city of corona

POTABLE WATER MASTER PLAN

Adopted
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Prepared for
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KEY TO ABBREVIATIONS

AC	Asbestos Cement
ADD	Average Day Demand
AF	Acre-Foot
AFY	Acre-Foot per Year
AMI	Advanced Metering Infrastructure
AMSL	Above Mean Sea Level
AWWA	American Water Works Association
BPS	Booster Pump Station
CAS	Cast Iron Pipe
CEM	Cement Pipe
cfs	Cubic feet per second
CIP	Capital Improvement Plan
CIPP	Cast-in Place Pipe
CMLC	Cement Mortar Lined and Coated Steel Pipe
CML-TW	Cement Mortar Lined and Tape Wrapped Steel Pipe
CoF	Consequence of Failure
COP	Copper Pipe
CCR	Consumer Confidence Report
DBP	Disinfection Byproducts
DBPR	Disinfectants and Disinfection Byproducts Rule
DDW	Division of Drinking Water
DIP	Ductile Iron Pipe
DPR	Direct Potable Reuse
DU	Dwelling Unit
DWSAP	Drinking Water Source Assessment and Protection
EPA	Environmental Protection Agency
EPS	Extended Period Simulation
FCV	Flow Control Valve
fps	feet per second

GAC	Granular Activated Carbon
GACWTP	Granular Activated Carbon Water Treatment Plant
GIS	Geographic Information System
GPM	Gallon per Minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HGCWD	Home Gardens County Water District
HGL	Hydraulic Grade Line
HWL	High Water Level
IPR	Indirect Potable Reuse
LAFCO	Local Agency Formation Commission
LoF	Likelihood of Failure
MCL	Maximum Contaminant Level
MG	Million Gallons
MGD	Million gallons per day
MDD	Maximum Day Demand
MWD	Metropolitan Water District
NTU	Nephelometric Turbidity Units
PHD	Peak Hour Demand
PRS	Pressure Reducing Station
PVC	Polyvinyl Chloride Pipe
RO	Reverse Osmosis
ROW	Right-of-Way
RWMP	Reclaimed Water Master Plan
SCADA	Supervisory Control and Data Acquisition
SDWA	Safe Drinking Water Act
SOI	Sphere of Influence
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOU	Time-of-Use

TTHM	Total Trihalomethanes
UCMR	Unregulated Contaminant Monitoring Rule
U.S. EPA	United States Environmental Protection Agency
UWMP	Urban Water Master Plan
WRF	Water Reclamation Facility
WTP	Water Treatment Plant
WMWD	Western Municipal Water District
WRCRWA	Western Riverside County Regional Wastewater Authority

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SECTION 1 - EXECUTIVE SUMMARY

1.1. Introduction

1.1.1. Purpose of Potable Water Master Plan

This Potable Water Master Plan provides a comprehensive, long-range evaluation for the City of Corona (City) potable water system to support informed decisions about system reliability, capacity, regulatory compliance, and capital investments. This Master Plan documents existing system conditions, evaluates current and planning period water demands, incorporates hydraulic modeling to assess system performance, and identifies potential improvements to continue to meet service requirements.

1.1.2. Master Plan Organization

This Master Plan is organized into the following sections.

- Section 1 – Executive Summary
- Section 2 – Existing Infrastructure
- Section 3 – Water Supply
- Section 4 -Water Use
- Section 5 – Service Criteria
- Section 6 – Hydraulic Model Development and Existing System Analysis
- Section 7 – Future System Model and Analysis
- Section 8 – Water Quality
- Section 9 – Master Plan Improvements

1.1.3. Planning Period and Master Plan Approach

The Master Plan uses 2040 as the planning period because the City's 2020-2024 General Plan identifies full buildout occurring around that year, providing a consistent basis for projecting future land use and associated water demands. This timeframe allows the City to evaluate long-range system needs, plan for growth, and prioritize capital improvements in alignment with anticipated development through buildout.

This Master Plan integrates available system data including historical records, service meter and production meter data, GIS datasets, asset inventories, and hydraulic modeling, operational considerations, and established industry standards, including guidance from the American Water Works Association (AWWA) and applicable California regulatory agencies. As with most large, legacy water systems, the available data may be incomplete, estimated, inconsistent, or subject to uncertainty due to limitations in recordkeeping, asset age, meter accuracy, changes in system configuration, and operational variability. Where complete or definitive data were not available, reasonable engineering assumptions and professional judgment were applied to support planning-level evaluations.

The recommendations and Recommended Improvements identified in this Master Plan are conceptual in nature and are intended to inform future studies, detailed engineering design, environmental review, permitting, and funding decisions.

1.2. Existing Infrastructure (Section 2)

Section 2 provides a comprehensive summary of the City's current potable water system infrastructure and provides a condition assessment primarily based on remaining service life of system assets.

1.2.1. Sphere of Influence

The Riverside County Local Agency Formation Commission (LAFCO) establishes the City's sphere of influence (SOI), which includes areas within the City boundaries as well as neighboring communities such as Coronita, El Cerrito, and portions of Temescal Canyon. While the City provides service to most of its SOI, adjacent water purveyors—including the City of Riverside, Home Gardens County Water District, Western Municipal Water District, and Lee Lake Water District—also serve portions of these areas.

1.2.2. Pressure Zones

The City's potable water system is organized into six pressure zones, further divided into subzones identified in this report, which collectively manage service elevations ranging from approximately 430 to 1,520 feet, with the highest system elevation at 1,640 feet. Each zone is supplied and regulated through a combination of storage tanks, booster pump stations, and pressure-reducing stations, which together maintain reliable system pressures and facilitate operational flexibility throughout the distribution network.

The City's water system exhibits significant operational complexity due to its elevation profile and inter-zone connectivity. Zones such as 905 and 1060 function as major hubs, receiving water from multiple sources and distributing it to higher elevation zones through booster stations and pressure-reducing stations. Interagency interconnections with Riverside, Norco, and Temescal Valley Water District provide emergency redundancy and regional supply coordination.

1.2.3. Infrastructure Facilities

The City provides potable water service to approximately 159,000 residents through approximately 46,000 service connections across a 39-square-mile service area. The water system is hydraulically complex, consisting of 22 pressure zones, inclusive of subzones, designed to accommodate service elevations from 430 feet to 1,520 feet above mean sea level. These zones are interconnected through a network of booster pump stations and pressure-reducing stations that maintain operational flexibility and ensure reliable service across varying topographies. Zones such as 905 and 1060 serve as critical distribution hubs, supplying water to multiple upstream and downstream zones and supporting inter-zone transfers during peak demand or emergency conditions.

1.2.3.1. Water Supply and Treatment

The City's water supply is sourced from a combination of local groundwater and imported water, supported by an extensive network of wells, treatment facilities, and agency interconnections. Groundwater is drawn from the Temescal and Bedford-Coldwater Basins through wells. Depending on the location of the well, groundwater is treated through the Temescal Desalter, which produces 10.4 million gallons per day (MGD) of reverse osmosis-treated water blended at Garretson Tank, or through the

Granular Activated Carbon Water Treatment Plant. Imported water is purchased from Western Municipal Water District (WMWD) and delivered through four turnouts: WR-19, WR-24, WR-33, and WR-29 (inactive), conveying surface water from the Lower Feeder pipeline (untreated) and Mills pipelines (treated). The Lower Feeder Pipeline provides untreated surface water from WMWD to the City, which is treated by the Lester Water Treatment Plant and the Sierra Del Oro Water Treatment Plant. The Green River Treatment Plant was historically used to treat surface water from the WMWD, but the Green River Water Treatment Plant is currently inactive.

Potable water system reliability is reinforced through a network of interconnections and emergency supply facilities. The City maintains system interconnections with Norco (two 2,500 gpm connections), Home Gardens (880 gpm metered connection), the Arlington Desalter (3,500 gpm), and Riverside and Temescal Valley Water District, enabling bidirectional supply under specific operating conditions. Emergency interconnections allow the City to receive or deliver water if treatment plants or major transmission facilities are offline.

Collectively, the City's groundwater wells, imported water turnouts, treatment plants, and interagency connections provide a redundant and diversified potable water supply, ensuring operational resilience and capacity to meet both current and future system demands.

1.2.3.2. Storage and Distribution System Infrastructure

Storage infrastructure consists of 18 tanks with capacities ranging from 0.5 to 6 million gallons, which are strategically located to provide operational and fire storage and maintain hydraulic grade lines. Four tanks also serve as blending tanks to maintain water quality. The distribution network comprises approximately 675 miles of pipelines, with 45 percent of the system consisting of 8-inch diameter mains and transmission pipelines of 14 inches or greater accounting for 14.5 percent of total length. Transmission mains (≥14 inches) account for 95 miles, while distribution pipelines (≤12 inches) account for 573 miles. The system also includes 20 booster pump stations, 32 pressure-reducing stations, and 15 flow control valves, all of which play a critical role in managing pressure transitions and maintaining system stability. Customer services include approximately 46,000 water meters, predominantly ¾-inch meters serving single-family residential units and larger meters serve commercial and industrial customers.

1.2.3.3. Water System Control and Safety and Safety Components

The City's potable water system includes an extensive set of control and safety components that support system reliability, pressure management, and emergency operations. The inventory includes blow-off valves (most are 2-inch), air-relief and combination valves (primarily 1–2-inch), and detector check/backflow control valves. The distribution system also utilizes approximately 11,500 main valves, nearly half of which are 8-inch. These components, along with booster pumping, form the backbone of the City's pressure-zone control strategy, enabling reliable operation and providing critical system isolation and fire-flow capability. System-wide reliability is supported by more than 9,000 fire hydrants.

1.2.4. Infrastructure Condition and Reliability Analysis

The condition and reliability of the existing infrastructure is evaluated primarily focusing on remaining service life analysis of major assets with consideration of pump efficiency data, where applicable. The analysis uses GIS asset data, SCADA records, staff interviews, and site inspections.

General results from the analysis are summarized below.

- Evaluation of the City's 23 groundwater wells finds that 3 wells operate below 50% pump efficiency, 7 wells between 50–60%, and 9 wells above 60%, while all carbon-steel well casings (25-year life) will have exceeded their service life by 2026; stainless steel casings (75-year life) remain in good condition.
- Storage tank assessments confirm the system includes 5 steel tanks (50-year life) and 13 concrete tanks (100-year life), with the Hayden Tank already past 50 years but still performing well, and the Border Tank expected to reach 100 years of age in 2069; the Glen Ivy Tank has already been removed from service.
- Pump station evaluations show most facilities are 20 to 40 years old, beyond the typical 20-year equipment life, with 17 stations operating above 60% efficiency and 2 stations operating below 50% efficiency and needing near-term rehabilitation or replacement.
- Pipeline condition analysis finds the City operates 667.75 miles of pipeline constructed from materials with varying service lives including asbestos cement (70-year life), PVC (70-year life), ductile iron (100-year life), CMLC (100-year life), and steel pipe (50-year life). As of 2026, approximately 16 miles of pipeline have already exceeded their service life, and an additional 118 miles are projected to reach end-of-life by buildout in 2040. Coronita, Temescal Valley, El Cerrito, and Downtown include pipelines less than 8-inches in diameter.

1.3. WATER SUPPLY (SECTION 3)

Section 3 summarizes how groundwater and imported water collectively provide the City's water supply and summarizes historic and current production trends.

1.3.1. Supply Sources and Historic Production

The City's water supply is derived from two groundwater basins (Temescal and Bedford–Coldwater) and imported water sources conveyed through WMWD via the Lower Feeder (untreated) and Mills (treated) pipelines, supplemented by Arlington Desalter and interconnections. Groundwater from Temescal Basin dominates local production, while Bedford–Coldwater Basin potable wells are currently inactive. Imported water is delivered primarily as untreated flow to Lester (WR-19) and Sierra Del Oro (WR-33), with treated deliveries via Mills (WR-24) and intermittent Arlington Desalter supplementation.

Historic and recent production records for 2016–2024 indicate supply follows with seasonal variability, where summer supply is approximately twice winter production. Average total production is about 28.61 MGD (2016–2019) and 28.90 MGD (2020–2024), reflecting stability with operational balancing between local and imported supplies. Records for 2016–2024 document source contributions by basin, turnout, and interconnection.

1.3.2. Groundwater

Groundwater wells extract groundwater from the Temescal and Bedford-Coldwater Basins. Each basin is managed by a Groundwater Sustainability Agency (GSA) and has a Groundwater Sustainability Plan (GSP) as mandated by the Sustainable Groundwater Management Act.

From 2016 through 2024, average groundwater production from the basins ranged from approximately 12.9 MGD to 13.5 MGD, reflecting increased reliance on Temescal Basin wells following inactivation of the Glen Ivy well facilities. The Temescal Basin receives both natural and artificial recharge, including percolation from reclaimed water discharged from WRF 1 and WRF 2, which accounts for an estimated 25% of total basin inflow under the 2019–2068 baseline scenario. Sustainability modeling in the 2022 Temescal Basin Groundwater Sustainability Plan projects total basin inflow on the order of 21.6 to 21.9 MGD, with comparable outflows of 21.7 to 21.8 MGD, indicating that additional groundwater production is limited without increasing recharge volumes.

The Bedford-Coldwater Basin provides a smaller but important supplemental groundwater source. The basin spans approximately 6,300 acres and is divided into two management areas—Bedford and Coldwater—under the 2021 Groundwater Sustainability Plan. Sustainable yields for the two areas are estimated at 2,047 acre-feet per year (AFY) for the Bedford Management Area and 5,088 AFY for the Coldwater Management Area, while the City extracts approximately 336 AFY of non-potable water from Bedford-Coldwater wells for irrigation use.

Groundwater quality varies by basin: the Temescal Basin is characterized by elevated nitrate, total dissolved solids, perchlorate, and emerging PFAS constituents (PFOS/PFOA), while the Bedford-Coldwater Basin exhibits historic nitrate and TDS issues, requiring treatment at the City's Temescal Desalter and GAC Water Treatment Plant for regulatory compliance. Together, the Temescal and Bedford-Coldwater Basins provide a critical local supply that meets a substantial portion of current potable water demand while requiring careful monitoring and recharge management to maintain long-term basin sustainability.

1.3.2.1. Wells and Production Capacity

Potable wells in the Temescal Basin are treated at the Temescal Desalter and/or GACWTP. A Drinking Water Source Assessment and Protection (DWSAP) program has been completed for each potable well. The total design capacity for all wells is about 32,082 gpm (46.20 MGD), with active wells totaling 25,272 gpm (36.39 MGD), reflecting reduced output associated with aging equipment and declining pump efficiencies.

Individual well performance varies—for example, recent efficiency tests indicate capacities ranging from approximately 273 gpm (Well 26) to over 1,400 gpm (Well 22)—highlighting the importance of ongoing rehabilitation, pump replacement, and efficiency testing to maintain reliable groundwater production across the Temescal and Bedford-Coldwater Basin wellfields.

1.3.3. Imported

Untreated imported water constitutes roughly 91% of the City's imported portfolio, conveyed via Lower Feeder turnouts WR-19 (to Lester WTP) and WR-33 (to Sierra Del Oro WTP); WR-29 is inactive along with the Green River raw booster and treatment plant.

Treated imported water is delivered via Mills Pipeline turnout WR-24 (Henry J. Mills WTP) and intermittently via the Arlington Desalter interconnection, typically in summer months. Average imported volumes (AFY) across 2016–2019 and 2020–2024 demonstrate sustained reliance on WR-19 and WR-33 with decreasing dependence on WR-24 and minimal Arlington deliveries in recent years.

1.3.4. Reclaimed Water – Supply, Demand, and Recharge

The reclaimed water program integrates treatment at WRF 1 (11.5 MGD permitted, secondary/tertiary), WRF 2 (3 MGD), and WRF 3 (1 MGD, membrane bioreactor; will be decommissioned), plus two non-potable wells. Average combined reclaimed production is approximately 11.64 MGD. Policy (Ordinance 2854) requires use of recycled water where feasible. The Prado Settlement (1968 agreement with WMWD) obligates Corona to discharge an annual average of 1,625 AFY (1.45 MGD) to the Santa Ana River Watershed at FCS-Creek, representing about 12.8% of reclaimed production. Beyond mandated discharge, tertiary effluent from WRF 1 and WRF 2 is recharged to Temescal Basin via Lincoln and Cota ponds; permitted tertiary capacity has been increased by the State Water Resources Control Board to 15.5 MGD. Remaining production serves the City's non-potable distribution (primarily for irrigation), substituting potable demand.

1.4. Water Use (Section 4)

Section 4 establishes the City's existing and future (2040 buildout) potable water demands by analyzing historical consumption, metered water-use patterns, land-use characteristics, and pressure-zone distribution.

1.4.1. Water Use

1.4.1.1. Representative Demand Year and Historical Trends

The City's 2024 metered consumption data were selected as the representative demand year for this Master Plan because the dataset reflects stabilized community behavior, post-pandemic economic normalization, and typical commercial and residential occupancy patterns.

1.4.1.2. Historical Demand Trends

Annual water use increased through the 1990s and early 2000s, reaching a peak of approximately 42 MGD in 2007. Water use then declined significantly beginning in 2008, influenced by the economic recession, multiple statewide drought-response measures, and long-term conservation trends. In recent years, average annual water use has stabilized at approximately 28 to 30 MGD despite continued population growth, indicating improved water-use efficiency throughout the community.

1.4.2. Water Demand

Water-use characterization relies on City meter-read datasets (account attributes and time-stamped consumption), facility production flowmeters, and GIS land-use layers to link meters to parcels and land-use categories. Hourly patterns and peaking behavior are evaluated using SCADA tank level and flow records, and demands were aggregated by land use and by hydraulic pressure zone for modeling and planning. Missing or inconsistent meter attributes are reconciled via geospatial placement and assessor parcel overlays, ensuring accurate spatial assignment of meter loads to the correct parcels and land-use categories. This protocol underpins subsequent development of area-based demand factors (gpd/acre and gpd/DU) and demand projections to 2040, recognizing that future conservation, land-use adjustments, reclaimed conversions, climate variability, and economic shifts may alter outcomes and therefore require periodic updates.

1.4.2.1. Water Demand By Land Use

When water demand is assigned to meters by land-use classes via GIS correlation, it confirms that water demand across the City is strongly influenced by residential land uses. Residential land use accounts for approximately 81% of all potable water delivered in 2024, reflecting the City's predominantly residential character and the substantial share of water used for domestic, irrigation, and household activities. In 2024, combined Single-Family and Multi-Family residential categories account for roughly four-fifths of potable deliveries, consistent with the City's predominantly residential character. Commercial, industrial, institutional, and other non-residential categories collectively represent the remaining demand, with individual land-use contributions detailed in the aggregated consumption summary table.

The City's aggregation approach sums average-day demands across all meters within each land-use class, producing planning-level totals rather than per-parcel averages. These totals inform projection baselines and allow derivation of area-based demand factors used for future scenario testing, infill assessments, and development review. They also provide a pathway to quantify potential potable offsets if irrigation-oriented parcels are converted to reclaimed water supply as infrastructure expands.

1.4.2.2. Water Demand by Pressure Zone

Zone-level aggregation of 2024 meter demands indicates Pressure Zone 905 exhibiting the highest overall demand due to its large service population and development density; Zones 1220 and 1060 follow, each at approximately two-thirds to three-fourths of Zone 905's volume. Lower-elevation zones such as 725, 780, and 820 show comparatively smaller demands, while increased consumption is anticipated in Zones 1380 and 1640 as undeveloped areas in the southern portion of the City build out. The resulting zone distribution provides critical inputs to the hydraulic model, validating storage turnover targets, pressure reducing station (PRS) setpoints, and booster run times.

The zone distribution frames expectations for future growth: southern hillside zones (1380 and 1640) are anticipated to increase as undeveloped areas build out, while largely built-out zones (1060 and 1220) are expected to remain stable aside from densification at select infill parcels.

1.4.2.3. Seasonal Variability

Records for 2016–2019 show an average of 32,048 AFY (28.6 MGD) with summer production peaking at about two times the amount of winter production. For 2020–2024, average annual production was 32,419 AFY (29.0 MGD), maintaining a similar groundwater/import split (roughly half from groundwater, of which the majority is treated through the Temescal Desalter) and displaying consistent seasonality. January and February represent the lowest months; August consistently exhibits the highest production (3,533–3,587 AF). Reconciling production with metered deliveries shows total losses in line with industry norms: audits indicate a decline from 9.5% (FY15/16) to 4.9% (FY18/19), and sustained performance between 3.26% and 4.17% during FY19/20–FY23/24. These values reflect ongoing pipeline rehabilitation, meter replacement programs, and tightened operational accounting, and they support confidence in demand baselines used for modeling and improvement planning.

1.4.3. System Losses

The City performs annual water audits to quantify total production, billed consumption, and unbilled authorized uses. The City's water losses have steadily declined over time, decreasing from approximately 9.5 percent in FY 2015/2016 to 4.9 percent in FY 2018/2019. This improvement aligns with industry expectations for systems with ongoing meter replacement programs and pipeline rehabilitation activities.

From FY 2019/2020 through FY 2023/2024, losses remained consistently below the 5 percent benchmark, ranging between 3.26 percent and 4.17 percent, further indicating stable system performance and continued reliability in the City's distribution network.

1.4.4. Reclaimed Water Use Opportunities

The reclaimed water program reduces potable demand by converting suitable irrigation and large landscaped parcels to recycled supply, subject to Title 22 tertiary treatment requirements. Historically (2018), reclaimed deliveries averaged 1,411 gpm (2,276 AFY) to city parks, schools, and commercial/industrial/multifamily landscapes, with additional potential identified along existing and planned reclaimed alignments. The Prado Settlement obligates a controlled average discharge of 1,625 AFY (1.45 MGD) to the Santa Ana River watershed, while WRF 1 and WRF 2 tertiary effluent supports Temescal Basin recharge via percolation ponds. As reclaimed capacity expands and distribution pipelines are extended, incremental potable offsets can be realized in irrigation-heavy corridors; planning should evaluate lifecycle costs, retrofit feasibility, and air-gap/backflow compliance alongside potable demand reduction benefits.

1.4.5. Existing System Demands and Peaking Factors

Identifying average day, maximum day, and peak hour demands is valuable for operating a reliable water system, as these benchmarks ensure adequate capacity for routine use, seasonal fluctuations, and short-term surges without compromising service or system integrity. Peaking factors further characterize existing demand data.

- The existing Average Day Demand (ADD) of 24.03 MGD is calculated by using the City's 2024 meter read-data and calculating the demand per land use and pressure zone.

- The Maximum Day Demand (MDD), the highest single-day production recorded by SCADA during the reference year, occurred on September 3, 2024, with a total system demand of 41.2 MGD.
- The Peak Hour Demand (PHD) according to SCADA data was 68.4 MGD and occurred on September 9, 2024.

Table 1.1 – Existing Demand and Peaking Factors

Load Demand	Existing Demand (MGD)	Peaking Factors	Existing Factor
Average Day Demand	24.0	-	-
Maximum Day Demand	41.2	1.8	1.7
Peak Hour Demand	68.4	3.0	2.8

1.4.6. Area-Based Demand Factors and Buildout Projections

Area-based demand factors (gpd/acre or gpd/DU) provide a consistent method to translate land-use plans into future water-use estimates. For 2024, factors were derived from meter datasets and GIS acreages (with DU alignment for single-family classes; multifamily factors based on acreage where DU counts were not reliably separable). Applying these factors to anticipated 2040 acreage and DU counts yields a projected 2040 ADD of approximately 32.42 MGD for the combined City and SOI. Interim year demands (2025–2035) are interpolated linearly for programmatic budgeting and phasing of capacity projects (e.g., PRSs, boosters, trunk mains, and storage). While these projections anchor capital planning, they should be revisited periodically to incorporate conservation trajectories, reclaimed conversions, densification, and regulatory changes.

1.4.7. 2040 Demand Projects

The future demands can be projected assuming full City build out by 2040. The existing demand from reference year 2024 is known from water meter data, and the demand for 2040 was calculated using area-based demand factors with the assumption the City will be built out. The demand in intermediate years between 2024 and 2040 was interpolated assuming annual demand will increase at a constant linear rate.

Table 1.2 – Future Water Use and Demands (MGD)

Year	2025	2030	2035	2040
ADD	24.55	27.18	29.80	32.42
MDD	44.20	48.92	53.64	58.36
PHD	73.66	81.53	89.39	97.26

1.5. Service Criteria (Section 5)

Section 5 establishes the service and design criteria used to evaluate the performance, reliability, and capacity of the City's potable water system.

1.5.1. Design and Performance Standards

Design and performance standards are based from AWWA guidance, California regulatory requirements including fire code and residential code, and City's standards (Fire Department and Department of Water and Power Design Policy). These criteria form the basis for hydraulic modeling, identifying system deficiencies, and developing future improvements, and they guide long-term asset planning, maintenance programs, and reinvestment strategies.

The City's water system must meet Average Day Demand (ADD), Maximum Day Demand (MDD), Peak Hour Demand (PHD), and fire-flow conditions without compromising service reliability. Storage reservoirs are required to balance diurnal demand fluctuations, provide fire suppression capacity, and maintain emergency reserves. Booster pump stations, pressure-reducing stations, and transmission pipelines are designed to maintain pressures between 60 and 120 psi under normal conditions, with minimum residual pressures of 40 psi during PHD and 20 psi during MDD plus fire flow. Pipeline velocities are limited to AWWA-recommended thresholds to minimize wear and maintain water quality.

1.5.2. Design Standards by Component

1.5.2.1. Well Design and Source Protection

New potable wells must comply with California DWR Bulletin 74, AWWA A100, and DDW standards. Design considerations include casing diameter, material selection, and structural integrity to prevent cross-contamination and ensure long-term reliability. Well screens and gravel packs are engineered to optimize yield and minimize sediment intrusion, while sanitary seals prevent surface water contamination. Source Water Assessments and monitoring wells are required to evaluate hydrogeologic conditions and identify potential contaminating activities prior to construction.

1.5.2.2. Storage and Emergency Supply

The City maintains approximately 44.9 MG of storage capacity across multiple pressure zones, exceeding the required 32.44 MG. Storage components include operational, fire suppression, and terminal reserves. Emergency supply planning assumes a seven-day outage scenario, requiring 168 MG of water. Combined tank storage and groundwater production capacity (approximately 17.8 MGD) meet this criterion, supported by interconnections with neighboring agencies for redundancy.

1.5.2.3. Fire Protection and Pressure Management

Fire-flow requirements range from 1,000 to 4,000 gpm depending on land use, with hydrant spacing and residual pressure criteria established by the California Fire Code and local fire authority. Pressure-reducing stations and booster pump stations are equipped with redundant pumps, telemetry, and backup power systems to maintain service during peak demand and emergency conditions.

1.5.2.4. Planning and Asset Management

Service life criteria for tanks, pipelines, and appurtenances guide long-term reinvestment planning. Performance indicators such as leak frequency, corrosion activity, and maintenance findings inform prioritization of capital projects. Routine maintenance programs include valve exercising, hydrant servicing, flushing, and leak detection to preserve system integrity and water quality.

1.5.3. Service Life Planning Criteria

Service life establishes the expected useful lifespan of wells, tanks, pipelines, pumps, and other facilities, and therefore directly shapes the City's long-term reinvestment strategy. By comparing each asset's age to its average service life, the City can identify which facilities are approaching end-of-life, prioritize replacements before failures occur, and forecast when major capital investments will be required. Assets with shorter service lives—such as pumping equipment (10–15 years), electrical systems (7–10 years), and meters (10–15 years)—drive more frequent reinvestment cycles, while long-life assets like concrete tanks (100 years) and ductile iron pipelines (up to 110 years) support long-range capital planning. Proactively aligning system improvements with service-life expectations reduces emergency repairs, prevents unplanned outages, and ensures that system reliability, regulatory compliance, and water quality are maintained as infrastructure ages.

1.5.4. Summary of Design Criteria

Table 1.3 – Summary of Design Criteria

Focus	Design Criteria
Total Supply	
Maximum Day Demand (MDD)	The total supply to the system is equal to the total demand, defined as MDD.
Average Day Demand (ADD)	The average day demand is determined using the demand factors specified in **Table 4.8** located in **Section 4 - Water Use**. These demand factors are provided on a per-acre and per-connection basis, tailored to specific land use types.
Storage	
Tank Capacity	Sum of Operational, Fire, and Terminal Storage
Operational Storage	50% of Maximum Day Demand (MDD)
Fire Suppression Storage	Each pressure zone shall contain fire suppression storage at least equal to the highest fire flow storage volume required in the zone based on actual land use in the zone. Refer to **Table 5.7** to calculate the highest fire demand in the Zone.
Terminal Storage	10% of Tank Capacity
Emergency System Storage	7 days of ADD (7 times ADD)
Booster Pump Station	
Pump Station Capacity	Pump Stations must supply maximum day demand (MDD). Note: The booster pump stations must supply MDD plus fire flow in subzones served exclusively by a hydro-pneumatic booster pump station.
Pump Station Configuration	At least one duty and one standby pump in parallel. The standby pump must be of the same size as the largest duty pump to maintain operations in the event the duty pump is offline.
Pump Station Details	Pump stations should be equipped with modern pump controllers, flow meters, suction and discharge pressure gauges, proper isolation valves, and telemetry equipment to control operations through SCADA.
Pump Station Fireproofing	Pump stations should be constructed of fireproof materials and provided with peripheral sprinkler systems.
Pump Station Backup Power	They are equipped with standby generators and automatic transfer switches to operate during power outages.
Pressure Reducing Station (PRS)	
PRS Capacity	Should deliver the entire range of demands and fire flows
PRS Details	PRS should be constructed with a pressure relief valve to preclude excessive pressures in the service area. Each PRS should be equipped with flow meters and telemetry equipment to control operation through SCADA. Each PRS should have two pressure reducing valves (sized typically for high and low flows per service area).
Pipe Size and Velocity	
Minimum Pipe Size	8-inch (12-inch where required by the City's DWP Design Policy)
Maximum Pipe Velocities PHD	5 fps

Table 1.3 – Summary of Design Criteria

Focus	Design Criteria
Maximum Pipe Velocities MDD + Fire Flow	12 fps
System Pressures	
Minimum Static Pressure	Existing System: 50 psi Future System: 60 psi
Maximum Static Pressure	120 psi
Preferred Static Pressure	60 psi – 120 psi
Minimum Residual Pressure	Existing System: 40 psi during PHD Future System: 60 psi during PHD Existing & Future System: 20 psi during MDD + Fire Flow
Energy Conservation	SCE operates Time-of-Use (TOU) rate schedules with evening on-peak periods (typically a 5-hour peak demand window between 4 PM and 9 PM or a 3-hour peak demand window between 5 PM and 8 PM). Pumping should be scheduled outside of the on-peak periods defined in the current SCE schedule, when practical.
Water Quality	
Blending	Blending stations are used to meet regulatory limits and internal targets for constituents identified in **Section 8** (Water Quality).
Fire Flow Requirements	
Single Family Residential	1,500 gpm for 2 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 300 ft. [1]
Multi-Family Residential	2,500 gpm for 2 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 250 ft. [1]
Schools/Commercial	3,000 gpm for 4 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 250 ft. [1]
Industrial	Min. 3,500 gpm for 4 hours with 20 psi residual pressure at a fire hydrant. If building Needed Fire Flow (NFF) is more than 3,500 gpm, then use NFF. The average spacing between hydrants is 250 ft. [1]

[1] Hydrant spacing shall apply as listed unless otherwise approved by the City of Corona Fire Department.

