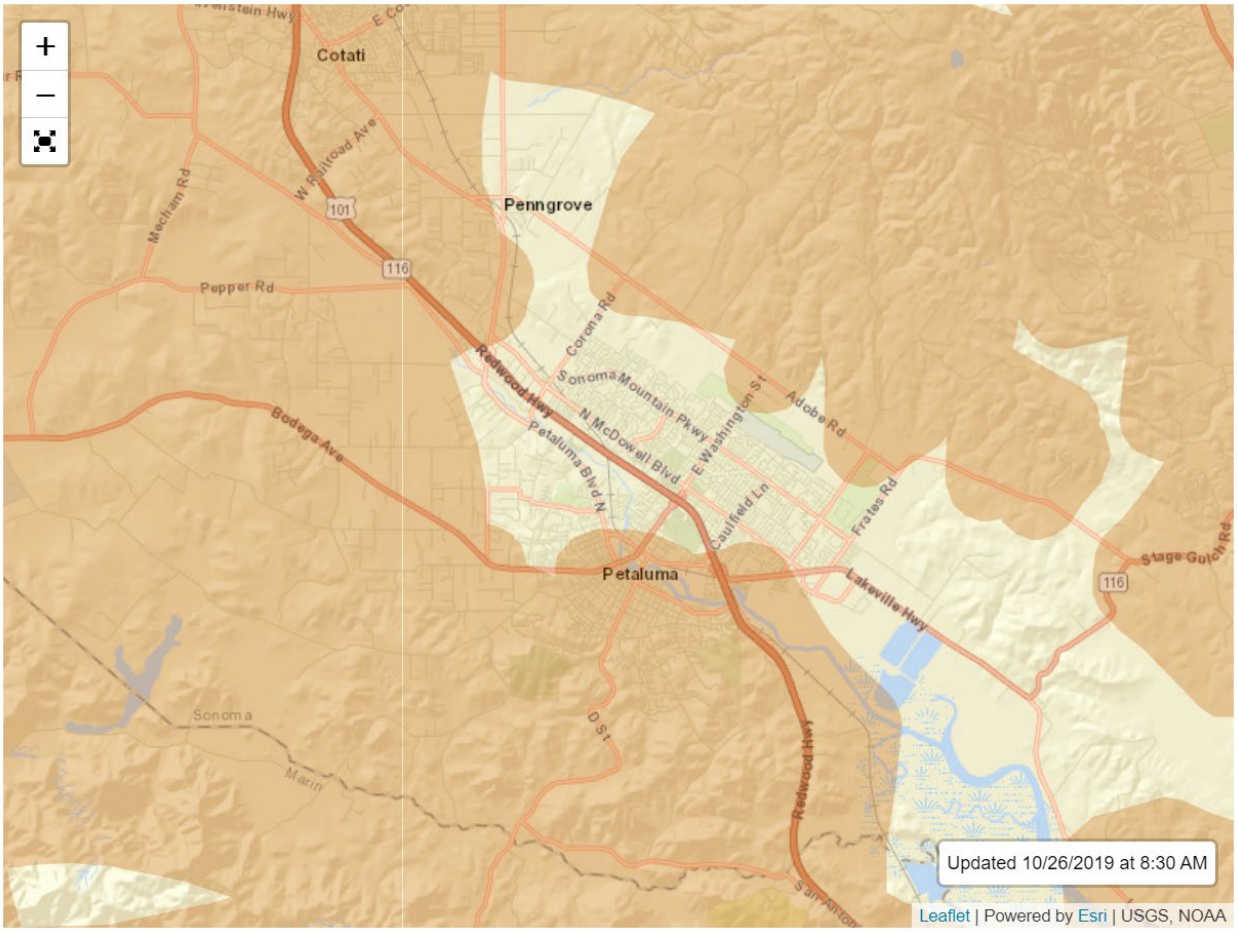
Several services are not powered through Block 50 and are subject to planned outages. These include:

- Fire Dept Station 1 (Block 9E)
- Fire Dept Station 2(Block 7C)
- Ellis Creek Wastewater Treatment Facility (Block 12A)
- US Postal Service (Block 7C)
- A few other utility locations marked on the LHMP not identifiable by aerial mapping

The City has recently been subject to rotating power shutoffs during high load events, such as multiple days in August 2020 when over 40,000 people in Sonoma County lost power for multiple hours. This was caused by increased demand from extreme heat events. The City was warned about possible rotating outages in June of 2021, but the City was not affected.