1.6. Hydraulic Model Development and Existing System Analysis (Section 6)

Section 6 describes the development and calibration of the City's hydraulic model and uses the hydraulic model to analyze the hydraulic performance of the existing potable water system.

1.6.1. Hydraulic Model Development

Hydraulic modeling results presented in this Master Plan represent planning-level simulations of assumed demand and operating conditions and are sensitive to input assumptions, system connectivity, and operational practices. Actual system performance may vary due to changes in operations, infrastructure condition, future development patterns, regulatory requirements, or climatic conditions.

1.6.1.1. Hydraulic Model History and Formulation

To build an accurate representation of the water system, physical data—including pipes, junctions, storage tanks, wells, pump stations, and valve facilities— are input from the City's GIS network and validated using as-built drawings and operator input. The modeling development process includes defining node elevations, pipe characteristics, pump performance curves, tank operating levels, and valve control settings within the Innovyze InfoWater software hydraulic model. Initial boundary conditions are set based on tanks levels and the initial open/closed setting for control valves and pumps. City Operations staff provided input about normally closed valves and current operational status and functionality for the City's PRS.

Metered demands, water supplies, pumped flows, and changes in tank volumes are reviewed to determine daily diurnal demand patterns. Annual consumption by metered account provides a spatial distribution of system demand.

1.6.1.2. Hydraulic Model Calibration

Calibration of the hydraulic model is essential to ensure its predictive accuracy. The City provided one month of SCADA tank levels, pump station flows, and pressure data to support calibration efforts. An extended period simulation (EPS) was performed to evaluate how the system behaves over a minimum 24-hour cycle, including tank drawdown and refill patterns.

Hydraulic model calibration is an iterative process of refining data and evaluating whether the hydraulic model captures the key operational characteristics of the potable water system. Graphical representations tank levels and pump station operations at each pressure zone are evaluated to analyze how well the hydraulic model is calibrated to the existing system conditions Some localized differences between modeled and field data points are expected. In complex potable water systems where looping and connectivity allows for numerous flow pathways, achieving an exact one-to-one alignment with every field data point is unlikely; however, graphical representations show the calibrated model successfully reproduced the behaviors of the system and closely reflects the SCADA-recorded conditions over the calibration period. The model accurately reflects overall system trends including tank filling and drawdown patterns, pump station operation sequences, and system pressure responses.

The difference between field measured storage tank levels and hydraulically modeled tank levels is a common parameter used to assess the accuracy of calibration. A guideline for assessing hydraulic model calibration is less than two (2) foot difference between field measured and hydraulically modeled tank levels 80 percent of the time, and less than five (5) foot difference 100% of the time. The primary locations where the City's hydraulic model sees larger differences between field measured tank levels and hydraulically modeled tanks levels are near the Garretson and Mangular Sites and blending facilities due to the complexity of these sites, which is rather common for such models. However, further refinement of the model must be balanced with the practical limitations of available data, staff effort, and project resources, recognizing that beyond a certain point, additional calibration effort yields diminishing improvements in accuracy relative to the cost and effort required.

The newly constructed and calibrated hydraulic model accurately reflects system operations and provides a strong basis for evaluating deficiencies and planning future improvements.

1.6.2. Existing Potable Water System Analysis

Existing system analysis analyzes system pressures, pipeline capacity through velocity, existing booster pump capacity, and fire flow capabilities based on the service criteria established in **Section 5**.

1.6.2.1. System Pressure Analysis

The calibrated hydraulic model is reviewed to identify areas of low pressure. The City's water system as modeled exhibits excellent pressure contours throughout. As expected, there are small areas around tanks and suction sides of pump stations and valving facilities, as well as at high points, where pressures are less than 40 psi. However, none of these areas are cause for improvements.

1.6.2.2. Pipeline Capacity Analysis

Velocity is a key component of pipeline capacity because it reflects how efficiently a pipe can convey flow under high-demand conditions; as flow approaches the pipe's hydraulic capacity, velocities increase, making velocity exceedances a practical indicator that the pipe is operating beyond its intended capacity.

Pipelines are evaluated during peak hour demand and maximum day demand plus fire conditions to identify velocities exceeding City standards. Pipeline capacity analysis under peak hour demand revealed that most pipelines operate below the five (5) feet-per-second (fps) threshold, with one exception documented in the existing hydraulic deficiencies. One notable exception is the 14-inch pipeline along Border Avenue (Zone 3 – 1060), where velocities reached up to 8.5 fps.

1.6.2.3. Booster Pumping Analysis

The City's existing potable water distribution system includes multiple booster pump stations operating within interconnected pressure zones supported by storage facilities and pressure- and flow-regulating valves. System operations allow water to move through different pathways depending on system demands, storage levels, and control settings. Booster station capacity appears sufficient when compared with existing maximum day demands, recognizing that pump operation varies based on operational configuration and real-time system conditions. The existing system displays stable tank cycling behavior and sufficient operational storage under normal conditions, as confirmed by EPS calibration results.

1.6.2.4. Fire Flow Analysis

Fire flow performance is evaluated under the MDD plus fire flow scenario. As expected, fire flow limitations correlate with areas containing undersized distribution mains. Dead-end services and older small-diameter pipelines (4- and 6-inch) present constraints in delivering the minimum residential or commercial fire flow requirements. These areas are known system conditions and are typically addressed as part of broader pipeline replacement programs.

1.6.3. Findings from the Existing System Hydraulic Analysis

The existing system analysis confirms that the City's potable water distribution system performs reliably under current operating conditions. System pressures are generally in alignment with City standards, pipeline velocities are acceptable with one localized exception, and fire flow performance aligns with known limitations associated with undersized legacy mains.

1.6.3.1. Existing System Hydraulic Deficiencies

Hydraulically Deficient Pipes. Due to the City's highly gridded, looped, and efficient potable water system, only five (5) projects were identified as hydraulically deficient under existing conditions. Hydraulic deficiencies—identified in the model based on high velocities, low pressures, inadequate fire flows, and elevated velocities during fire flow conditions—were consolidated into specific project cutsheets provided in Appendix K. Projects identified based on hydraulic deficiencies within the existing system are incorporated into Recommended Improvements in **Section 9**.

Table 1.4 – Existing System Hydraulically Deficient Pipes

Zone	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Priority
725	(10") 12"	Green River Road at Dominguez Ranch	290	Fire Velocity > 12 fps	Low
905	(12") 16"	Small segment in Railroad St east of Alcoa Cir	21	Fire Velocity > 12 fps	Low
	(10") 16"	Alcoa Cir north of Railroad up to Alcoa PRS	1,025	Fire Velocity > 12 fps	Low
1060	(14") 16"	Border Ave between Ontario Ave and Carolwood Dr	994	Velocity > 5 fps *(Ultimate 5.6 fps)*	Low
1220	(6") 12"	400' South of Magnolia Ave and S Main Street	380	Fire Velocity > 12 fps	Med
	(6") 8"	Grandview St between Consul Ave and Diplomat Ave	380	Fire Velocity > 12 fps	Med

Size-deficient pipes. Size-deficient pipes were identified based on the City's Department of Water and Power (DWP) Design Policy (Nov 2012), Section B.6, which establishes minimum pipeline sizes (**Section 5.2.6.4**). Appendix L includes figures and tables identifying size-deficient pipes which are determined based on City design standards independent of hydraulic modeling results. The identified pipelines include dead-end mains less than 8-inches that serve hydrants and are therefore expected to meet the minimum size criteria. Recommendations for upsizing these pipelines, where applicable, are discussed in **Section 9**.

Pipelines Beyond Typical Service Life. Pipelines beyond their typical service life, determined by material type, are also identified in Appendix L. Figures and tables highlighting pipelines that have exceeded, or will exceed, their typical service life by 2040.

Reference Only (Not Recommended for Improvement): Non-Deficient Dead-End Pipelines Not all pipelines under 8 inches are considered size-deficient. Dead-end pipelines less than 8 inches in diameter that extend past the last hydrant and primarily serve residential connections are considered service extensions and are not recommended for upsizing. These non-deficient dead-end pipelines are included for reference in Appendix M.

1.7. Future System Modeling and Analysis (Section 7)

Section 7 uses the calibrated hydraulic model along with projected 2040 buildout demands to analyze the hydraulic performance of the future potable water system.

1.7.1. Future Hydraulic Model

Similar to the existing system analysis, projections of future demands, system needs, and infrastructure performance are inherently uncertain and should be interpreted as planning-level indicators rather than guarantees of future conditions.

This future model is developed from the calibrated existing system hydraulic model, future demand projections established in **Section 4**, and the design and operational criteria outlined in **Section 5**. The future model assumes that the hydraulically deficient project identified in the existing system analysis is complete. The future model retains existing undersized pipelines rather than assuming full upsizing to City standards, as comprehensive replacement represents a substantial capital investment unlikely to be completed within the planning period. This hydraulic modeling approach provides a conservative assessment of future system performance while recognizing that some targeted upsizing may occur.

Water demands are assigned to the future hydraulic model based on projected conditions described in **Section 4**, including growth within the existing system and SOI, planned near-term development areas with conceptual designs, and land-use-based projections in areas without defined plans. Demands for future developments were added at anticipated connection points to evaluate whether the existing transmission system can support fire-flow and operational needs without designing the off-site facilities that will ultimately be required to supply water to future development.

The near-term developments considered in the future hydraulic model are summarized below. Planning documents for these developments are provided in Appendix J.

- Arantine Hills Holdings, LP (TTM 38572) – Residential development of 85.51 acres
- Green River Ranch Business Park (PM 37963) – Commercial development of 42.56 acres
- Skyline Heights Phase 1, 2, 3 (TTM 36544) – Residential development of 249.39 acres

1.7.2. Future Potable Water System Analysis

1.7.2.1. Water Supply Analysis

The maximum day demand for 2024 and 2040 maximum day demand projections is compared to the currently available supply sources using both design capacity and actual capacity. The City maintains a combined available supply of 65.7 MGD, which remains sufficient to meet the projected 2040 maximum day demand of 58.4 MGD. This confirms that the City retains an adequate supply buffer through buildout. Notably, the Arlington Desalter is not included in the base supply calculation, as its role is emergency and peaking support rather than sustained daily use.

Table 1.5 – 2040 Water Supply Analysis

Demand Scenario	Demand (MGD)	Available Supply (MGD)
2024 Max Day Demand	43.2	65.7
2040 Max Day Demand	58.4	65.7

1.7.2.2. Storage Analysis

Future storage capacity analysis operational, fire flow, and terminal storage requirements for each pressure zone under 2040 buildout demand conditions. Total future tank storage across all zones amounts to 48.0 MG. Additional storage contributions from Skyline Heights Zone 5 (2.5 MG) and Zone 6A (0.6 MG) must be incorporated into final totals. Storage improvements must be timed with development-driven demand increases to ensure zone-level adequacy. Individual tank sizing and timing remain dependent on fire protection criteria, hydraulic gradeline constraints, and operational balancing among adjacent zones.

1.7.2.3. Booster Pumping Analysis

Due to the potable water system's interconnected configuration, booster pump stations are not evaluated by direct comparison of pumping capacity to the MDD of an individual pressure zone. Under normal and peak demand conditions, water may enter or leave a zone through a combination of direct supply, pumped transfers, and pressure-regulated connections. As a result, a simple capacity-to-demand comparison does not reliably indicate whether a booster station provides adequate support to the system. Booster station adequacy is therefore determined by model behavior under maximum day demand scenarios. Key performance criteria include tank refill capability, pump cycle recovery, sustained pressure maintenance, and operational stability. Booster stations did not exhibit operational deficiencies in the hydraulic model and were considered to provide adequate support under projected 2040 buildout demand conditions.

1.7.2.4. Pipeline Capacity Analysis

Pipelines are evaluated during peak hour demand and maximum day demand plus fire conditions to identify high velocities. Pipeline capacity analysis under peak hour demand revealed some pipelines that operate slightly above the five (5) feet-per-second (fps) threshold, as documented in the future hydraulic deficiencies. A low priority was placed on these projects, and should the City move forward with these projects, they should coincide with street paving activities where possible. Two of the identified projects also exceed 12 fps during fire flow.

1.7.3. Findings from the Future System Hydraulic Analysis

Potential deficiencies may arise from high velocities, low pressures, inadequate fire flows, or insufficient storage replenishment capability. Mitigation measures often include pipeline upsizing, inter-zone connection improvements, booster station upgrades, PRV modifications, and additional storage.

The future system analysis confirms that the City's potable water distribution system is positioned to meet projected 2040 buildout demands, supported by diverse supply sources, robust storage infrastructure, and interconnected hydraulic pathways.

1.7.3.1. Future System (Buildout) Hydraulic Deficiencies

Due to the highly gridded, looped, and efficient potable water system, only eight (8) projects were identified as hydraulically deficient for the future system at buildout (2040). For the majority of projects identified, the velocity under peak hour demands is marginally above the 5 fps threshold, and the projects are considered low priority. Projects identified based on hydraulic deficiencies within the existing system are incorporated into Recommended Improvements in **Section 9**.

Table 1.6 – Future (Buildout 2040) Hydraulically Deficient Pipes

Zone	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Priority
905	(12") 16"	Smith Ave between Sherman Ave and Border Ave connection to existing 24" main	622	Velocity > 5 fps *(Ultimate 5.5 - 6.9 fps)*	Low
	(12") 14"	Radio Rd south of Quarry St	233	Velocity > 5 fps *(Ultimate 5.1 fps)*	Low
	(12") 14"	6th Ave between Radio Rd and Compton Ave	1,052	Velocity > 5 fps *(Ultimate 6.1 fps)*	Low
	(12") 16"	Small segment in Railroad St east of Alcoa Cir	21	Velocity > 5 fps *(Ultimate 5.8 fps)*	Low
	(10") 16"	Alcoa Cir north of Railroad up to Alcoa PRS	1,025	Velocity > 5 fps *(Ultimate 12.0 fps)*	Low
(Sub zone) 780	(10") 16"	Alcoa Cir north of PRS to Rincon St	1,094	Velocity > 5 fps *(Ultimate 12.0 fps)*	Low
	(10") 12"	Segment in Rincon St west of Alcoa Cir	14	Velocity > 5 fps *(Ultimate 6.9 fps)*	Low
1060	(8") 10"	Kroonen Dr between Newton Ln and Peeler St	380	Velocity > 5 fps *(Ultimate 5.3 fps)*	Low
1220	(12") 16"	I-15 crossing between Bedford Canyon Road and Tuscany St	1,644	Velocity > 5 fps *(Ultimate 6.1 - 8.6 fps)*	Low
	(16") 24"	Duncan Way from Plantation Cir to the Hayden Reservoir	2,249	Velocity > 5 fps *(Ultimate 6.1 - 8.6 fps)*	Low
1380	(16") 20"	Upper Dr from Orange Crest St to Peregrin Dr	938	Velocity > 5 fps *(Ultimate 6.8 fps)*	Med

1.8. Water Quality (Section 8)

The City is committed to providing a safe, reliable, and high-quality potable water supply that meets or exceeds all regulatory requirements established by the U.S. Environmental Protection Agency (EPA) and the California State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW).Compliance is maintained with all federal and state standards, and the City's practices are designed to address both health-based and aesthetic water quality concerns.

- Primary Standards: Enforceable limits for contaminants with direct health impacts; all monitored parameters are maintained below Maximum Contaminant Levels (MCLs).
- Secondary Standards: Guidelines for taste, color, and odor; all measured values, except aluminum (which exceeded the individual secondary MCL but remained compliant on a running annual average), were below regulatory thresholds.

- Unregulated Contaminants: Monitored for emerging risks; not subject to mandatory treatment but tracked for future regulation.

The City performs routine sampling and laboratory analysis in accordance with federal and state regulations, including the Safe Drinking Water Act (SDWA), Title 22 of the California Code of Regulations, and the Disinfectants and Disinfection Byproducts Rule (DBPR). Results are published annually in the Consumer Confidence Report (CCR) and incorporated into this Water Master Plan to document ongoing compliance and system performance.

1.8.1. Key Water Quality Data

Routine monitoring confirms compliance with primary standards for clarity, microbiological safety, radioactive elements, inorganic and organic contaminants, and volatile compounds. Turbidity levels remain well below regulatory thresholds, indicating effective filtration. Microbiological testing verifies absence of harmful pathogens, while inorganic constituents such as nitrate and perchlorate are managed through treatment and blending. Synthetic and volatile organic compounds are consistently maintained below state and federal limits. For example, turbidity in groundwater ranges from 0.1 to 0.55 NTU, well below the 5 NTU secondary standard and the 0.3 NTU treatment performance criterion. Nitrate concentrations after blending average 30 mg/L, below the 45 mg/L MCL. Perchlorate levels are reduced to below 4 µg/L through targeted treatment and blending strategies.

Water quality monitoring in 2024 demonstrated consistent compliance with regulatory limits across all major contaminant categories. The City’s blending and treatment strategies effectively control contaminant levels, ensuring safe and reliable drinking water.

- Turbidity: Filtered water turbidity consistently ≤0.3 NTU in ≥95% of monthly measurements; groundwater turbidity ranged 0.1–0.55 NTU, well below the 5 NTU secondary MCL.
- Microbiological Contaminants: No positive samples for total coliform or E. coli detected in 2024.
- Radioactive Contaminants: Gross Alpha Particle Activity and Uranium levels remained below state and federal limits.
- Inorganic Contaminants: Nitrate concentrations in blended water averaged ~30 mg/L, below the 45 mg/L MCL. Perchlorate levels in treated/blended groundwater were maintained below 4 µg/L (MCL: 6 µg/L).
- Synthetic Organic Contaminants: 1,2,3-Trichloropropane (TCP) concentrations in finished water were kept below 3 ppt (MCL: 5 ppt).
- Volatile Organic Contaminants: Tetrachloroethylene (PCE) and Trichloroethylene (TCE) were detected in select wells but treated/blended to meet 5 µg/L MCLs.
- Lead and Copper: 2023 sampling showed 3 sites exceeded the lead action level (15 ppb); no sites exceeded the copper action level (1.3 ppm).

Secondary standards, including turbidity, manganese, and total dissolved solids, are monitored to preserve taste, color, and odor. All aesthetic parameters remain below the thresholds recommended by the EPA and adopted by the State of California.

1.8.2. Unregulated and Emerging Contaminants

The City proactively monitors unregulated and emerging contaminants, including Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS), under precautionary Notification Levels, to anticipate future regulatory changes and protect public health. Recent detections of PFOS and PFOA in groundwater prompted targeted treatment and blending strategies to achieve concentrations below both state and federal thresholds. In 2024, the EPA established MCLs for PFOS and PFOA at 4 ppt each, with compliance required by 2031. State Notification Levels are 6.5 ppt for PFOS and 5.1 ppt for PFOA, with Response Levels of 40 ppt and 10 ppt respectively. Wells exceeding these thresholds are treated at the Temescal Desalter and blended at Garretson Tank, reducing PFOS and PFOA concentrations to non-detect in finished water. Participation in the Unregulated Contaminant Monitoring Rule (UCMR) program enhances data collection for national regulatory development and positions the City as a proactive leader in addressing emerging water quality challenges.

1.8.3. Disinfection and Byproducts

Disinfection is essential for microbial deactivation, but it may produce regulated chemical byproducts. The City's operational controls ensure that both disinfectant residuals and byproducts remain well below regulatory limits.

- Disinfection Byproducts: Total trihalomethanes (TTHMs), haloacetic acids (HAA5), and bromate levels were consistently below MCLs.
- Disinfectant Residuals: Chloramines used for microbial control; residuals maintained within safe limits.

1.8.4. Operational Practices

The City employs advanced blending operations, treatment technologies, and distribution system maintenance to optimize water quality. Five blending facilities optimize water quality and maintain nitrate concentrations below regulatory limits. Active mixing systems in storage tanks prevent stagnation and reduce disinfection byproduct formation. Comprehensive flushing programs maintain chlorine residuals and remove sediments, supporting consistent water quality across all pressure zones. Flushing schedules include weekly, monthly, quarterly, and annual cycles, targeting over 100 locations citywide. Imported water from WMWD is treated at Lester and Sierra Del Oro plants before blending with groundwater, ensuring compliance with all regulatory standards.

1.8.5. Groundwater and Imported Water

The City's groundwater meets all primary standards following treatment and blending. Nitrate and perchlorate levels are managed through operational controls and desalting processes.

Imported water supplied by WMWD is sourced from the Metropolitan Water District (MWD) via the Colorado River and State Water Project. Imported water supplements local supplies and is treated and blended to ensure compliance with all standards. This approach provides flexibility and resilience in meeting system demand.

- Imported water from WMWD is treated and blended with local groundwater to meet all regulatory standards.

1.8.6. Conclusions

The City's potable water supply consistently meets or exceeds all state and federal water quality standards. Strategic blending, advanced treatment, and proactive monitoring ensure the safety, reliability, and aesthetic quality of drinking water delivered to the community.

The City's integrated program of treatment, blending, and system optimization demonstrates a proactive approach to regulatory compliance, emerging-contaminant management, and long-term public health protection. Continued investment in monitoring technologies and infrastructure will support sustained water quality and operational resilience well into the planning period.

Key findings include consistent turbidity performance below 0.3 NTU, nitrate blending strategies that achieve an average concentration of 2.3 mg/L during 2025 (well below the 45 mg/L MCL), and effective perchlorate mitigation through targeted treatment and blending. PFAS management remains a critical priority, with advanced treatment at the Temescal Desalter reducing PFOS and PFOA concentrations to below 10 ppt in finished water—significantly lower than both state and federal thresholds. Operational strategies such as active tank mixing and systematic flushing have minimized disinfection byproducts and preserved chlorine residuals across all pressure zones. PFAS treatment technologies, expansion of blending capacity, and enhanced monitoring for emerging contaminants ensure sustained regulatory compliance, protect public health, and maintain consumer confidence in water quality.

1.9. Master Plan Improvements (Section 9)

Section 9 presents the Recommended Improvements—projects identified through the condition assessments and the existing and future system analyses in **Sections 2**, **6**, and **7**.

The Recommended Improvements are the result of this Master Plan effort and are identified independently of the City's CIP. Where this master plan identifies improvements that are also included in the City's Capital Improvement Plan Fiscal Year (FY) 2026-FY2035 at the time of the adoption of this Master Plan, those projects are denoted with (**Existing CIP**).

1.9.1. Risk-Based Framework

The risk-based analysis used was based on the intersection between the consequence of failure (CoF) and likelihood of failure (LoF). The CoF is used to evaluate the consequences, or impacts, which could affect the City, the water service users, or the public health and safety if a failure of that facility were to occur. The LoF is used to evaluate the probability of a particular asset failing based on known information. Both the LoF and CoF are assigned a value between 1 (low) to 5 (high). A low LoF score indicates that the facility is not likely to fail, while a high LoF indicates the facility is likely to fail or has already failed. A low CoF score indicates that relatively little to no interruption of service or public safety threat would occur if the facility were to fail. Based on the intersection of the LoF and CoF, facilities fall within a low-risk, medium-risk, or high-risk zone. High-risk assets include aging wells, pump stations with low efficiency, and pipelines nearing end of life.

1.9.2. Basis of Planning Level Cost Opinions

Note that planning-level cost opinions, presented in 2026 dollars, included in the Master Plan are provided for comparative evaluation and long-term financial planning only and may differ from final project costs as project scopes are refined and market conditions evolve.

The cost opinions are developed by applying a percentage factor for planning, design, construction management, contingency, and City Administrative and Legal Costs to the estimated construction opinion.

Table 1.7 – Summary of Elements Used to Estimate Recommended Improvement Costs

	Pipelines	WTPs	Tanks	Wells	Booster Pump Stations	Pressure Reducing Stations
Estimated Construction Opinion						
Planning	5%	5%	5%	5%	5%	5%
Design	10%	10%	10%	10%	10%	10%
Construction Management, Inspection, and Materials Testing	15%	15%	15%	15%	15%	15%
Contingency	25%	25%	25%	25%	25%	25%
City Administrative and Legal Costs	5%	5%	5%	5%	5%	5%

1.9.3. Recommended Improvements

The Recommended Improvements were developed using a risk-based methodology applied across all major asset classes, including pipelines, water meters, water treatment facilities, storage tanks, groundwater wells, booster pump stations, and pressure reducing stations. Asset risk was evaluated based on the Likelihood of Failure (LOF) and Consequence of Failure (COF), informed by available condition data, asset age, operational performance, hydraulic modeling results, and professional engineering judgment.

Table 1.8 – Recommended Improvements

Improvement No.	Improvement Description
W1: Water Distribution System Improvements	
W1-1	Systematic Water Distribution System Replacement Considering Deficiencies
W1-2	Systematic Meter Replacement
W1-3	SCADA Improvements
W2: Treatment Plant Improvements	
W2-1	Temescal Desalter WTP Improvements
W2-2	Lester WTP Improvements
W2-3	Sierra Del Oro WTP Improvements (Existing CIP)
W2-4	Glen Ivy WTP Improvements
W3: Storage Tank Improvements	
W3-1	Welded Steel Storage Tank Recoating
W3-2	Pressure Zone 1380 Improvements
W4: Well Improvements	
W4-1	Systematic Groundwater Well Pumping Equipment Rehabilitation
W4-2	New Well 34
W5: Booster Pump Station Improvements	
W5-1	Systematic Booster Pump Station Rehabilitation
W6-1	Systematic PRS Station Rehabilitation

1.9.4. Next Steps

Recommended Improvements identified in **Section 9** reflect system needs identified through planning-level analysis. Inclusion of the Recommended Improvements in the City's adopted CIP and implementation schedule is subject to the City's final prioritization, funding availability, environmental review, and detailed engineering design.

Financial planning is critical as escalating replacement costs highlight the need for long-term capital improvement planning and prioritization based on risk and remaining service life. The City's approach to asset management, combined with its commitment to maintaining water quality and service reliability, will ensure the continued sustainability of its potable water system.

SECTION 2 - EXISTING INFRASTRUCTURE

2.1. GENERAL DESCRIPTION

The City of Corona Utilities Department (City) currently provides water service to approximately 159,000 people[1] through 46,000 domestic service connections to an area approximately 39 square miles in size. This section summarizes the existing potable water system infrastructure, describes the condition of the potable water system infrastructure, documents the remaining service life, and explains the risk-based critical asset approach to capital improvement planning.

The potable water system infrastructure discussed in this section can be generally summarized under the following categories.

- Pressure Zones
- Water Supply and Treatment
- Storage and Distribution System Infrastructure
- Water System Control and Safety Components
- Customer Services (specifically water meters)

2.1.1. Sphere of Influence

The Riverside County Local Agency Formation Commission (Riverside LAFCO) is the regional planning authority that has responsibility for establishing spheres of influence (SOI) for each local agency in the County, including the sphere of influence for the City. The City generally provides water service to areas within its SOI. The City's SOI includes areas within the City's boundary and within neighboring jurisdictions, such as Coronita, an unincorporated area, and El Cerrito and portions of Temescal Canyon, census-designated places, in the County. Neighboring water purveyors also provide water service to portions of the City's SOI. For example, the City of Riverside and the Home Gardens County Water District provide water service to the Home Gardens area in the easterly SOI; the Western Municipal Water District (WMWD) provides water service to the Eagle Valley area in the southerly SOI; and the Lee Lake Water District provides water service to portions of the Temescal Canyon area also in the southerly SOI. A map showing the boundaries of the City's SOI can be found in **Figure 2.2**.

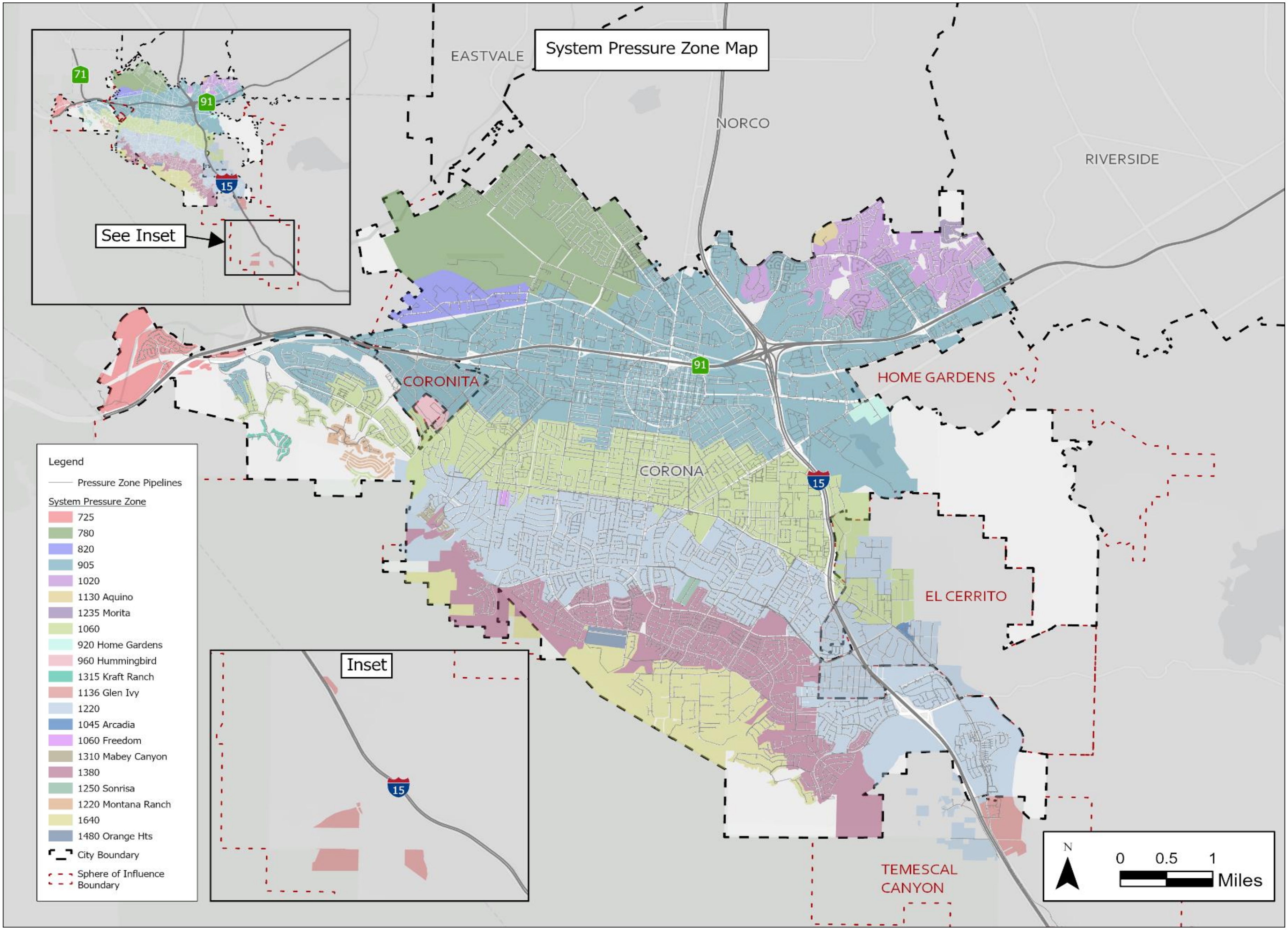
2.2. PRESSURE ZONES

The City's potable water system consists of twenty-two (22) pressure zones that serve elevations varying from a low point of 430 feet to a high point of 1,520 feet. Tanks are placed at the same hydraulic grade as the service zone it services to maintain the pressure within the zone. Smaller pressure zones (or subzones) are supplied by larger pressure zones through pressure reducing stations or booster pump stations. A hydraulic schematic of the City's system is shown in **Figure 2.1**. A map of all the City's pressure zones can be found in **Figure 2.2**. Refer to **Table 5.2** in **Section 5** for a summary of pressure zone names and aliases.

[1] City of Corona Brochure from ESRI 2024 data

City of Corona
Figure 2.1 Existing Water System Hydraulic Schematic

Figure 2.2 – System Pressure Zone Map



2.2.1. Zone 725 (Zone 1)

Zone Overview

Zone 725 is located in the western portion of the City's service area, bounded by the 91 Freeway to the southeast and the City boundary to the west. The zone also includes a small commercial district north of Green River Road. Ground elevations within Zone 725 are generally below 600 feet above mean sea level (AMSL). The zone operates at the hydraulic grade established by the Green River Tank, which provides the controlling hydraulic grade line (HGL) for service pressures within the zone.

Storage Facilities

- Green River Tank
  - Provides primary storage and establishes system pressures for Zone 725.
  - Historically supplied by the Green River Water Treatment Plant (WTP) and the WR-29 turnout (both currently inactive).

Supply Sources and System Interconnections

The current water supply to Zone 725 is delivered through the following inter-zone facilities:

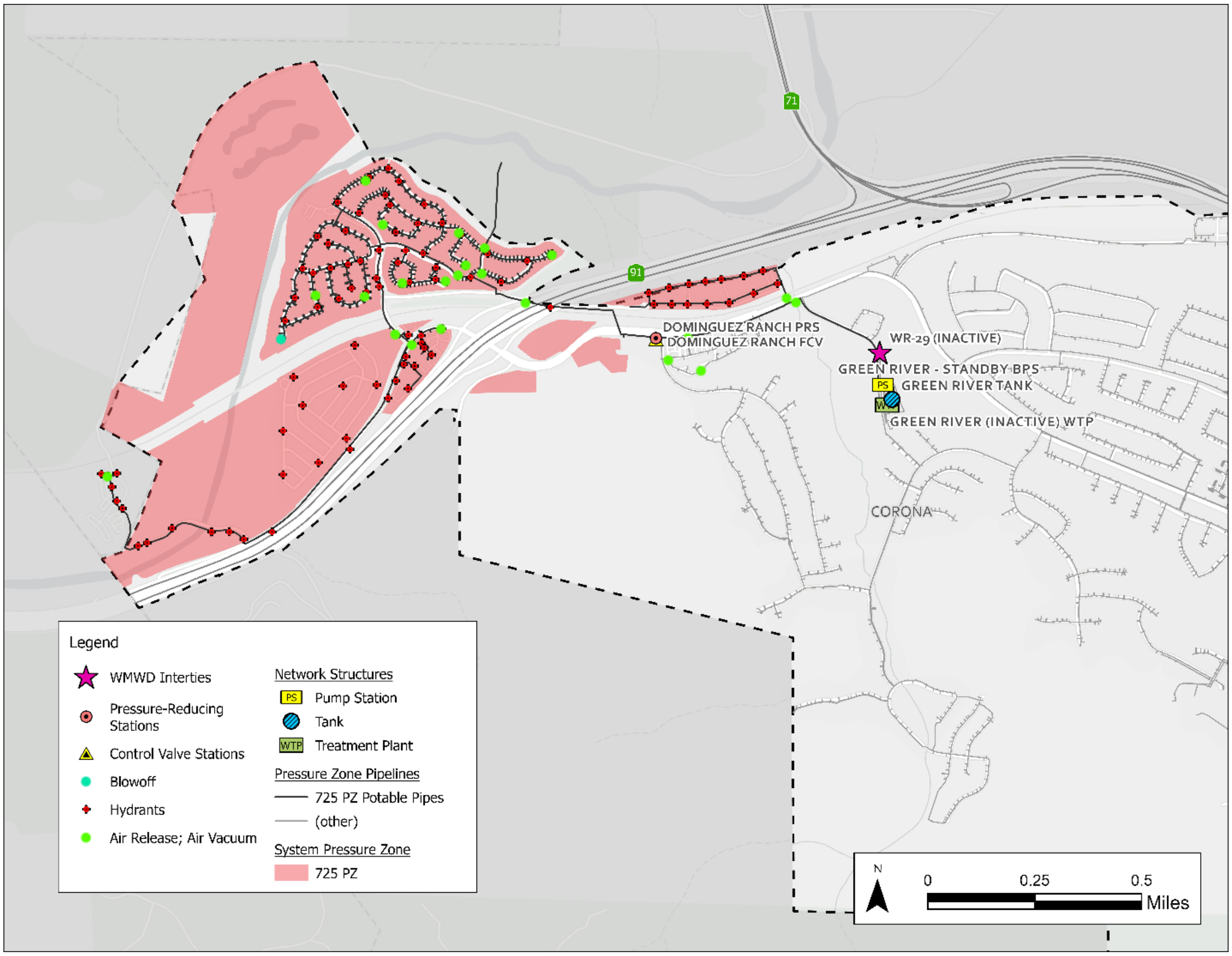
- Dominguez Ranch Sustaining Station – Supplies water from Zone 905.
- Nicholas Flow Control Valve – Supplies water from Zone 1060.
- Green River Booster Pump Station – Lifts water from Zone 725 to Zone 1060.

Zone Characteristics

- Primarily residential areas with a small commercial corridor along Green River Road.
- The inactive status of the Green River WTP and WR-29 turnout places full reliance on inter-zone supply from Zones 905 and 1060.
- Booster pump station capacity between Zones 725 and 1060 is important for operational flexibility.
- Pressure reducing stations (PRS) operations must maintain reliability due to their role as the primary supply source for the zone.

A system map illustrating Zone 725 boundaries and facilities is provided in **Figure 2.3**.

Figure 2.3 – System Pressure Zone 725



2.2.2. Zone 905 and Subzones (Zone 2)

Zone Overview

Zone 905 spans the City from east to west and is one of its largest pressure zones. It is bounded by Olive Street to the south, Zone 725 to the west, Zone 780 to the north, and Zone 1020 to the east. Ground elevations range from approximately 760 to 600 feet AMSL. The zone operates at the hydraulic grade established by its multiple storage tanks.

Storage Facilities

Zone 905 is supplied and pressurized by four storage tanks:

- R-3 Tank – Can serve Zone 905 directly and can receive water from Zone 1060 via the R-3 PRS.
- Cresta Verde Tank – Supplies Zone 905, provides water to the Riverside Emergency Interconnection, and can supply Zone 1020 through the Cresta Verde BPS
- Mangular Tank – Receives water from the West Wells and serves as a blending facility; supplies Zones 1060 and 1220 through the Mangular booster pump stations.
- Garretson Tank – Receives water from the Temescal Desalter and Temescal Desalter Wells. While Garretson Tank serves as a blending facility and forebay for the two booster pump stations (Garretson Zone 3 BPS (supply to Pressure Zone 1060) and Garretson Zone 4 BPS (supply to Pressure Zone 1220)), it is not physically connected to Zone 905.

Supply Sources and System Interconnections

Zone 905 receives and distributes water through numerous inter-zone facilities, including:

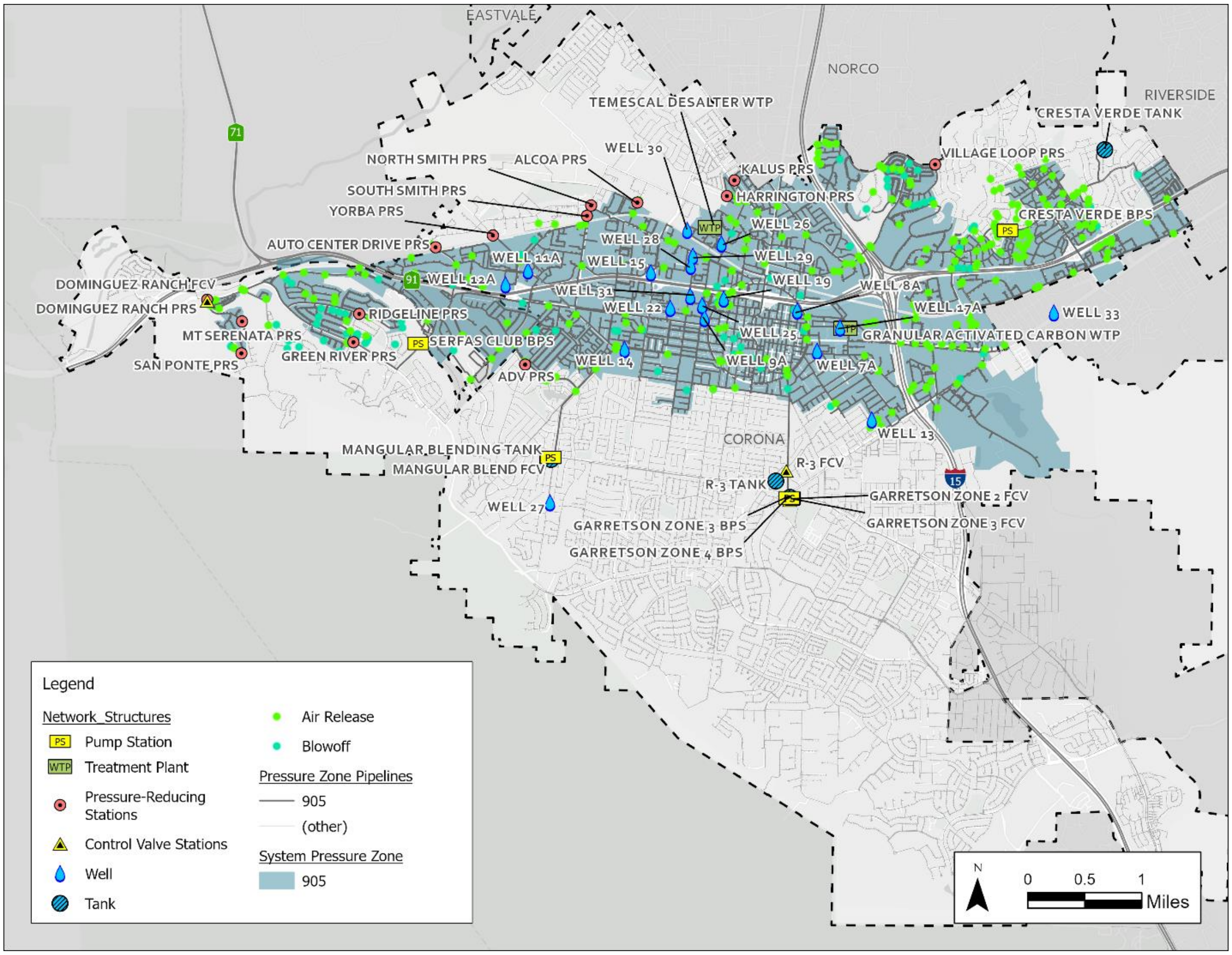
- R-3 PRS – Transfers water from Zone 1060 into Zone 905.
- Cresta Verde PRS – Transfers water from Zone 1020 into Zone 905.
- Sampson FCV- Transfers water from Zone 1060 to Zone 905.
- Garretson Booster Pump Stations – Lifts water to Zones 1060 and 1220.
- Mangular Booster Pump Stations – Provide additional supply to Zones 1060 and 1220.
- Interconnections – Water can also be transferred through Yuma Village Loop, Sampson, Avenida Del Vista, Ridgeline, Green River, San Ponte, and Mt. Serenata PRSs to lower pressure zones.

Zone Characteristics

- One of the most operationally critical and hydraulically complex zones in the system.
- Receives water from multiple potable sources, including desalter wells and groundwater treatment facilities.
- Acts as a distribution hub, supplying multiple upstream higher elevation zones.
- Redundancy is high due to the number of PRSs, tanks, and booster pump stations.

A system map illustrating Zone 905 boundaries and facilities is provided in **Figure 2.4**.

Figure 2.4 – System Pressure Zone 905



NOTE: The "Hydrant" layer was turned off for this pressure zone, to showcase other GIS attributes.

2.2.2.1. Subzone 780

Subzone Overview

Subzone 780 is located in the northernmost portion of the City. The zone extends from the City of Norco at the northeast boundary and continues south along Butterfield Park to the Railroad Street corridor. This subzone serves residential areas situated below approximately 600 feet AMSL. The zone operates under the hydraulic grade established by the upstream Zone 905 PRSs supplying this area.

Storage Facilities

Subzone 780 does not contain storage facilities. Pressure and supply conditions are maintained entirely through PRS operations from Zone 905.

Supply Sources and System Interconnections

Water is delivered to Subzone 780 exclusively from Zone 905 through the following pressure-reducing stations:

- River & Kalus PRS – Provides primary supply from Zone 905.
- Harrington PRS – Secondary PRS supplying the southern portion of the subzone.
- Alcoa PRS – Serves parcels east of Butterfield Park.
- North Smith PRS – Serves the western edge of Subzone 780.

Subzone Characteristics

- The subzone is entirely residential.
- All service pressures depend on reliable PRS functionality due to the absence of local storage.
- The area includes several cul-de-sacs and looped mains that benefit from multiple PRS inputs.
- PRS redundancy from four stations provides operational flexibility.

A system map illustrating Subzone 780 is provided in **Figure 2.5**.

Figure 2.5 – System Pressure Zone 780

2.2.2.2. Subzone 820

Subzone Overview

Subzone 820 is located southwest of Subzone 780 and serves residential neighborhoods generally situated between Railroad Street to the south and Butterfield Park to the north. The zone is bounded to the east by Smith Avenue and to the west by the Prado Reservoir. Subzone 820 operates under the hydraulic grade supplied from Zone 905.

Storage Facilities

This subzone does not have dedicated storage facilities. Pressure and supply conditions originate from pressure reducing stations connected to Zone 905.

Supply Sources and System Interconnections

Water is delivered from Zone 905 through the following PRS facilities:

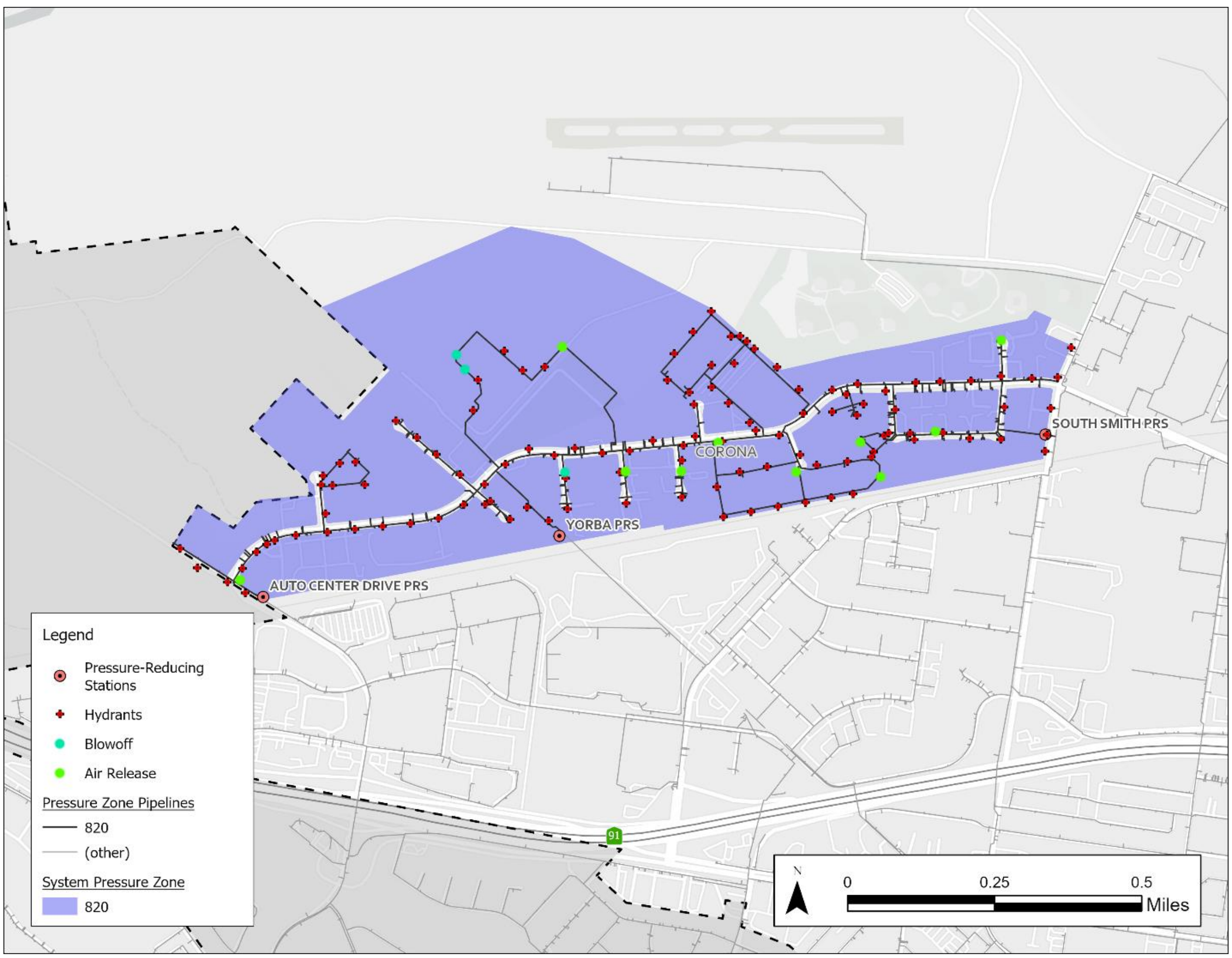
- South Smith PRS – Serves the eastern portion of Subzone 820.
- Yorba PRS – Serves the central zone along Yorba Street.
- Auto Center Drive PRS – Provides supply to the western portion of the subzone.

Subzone Characteristics

- Subzone is primarily composed of commercial and industrial land uses.
- All supply depends on PRS reliability; no local storage is provided.
- Multiple PRSs ensure redundant supply paths.

A system map illustrating Subzone 820 boundaries and facilities is provided in **Figure 2.6**.

Figure 2.6 – System Pressure Zone 820



2.2.3. Zone 1020 and Subzones

Zone Overview

Pressure Zone 1020 is located in the northeastern portion of the City. It is bounded by the City of Norco to the north, the 91 Freeway to the south, and the City of Riverside to the east. A small neighborhood located approximately half a mile west of the main zone footprint also falls within Zone 1020. Ground elevations in this zone are supported by the hydraulic grade established by the Yuma Tank.

Storage Facilities

Zone 1020 operates with one primary storage facility:

- Yuma Tank – Provides operational storage and establishes the hydraulic grade line for Zone 1020.
- Border Tank – See Zone 1060.

Supply Sources, System Interconnections, and Intercity Connections

Zone 1020 receives and distributes water through the following system interconnections:

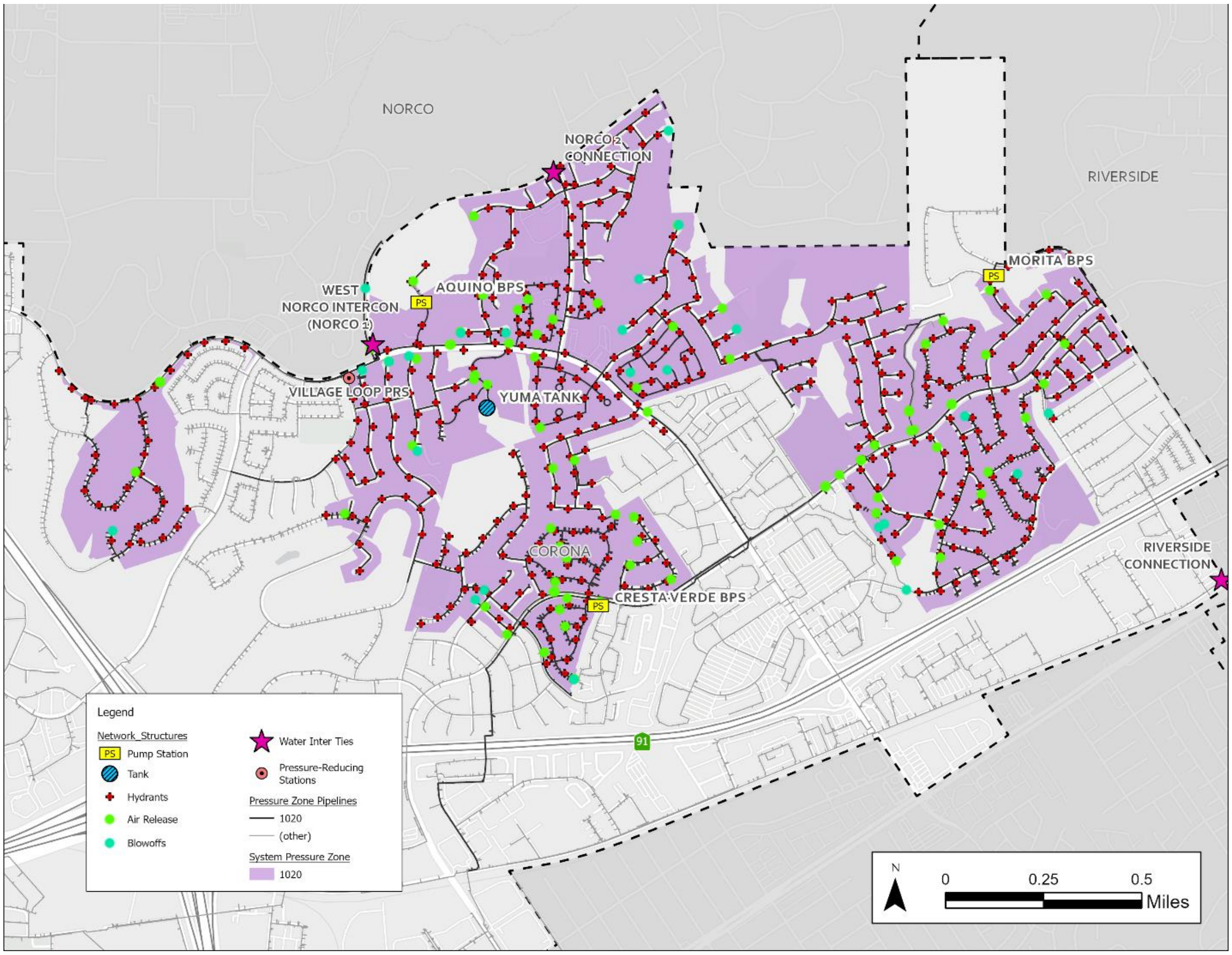
- Incoming Supply:
    - Cresta Verde Booster Pump Station – Lifts water from Zone 905 to Zone 1020.
    - Sampson PRS – Supplies water from Zone 1060 to Zone 1020.
    - Yuma Village Loop PRS – Supplies water from Zone 1020 back into Zone 905.
    - Aquino Hydro-Pneumatic Pump Station – Lifts water from Zone 1020 into Zone 1130.
    - Morita Hydro-Pneumatic Pump Station – Lifts water from Zone 1020 into Zone 1235.
- Intercity Connections:
    - Zone 1020 provides water to the City of Norco through two interconnections, commonly referred to as Norco-1 and Norco-2.

Zone Characteristics

- Zone 1020 is a major mid-elevation zone serving mixed residential neighborhoods.
- It functions as both a receiving and distributing zone, supplying two higher-elevation zones (1130 and 1235).
- System performance depends on PRS reliability due to the zone's dual role as both a supply and passthrough zone.
- The hydraulic configuration allows operational flexibility between Zones 905 and 1060.
- The presence of City-to-City interconnection (Corona–Norco) adds an additional operational layer for regional supply coordination.

A system map illustrating Zone 1020 and its subzones is provided in **Figure 2.7**.

Figure 2.7 – System Pressure Zone 1020



2.2.3.1. Subzone 1130 (Aquino)

Subzone Overview

Subzone 1130 (Aquino) is a small, isolated high-elevation pocket located within the larger footprint of Zone 1020, generally surrounding Aquino Circle. This area requires a higher hydraulic grade than the surrounding neighborhoods, necessitating a dedicated boosted subzone.

Storage Facilities

Subzone 1130 does not contain any storage facilities. Pressures within the subzone are maintained entirely through pumping from Zone 1020.

Supply Sources and System Interconnections

Water is delivered to Subzone 1130 through:

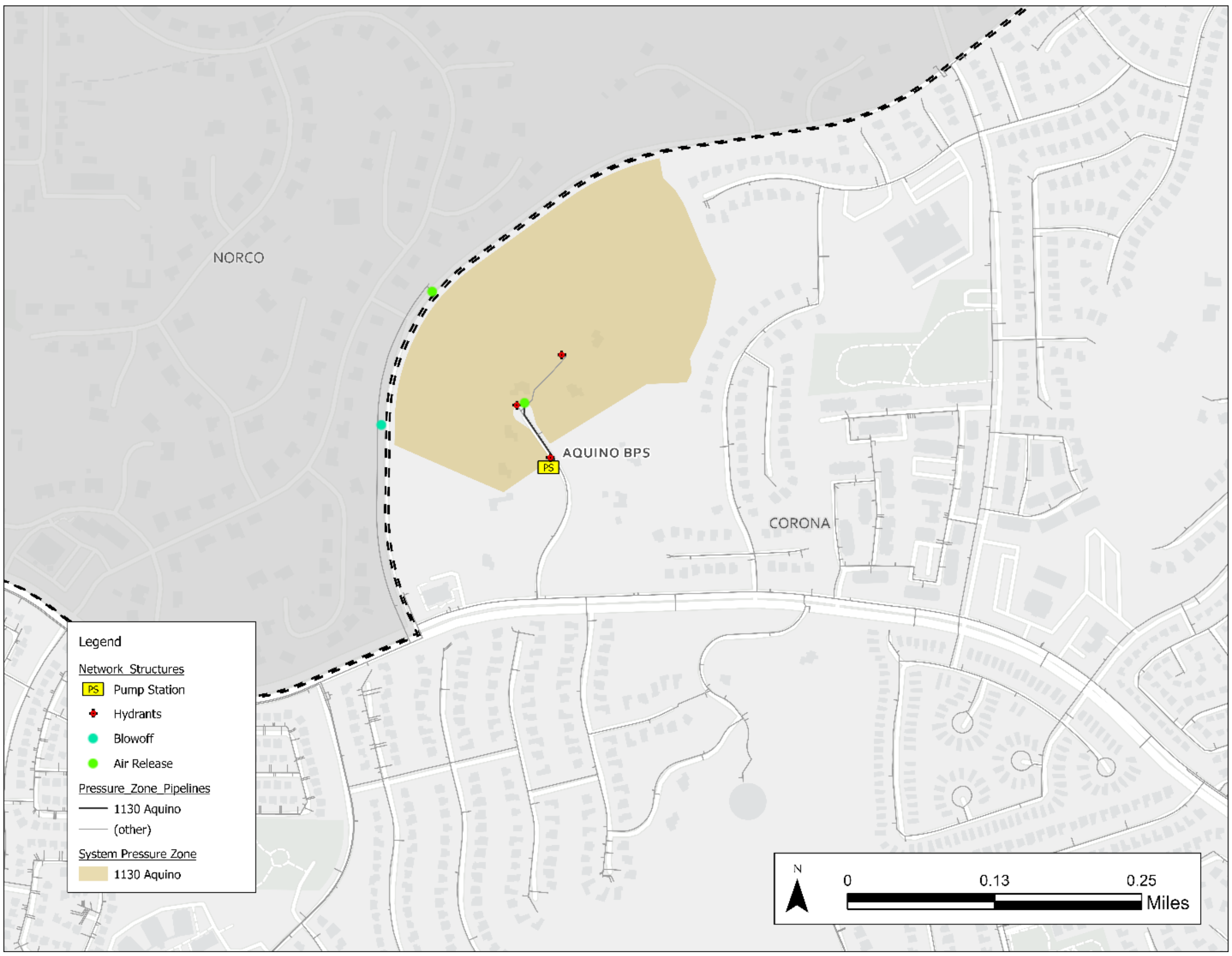
- Aquino Hydro-Pneumatic Pump Station – Lifts water from Zone 1020 to Zone 1130.
- No PRSs or inter-zone transfer facilities are associated with this subzone.