PG&E announced in 2018 it would be conducting Public Safety Power Shutoffs (PSPS) during high wind and dry conditioned when there is heightened forecasted fire risk. These can last several days. Significant portions of the City, and the majority of the county can be affected. Outages are typically accompanied by warnings in the preceding days. The Block 50 essential services designation does not protect certain sections of the grid from PSPS events, and critical facilities are known to lose power during these events.

Figure 18: Sample PG&E Public Safety Power Shutoff Map, October 26, 2019



Source: Petaluma 360, Petaluma included in planned power shutoff

Improvement Projects

Since the recent wildfires PG&E has been supporting programs to reduce fire risks from their equipment, including system hardening, enhanced vegetation management, exploring temporary microgrids, weather forecasting and fire cameras. Because Petaluma does not have any Tier 3 extreme Fire Threat zones, and only limited Tier 2 Elevated areas, much of this work is taking place outside the city limits. The PSPS notification website map viewer is being updated to provide parcel specific shutoff warnings.

A 100 megawatt battery backup system is currently in planning near the Adobe Road substation. This privately owned facility would provide peaking power generation. It is unclear If this system will reduce the likelihood of peak event shutdowns in the city.

The City is currently developing 4 solar arrays on City facilities for generating electricity. These are currently envisioned without battery backup systems. The four arrays located at the East Washington Sports Fields, Community Center, Police Department and Swim center would produce 629 kW of power, offsetting 83% of the annual energy demand for those facilities. Further arrays are considered for high energy demand facilities such as Ellis Creek Wastewater Treatment Plant and Petaluma Airport. Many schools within the City already utilize significant onsite solar production, including Old Adobe School

Districts 600 Kw system. The City owns backup fossil fuel operated generators at many critical infrastructure sites, though they are rarely used.

Table 8: Current and Proposed Electrical CIP Projected Costs

Emergency Power Backup at Petaluma Airport	$100,000
Electric Vehicle Chargers	$254,000
Community Center/City Hall Emergency Generator Purchase and Building Mods	$489,000
City Hall/Police Headquarters Emergency Generator Purchase and Building Mods	$374,000

Natural Gas

Natural gas services often supply fuel for heating and generating electricity for residential, commercial, and industrial applications. No Natural Gas is produced within the City for distribution.

Natural Gas Distribution Network

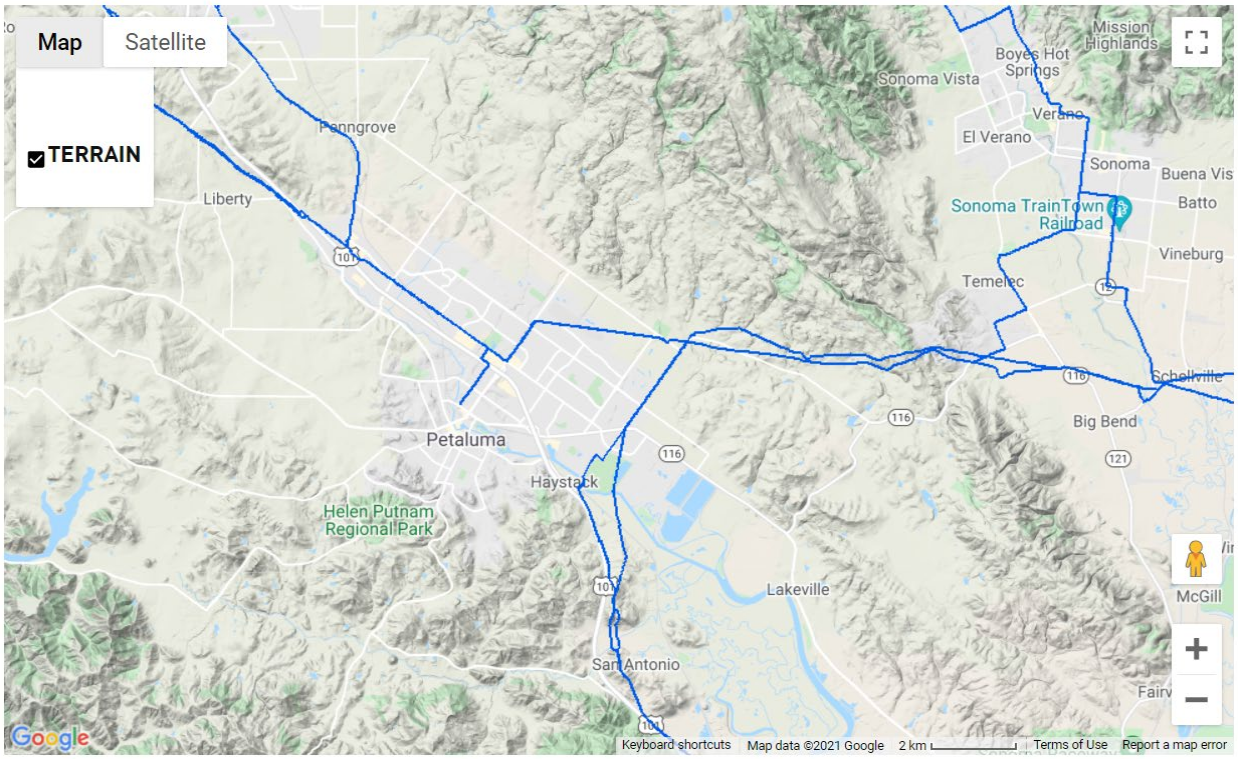
Pacific Gas and Electric (PG&E) supplies the City of Petaluma with natural gas. The network components and facilities are owned, mapped, monitored, and maintained by the supplier