Subzone Characteristics

- Very small service area.
- Fully dependent on Zone 1020 for supply.
- Operates as a localized boosted pocket to maintain adequate service pressures.
- No downstream or lateral distribution; all flow remains within the subzone.

A system map illustrating Subzone 1130 is provided in **Figure 2.8**.

Figure 2.8 – System Pressure Zone 1130



2.2.3.2. Subzone 1235 (Morita)

Subzone Overview

Subzone 1235 (Morita) serves a small neighborhood located within the boundary of Zone 1020. The subzone includes portions of Baghdady Street, Wolfson Street, and Wycliffe Street. Due to the elevation in this area, it requires a higher pressure than Zone 1020 can supply directly.

Storage Facilities

- Subzone 1235 does not include any storage tanks. Hydraulic grade is maintained solely by pumping from Zone 1020.

Supply Sources and System Interconnections

Water is supplied to Subzone 1235 through:

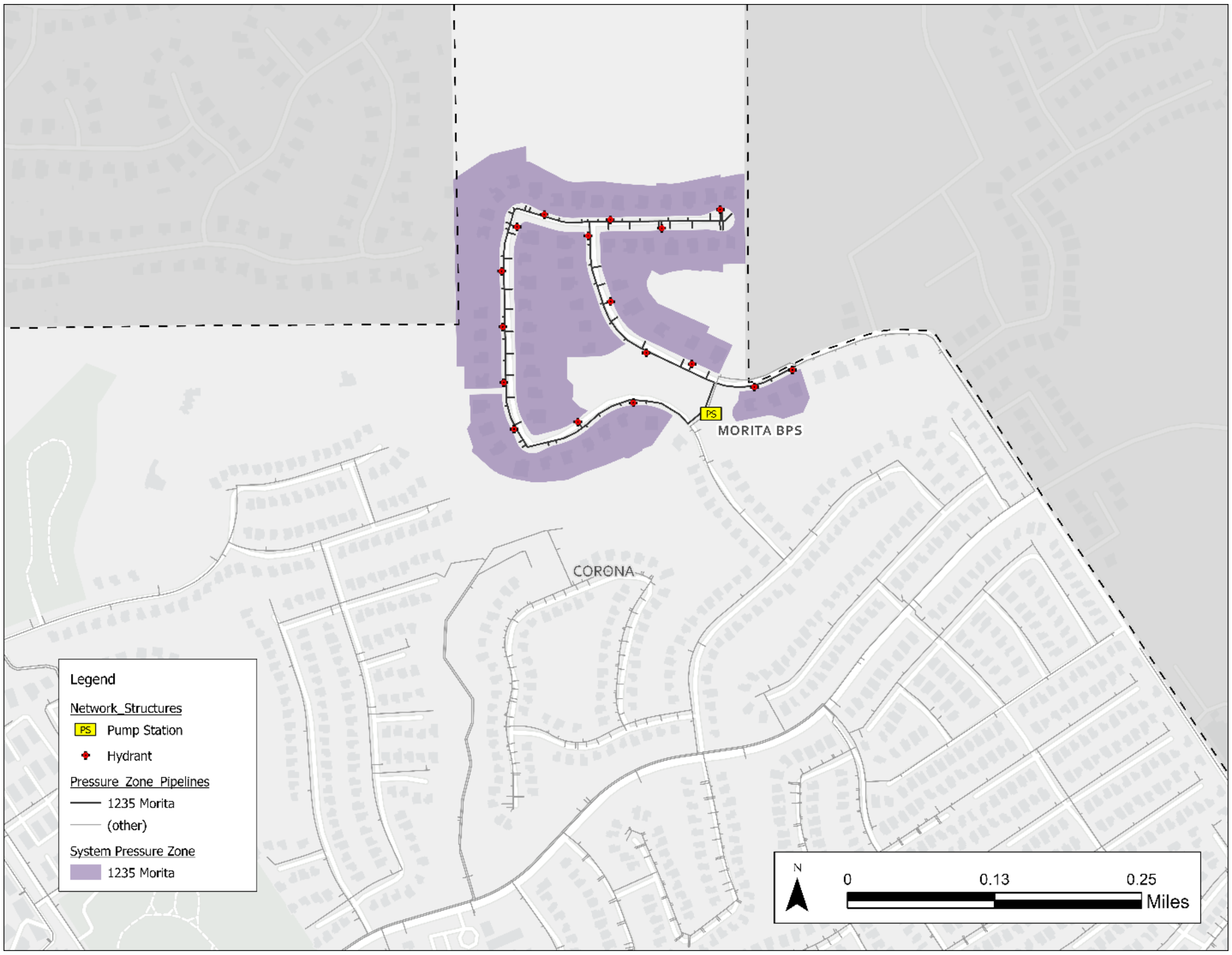
- Morita Hydro-Pneumatic Pump Station – Lifts water from Zone 1020 to Zone 1235.
- No pressure-reducing stations or interconnections are associated with this subzone.

Subzone Characteristics

- Small, localized pressure zone created to meet elevation-specific pressure needs.
- Entirely reliant on Zone 1020 and the Morita Hydro-Pneumatic Pump Station for water supply.
- Contains no supplemental facilities such as storage or PRS assets.
- Functions solely as a boosted high-elevation extension of Zone 1020.

A system map illustrating Subzone 1235 is provided in **Figure 2.9**.

Figure 2.9 – System Pressure Zone 1235



2.2.4. Zone 1060 and Subzones (Zone 3)

Zone Overview

Pressure Zone 1060 spans the central portion of the City of Corona and serves customers at elevations ranging from approximately 760 to 920 feet above mean sea level (AMSL). The zone operates at the hydraulic grade established by the Lester, Sierra Del Oro, and Border Tanks, which collectively provide storage capacity and maintain system pressures throughout this area.

Zone 1060 includes a mix of residential, commercial, and institutional land uses. Due to its central location and elevation profile, Zone 1060 also serves as a major intermediate zone that supports water transfers to several higher-pressure zones.

Storage Facilities

Zone 1060 relies on four primary storage facilities, which establish the HGL, provide fire and operational storage, and maintain pressure stability throughout the zone:

- Lester Tank #1 – Provides primary operational storage for the central distribution area and stabilizes system pressures during varying demand conditions.

- Lester Tank #2 – Functions alongside Lester Tank #1 to increase available storage volume and enhance system reliability during peak demand or supply interruptions.
- Sierra Del Oro Tank – Supports the western portion of Zone 1060 by providing operational and fire storage and maintaining adequate pressures in the Sierra Del Oro and Green River areas.
- Border Tank – Hydraulically part of Zone 1060 and provides operational storage and flexibility. The tank may be drawn down to supply water to the Mangular Blending Facility which can pump blended water back into Zone 1060.

Supply Sources and System Interconnections

Zone 1060 receives water from multiple treatment plants and system interconnections, along with booster and pressure-reducing facilities that manage flow between adjacent zones:

- Lester Water Treatment Plant (WTP) – Treats and supplies potable water to Zone 1060. The plant receives water through the WR-19 turnout.
- Sierra Del Oro Water Treatment Plant (WTP) – Treats and supplies potable water to Zone 1060. The plant receives water through the WR-33 turnout.
- Temescal Desalter – Supplies Zone 1060 through the Temescal Desalter pipeline and also contributes to the Garretson and Mangular systems.
- Garretson Zone 3 Booster Pump Station – Lifts water from the Garretson Tank to Zone 1060.
- Lester Booster Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Chase Booster Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Montana Ranch Hydro-Pneumatic Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Border Booster Pump Station (BPS) – Lifts water from Zone 1060 to Zone 1380.
- R-3 PRS – Transfers water from Zone 1060 to Zone 905.
- Sampson PRS – Transfers water from Zone 1060 to Zone 905.
- Magnolia PRS – Transfers water from Zone 1060 to Zone 905 and Home Gardens.
- Arlington Desalter PRS – Supplies treated desalter water into Zone 1060.
- Avenida Del Vista PRS – Transfers water from Zone 1060 to Zone 905.
- Hummingbird PRS – Transfers water from Zone 1060 to Zone 905 and 960.
- Ridgeline PRS – Transfers water from Zone 1060 to Zone 905.
- Green River PRS – Transfers water from Zone 1060 to Zone 905.
- San Ponte PRS – Transfers water from Zone 1060 to Zone 905.
- Mt. Serenata PRS – Transfers water from Zone 1060 to Zone 905.

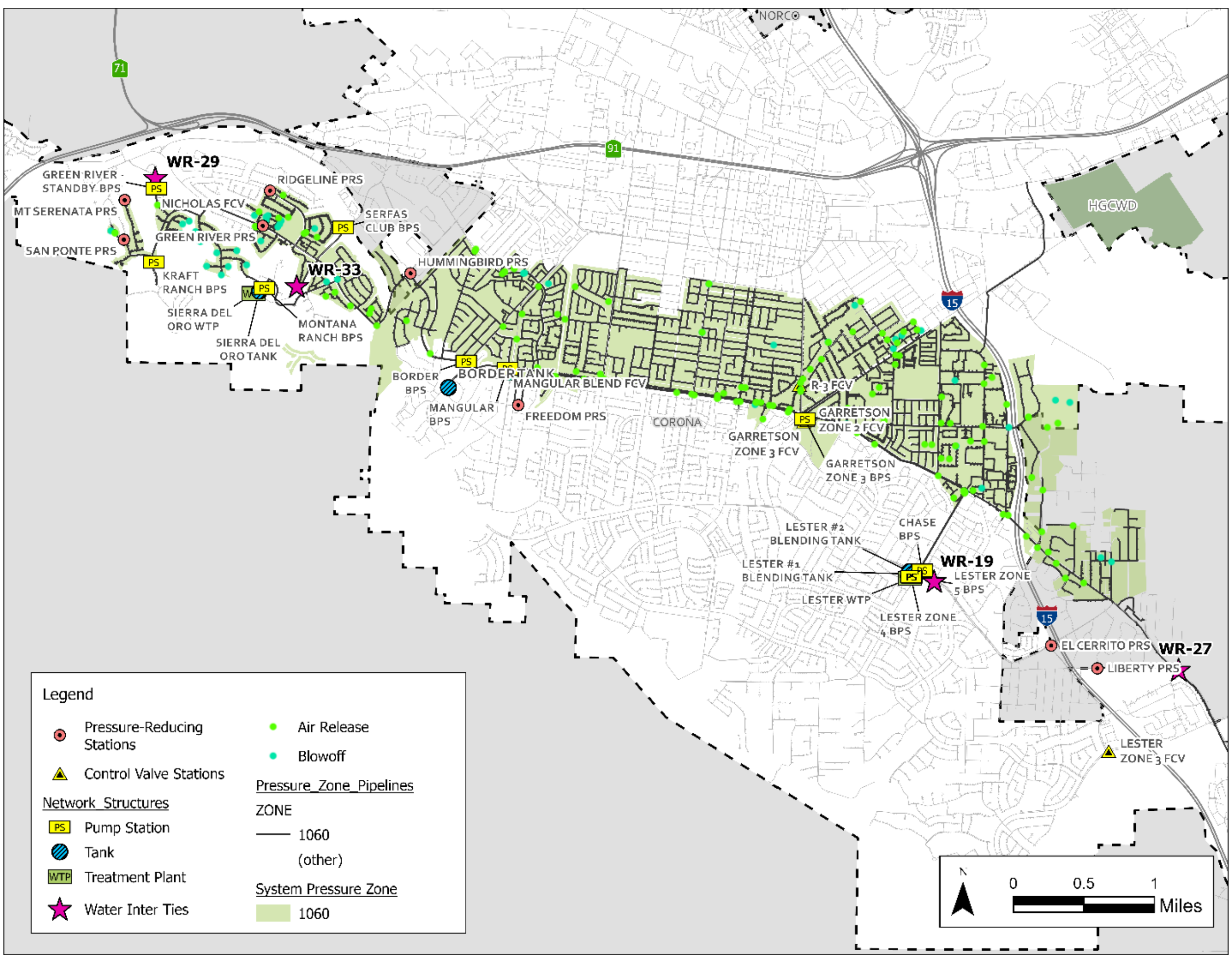
- Serfas Club Booster and Pressure Reducing Station - Transfers water between Zone 1060 and Zone 905.

Zone Characteristics

- A centrally located, mixed-use service area that supports several surrounding higher and lower elevation zones.
- Multiple water treatment plants located within the zone.
- Extensive inter-zone connectivity that enables operational flexibility.
- Numerous PRSs and BPSs that maintain pressure balance and manage hydraulic transitions across adjacent zones.
- Strategic importance as a central distribution hub for Zones 905, 1220, and 1380.

A system map illustrating Zone 1060 boundaries, pipelines, and facilities is provided in **Figure 2.10**.

Figure 2.10 – System Pressure Zone 1060



NOTE: The “Hydrant” layer was turned off for this pressure zone, to showcase other GIS attributes.

2.2.4.1. Subzone 920 (Home Gardens)

Subzone Overview

Subzone 920 (Home Gardens) is a small pressure subzone located within Zone 1060 near the eastern boundary of the City. The subzone is bounded by 6th Street to the north, All American Way to the south, and Dubley Way to the west. This subzone primarily serves residential areas at lower elevations within Zone 1060.

Supply Sources and System Interconnections

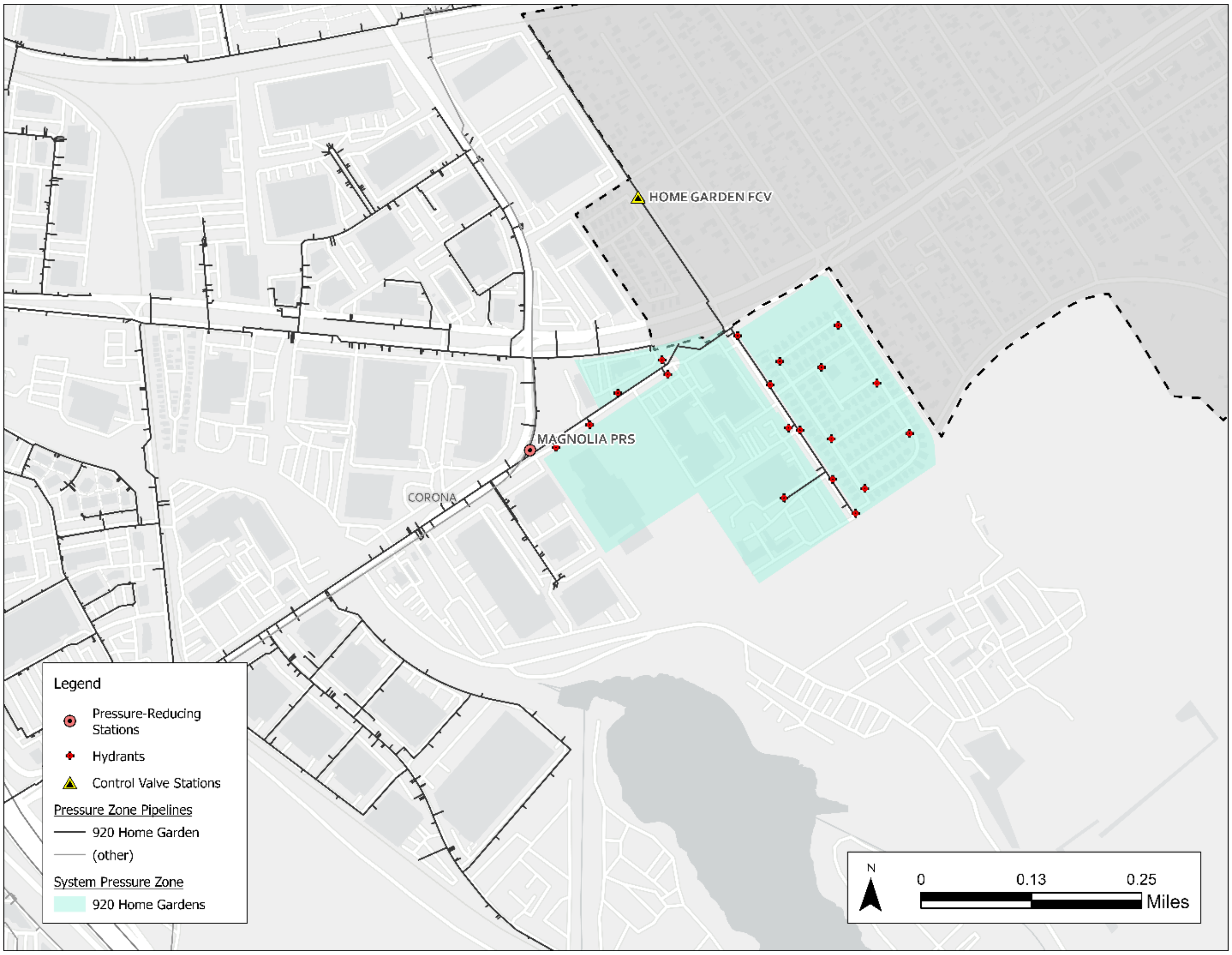
- Magnolia PRS – Supplies water from Zone 1060 to Subzone 920.
- In addition to serving local demand, Subzone 920 also functions as a transfer point for water delivered from the City of Corona to the unincorporated Home Gardens community. This transfer is monitored through a dedicated flow meter located at the system boundary.

Subzone Characteristics

- A small, mostly residential service area located at the western edge of Zone 1060.
- Reliance on a single PRS supply connection, which emphasizes the importance of reliable operations at the Magnolia PRS.
- Hydraulic positioning that allows the City to supply water to the adjacent unincorporated Home Gardens community under monitored conditions.

A system map illustrating Subzone 920 and its boundaries is provided in **Figure 2.11**.

Figure 2.11 – System Pressure Zone 920



2.2.4.2. Subzone 960 (Hummingbird)

Subzone Overview

Subzone 960 (Hummingbird) is a small, embedded subzone situated between portions of Zones 905 and 1060. The subzone is bounded generally by Paseo Grande to the southeast and Pine Crest Drive to the west. The area consists primarily of residential neighborhoods requiring a localized elevated hydraulic grade.

Storage Facilities

This subzone does not contain any dedicated storage facilities. Pressures within the subzone are established through pumping from Zone 1060.

Supply Sources and System Interconnections

Water supply to Subzone 960 is provided through the following facility:

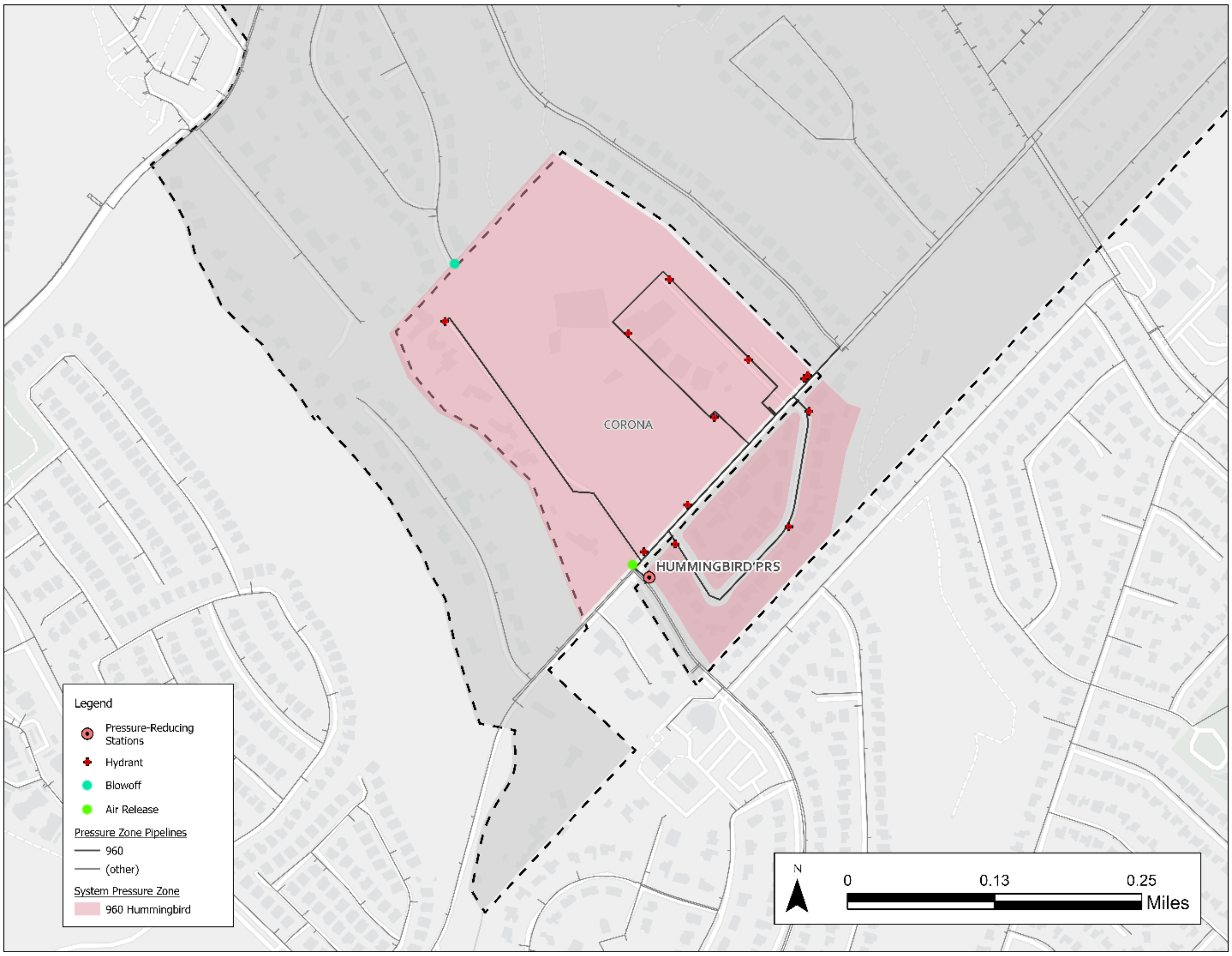
- Hummingbird PRS – Supplies water from Zone 1060 to Subzone 960.

Subzone Characteristics

- A compact residential service area located between major system zones.
- Full reliance on the Hummingbird PRS to maintain local pressures.
- No direct storage, which increases the operational importance of dependable PRS performance.

A map of Subzone 960 is provided in **Figure 2.12**.

Figure 2.12 – System Pressure Zone 960



2.2.4.3. Subzone 1315 (Kraft Ranch)

Subzone Overview

Subzone 1315 (Kraft Ranch) serves the neighborhood located along Oakridge Drive, extending beyond the intersection of Oakridge Drive and San Ramon Drive. The area includes homes at higher elevations that require pumping to maintain adequate service pressure.

Storage Facilities

- This subzone does not contain any dedicated storage facilities. Pressure is maintained through booster pumping from Zone 1060.

Supply Sources and System Interconnections

Water supply to Subzone 1315 is delivered through:

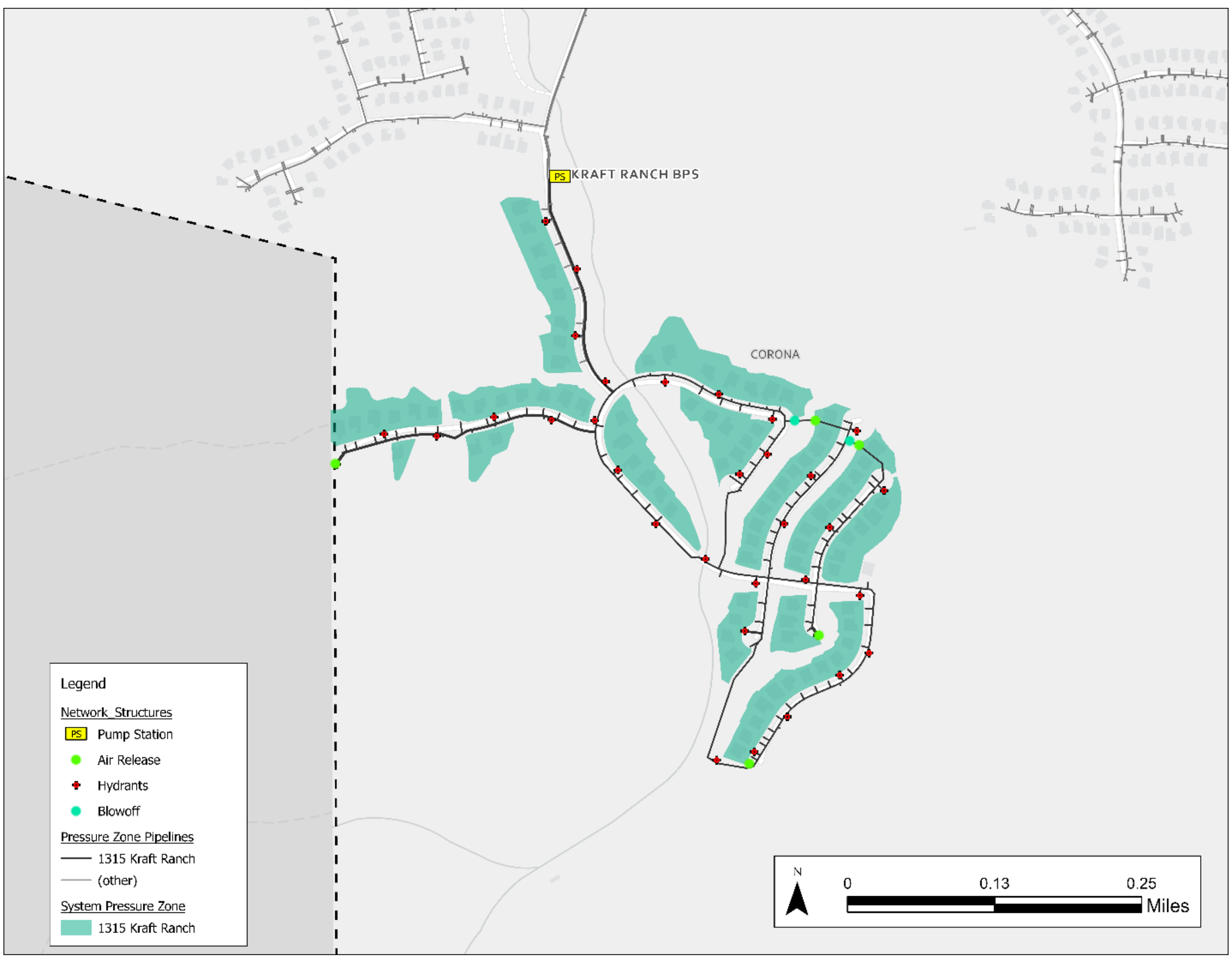
- Kraft Ranch Hydro-Pneumatic Pump Station – Lifts water from Zone 1060 to Subzone 1315.

Subzone Characteristics

- A hillside residential community requiring elevation-driven pressure boosting.
- Complete dependence on the Kraft Ranch Hydro-Pneumatic Pump Station for both pressure regulation and supply continuity.
- No direct storage, which increases the operational importance of dependable PRS performance.

A map of Subzone 1315 is provided in **Figure 2.13**.

Figure 2.13 – System Pressure Zone 1315



2.2.5. Zone 1136 (Glen Ivy)

Zone Overview

Zone 1136 (Glen Ivy) is located in the southernmost portion of the City's service area within the Temescal Valley. The zone is bounded by Dos Lagos Drive to the north, Stellar Court to the south, the Estelle Mountain Range to the east, and Interstate 15 to the west. The zone includes a mix of rural and semi-rural development at higher elevations.

Storage Facilities

- Glen Ivy Tank – Provided primary operational storage and establishes the hydraulic grade for Zone 1136 and has recently been removed from service.
- Glen Ivy Tank historically stored water produced from the Glen Ivy Wells, which are currently inactive.

Supply Sources and System Interconnections

Water supply to Zone 1136 is delivered through the following facilities:

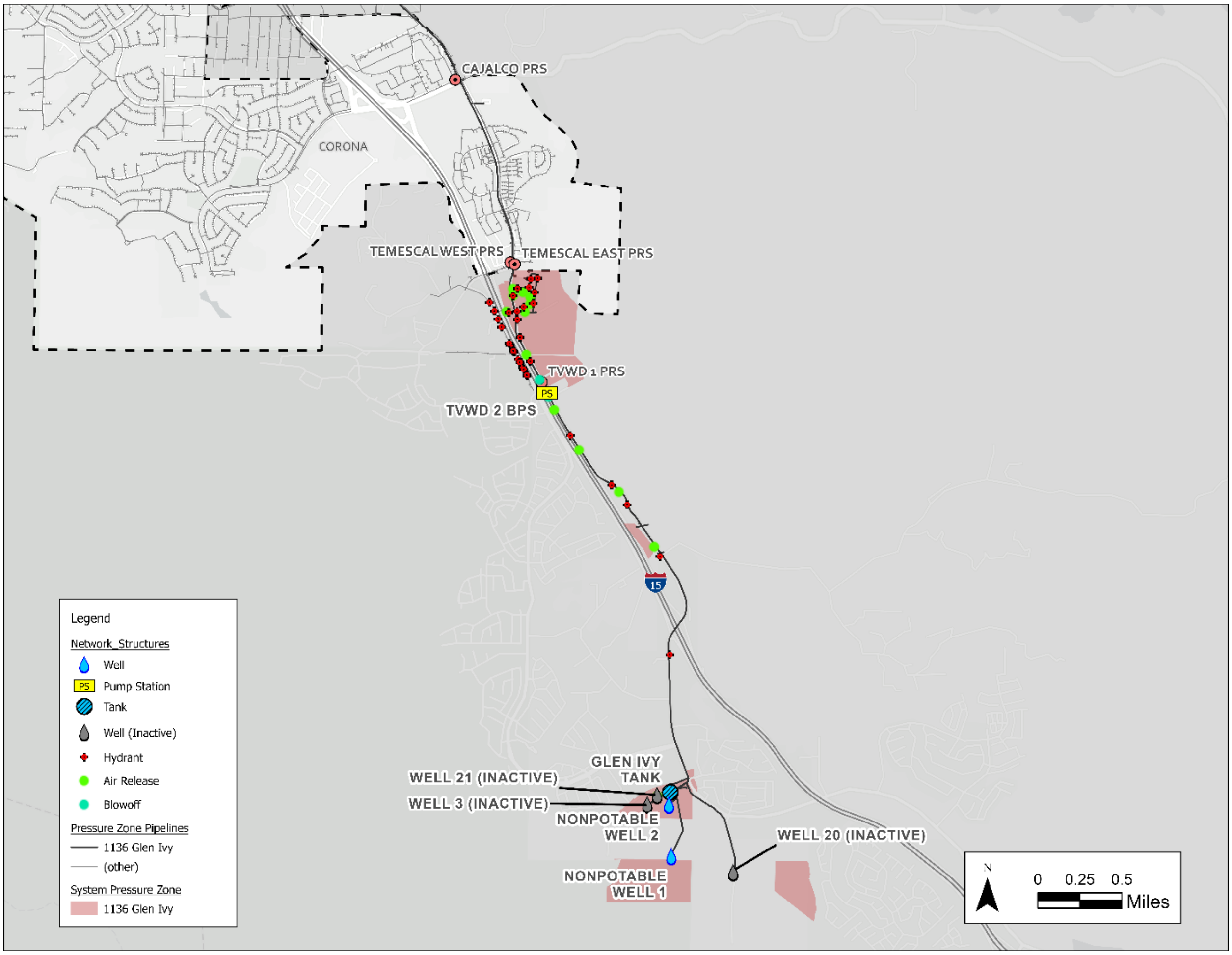
- Temescal East Sustaining Station – Supplies water from Zone 1220 to Zone 1136.
- Cajalco PRS – Supplies water from Zone 1220 to Zone 1136.
- Zone 1060 Interconnection – A zone valve connection that allows Zone 1060 to supply water to Zone 1136; this valve normally remains closed.
- Agency Connections:
    - TVWD-2 Booster Pump Station – Lifts water from Zone 1136 to the Temescal Valley Water District.
    - TVWD-1 PRS – Transfers water from the Temescal Valley Water District into Zone 1136.

Zone Characteristics

- A geographically isolated pressure zone dependent on two primary PRSs for continuous supply.
- The presence of inactive Glen Ivy wells (Wells 3, 20, and 21) and out-of-service Glen Ivy Tank.
- Critical inter-agency interconnections allowing bidirectional supply with the Temescal Valley Water District.
- Rural terrain and elevation changes influence hydraulic conditions and system operations.

A map of Zone 1136 is provided in **Figure 2.14**.

Figure 2.14 – System Pressure Zone 1136



2.2.6. Zone 1220 and Subzones (Zone 4)

Zone Overview

Pressure Zone 1220 extends across the City from east to west and is generally bounded by Ontario Avenue to the north. The zone serves areas with ground elevations ranging from approximately 900 to 1,100 feet AMSL. Zone 1220 is a major high-elevation zone in the City's distribution system and supports both local demands and several dependent subzones.

Storage Facilities

- Hayden Tank – Provides operational and fire storage and establishes the hydraulic grade for the surrounding service area.
- Keith Tank – Provides operational storage for customers along the northern portions of the zone.
- Upper & Main Tanks – Provide combined system storage supporting the central and southern areas of Zone 1220.

- Avenida Del Vista Tank – Supports the eastern portion of the zone and maintains pressures for nearby subzones and interconnections.

Supply Sources and System Connections

Water is supplied to Zone 1220 through several inter-zone facilities:

- Mills Connection – Transfers water from Zone 1060 to Zone 1220.
- Chase Booster Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Lester Zone 4 Booster Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Border Booster Pump Station – Lifts water from Zone 1060 to Zone 1220.
- Mountain Gate PRS – Supplies water from Zone 1380 to Zone 1220.
- Sonrisa PRS – Supplies water from Zone 1380 to Zone 1220.
- Mangular Zone 4 Booster Pump Station – Lifts water from Zone 905 to Zone 1220.
- Garretson Zone 4 Booster Pump Station – Lifts water from the Garretson Tank to Zone 1220.

Downstream supplies from Zone 1220 include:

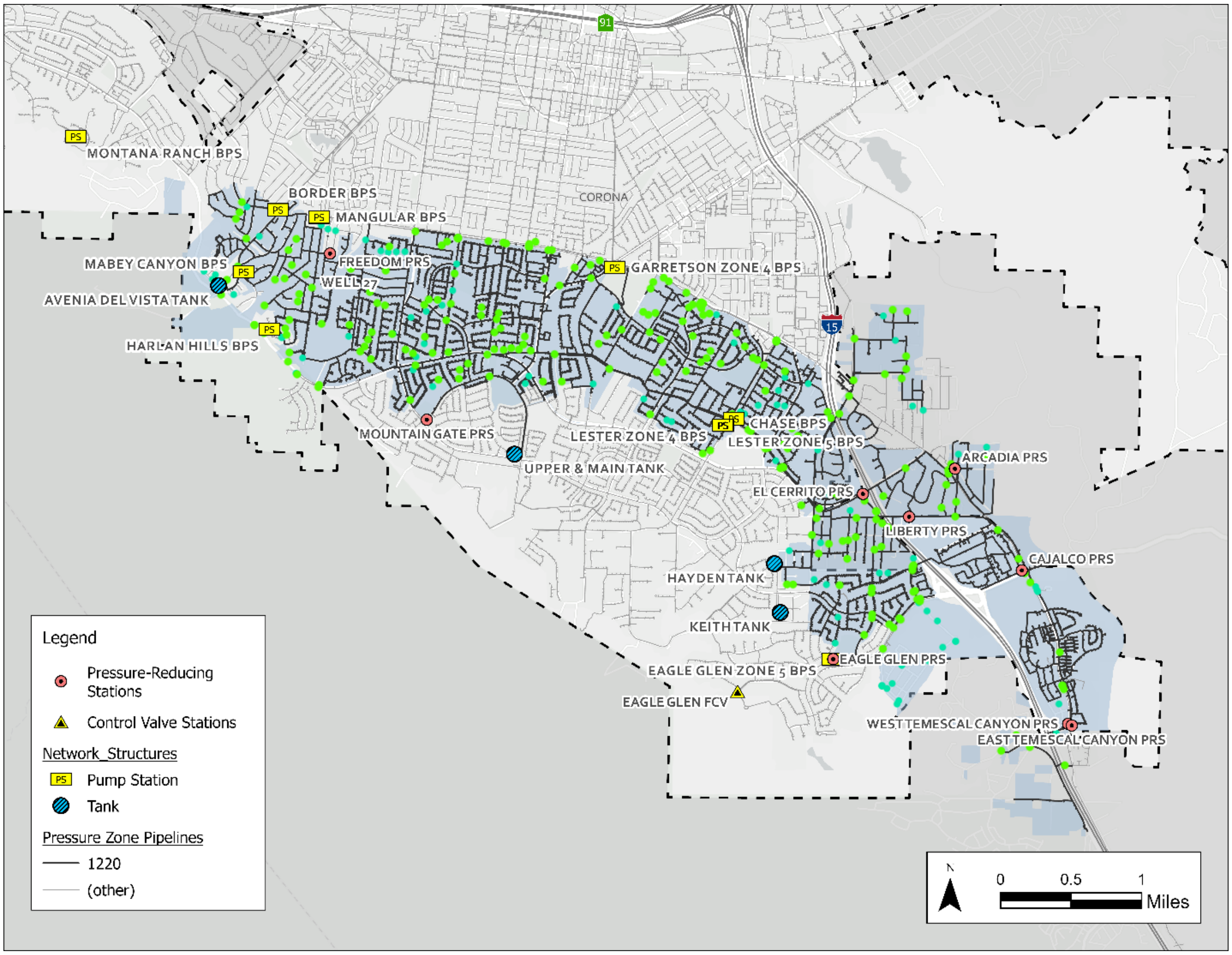
- Cajalco PRS – Supplies water from Zone 1220 to Zone 1136.
- Arcadia PRS – Supplies water from Zone 1220 to Zone 1045.
- Freedom PRS – Supplies water from Zone 1220 to Zone 1060.
- Mabey Canyon Hydro-Pneumatic Pump Station - Lifts water from Zone 1220 to Zone 1310
- Harlan Hills Booster Pump Station – Lifts water from Zone 1220 to Zone 1380

Zone Characteristics

- A large, continuous high-elevation zone containing multiple storage tanks that maintain hydraulic grade.
- Significant inter-zone transfers, making Zone 1220 a central supply point for multiple dependent pressure zones.
- Operational complexity driven by numerous booster pump stations and PRSs that must coordinate to maintain pressures and storage turnover.
- A mix of residential neighborhoods situated in hillside terrain.

A map of pressure Zone 1220 is provided in **Figure 2.15**.

Figure 2.15 – System Pressure Zone 1220



NOTE: The "Hydrant" layer was turned off for this pressure zone, to showcase other GIS attributes.

2.2.6.1. Subzone 1045 (Arcadia)

Subzone Overview

Subzone 1045 (Arcadia) lies within Zone 1220. The subzone is bounded by Minnesota Road to the north, East Ontario Avenue to the southwest, and Arcadia Street to the east. It serves a small residential neighborhood requiring a slightly lower hydraulic grade than Zone 1220. The City plans to eliminate the existing subzone and remove the associated PRS.

Storage Facilities

- This subzone does not include dedicated storage; pressures are established through PRS operation.

Supply Sources and System Connections

- Arcadia PRS – Supplies water from Zone 1220 to Subzone 1045. With the planned elimination of Subzone 1045, the Arcadia PRS will be removed from service.

Subzone Characteristics

- Historically, reliant on the Arcadia PRS to maintain local pressures. The Arcadia PRS would no longer be required under the planned elimination of Subzone 1045.
- A compact residential service area located adjacent to the main Zone 1220 distribution trunk lines.

A map of Subzone 1045 is presented in **Figure 2.16**.

Figure 2.16 – System Pressure Zone 1045

2.2.6.2. Subzone 1060 (Freedom)

Subzone Overview

Subzone 1060 (Freedom) is situated between Zones 1060 and 1220 and serves the residential neighborhood along Orchard Circle and Heritage Drive, north of Freedom Drive. The subzone's slightly lower hydraulic grade requires a dedicated PRS supply from Zone 1220.

Storage Facilities

- This subzone does not have storage facilities. Pressure is provided solely by the PRS connection.

Supply Sources and System Connections

- Freedom PRS – Supplies water from Zone 1220 to Subzone 1060

Subzone Characteristics

- A small, localized service area dependent entirely on PRS operations.
- Residential land use
- Proximity to Zone 1220 pipelines, allowing reliable PRS supply.

A map of Subzone 1060 (Freedom) is included in **Figure 2.17**.

Figure 2.17 – System Pressure Zone 1060 (Freedom)

2.2.6.3. Subzone 1310 (Mabey Canyon)

Subzone Overview

Pressure Zone 1310 (Mabey Canyon) is located in the foothill area near Mabey Canyon Road. The subzone is bounded by Avenida Del Vista to the north, Border Avenue to the east, and Foothill Parkway to the west. The subzone serves a small residential neighborhood requiring a higher hydraulic grade than Zone 1220.

Storage Facilities

- Subzone 1310 does not include dedicated storage; pressures are established through booster pump operations.

Supply Sources and System Connections

- Mabey Canyon Hydro-Pneumatic Pump Station – Lifts water from Zone 1220 to Subzone 1310.
- Note: The Mabey Canyon Hydro-Pneumatic Pump Station is expected to be abandoned in the future based on system operational planning.

Subzone Characteristics

- A small hillside residential neighborhood dependent solely on a single booster pump station for supply.
- Lack of storage creates sensitivity to booster pump station downtime.
- Future station abandonment will likely require hydraulic realignment or PRS adjustments.

A map of Subzone 1310 is shown in **Figure 2.18**.

Figure 2.18 – System Pressure Zone 1310

2.2.7. Zone 1320

Zone Overview

Pressure Zone 1320 is a small operational zone located near the Temescal Valley Water District (TVWD) service area. Rather than serving a dedicated demand area, Zone 1320 functions primarily as a transfer zone that supports emergency and interagency water exchanges.

Storage Facilities

- Zone 1320 does not include any storage facilities. All operations occur through PRS and pump station movements.

Supply Sources and System Connections

- TVWD-1 PRS – Conveys water from TVWD to City of Corona Zone 1320
- TVWD-2 Pump Station – Conveys water from City of Corona Zone 1320 to TVWD.

Zone Characteristics

- Zone 1320 functions entirely as a bi-directional transfer zone rather than a standard pressure zone.
- Operation is driven by interagency needs, emergency water movement, and mutual aid requirements.
- No local distribution network is present.

Because the subzone only serves as an inter-agency connection, a zone map is not provided.

2.2.8. Zone 1380 and Subzones (Zone 5)

Zone Overview

Pressure Zone 1380 is located in the southern area of the City, south of Zone 1220. The zone serves hillside neighborhoods at elevations ranging from approximately 1,100 to 1,260 feet AMSL. Zone 1380 is a high-pressure zone with significant reliance on pumping and dedicated tank storage.

Storage Facilities

- Gilbert Tank – Provides operational and fire storage and establishes the zone's hydraulic grade.
- Eagle Glen Tank – Supplements storage capacity and stabilizes pressures across the southern service area.

Supply Sources and System Connections

- Mills Connection – Transfers water from Zone 1220 to Zone 1380.
- Eagle Glen Zone 5 Booster Pump Station – Lifts water from Zone 1220 to Zone 1380.
- Lester Zone 5 Booster Pump Station – Lifts water from Zone 1060 to Zone 1380.
- Sierra Bella Booster Pump Station – Lifts water from Zone 1060 to Zone 1380.

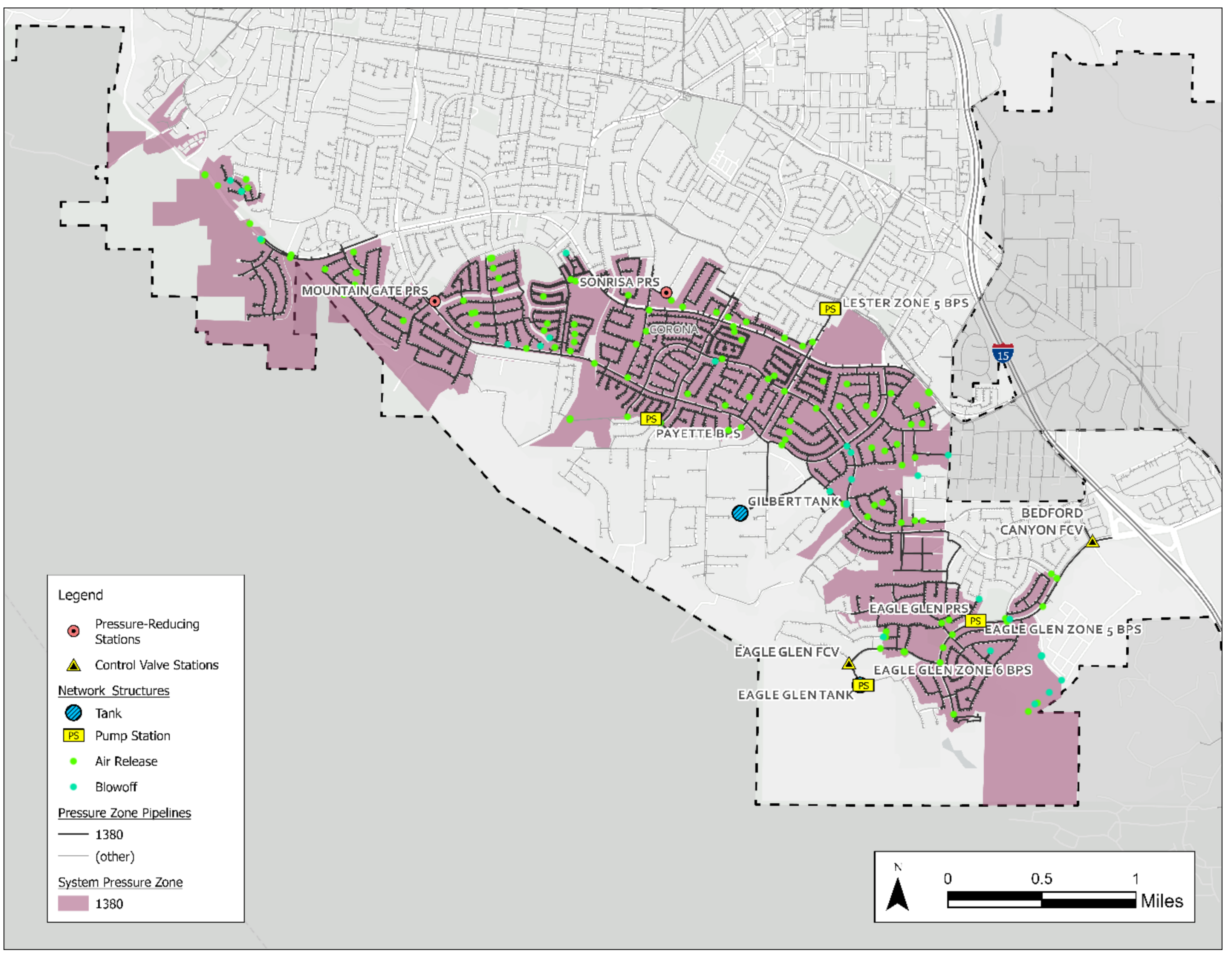
- Eagle Glen PRS – Supplies water from Zone 1380 to Zone 1220.
- Mountain Gate PRS – Supplies water from Zone 1380 to Zone 1220.
- Sierra Bella East/West PRSs – Supply water from Zone 1380 to Zone 1220.
- Sonrisa PRS – Supplies water from Zone 1380 to Subzone 1250.
- Eagle Glen Zone 6 Booster Pump Station – Lifts water from Zone 1380 to Zone 1640.
- Payette Booster Pump Station – Lifts water from Zone 1380 to Zone 1640.

Zone Characteristics

- A high-elevation pressure zone with multiple hillside neighborhoods requiring elevated hydraulic grades.
- Two large storage tanks that support both Zone 1380 and downstream PRS flows.
- Multiple PRSs provide controlled pressure step-down to lower adjacent zones.

A map of Zone 1380 is provided in **Figure 2.19**.

Figure 2.19 – System Pressure Zone 1380



NOTE: The "Hydrant" layer was turned off for this pressure zone, to showcase other GIS attributes.

2.2.8.1. Subzone 1250 Sonrisa

Subzone Overview

Pressure Zone 1250 (Sonrisa) is situated between Pressure Zones 1220 and 1380 and serves residences along Sonrisa Drive. The subzone occupies a narrow development area requiring a lower hydraulic grade than Zone 1380.

Storage Facilities

- Subzone 1250 does not include any storage facilities.

Supply Sources and System Connections

- Sonrisa PRS – Supplies water from Zone 1380 to Subzone 1250.

Subzone Characteristics

- A linear residential service area located along a single street corridor.
- Fully dependent on PRS supply, with no boosting or storage.
- Hydraulic grade tailored specifically to avoid excessive pressures from adjacent high-elevation zones.

A map of Subzone 1250 is shown in **Figure 2.20**.

Figure 2.20 – System Pressure Zone 1250

2.2.8.2. Subzone 1220 (Montana Ranch)

Subzone Overview

Pressure Zone 1220 (Montana Ranch) is located near the City's western boundary, in the hillside neighborhoods accessed from Hidden Hills Way and Montana Ranch Road. The subzone is bordered by Hidden Hills Way and Montana Ranch Road to the north and by Green River Road to the east. Montana Ranch requires an elevated hydraulic grade relative to adjacent portions of Zone 1220.

Storage Facilities

- Subzone 1220 does not include dedicated storage; pressures are established through upstream supply facilities.

Supply Sources and System Connections

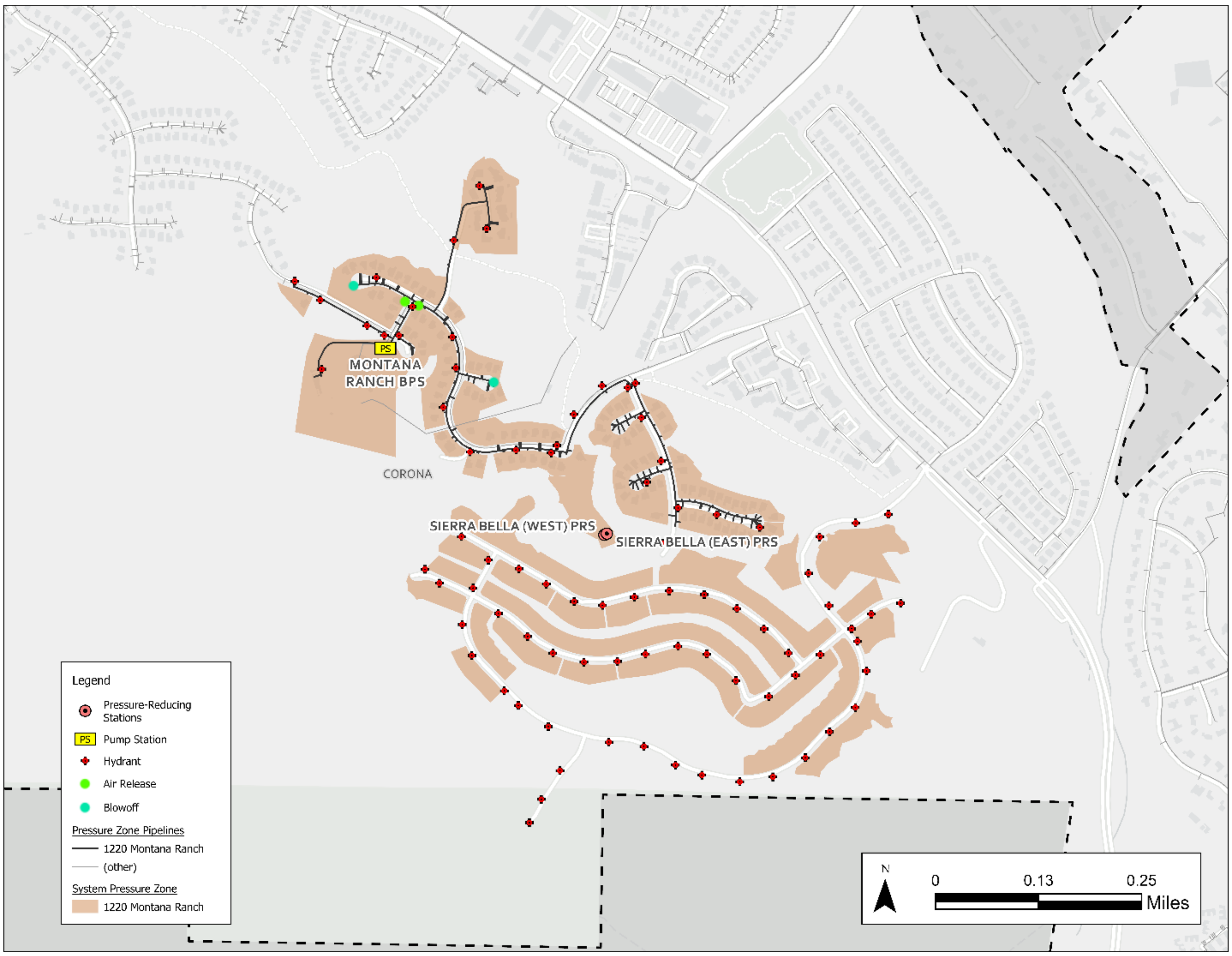
- Sierra Bella East and West PRSs – Supply water from Zone 1380 to Subzone 1220.
- Montana Ranch Hydro-Pneumatic Pump Station – Lifts water from Zone 1060 to Subzone 1220.

Subzone Characteristics

- A small, isolated hillside neighborhood requiring a lower hydraulic grade.
- Redundant supply paths from two separate PRSs and one booster pump station, providing operational reliability.
- No local storage, making PRS and booster pump station performance critical.

A map of Subzone 1220 (Montana Ranch) is provided in **Figure 2.21**.

Figure 2.21 – System Pressure Zone 1220 (Montana Ranch)



2.2.9. Zone 1640 and Subzones (Zone 6)

Zone Overview

Pressure Zone 1640 represents the City's highest operational pressure zone, located in the southernmost portion of Corona, above Zone 1380. The Zone serves elevations above approximately 1,450 feet AMSL and includes steep hillside neighborhoods requiring maximum system hydraulic grade.

Storage Facilities

- Jameson Tank – Provides the controlling hydraulic grade for Zone 1640 and offers both operational and fire storage capacity.

Supply Sources and System Connections

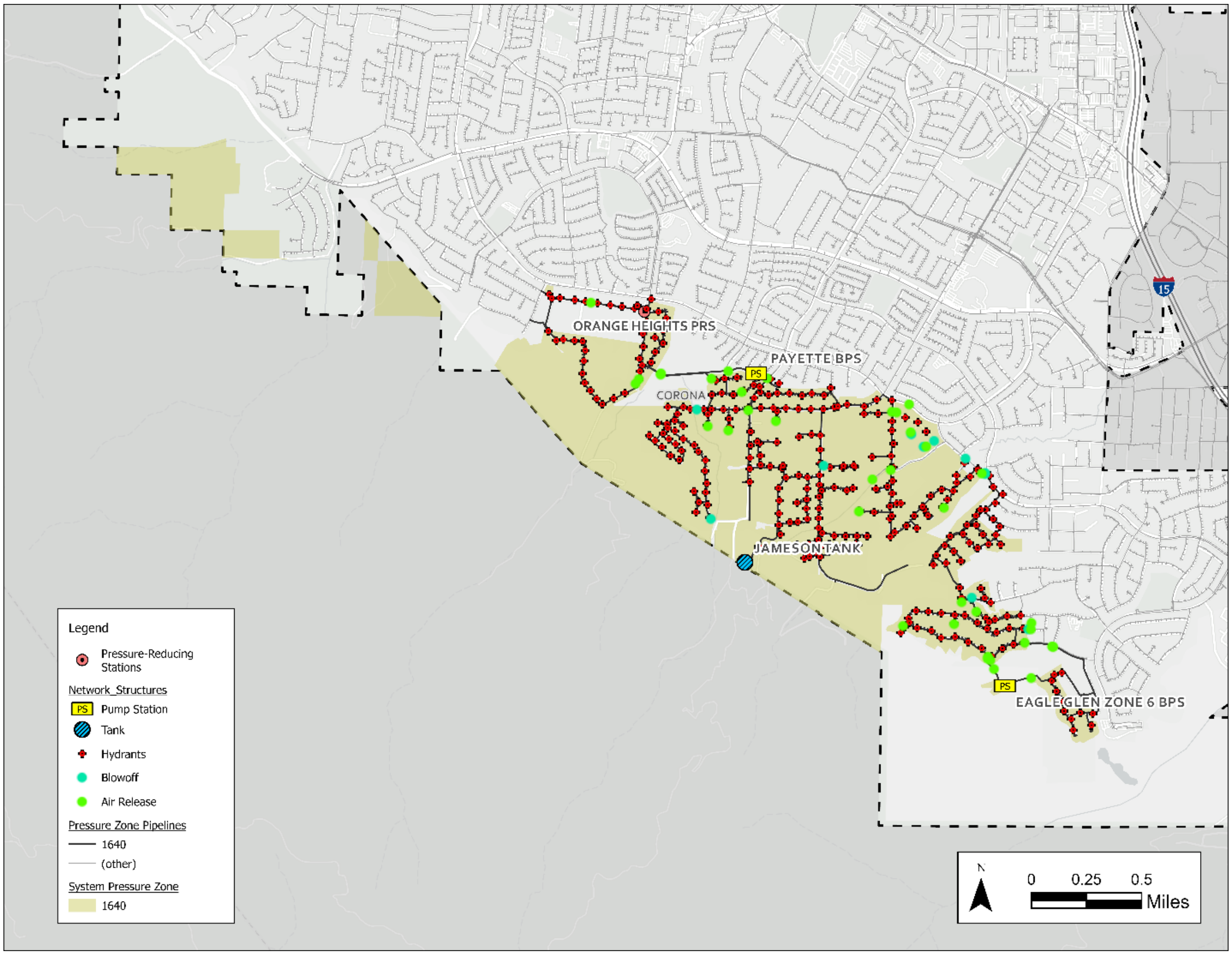
- Payette Booster Pump Station – Lifts water from Zone 1380 to Zone 1640.
- Eagle Glen Zone 6 Booster Pump Station – Lifts water from Zone 1380 to Zone 1640.
- Orange Heights PRS – Supplies water from Zone 1640 to Subzone 1480.

Zone Characteristics

- The highest-pressure service area in the City requiring robust booster pump station support.
- Two independent booster supply paths for the hillside neighborhoods.