All residential services via lateral lines are likewise provided by PG&E. Gas meter inspections for residential and commercial gas meters are carried out routinely to ensure safe and reliable service. Monitoring of all subsurface pipe networks is done from inspection sites throughout the service area. Specialized equipment is used to identify threats to the system via corrosion, dents, cracks, or other structural vulnerabilities.[34] The City does not map or monitor individual connections to the gas distribution system. A 24-inch transmission pipeline was installed along McDowell Boulevard in 2015.[35]

[34] *PG&E Natural Gas Systems.*

[35] *Jarrell, Allison. Agrgus-Courier.*

Figure 19: PG&E Natural Gas Pipelines



Source: PG&E Natural Gas System

Management and Improvements

In May 2021, the Petaluma City Council adopted the All-Electric Construction in New Constructed Buildings ordinance to assist the City's target of carbon neutrality by 2030. This ordinance modifies the Petaluma Municipal Code to require that newly constructed buildings use electricity-based systems rather than natural gas systems. The ordinance does not apply to existing buildings with the exception of when such buildings undergo remodeling involving at least 50% of the exterior walls or the addition of at least 50% of the gross floor area.

Telecom and Data

A telecommunications facility is a facility that transmits or receives electromagnetic signals, often through the use of antennae, microwave dishes, horns, and other types of equipment.[36] [37]The City does not provide telecommunications services. Telecom providers that serve Petaluma include AT&T, Comcast, and Sonic as well as smaller private operators.

The City of Petaluma divides its telecommunications facilities into four categories: Exempt, Mini, Minor, and Major. Each facility category has different application procedures and fees. The City requires a removal agreement prior to telecom equipment installations to ensure facilities are removed once obsolete or no longer active.

Data Distribution Network

Fiber optic networks are installed and maintained by the independent providers. Main transmission lines are undergrounded. Segments of the lines that extend into residential areas exist above ground, running along utility poles. In 2019, Sonic won contracts to provide service to the Old Adobe and Petaluma City School Districts.[38] The location, capacity, condition of these networks has not been published by the providers or by the City.

Management and Improvements

In June 2021, the County of Sonoma Board of Supervisors approved the Access Sonoma Broadband Action Plan.[39] This plan addresses the goal of improving access to broadband utilities in underserved and disadvantage communities through a government-run broadband utility. The plan includes initial research and analysis of publicly governed broadband entities.

Installation of lines underground is a significant barrier to expanding high speed services. A new senate bill on 'microtrenching' offers providers a more cost-effective method of laying cables. Traditional utility trenches require excavating a ditch that is at least 3 feet wide and 5 feet deep. When expanding networks through existing developments, this process requires extensive permitting and causes road closures and service interruptions during construction. The cost to the provider, which is passed on to customers, is significant. Microtrenching offers a cheaper, less disruptive solution. It allows installation of underground fiber in a narrow excavation trench that is 4 inches wide and approximately 1 foot deep.[40] The City of Santa Rosa has approved a pilot program to allow Sonic to install fiber in micro-trenches to determine the feasibility of standardizing the method in order to drive down costs and increase speed of fiber deployment.[41] This may provide reference information for potential projects in Petaluma.