A map of Zone 1640 is shown in **Figure 2.22**.

Figure 2.22 – System Pressure Zone 1640



2.2.9.1. Subzone 1480 Orange Heights

Subzone Overview

Pressure Zone 1480 (Orange Heights) is a small subzone located within Zone 1640. The subzone serves residents along Orange Heights Lane, generally between Malaga Street and South Main Street.

Storage Facilities

- Subzone 1480 does not include dedicated storage; all pressures are controlled through the upstream PRS.

Supply Sources and System Connections

- Orange Heights PRS – Supplies water from Zone 1640 to Subzone 1480.

Subzone Characteristics

- A compact residential area requiring a reduced hydraulic grade relative to Zone 1640.
- Full dependence on PRS operation with no storage or booster facilities.

- PRS control is essential to avoid over-pressurization due to the high elevation head of Zone 1640.

A map of Subzone 1480 is shown in **Figure 2.23**.

Figure 2.23 – System Pressure Zone 1480

2.3. Water Supply And Treatment Facilities

The City's potable water supply is a combination of groundwater and imported water (treated and untreated). Corona's groundwater is supplied from wells in two (2) basins: the Temescal Basin and the Bedford-Coldwater Basin. The imported water, both untreated and treated, is from Western Municipal Water District (WMWD). **Section 3** contains detailed information about the water supply.

2.3.1. Local Groundwater Supply

The groundwater wells extract groundwater from the Temescal and Bedford-Coldwater Basins. The City operates and maintains a total of twenty-three (23) wells, twenty-one (21) of which are potable water wells, and two (2) are non-potable water wells on the Water Reclamation System. Some wells have been designated as inactive by the State of California Water Resources Control Board Division of Drinking Water (DDW) and are noted in subsequent tables as "inactive" or "standby". An inactive source is not an approved source of supply and must be physically disconnected or otherwise isolated so that only an intentional act by an operator can place the source into service, and a standby source is an emergency source that is not approved to be used for more than 15 calendar days per year or for periods that exceed 5 consecutive days.

2.3.1.1. Temescal Basin Wells

The City owns and operates eighteen (18) potable water wells in the Temescal Basin, and their locations are shown in **Figure 2.24**. The Temescal Basin well specifications, construction information, and capacity are presented in **Table 2.1**, and **Table 2.2** summarizes the treatment and storage at each well. Appendix G includes a detailed condition assessment based on the provided well data, record drawings, picture log, and SCE efficiency test.

Table 2.1 – Temescal Basin Well Inventory and Specifications

No.	Well No.	Address	Status	Well Head Elevation (ft)	Depth (ft)	Pump Depth (ft)	Year Drilled	Maximum Capacity (GPM)	Record Drawing No.
1	7A	917 Circle City Drive	Active	680	210	200	2002	1,000	02-088
2	8A	219 S. Joy Street	Active	647	210	200	2002	1,650	02-088, 91-012
3	9A	505 S. Vicentia Avenue	Active	691	250	240	2002	1,500	02-088 [1]
4	11A	1865 W. Pomona Road	Active	650	234	180	1953	700	09-093
5	12A	519 S. Maple Street	Active	661	250	180	1949	1,100	43-1299 [1]
6	13	1018 Cottonwood Court	Inactive	735	279	160	1952	1,000	Well No. 13 [2]
7	14	1200 W. 10th Street	Active	728	515	210	1936	1,000	07-102 97-102
8	15	102 N. Lincoln Avenue	Active	640	220	120	1946 [3]	1,100	08-100E
9	17A	1052 Quarry Street	Active	648	204	150	1987	1,400	02-089
10	19	219 W. Grand Boulevard	Active	630	660	460	1990	2,100	90-036
11	22	405 Sierra Vista Street	Active	660	410	370	1998	3,500	99-088
12	25	310 S. Vicentia Avenue	Active	648	210	180	1999	3,500	99-088
13	26	710 McGrath Drive	Active	578	452	410	1999	1,000	99-088
14	27	2581 Mangular Avenue	Active	954	545	480	1980	500	N/A
15	28	202 N. Buena Vista Avenue	Active	610	190	170	2003	2,000	02-088
16	29	240 N. Buena Vista Avenue	Active	602	302	235	2008	N/A	07-083
17	31	210 N. Buena Vista Avenue	Active	639	233	225	2014	N/A	09-110U
18	33	3882 Grant Street	Active	666	280	255	2016	N/A	13-038U

[1] Refer to as-builts for pipeline connections to the well and the manufacturer's specifications for the well itself.
[2] As-built drawing number does not exist; please refer to the building construction plan for a site plan.
[3] Well was rehabilitated in 1998.

Figure 2.24 – Map of Temescal Basin Wells

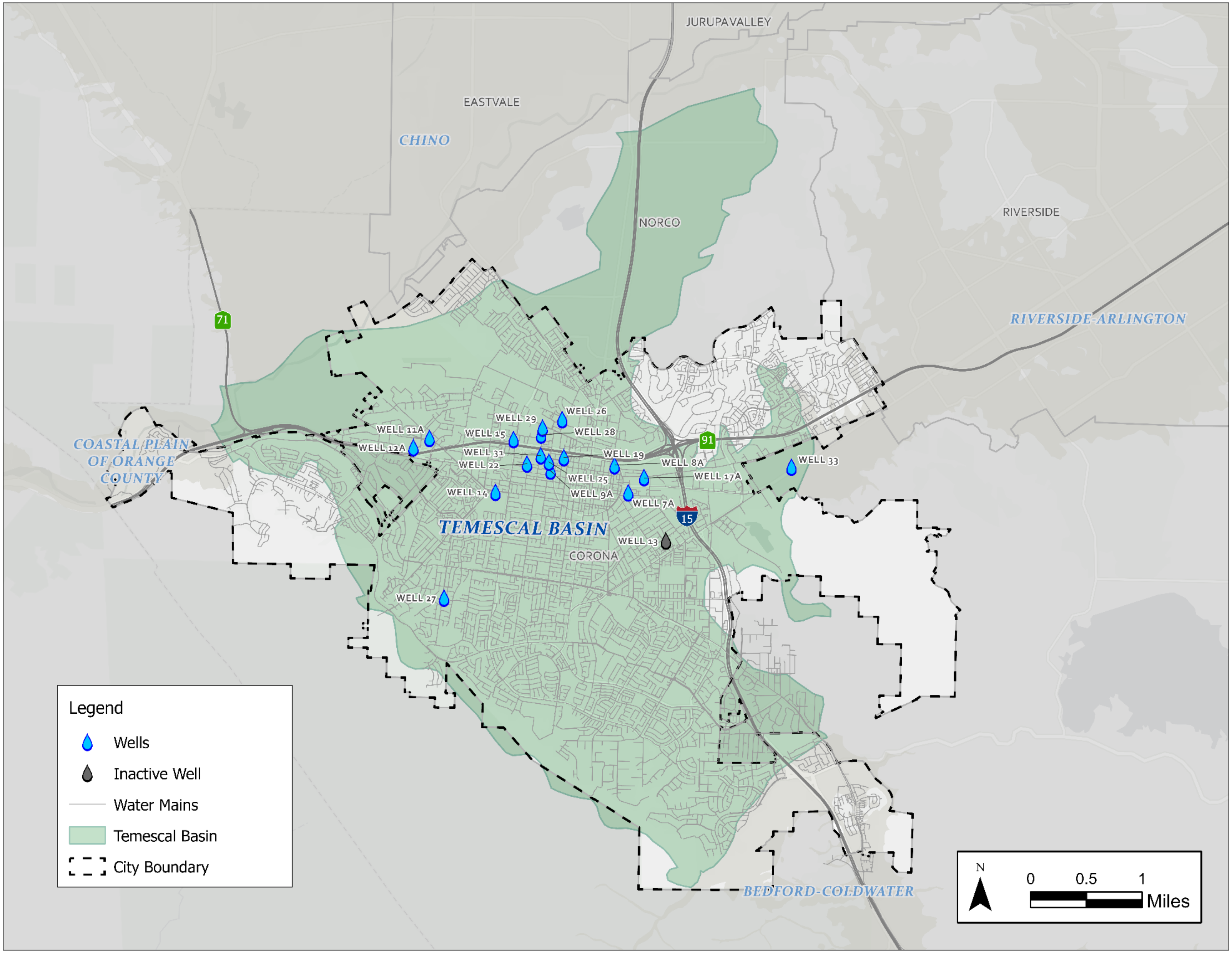


Table 2.2 – Temescal Basin Wells Treatment and Storage

Well No.	Treatment	Storage
7A, 13 (Inactive)	Temescal Desalter	Garretson Tank (Zone 905)
8A, 17A, 33	Granular Activated Carbon WTP	Garretson Tank (Zone 905)
	Temescal Desalter	
9A, 19, 22, 25, 26, 28, 29, 31	Temescal Desalter	Garretson Tank (Zone 905)
11A, 12A, 14, 15, 27	Routed to Mangular Tank (Zone 905) for blending	Mangular Tank (Zone 905)
	Temescal Desalter	Garretson Tank (Zone 905)

2.3.1.2. Bedford-Coldwater Basin Wells

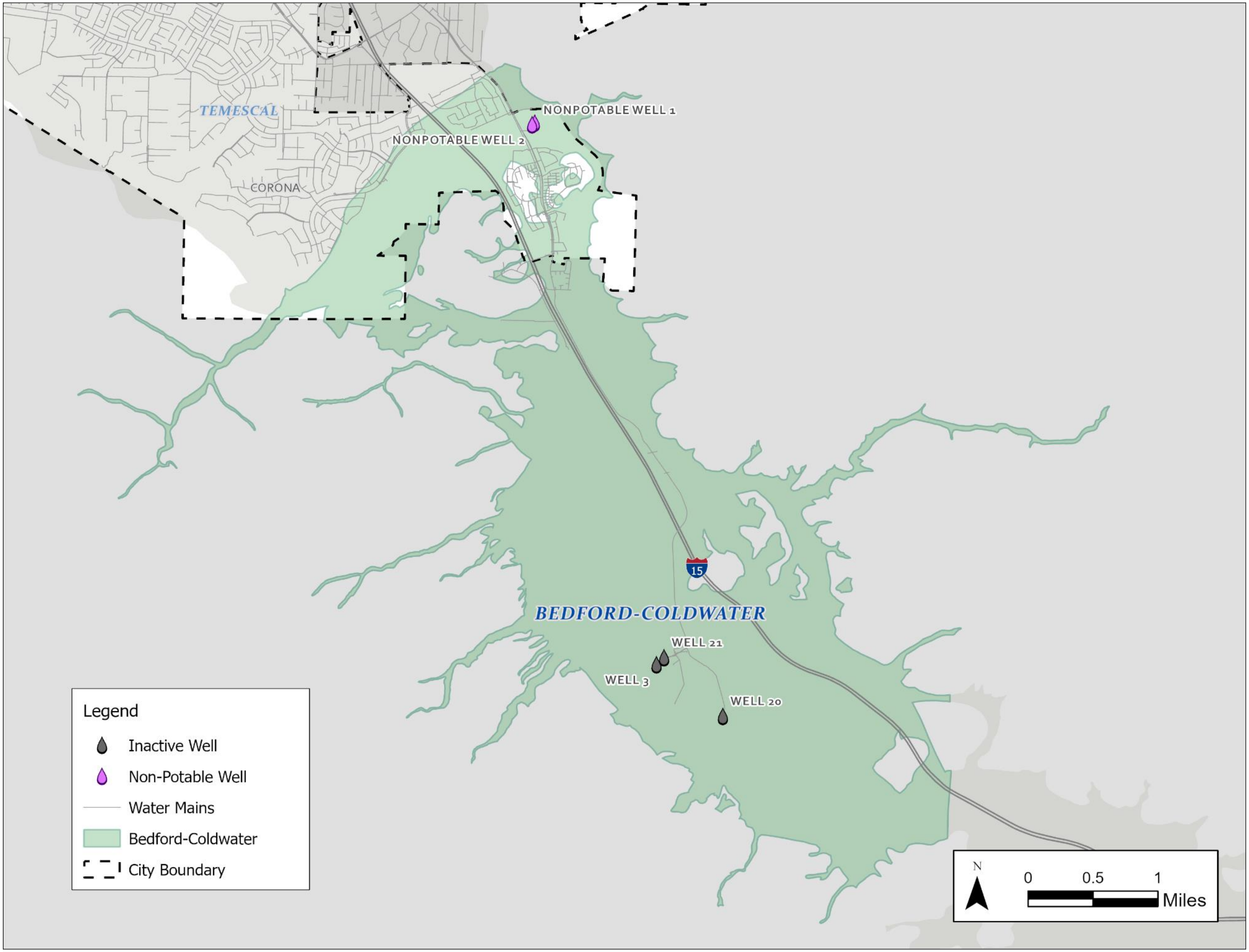
The City owns and operates three (3) potable wells and two (2) non-potable wells in the Bedford-Coldwater Basin, and their locations are shown in **Figure 2.25**. Appendix G includes a detailed condition assessment based on the provided well data, record drawings, picture log, and SCE efficiency test.

Table 2.3 – Bedford-Coldwater Basin Wells

No.	Well No.	Address	Status	Well Head Elevation (ft)	Depth (ft)	Pump Depth (ft)	Year Drilled	Maximum Capacity (GPM)	Record Drawing #
19	3	9865 Glen Ivy Road	Inactive	1138	543	370	1935	1,000	W-200
20	20	25225 Maitri Road	Inactive	1150	660	460	1998	1,650	97-064
21	21	24650 Glen Ivy Road	Inactive	1128	660	460	1998	1,500	97-064
22	NP 1	See Note [1]							
23	NP 2	See Note [1]							

[1] This is a non-potable well; please refer to the "2018 Reclaimed Water Master Plan" for more information.

Figure 2.25 – Map of Bedford-Coldwater Basin Wells



2.3.2. Imported Water Supply, System and Emergency Interconnections, and Emergency Interconnections

The City operates four imported water turnouts and maintains system interconnections and emergency interconnections with neighboring agencies.

2.3.2.1. Imported Water Turnouts

The City's imported water is supplied by the Metropolitan Water District (MWD) and its member agency, Western Municipal Water District (WMWD). WMWD purchases imported water from MWD, and the City purchases imported water from WMWD. Imported water is delivered to the City through two separate pipelines: the Lower Feeder Pipeline and the Mills Pipeline.

- The Lower Feeder Pipeline is part of MWD's major transmission system and supplies untreated imported water through WMWD.
- The Mills Pipeline is WMWD's pipeline which delivers treated imported water to portions of Riverside County.

Figure 2.26 depicts the location of the turnouts within the City's service area.

Table 2.4 – Imported Water Turnouts

Turnout Name	Turnout Location	Supply Location	Elevation (ft)	Approximate Hydraulic Grade Elevation (ft)	Approximate Capacity (gpm)	Service to Zones	Description
WR-19	Chase Drive east of Lester Avenue	Lester WTP	945	1,075	13,900	1060	Flow from turnout is gravity fed to Lester Water Treatment Plant from Lower Feeder Pipeline
WR-24	Temescal Canyon Road at La Gloria Road	Lester WTP	890	1,070	6,300	1060, 1220, 1380	Connected to Mill's Pipeline. Connection to Bedford Canyon, Lester, and Tom Barnes
WR-29 [1]	Green River WTP						Green River Treatment Plant is currently inactive
WR-33	1670 Montana Ranch Road, west of Green River Road	Sierra Del Oro WTP	940	1,380	4,500	1060	Connected to the Lower Feeder Pipeline and delivers untreated water to Sierra Del Oro Treatment Plant

[1] This turnout is offline due to the inactive Green River Water Treatment Plant. However, it is connected to WMWD's imported water supply via the Lower Feeder Pipeline.

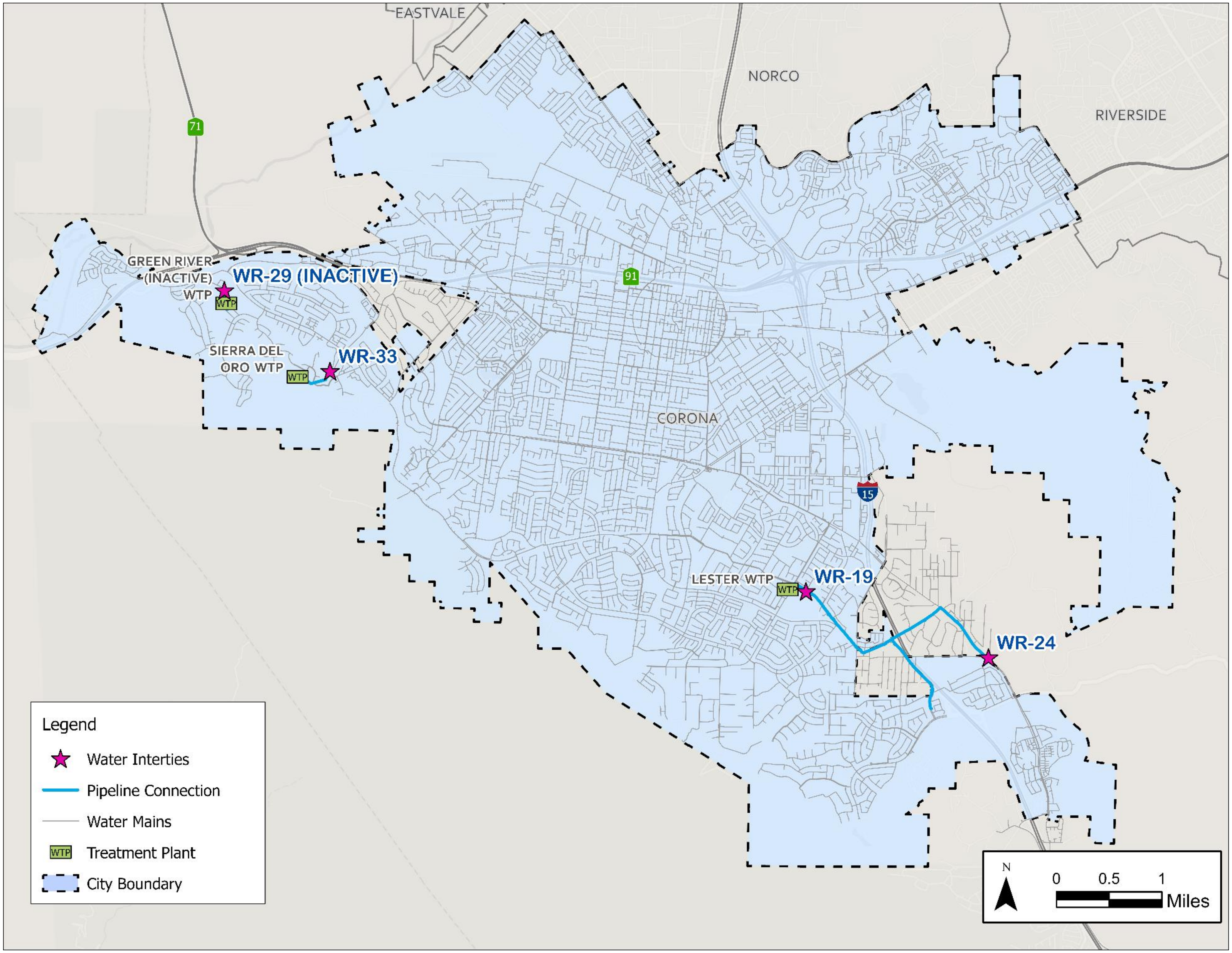
Turnout WR-19. Turnout WR-19 provides imported water from the Lower Feeder Pipeline from WMWD. The turnout is located on Chase Dr, east of Lester Ave, and the untreated imported water is gravity fed to Lester Water Treatment Plant. The Lester Raw Water Booster Pump Station provides additional pumping head when pressure in the Lower Feeder Pipeline is insufficient for gravity flow to the Lester Water Treatment Plant. The hydraulic grade line of the turnout is typically 1,075 ft above mean sea level (AMSL). However, it may vary depending on the operation and flow through the turnout.

Turnout WR-24. Turnout WR-24 provides imported water from the Mill's Pipeline from WMWD. The turnout is located at Canyon Road and La Gloria Road, and the imported treated water can be delivered to Pressure Zones 1060, 1220, and 1380 through several pressure reducing stations. Corona's maximum allotment for this turnout is 10 cubic feet per second (cfs).

Turnout WR-29 (Inactive). Turnout WR-29 can provide imported water from the Lower Feeder Pipeline from WMWD, but it is currently inactive. Untreated imported water can be pumped from through the Green River Raw Booster Pump Station to the Green River Water Treatment Plant. The Green River Raw Water Booster Pump Station and the Green River Water Treatment Plant are currently inactive.

Turnout WR-33. Turnout WR-33 provides imported water from the Lower Feeder Pipeline from WMWD. The turnout is located near Montana Ranch Road, and the untreated imported water is pumped through the Sierra Del Oro Raw Water Booster Pump Station to the Sierra Del Oro Water Treatment Plant. The hydraulic grade line of the turnout is typically at 1070 ft AMSL and may vary depending on the operation and flow through the turnout.

Figure 2.26 – Map of Imported Water Service Connections



2.3.2.2. Interconnections

The City maintains interconnections with neighboring agencies: Riverside, the City of Norco, Temescal Valley Water District (TVWD), and Home Gardens County Water District. The Riverside and TVWD interconnections are maintained in case of emergencies (emergency interconnections explained in **Section 2.3.2.3.**). A map of the location of the interconnection is provided in **Figure 2.27**.

Table 2.5 – Interconnections with Neighboring Agencies

Name	Location	Type of Interconnection	HGL Upstream	HGL Downstream	Treatment Type	Supply Location	Operability	Approximate Capacity (gpm) [2]
Norco 1 Interconnection	NW on Norco Hills Rd and Hidden Valley Pkwy	Flow Control Station	Zone 1020	Norco System	Chloramine	Treated Water from the City of Corona [1]	Operable but not currently in use	2,500
Norco 2 Interconnection	2191 Norco Hills Rd	Flow Control Station	Zone 1020	Norco System	Chloramine	Treated Water from the City of Corona [1]	Operable but not currently in use	2,500
Home Gardens Interconnections	3900 S Temescal St	Flow Control Station	Zone 920	Home Gardens System	Chloramine	Treated Water from the City of Corona	Operating Currently	880
Arlington Desalter Interconnection	Promenade Ave	Pressure Reducing Station	WMWD System	905	Free Chlorine	WMWD	Operating Currently	3,500
Arlington Desalter Interconnection	Promenade Ave	Pressure Reducing Station	1060	WMWD System	Chloramine	Treated Water from the City of Corona	Operating Currently	3,500

[1] WMWD supplies desalinated brackish water via the Arlington Desalter, which is the City of Norco's primary source of treated water.

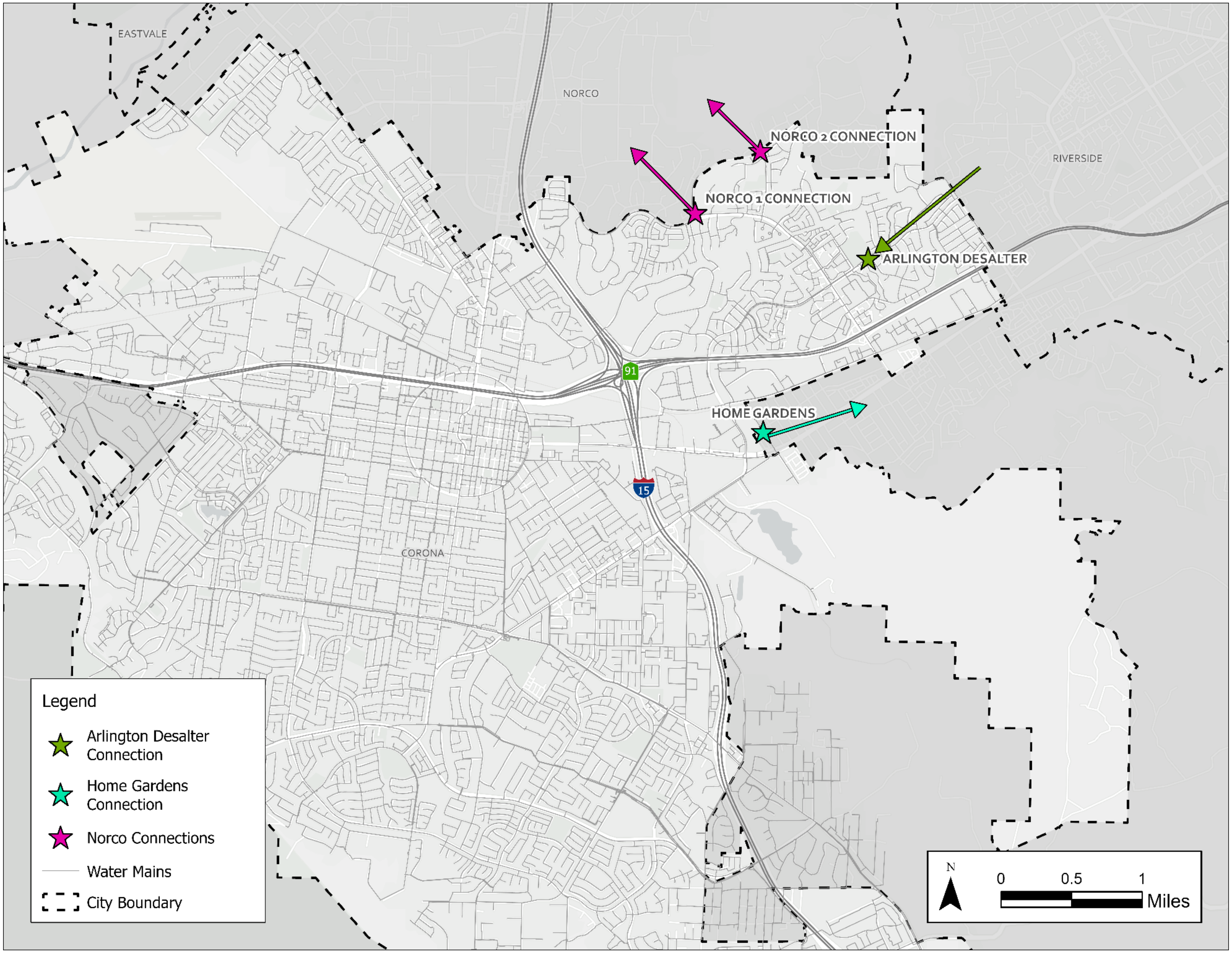
[2] It should be noted that the maximum day flows should not exceed 10 feet per second (fps) and that this approximate capacity is based on this.

Norco 1 and Norco 2. The City of Corona's Yuma Tank, located in Zone 1020, provides the City of Norco with metered interconnections #1 and #2. In addition, the Norco interconnections could provide reverse flow into the City of Corona in an emergency.

Home Gardens. The unincorporated community of Home Gardens purchases all its water from the City of Corona. The interconnection to Home Gardens is a one-way, metered interconnection.

Arlington Desalter. The Arlington Desalter is owned by WMWD, and the WMWD Arlington Desalter pipeline supplies the City potable water to Zone 905.

Figure 2.27 – Interconnection with Neighboring Agencies Map



2.3.2.3. Emergency Interconnections

In the event that the City is unable to supply a portion of its service area due to a catastrophic event within the City, several agreements between the City and neighboring agencies have been made to ensure the City's users can receive water.

Table 2.6 – Emergency Interconnections

Name	Location	Type of Inter-connection	HGL Upstream	HGL Down-stream	Treatment Type	Supply Location	Approximate Capacity (gpm) [3]
Riverside Emergency Interconnection 1	Sampson Ave West of Buchanan St	Normally Closed Valve	905	925	Chloramine	Treated Water from the City of Corona	1,500
Riverside Emergency Interconnection 2	Sampson Ave West of Buchanan St	Normally Closed Valve	925	905	Free Chlorine	City of Riverside	
TVWD 1 Emergency Interconnection [1]	Knabe St North of Forest Bndy Rd	Pressure Reducing Station	1320	1220	Chloramine	TVWD	1,500
TVWD 2 Emergency Interconnection [2]	Temescal Cyn Rd at Brown Cyn Wash	Pump Station	1220	1320	Chloramine	Treated Water from the City of Corona	2,500

[1] Please note this emergency interconnection is also a pressure-reducing station and will be accounted for in the Pressure Reducing Station section.

[2] Please note this emergency interconnection is also a pump station and will be accounted for in the Pump Station section.

[3] It should be noted that the maximum day flows should not exceed 10 feet per second (fps) and that this approximate capacity is based on this.

City of Riverside. The City of Riverside interconnections are normally closed with the ability to import water to the City of Corona (Interconnection 1) and export water from the City of Corona to the City of Riverside (Interconnection 2).

Temescal Valley Water District (TVWD). TVWD has two (2) interconnections; one for importing water (TVWD 1) and one for exporting (TVWD 2) water. It is important to note that although TVWD 1 and TVWD 2 are emergency interconnections, they are also referred to as pressure-reducing stations and booster pump stations, respectively.

2.3.3. Water Treatment Plants

The City utilizes four active water treatment facilities at locations shown on **Figure 2.28** to ensure the quality of its imported surface water and local groundwater meets the state and federal requirements for potable water.

Imported Surface Water Treatment. The Lower Feeder Pipeline provides untreated surface water from WMWD to the City, which is treated by the Lester Water Treatment Plant and the Sierra Del Oro Water Treatment Plant. The Green River Treatment Plant was historically used to treat surface water from the WMWD, but the Green River Water Treatment Plant is currently inactive.

Local Groundwater Treatment. Depending on the location of the well, local groundwater can be treated by the Temescal Desalter or the by the Granular Activated Carbon Water Treatment Plant, see **Figure 2.1**

or **Section 2.3.2** for additional information. Blending tanks, as described in **Section 2.4.1.** also support water quality.

Table 2.7 summarizes water treatment facility data, and Appendix F includes more in-depth descriptions of the water treatment facilities including photos. Appendix G includes data, record drawings, picture logs from the 2021 site visit to the water treatment plants.

Table 2.7 – Water Treatment Facilities

No.	Water Treatment Plant Name	Address	Capacity (MGD)	Water Source	Constructed	Service Zone(s)
1	Sierra Del Oro	2940 Wilderness Circle	6	MWD WR-33	1988	See Note [1]
2	Temescal Desalter	745 Corporation-Yard Way	10	Groundwater (Well No.7A, 8A, 9A, 11A, 12A, 13, 14, 15, 17A, 19, 22, 25, 26, 27, 28, 29, 31, & 33)	2002	See Note [2]
3	Lester	2970 Rimpau Ave	30	MWD WR-19 MWD WR-24	1966	See Note [3]
4	Granular Activated Carbon	410 Rimpau Ave	2	Well 32, 33, 17A, 8A	2019	NA (Temescal Desalter TP) [4]
5	Green River	1400 Nicolas Pl	Inactive			

[1] Sierra Del Oro's treated water is stored in the storage tank (4 MG at 1060 HGL). The water from the tank flows directly to Zone 1060. The water is blended and goes through a series of pump stations and pressure-reducing stations to serve other zones.

[2] The Temescal Desalter's treated water is blended in Garretson Tank. The water from the tank flows directly to Zone 905. The water goes through a series of pump stations and pressure-reducing stations to serve other zones.

[3] Lester Water Treatment Plant's treated water is stored in Lester Tank #1 and Lester Tank #2 (1060 HGL). The water from the tanks flows directly to Zone 1060. The water then goes to Zone 1220 and Zone 1380 by a series of pump stations.

[4] The water from the Granular Activated Carbon Water Treatment Plant goes directly to the Temescal Desalter. Refer to note [2] for further explanation of where the water goes after being treated in the Temescal Desalter.

2.3.3.1. Lester Water Treatment Plant

The City constructed its first treatment facility, Lester Water Treatment Plant, in 1966; and began supplementing local groundwater supplies with imported Colorado River Water. The treatment plant has a total rated capacity of thirty (30) million gallons per day (MGD), producing up to 30% of the City's demand, and is the largest treatment plant in the City of Corona. It is fed by WMWD's Colorado River Aqueduct from the Lower Feeder Pipeline through the WR-19 turnout. The treatment plant uses Lester Raw Water Booster Pump Station when the hydraulic grade elevation of the Lower Feeder Pipeline is too low. Please refer to **Table 2.7**, footnote number 3. Lester Water Treatment Plant treats total suspended solid (TSS) using six (6) filters. The treatment process is as follows:

1. Pre-treatment: Chlorine, aluminum sulfate, and cationic polymer are fed into the static mixer. The aluminum sulfate and cationic polymer act as a coagulant to help the creation of floc. Chlorine dosing will start the disinfection process, prevent the bio-growth from occurring on the filter and pipes, and assist with any taste and odor issues the plant may have.

2. Coagulation and flocculation: Suspended solids are aggregated to form larger particles called floc. The purpose of creating floc is to prevent small particles from escaping the filtration system.
3. Filtration: The water passes through the dual media bed of anthracite and sand. The filtration process will capture any floc formed during the flocculation process.
4. Disinfection: The chlorine is injected after combining filter effluent before going to the Chlorine contact basin (CCT). Water flows through CCT for a few minutes to a few hours. Once the water leaves Lester, it is safe to drink and meets all state regulations.
5. Backwash: During backwash, water is pumped backward through the filters to clean particulates and polymers that adhere to the filters. Backwashing is part of routine maintenance that enables near continuous operation.

This plant typically produces 4 to 25 MGD depending on City demand. Hydraulic detention time is 30 minutes to 3 hours, depending on the flow rate. Once water is treated, it is stored in the onsite Lester tank.

2.3.3.2. Sierra Del Oro Water Treatment Plant

The Sierra Del Oro Water Treatment Plant is located on the City's west side and has a total rated capacity of six (6) MGD. However, the facility routinely treats 9.1 MGD during the City's maximum day conditions from turnout WR-33. The treatment process is as follows:

1. Pretreatment: In the pre-treatment stage, chlorine, aluminum sulfate, and cationic polymers are injected into a static mixer. The aluminum sulfate and cationic polymer act as a coagulant to assist with the formation of floc.
2. Coagulation and flocculation: Floc is created when suspended solids group together to form larger particles, and floc is captured by the filtration system. Generally, the flocculation occurs in the sedimentation basin. Polyethylene balls block UV rays and limit chlorine loss in the sedimentation basins.
3. Sedimentation Basin: In the sedimentation basin, aluminum sulfate and cationic polymer added in pretreatment promote floc formation which results in larger particulates settling. Settled floc and other settled particulates are ranked from the bottom of the sedimentation basin twice per day by the traveling bridges, and the sludge is pumped.
4. Filtration: The water from the sedimentation is gravity fed through the series of three (3) dual media filters consisting of anthracite and sand. These filters remove remaining suspended solids that formed during the flocculation process.
5. Disinfection: Chlorine is added to the filtered water to complete disinfection before it is discharged into the distribution system.

Since the Sierra Del Oro Water Treatment Plant is a conventional treatment plant with sedimentation basins, it has longer detention times and less frequent backwashes than the Lester Water Treatment Plant.

2.3.3.3. Green River Treatment Plant (Inactive)

The Green River Treatment Plant is inactive but connected to the MWD Lower Feeder Pipeline via WR-29. It has a total rated capacity of one (1) MGD and is located on the City's west side.

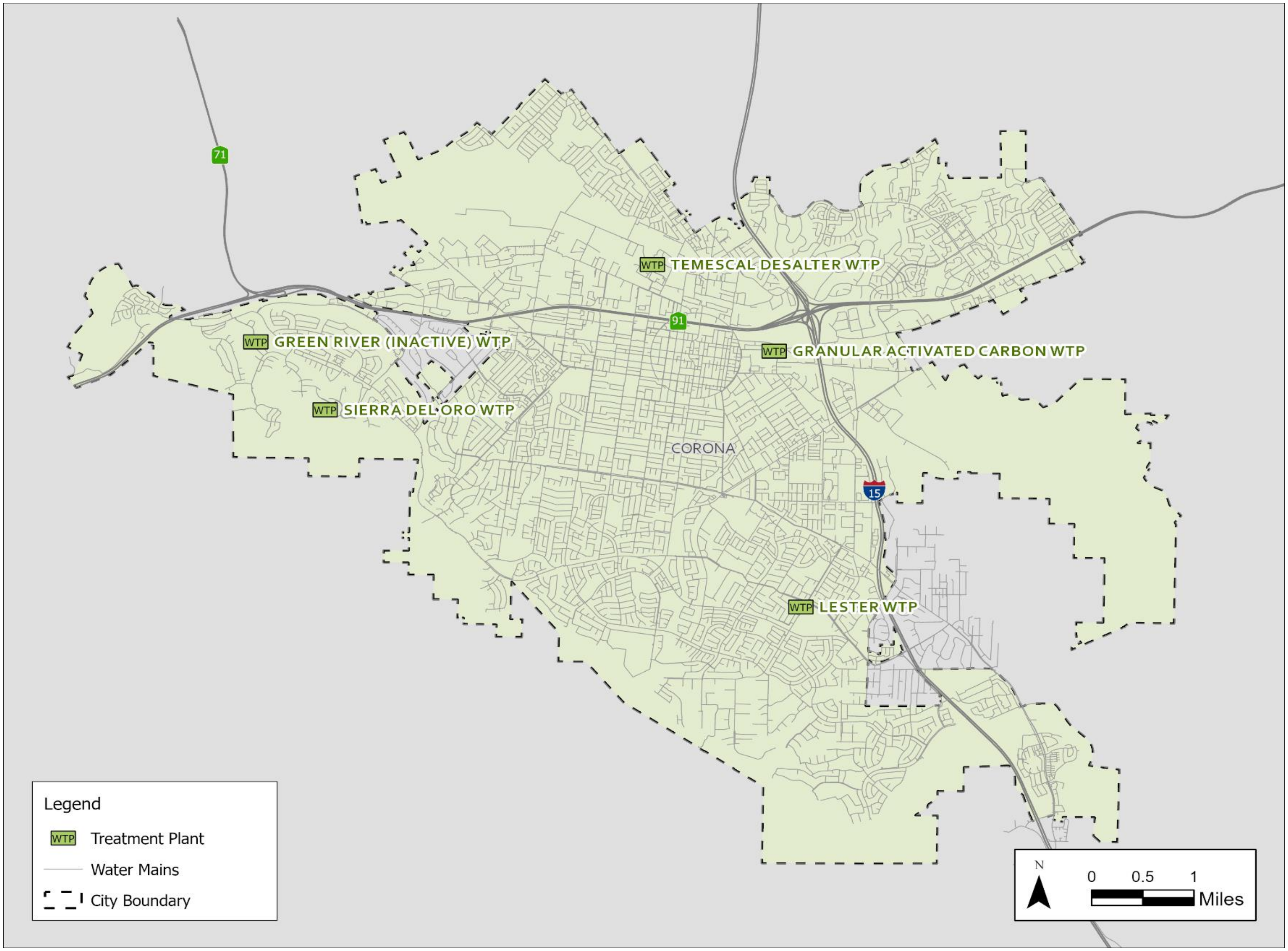
2.3.3.4. Temescal Desalter Treatment Plant

The Temescal Desalter treats groundwater from the Temescal Basin Wells. The Temescal Basin Wells include the following: Common Well Flow Valve 19 (a portion of flow from Wells 7A, 8A, 13, 17A, 32 and 33), Common Well Flow Valve 22 (a portion of flow from Wells 11A, 12A, 14, 15 and 27), and the Desalter Wells. The Temescal Desalter is a Reverse Osmosis (RO) Treatment Facility where water is forced through a membrane that rejects most dissolved solids. The Temescal Desalter has 1,407 membranes. All the water is prefiltered before it gets to the Desalter to avoid membrane damage. The Temescal Desalter provides high-quality groundwater by removing salts, nitrates, and contaminants. It reduces the City’s dependence on imported surface water by treating local groundwater.

The Temescal Desalter produces 10.4 MGD of treated water, which is transmitted to Garretson Tank and blended with another 4.3 MGD of groundwater that has high concentration of nitrate. Blending of multiple water supply sources at Garretson Tank results in the 14.7 MGD of treated water that meet state and Federal drinking water quality requirements. The Temescal Desalter also generates concentrate byproduct that is discharged into the Inland Empire Brine Line owned and operated by the Santa Ana Watershed Project Authority and transmitted to a brine treatment plant owned and operated by Orange County Sanitary District. The treatment process is as follows:

1. Pre-chemical injection: Sulfuric acid is injected to reduce the pH of the water. Threshold inhibitor is injected to keep a soluble salt in place to prevent fouling membranes.
2. Pre-treatment filters: Four cartridge vessels that contain 176 filters-in-place are designed to remove the larger suspended solids from the water prior to RO filtration.
3. Reverse osmosis filtration: The 201 vessels containing seven reverse osmosis membranes each operate under high pressure. Total dissolved solids are removed through the 1-micron membrane, and the RO filtered water is permeate drinking water.
4. Post-treatment: Four (4) de-carbonators strip Carbon Dioxide (CO_2) from the water.
5. Post-chemical injection: The final treatment is sodium hydroxide injection to raise the pH of the water, and chlorine injected with aqueous ammonia to create chloramines for chlorine residuals in the distribution system.

Figure 2.28 – Map of Treatment Plants



2.3.3.5. Granular Activated Carbon Water Treatment Plant

The City's Granular Activate Carbon (GAC) Water Treatment Plant serves Zone 1 and has a capacity of 3.45 MGD. In GAC water treatment, the water flows through a bed of GAC granules, and contaminants are adsorbed to the porous carbon material.

The GAC water treatment plant is housed in a metal building, and the treatment process targets removal of 1,2,3-Trichloropropane (TCP) and PFAS/PFOS. The facility was formerly an ion exchange treatment facility at this location.

2.4. Storage and Distribution Infrastructure

2.4.1. Tanks

The City's water storage consists of eighteen (18) tanks, including five (5) steel and thirteen (13) concrete, constructed between 1954 and 2019. The tank volumes range from 0.5 million gallons (MG) to 6 MG and are located throughout the City as shown on **Figure 2.29**. **Table 2.8** shows each tank's location, service zone, capacity, high water level (HWL), depth, construction type, year constructed, and As-Built number.

Four water tanks also serve as blending tanks, which are essential for maintaining drinking water quality in accordance with state and federal regulations. The location of each Blending Water Tank is shown in Figure **2**.**30** and the blending tanks are denoted in **Table 2.8**.

Appendix G includes a detailed condition assessment based on the provided tank data, record drawings, and picture log.

Table 2.8 – Tanks

No.	Tank Name	Address	Water Supply Sources	Service Zone	Capacity (mg)	HWL (ft)	Depth (ft)	Outlet (in)	Construction Type	Year Constructed	As-Built No.
1	Green River	4130 Green River Rd	Green River WTP (inactive)	725	1.5	725	24	18 - 24	Welded Steel	1984	N/A
2	Cresta Verde	2549 Promenade Ave	R-3 blend station for the Corona Hills area	905	4.0	905	24	30	Reinforced Concrete	1986	86-02
3	Garretson [1]	2209 E Garretson Ave	Temescal Desalter and temescal desalter bypass	905	2.0	905	24	16 - 16	Reinforced Concrete	1978	W-184B
4	Mangular [1]	2208 Mangular Ave	Mangular Blending Cell, primarily from the West Well; Wells #11A, #12A, #14, #15, and #27	905	2.0	905	24	16 - 20	Reinforced Concrete	1978	W-184D
5	R-3	2000 Garretson Ave	Groundwater wells and Lester WTP	905	2.5	905	19	16 - 20	Reinforced Concrete	2015	W-182S 07-023U
6	Border	2525 Border Ave	Glen Ivy Tank, Lester Treatment Plant, and Sierra Del Oro tanks.	1060	3.0	1,020	20	18 - 2(12)	Reinforced Concrete	1969	W-121
7	Glen Ivy [2] (Inactive)	8965 Glen Ivy Rd	Well 3, 20, and 21 (Inactive) and Lester Tanks	1136	0.5	1,136	23.5	16 - 18	Welded Steel	1977	W-182 W-183CC
8	Lester #1 [1]	2970 Rimpau Ave	Lester WTP and blended well water	Eastern areas of 1060	2.0	1,060	24	16 - 24	Reinforced Concrete	1978	W-184A
9	Lester #2 [1]	2970 Rimpau Ave	Lester WTP and blended well water	Eastern areas of 1060	2.0	1,060	18	24 - 16	Reinforced Concrete	1995	N/A
10	Sierra Del Oro	2940 Wilderness Cir	Sierra Del Oro WTP	1060	4.0	1,060	30	24 - 24	Post Tensioned Concrete	1987	W-347
11	Yuma	881 Corsica Dr	Lester Tanks (#1 and #2) and the Cresta Verde Booster Pump Station	1020	6.0	1,020	35	20	Post Tensioned Concrete	1991	89-063U
12	Avenida Del Vista	2750 Raven Cir	Zone 1020 and Border Booster Pump Station	1220	1.6	1,220	31	16	Welded Steel	1977	W-142
13	Hayden	3590 Nelson Ave	Zone 1220	1220	1.6	1,220	31	16	Welded Steel	1970	W-118
14	Upper & Main	101 W Upper Dr	Lester Zone 4 Booster Pump Station and Zone 1220	1220	4.0	1,220	30	16	Reinforced Concrete	2000	92-01
15	Eagle Glen	1602 Fairway Dr	Zone 1380	1380	2.0	1,380	30	16	Welded Steel	1999	98-061U
16	Gilbert	4065 Gilbert Ave	Zone 1380	1380	4.7	1,380	30	20	Post Tensioned	1994	US91-03
17	Jameson	4268 Jameson Dr	Payette Booster Pump Station	1640	2.5	1,640	29.6	16	Post Tensioned Concrete	2005	05-078U
18	Keith	3985 Nelson St	Zone 1220	1220	2.5	1,220	33	16	Reinforced Concrete	2019	17-052U

[1] Blending Water Tank
[2] Scheduled for demolition

Figure 2.29 – Map of Tanks

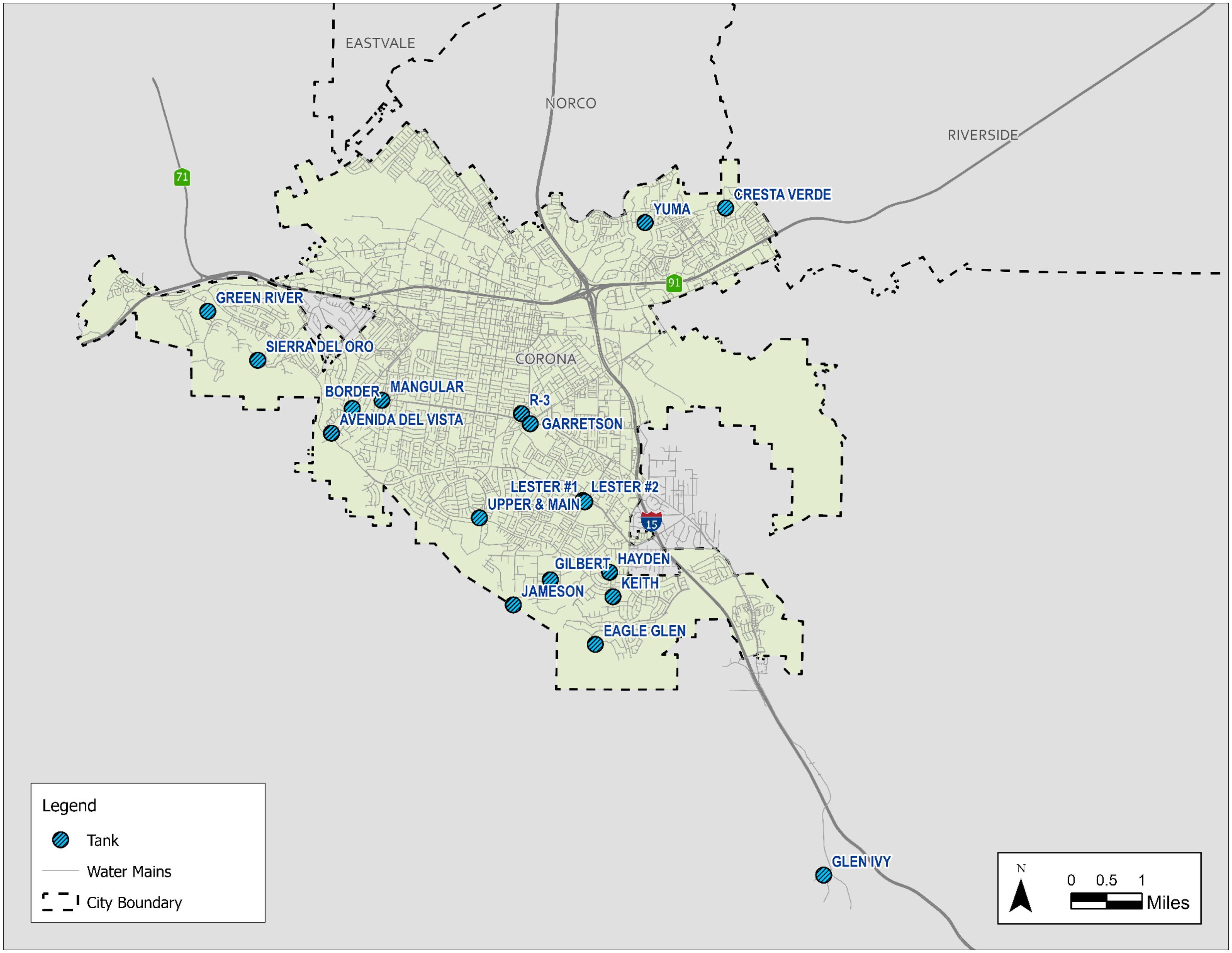
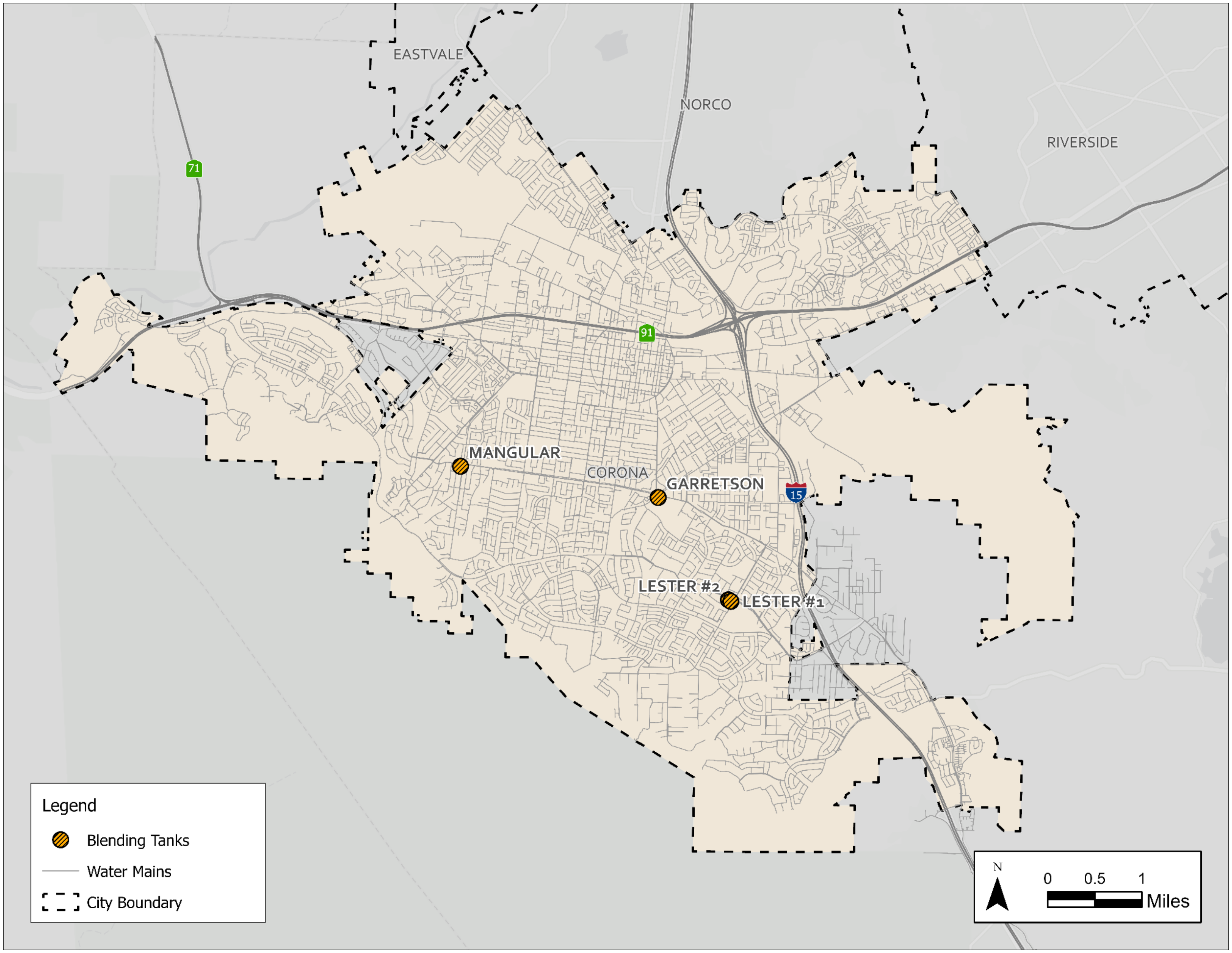


Figure 2.30 – Map of Blending Stations



2.4.2. Booster Pump Stations

The City's twenty (20) pump stations deliver groundwater from wells to the system tanks, lift water from lower pressure zones to higher pressure zones, and lift imported water from the MWD Colorado River transmission lines to the treatment plants. The City has both booster pump stations and hydro-pneumatic pump stations. The Pump Stations' general data, pump data, and motor data are listed in **Table 2.9** and additional motor information is listed. Appendix G includes a detailed condition assessment based on the provided pump data, record drawings, picture log, and SCE efficiency test.

Table 2.9 – Booster Pump Stations

General Data								Pump Data				Motor Data	
No	Suction Zone	Discharge Zone	Name	Location	Suction Tank	Discharge Tank	Type of PS	Pump No.	Type of Pump	GPM	TDH (ft)	HP	RPM
1	725	1060	Green River (standby)	1400 Nicholas Pl	Green River	SDO	Booster	1	Horz.	850	341	125	1775
2	905	1020	Cresta Verde	2005 Promenade Avenue	Cresta Verde	Yuma	Booster	1	Vert.	1,350	128	60	1785
								2	Vert.	1,350	128	60	1785
								3	Vert.	1,350	128	60	1785
								4-fire	Vert.	1,350	128	60	1785
3	905	1060	Garretson Zone 3	2209 Garretson Avenue	Garretson	Lester 1 & 2	Booster	1	Vert.	2,500	229	200	1785
								2	Vert.	2,500	229	200	1785
								3	Vert.	2,500	229	200	1785
								4	Vert.	2,500	229	200	1785
								5	Vert.	2,500	190	200	1785
								6	Vert.	2,500	229	200	1785
4	905	1060	Serfas Club	1290 Serfas Club Dr	Mangular	SDO	Booster	1	Vert.	1,500	282	150	1790
								2-spare [4]	-	-	-	-	-
5	905	1060 & 1220	Mangular [2]	2208 Mangular Ave	Mangular	SDO or Lester 1 & 2	Booster	1-Z3 [3]	Vert.	2,500	190	150	1785
								2-Z3 [3]	Vert.	2,500	190	150	1785
								1- Z4 [3]	Vert.	1,250	366	150	1785
								2-Z4 [3]	Vert.	1,250	366	150	1785
								3-Z4 [3]	Vert.	1,250	366	150	1785
6	905	1220	Garretson Zone 4	2209 Garretson Avenue	Garretson	All Zone 4 Reservoirs	Booster	1	Vert.	1,250	392	200	1785
								2	Vert.	1,250	392	200	1785
								3	Vert.	1,250	392	200	1785

Table 2.9 – Booster Pump Stations

General Data								Pump Data				Motor Data	
No	Suction Zone	Discharge Zone	Name	Location	Suction Tank	Discharge Tank	Type of PS	Pump No.	Type of Pump	GPM	TDH (ft)	HP	RPM
7	1020	1235	Morita	755 Morita Dr	Cresta Verde	Sub Zone	Hydro-Pneumatic	1	Vert.	500	259	50	1790
								2	Vert.	500	259	50	1790
								3-fire	Vert.	1,500	200	100	1790
8	1020	1130	Aquino	1036 Aquino Ci	Yuma	Sub Zone	Hydro-Pneumatic	1	Horz.	150	93	7.5	3450
								2	Horz.	150	93	7.5	3450
9	1060	1220	Border	Border Ave, N/W Corner of Border Ave & Ontario Ave	Border	Avenida Del Vista	Booster	1	Vert.	400	220	30	1800
								2	Vert.	1,200	220	100	1770
								3	Vert.	900	220	75	1770
10	1060	1220	Chase	1315 Chase Dr, N/E Corner of Chase Dr & Rimpau Ave	Lester 1 & 2	Hayden	Booster	1	Vert.	800	236	60	1775
								2	Vert.	800	235	60	1770
								3	Vert.	900	185	60	1800
								4	Vert.	1500	250	125	1785
11	1060	1220	Lester Zone 4 [1]	2970 Rimpau Ave	Lester 1 & 2	Upper & Main	Booster	1	Vert.	1,600	180	100	1800
								2	Vert.	1,600	180	100	1800
								3	Vert.	1,600	180	100	1750
								4	Vert.	1,600	180	100	1750
12	1060	1220	Montana Ranch	2930 Wilderness Circle	SDO	Sub Zone	Hydro-Pneumatic	1	Vert.	375	173	25	1770
								2	Vert.	375	173	25	1770