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[36] *City of Petaluma. Telecommunications Facilities Information Handout.*

[37] *City of Petaluma. Telecommunication Equipment.*

[38] *Swindell, Bill. The Press Democrat.*

[39] *Sonoma County. Press Release. "County of Sonoma Board of Supervisors approves Access Sonoma broadband Action Plant to close 'Digital Divide'."*

[40] *California State Senate. SB-378.*

[41] *The North Bay Business Journal.*

Issues and Opportunities

Utility improvement, enhancement, and sustainability opportunities can be integrated into City planning to better serve the residents through innovative and resilient systems. The limits of the infrastructure network act as constraints for growth of the City. Vulnerabilities within the systems can likewise pose threats to economic systems as well as to the livelihood and safety of the communities they support. Understanding the conditions of the existing networks relative to anticipated changes in environment and demands can empower the City to open up opportunities for their future. As major telecom providers reduce their maintenance and service of existing copper-wire data lines in favor of broadband and fiberoptic, it is unclear what effect this might have on the reliability and affordability of telecom access to the Cities residents, particularly those in currently underserved areas.

Key Findings

Potable Water

The City's 2020 UWMP describes long-term-reliability of the City's potable and non-potable water supplies under varying conditions through 2045: Normal conditions, single dry year conditions, and five consecutive dry year periods. The 2020 UWMP also provides a Drought Risk Assessment (DRA) which considers water supply and demand for the next five years (2021-2025), assuming those years will be equivalent to the driest five years on record. The City projects meeting water demands for normal water years and for five consecutive dry year periods through 2045. For single dry year conditions the City projects experiencing a shortfall in contract water supply from Sonoma Water by 2030 in which the City may reduce its potable demands and supply groundwater as needed. For the DRA, the City anticipates having adequate supplies to meet demand if 2021-2025 is equivalent to driest five-year period on record1987–1991). The 2021 Drought water delivery reductions from Sonoma Water have forced significant drought measures in the City, and challenge the assertions in the UWMP and DRA.

Wastewater

The City's wastewater system plan was found to be mostly satisfactory with only few minor concerns identified in a 2020 audit. Sanitary Sewer Overflows (SSOs) within Petaluma are overall less severe in comparison to other areas in the region and state, though may become more frequent in the Flood Prone City of Petaluma. The ECWRF provides water recycling that offsets potable demand for some landscape and agricultural irrigation and produced recycled natural gas. Few to no buildings, including recently built structures, are known to be dual plumbed for future use of recycled water as a non-potable supply. The analysis of hydraulic capacity should be completed to inform which areas are currently near or above capacity. The municipal waste treatment plant is currently operating under daily capacity.

Stormwater

Lack of funding for the City's stormwater drainage system is currently being investigated. Deferred maintenance costs continue to grow each year. There remain significant portions of the City which are underserved by existing stormwater infrastructure and are prone to flooding. Storm events will continue to become more intense with climate change, threatening to overwhelm the capacity of natural waterways and City storm drain network. The City does not currently have flood mapping which integrates rainfall flooding with Sea Level Rise predictions, nor with the expected increased flood intensity due to higher precipitation and further land development in the future. Though the City is currently in process of improving the accuracy of its river flood maps for FEMA review, further hydraulic modeling is needed to expand these flood maps in the face of increased rainfall intensity, proposed development land uses, and the combining effect of Sea Level Rise scenarios. The limited remaining greenspace in the City,

particularly flood plains or channel-adjacent undeveloped parcels, provide significant stormwater management function and represent critical sites for future stormwater management and flood mitigation infrastructure projects. Additional measures in regard to water quality must be taken in order to address the TMDL goals defined by the City to protect the Petaluma River from pathogens, nutrients, sediment, trash, and other contaminants, as identified by the Clean Water Act. The opportunities identified in the Southern Sonoma Stormwater Resource Plan provide concepts for regional projects that could significantly improve water quality and reduce flood risk within the City. The upper watershed, outside of City Limits have significant impacts on the performance of stormwater infrastructure and flood outcomes within the City.

Electrical

Outage Block 50, which serves essential infrastructure not subject to rolling outages conducted by PG&E, does not serve multiple critical city operations and public safety functions. Though the city owns many backup generators for critical facilities such as water or sewer lift stations, there is political resistance to continued reliance or expansion of fossil fuel backups. PSPS and High Load shutdown events can create significant economic and safety issues in and around the City. Market changes with the expansion of onsite solar, and expansion of non CPUC regulated CCA should be evaluated for their potential impacts on the price and supply stability to City residents.

Natural Gas

The City has taken a strong stand in becoming a carbon neutral City by the end of the decade. To limit greenhouse gas emissions, the City has banned the expansion of natural gas lines for any new construction. All new developments will use electricity-based systems.

Telecom and Data

Many parts of the City and surrounding areas, particularly disadvantaged communities are underserved by high speed internet. The adoption of microtrenching construction methods can encourage development by streamlining processes and reducing cost of installation. Expansion of broadband data to the rural peripheries of the City has been noted as a priority, particularly as providers are reducing service and maintenance of existing copper-wire services, on which many people rely.

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