Table 2.9 – Booster Pump Stations

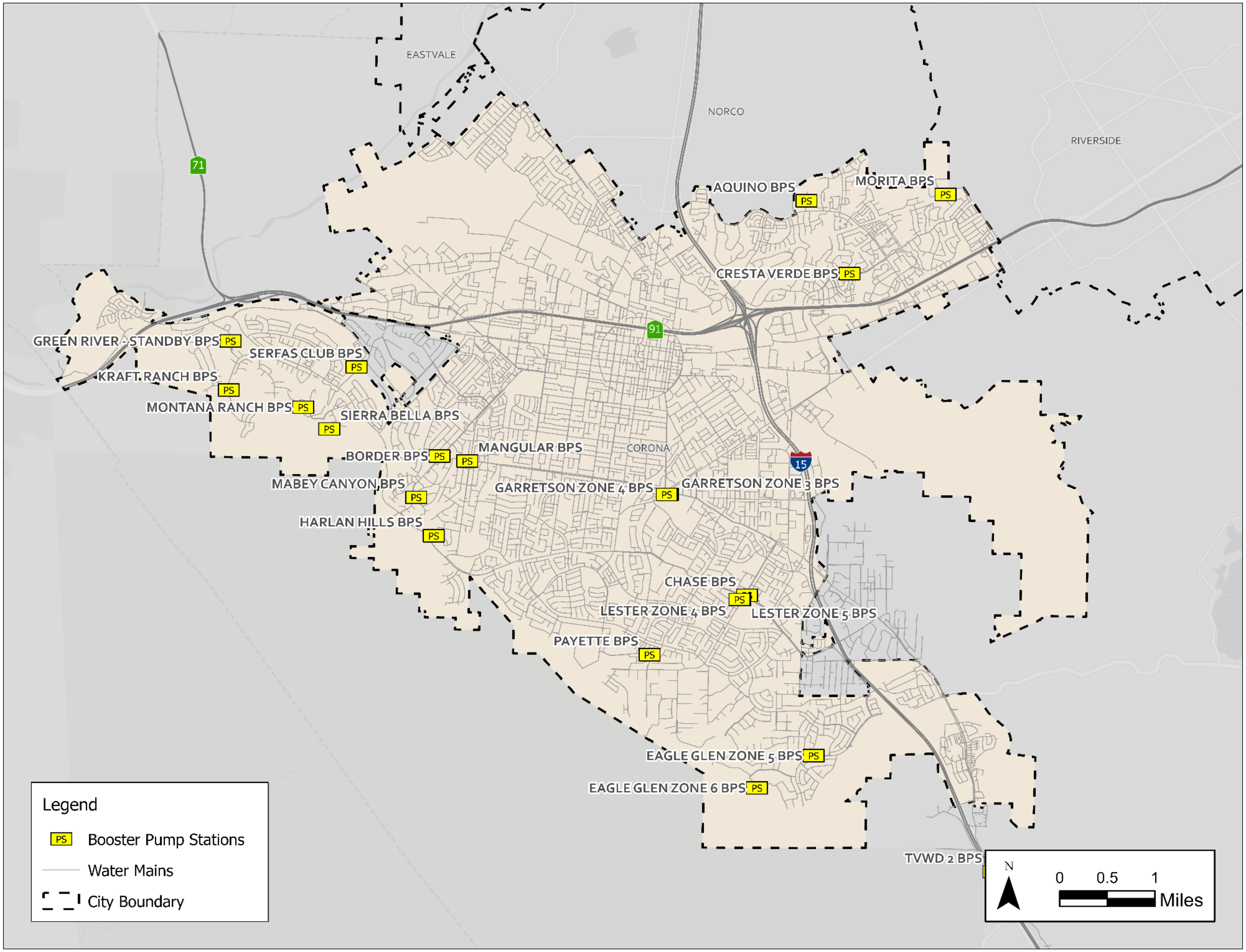
General Data								Pump Data				Motor Data	
No	Suction Zone	Discharge Zone	Name	Location	Suction Tank	Discharge Tank	Type of PS	Pump No.	Type of Pump	GPM	TDH (ft)	HP	RPM
13	1060	1315	Kraft Ranch	1725 Oakridge Dr	SDO	Sub Zone	Hydro-Pneumatic	1	Vert.	600	260	50	1780
								2	Vert.	600	260	50	1780
								3-fire	Vert.	1,500	240	125	1785
14	1060	1380	Lester Zone 5 [1]	2970 Rimpau Avenue	Lester 1 & 2	Gilbert	Booster	1	Vert.	1,365	354	200	1786
								2	Vert.	1,365	354	200	1786
								3	Vert.	1,365	354	200	1785
								4	Vert.	1,365	354	200	1786
								5	Vert.	1,365	354	200	1785
15	1220	1380	Eagle Glen Zone 5	4255 Eagle Glen Pkwy	Hayden	Eagle Glen	Booster	1 [1]	Horz.	800	190	60	1775
								2	Horz.	800	190	60	1775
16	1220	1380	Harlan Hills	S/W Corner of Bonnyview Ci & Lindsey Ln	Avenida Del Vista	Sub Zone	Booster	1	Vert.	230	90	10	1760
								2	Vert.	230	90	10	1760
								3-fire	Vert.	1,500	130	75	1780
17	1220	1310	Mabey Canyon	2643 Border Ave	Avenida Del Vista	Sub Zone	Hydro-Pneumatic	1	Vert.	1,250	125	50	1765
								2	Vert.	1,250	125	50	1765
								3-fire	Horz.	1,500	144	90	1770
18	1380	1640	Eagle Glen Zone 6	1602 Fairway Dr	Eagle Glen	Jameson	Booster	1	Vert.	230	270	25	1770
								2	Vert.	236	270	25	1770
								3	Vert.	230	270	25	1770
								4-fire	Vert.	1,500	266	150	1780
19	1380	1640	Payette	881 Payette Dr	Gilbert	Jameson	Booster	1	Vert.	750	273	75	1780
								2	Vert.	750	273	75	1780
								3	Vert.	750	273	75	1780
								4	Vert.	750	273	75	1780

Table 2.9 – Booster Pump Stations

General Data								Pump Data				Motor Data	
No	Suction Zone	Discharge Zone	Name	Location	Suction Tank	Discharge Tank	Type of PS	Pump No.	Type of Pump	GPM	TDH (ft)	HP	RPM
20	1060	1380	Sierra Bella	2690 Hidden Hills Way West	Lester 1 & 2	Eagle Glen	Booster	1	Vert.	1,500	338	200	1785
								2	Vert.	1,500	338	200	1785

[1] The booster pump station is part of a treatment plant
[2] If water is blending at Lester, then the discharge reservoir is Sierra Del Oro (SDO). If water is blending at SDO, then the discharge reservoir is Lester 1 & 2.
[3] Pumps at this booster pump station discharge to two zones: Zone 1060 (Z3) and Zone 1220 (Z4).
[4] Spare pump denotes an unequipped pump can.

Figure 2.31 – Map of Booster Pump Stations



2.4.3. Pressure Reducing Stations

The City's thirty-two (32) pressure reducing stations (PRS's) transfer water from higher-pressure zones to lower-pressure zones while maintaining the pressure in each zone. Proper maintenance of these facilities is critically important to the pressure maintenance within each City's pressure zone. **Figure 2.32** shows a map of these facilities within the City's service area. Appendix G includes a detailed condition assessment based on the provided PRS data, and picture log.

Table 2.10 – Pressure Reducing Stations

No	Name	Location	Elevation (ft)	D/S Zone	U/S HGL (elev)	D/S HGL (elev)	Valve Size	D/S Pressure Settings (psi)	U/S Pressure Settings (psi)
1	North Smith	N Smith St. & Railroad St.	575	780	905	749	4-inch	88	140
						722	8-inch	80	
						763	4-inch	100	Atmo
2	Kalus	River Rd., Btw Samar Ct. & Kalus Ave.	589	780	905	750	4-inch	78	128
						723	8-inch	70	
						797	4-inch	90	Atmo
3	Alcoa	W Rincon St. & Alcoa Ci.	574	780	905	763	4-inch	82	135-140
						740	8-inch	72	
						787	4-inch	92	Atmo
4	Harrington	Harrington St & Windstream St	592	780	905	795/781	4-inch	88-82	130
							8-inch	88-72	
						800	4-inch	90	Atmo
5	Dominguez Ranch	SW of Dominguez and Green River	515	725	905	N/A	4-inch	N/A	160
						N/A	8-inch	N/A	
						973	4-inch	95	Atmo/100
6	Auto Center Drive	Railroad St. & Auto Center Dr.	576	820	905	779	4-inch	88	135
						761	8-inch	80	
						807	4-inch	100	Atmo
7	Yorba	125 Klug Ci, Railroad St. & Klug Ci.	595	820	905	768	4-inch	75	130
						752	8-inch	68	
						821	4-inch	98	Atmo
8	South Smith	N Smith Ave, Btw Railroad St & W Maple St.	590	820	905	775	4-inch	80	130
						756	8-inch	72	
						821	4-inch	100	Atmo
9	Avenida Del Vista	Avenida Del Vista & Via Del Rio	755	905	1060	871	6-inch	50	125
10	Mt. Serenata	Dominguez Ranch Rd. & Mount Serenata Ci.	754	905	1060	883	4-inch	56	140
						865	8-inch	48	
						930	4-inch	76	Atmo
11	Green River	Green River Rd. & Kraemer Dr.	760	905	1060	889	4-inch	56	127
						871	8-inch	48	
						922	4-inch	70	Atmo
12	Ridgeline	Ridgeline Dr, Btw Bayberry Dr. & Silkwood Dr.	760	905	1060	894	4-inch	58	130
						876	8-inch	50	
						922	4-inch	70	Atmo

Table 2.10 – Pressure Reducing Stations

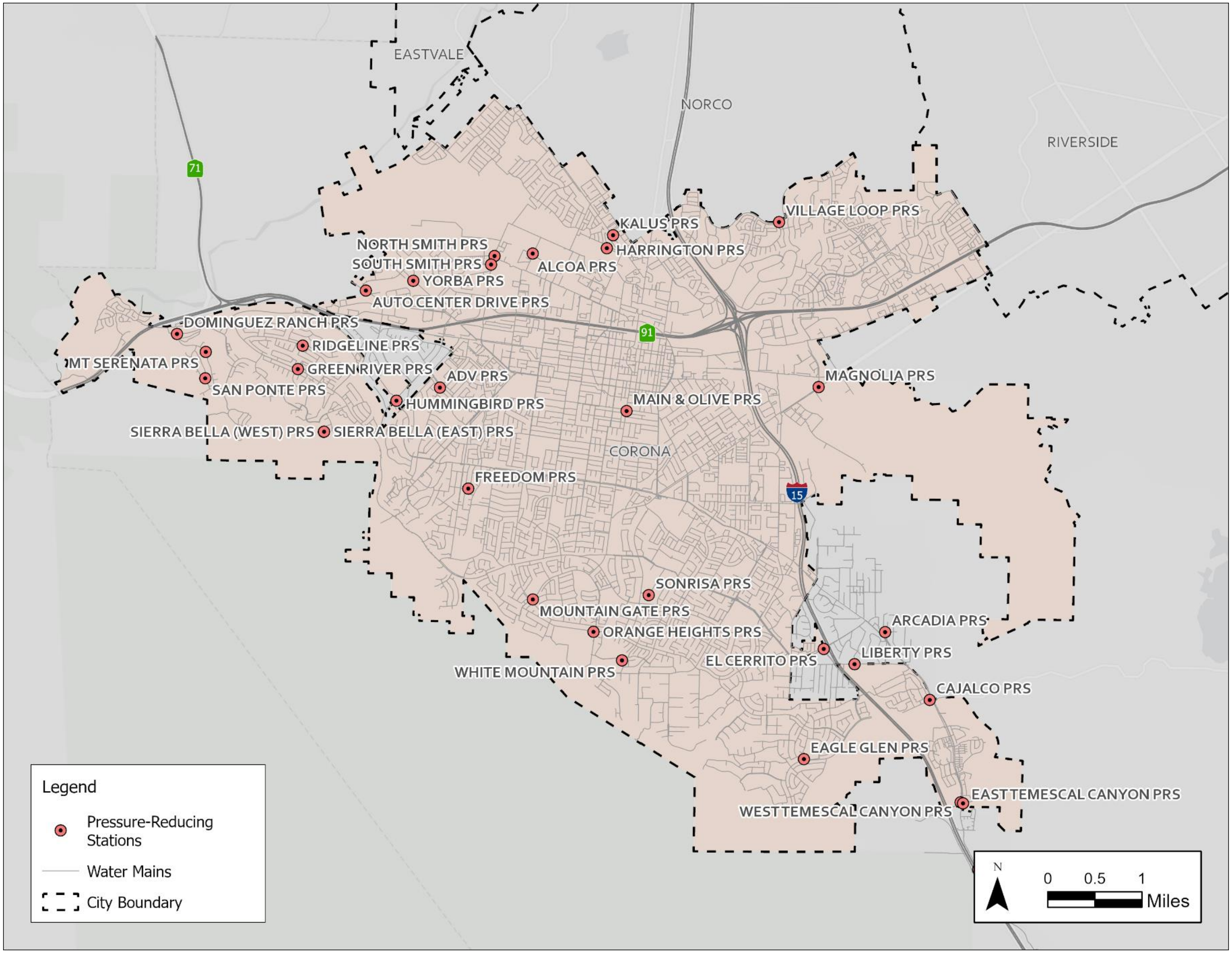
No	Name	Location	Elevation (ft)	D/S Zone	U/S HGL (elev)	D/S HGL (elev)	Valve Size	D/S Pressure Settings (psi)	U/S Pressure Settings (psi)
13	San Ponte	San Almada Rd. & San Ponte Rd.	764	905	1060	868	4-inch	45	130
						856	8-inch	40	140
						896	4-inch	57	Atmo
14	Village Loop	Hidden Valley Py. & Village Loop Dr.	761	905	1020	893	4-inch	57	109
						877	8-inch	50	
						911	4-inch	65	Atmo
15	Hummingbird	Ontario Ave & Paseo Grand	776	960	1060	905	4-inch	85	110
						905	8-inch	85	
						905	4-inch	150	Atmo
16	Arcadia (to be decommissioned)	Arcadia St. & Jolora Ave.	892	1045	1220	1061	1-inch	60	105
						N/A	2-inch	60	Atmo
17	West Temescal Canyon	Temescal Canyon Rd. & Dos Lagos Dr.	862	1136	1220	1174 [1]	6-inch [1]	135 [1]	120 [1]
						1116 [1]	12-inch [1]	110 [1]	
						1185	6-inch	140	Atmo
18	Freedom	Freedom Dr. & Orchard Ln	930	1060	1220	1063	4-inch	60	124
						1045	8-inch	52	
						1098	4-inch	75	Atmo
19	El Cerrito	El Cerrito Rd. & Interstate 15	954	1060	1220	1100	4-inch	63	115
						1083	8-inch	56	
						1132	4-inch	77	Atmo
20	Liberty	Liberty Ave. & Washington St.	956	1060	1220	1129	4-inch	75	120
						1111	8-inch	67	
						1164	6-inch	90	Atmo
21	Cajalco	Temescal Canyon Rd. & Cajalco Rd.	816	1136	1220	992	3-inch	76	181
						1024	10-inch	90	
						1105	4-inch	125	Atmo
22	East Temescal Canyon	Temescal Canyon Rd. & Dos Lagos Dr.	860	1136	1220	1190	6-inch	118	154
						1190	12-inch	118	
						1190	6-inch	128	Atmo
23	Eagle Glen	4255 Eagle Glen Parkway	1132	1220	1380	--	4-inch	N/A	30
						--	8-inch	N/A	
						N/A	5-inch	--	Atmo

Table 2.10 – Pressure Reducing Stations

No	Name	Location	Elevation (ft)	D/S Zone	U/S HGL (elev)	D/S HGL (elev)	Valve Size	D/S Pressure Settings (psi)	U/S Pressure Settings (psi)
24	Mountain Gate	Mountain Gate Dr. & Upper Dr.	1135	1220	1380	1216	4-inch	35	95
						1204	8-inch	30	
						1238	4-inch	45	Atmo
25	Sonrisa	Pacific Rd. & Sonrisa Dr.	1132	1250	1380	1259	2-inch	55	No Gauge
						1248	6-inch	50	No Gauge
26	Orange Heights	S Main St. & W Orange Heights Ln.	1250	1480	1640	1479	4-inch	100	105
						1447	8-inch	86	105
27	White Mountain	Valencia Rd. & White Mountain Ci.	1290	1380	1640	1526	4-inch	102	160
						1498	8-inch	90	160
						1673	4-inch	166	Atmo
28	Main & Olive	1301 S. Main St.	Out of Service				4-inch	50	125
							6-inch	42	125
29	Magnolia	Magnolia and Leeson	754	920	1060	886 [1]	10-inch	57	140
						860 [1]	8-inch	46	140
						915 [1]	6-inch	70	Atmo
31	Sierra Bella (East)	Sierra Bella Dr. & Pele Wy.	1011	1220	1380	1225	4-inch	93	N/A
						1190	8-inch	78	N/A
32	Sierra Bella (West)	2700 Hidden Hills Way	N/A	1220	1380	1238	4-inch	80	N/A
						1220	8-inch	72	N/A

[1] Values calculated and not field measured.

Figure 2.32 – Map of Pressure-Reducing Stations



2.4.4. Flow Control Valve

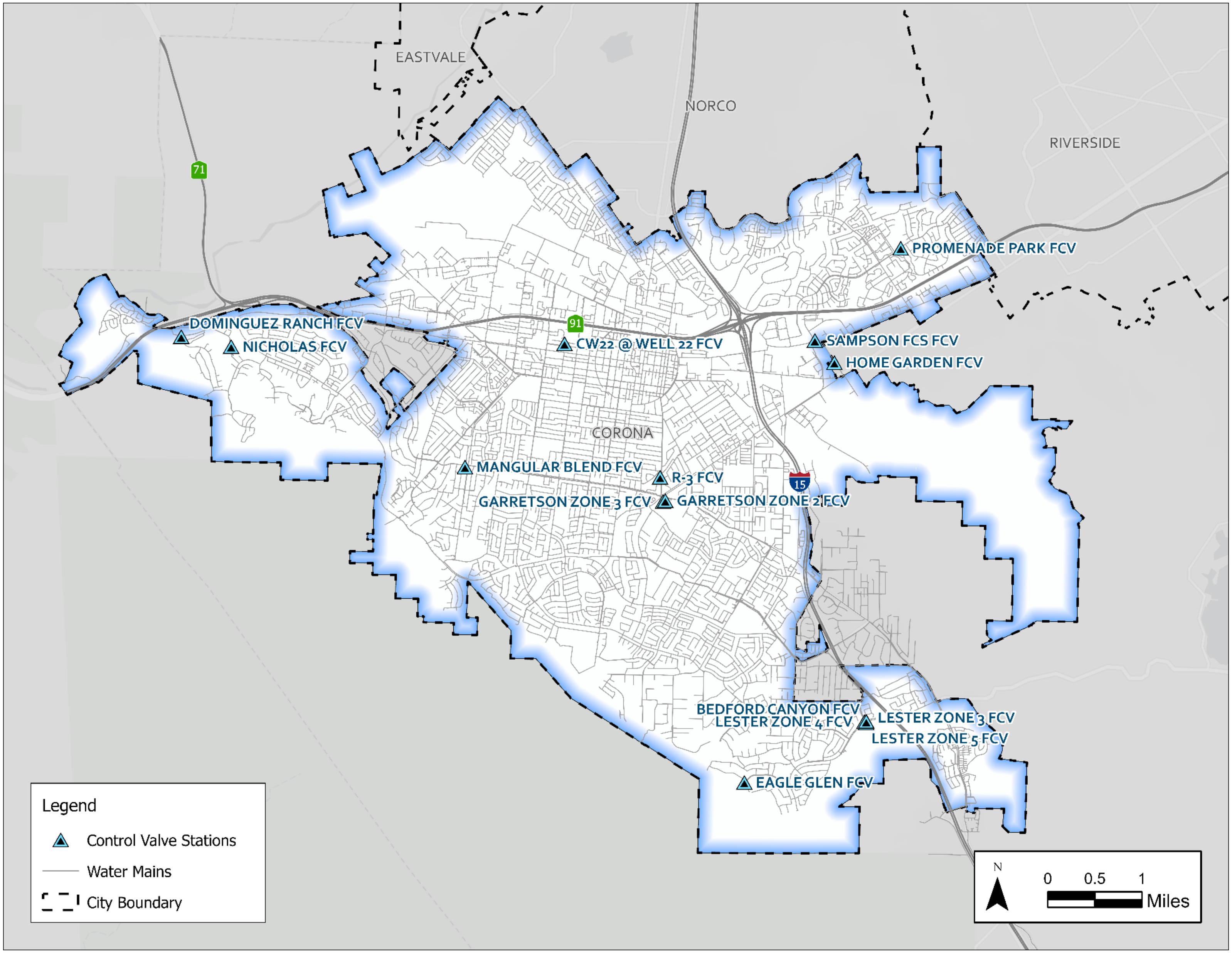
The City's fifteen (15) flow control valves (FCV) regulate the flow of water by maintaining desired flow rates to balance system pressure. **Table 2.11** shows each of the City's flow control stations, the status, elevation, upstream and downstream HGL, the flow control valves, and the valve size. **Figure 2.33** shows a map of these facilities within the City's service area. Appendix G includes a detailed condition assessment based on the provided FCV data, and picture log.

Table 2.11 – Flow Control Valves

No	Name	Location	Status	Elevation ft	D/S HGL	U/S HGL	Model Name	Size
1	Dominguez Ranch	Green River Road and Dominguez Ranch Road	In Service	516	725	905	CLA- VAL	8-inch
2	Garretson Zone 3	Ontario Ave and Magnolia Ave	In Service	916	905	1060	CLA- VAL	12-inch
3	Garretson Zone 2	E Ontario Ave and Magnolia Ave	In Service	910	905	1060	CLA- VAL	16-inch
4	Mangular Blend	Ontario Ave and Mangular Ave	In Service	900	905	1060	CLA- VAL	10-inch
5	R-3	Garretson Ave, between Monterey Rd and Beatrice Dr	Out of Service	880	905	1060	CLA- VAL	10-inch
6	Eagle Glen	Vandagriff Way and Fairway Drive intersection	In Service	1,132	1220	1380	CLA-VAL	8-inch
7	Lester Zone 5	Eagle Glen Parkway and Bedford Canyon Rd	In Service	930	1380	1500	Flowserve	16-inch
8	Lester Zone 4	Eagle Glen Parkway and Bedford Canyon Rd	In Service	930	1220	1500	Limitorque	12-inch
9	Lester Zone 3	Eagle Glen Parkway and Bedford Canyon Rd	In Service	930	1060	1500	Bayley	12-inch
10	Nicholas	Green River Rd and Nicholas Plaza	In Service	708	725	1060	CLA- VAL	8-inch
11	Bedford Canyon	Eagle Glen Parkway and Bedford Canyon Rd	In Service	930	1380	1500	CLA- VAL	4-inch
12	Promenade Park	Promenade Ave and Ruth Circle	In Service	N/A	N/A	N/A	N/A	12-inch
13	CW22 @ Well 22	5th St and Sierra Vista	In Service	N/A	N/A	N/A	N/A	8-inch
14	Sampson FCS [1]	Corporate Terrace St and Sampson Ave	In Service	643	Vary between 905 and 1020	1060	CLA-VAL	12-inch
15	Home Gardens	Temescal St and Estelle St	In Service	N/A	Home Gardens	920	CLA-VAL	6-inch

[1] The Sampson facility is classified as a flow control station. When supplying pressure zone 1020, the facility also performs a pressure-reducing function.

Figure 2.33 – Map of Flow Control Stations



2.4.5. Water Transmission and Distribution Pipelines

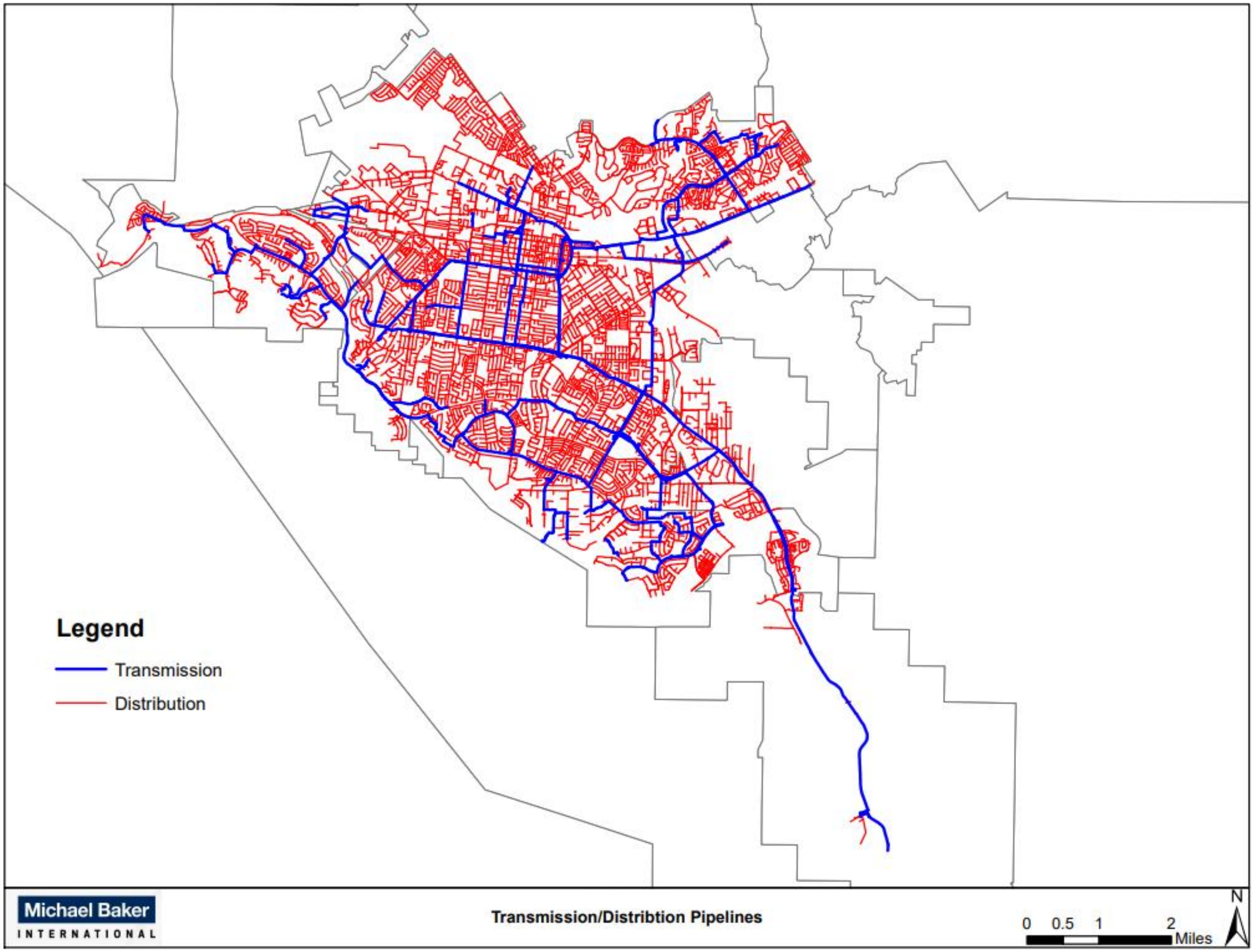
The City has approximately 675 miles of water distribution pipelines within the service area. The water pipelines transmit the water to reservoirs and water treatment plants and distribute water across the City to all of Corona's potable water system users. Each pipeline has unique attributes including length, materials, diameters, and flow. **Table 2.12** lists total length of each pipe diameter, and **Figure 2.34** maps pipeline diameters within the City. This section bases the pipeline inventory summary on GIS data provided in November 2021.

Pipelines range from 1-inch to 36 inches diameter with approximately 45% of the system as 8-inch and approximately 12% of the system as 12-inch diameter. Pipelines smaller than 8 inches were constructed before the City adopted a minimum 8-inch diameter water distribution pipeline size and will be replaced with 8-inch diameter pipelines when the pipelines have reached the end of their service life. Pipelines 12 inches or smaller are classified as distribution pipelines, and pipelines 14-inch or larger are classified as transmission lines.

Table 2.12 – 2021 City of Corona Water Pipelines Inventory

Size (in)	Length (ft)	(%) of Total Water Distribution System
1	451	0.01%
1.25	51	0.00%
1.5	439	0.01%
2	27,271	0.77%
2.5	2,918	0.08%
3	3,433	0.10%
4	89,717	2.52%
6	426,751	11.97%
8	1,615,731	45.34%
10	341,608	9.58%
12	537,372	15.08%
14	34,481	0.97%
16	198,300	5.56%
18	38,146	1.07%
20	57,085	1.60%
22	7,540	0.21%
24	87,497	2.46%
27	11,802	0.33%
30	79,059	2.22%
36	4,035	0.11%
Total	**3,563,698**	**100%**

Figure 2.34 – Transmission/Distribution Pipelines



2.4.5.1. Transmission Pipelines

Transmission pipelines are arteries that move water through the City and range from 14 to 36 inches in diameter. **Table 2.13** lists the City's transmission pipeline by diameter. In 2021, the City had 457,343 linear feet (95 miles) of transmission pipeline which accounts for 13.74% of the City's pipelines.

Table 2.13 – 2021 Transmission Pipeline Inventory

Pipe Diameter (in)	Length (ft)	% of Total Distribution Pipelines
14	34,481	0.97%
16	198,300	5.56%
18	38,146	1.07%
20	57,085	1.60%
22	7,540	0.21%
24	87,497	2.46%
27	11,802	0.33%
30	79,059	2.22%
36	4,035	0.11%
Total	**517,946**	**14.53%**

2.4.5.2. Distribution Pipelines

Distribution pipelines are 12-inch diameter or less and deliver water to communities and neighborhoods within each pressure zone. **Table 2.14** lists of the City's distribution pipeline by diameter. In 2021, the City had 3,024,320 linear feet (572.8 miles) of distribution pipeline which accounts for 85.8% of the City's pipelines. 45% of the City's pipelines are 8-inch diameter. As of 2021, the City had 529,547 linear feet (100.3 miles) of pipeline below 8 inches which need to be replaced with 8-inch diameter pipelines at the end of their service life.

Table 2.14 – 2021 Distribution Pipelines Inventory

Pipe Diameter (in)	Length (ft)	% of Total Pipelines
1	451	0.01%
1.25	51	0.00%
1.5	439	0.01%
2	27,271	0.77%
2.5	2,918	0.08%
3	3,433	0.10%
4	89,717	2.52%
6	426,751	11.97%
8	1,615,731	45.34%
10	341,608	9.58%
12	537,372	15.08%
Total	**3,045,753**	**85.47%**

2.5. Water System Control and Safety Components

The potable water system inventory presented in this section is based on GIS data provided by the City in November 2021. All quantities and asset summaries reflect system conditions as of that date.

2.5.1. Blow-Off Valves

Blow-off valves allow for flushing of water for maintenance and to sample and maintain water quality. **Table 2.15** lists the number of blow-off valves and corresponding sizes captured in the City's GIS database in 2021. In 2021, the City had 397 blow-off valves, of which 89% were 2 inches in nominal size, and approximately 10% of the blow-off valves had unspecified size attribute data.

Table 2.15 – 2021 Blow-Off Valve Inventory

Valve Size (in)	Number of Blowoff Valves
1	2
2	355
3	1
4	1
6	5
8	1
Unspecified	32
Total	**397**

2.5.2. Air Relief Valves & Combination Valves

Air relief and combination valves release trapped air within the potable water system to maintain uninterrupted water flow within the pipeline. **Table 2.16** lists the number of air relief valves and combination valves captured in the City's GIS database in 2021. As of 2021, the City had 1,067 air relief and combination valves; 71% of which were 1-inch and 2-inches, and approximately 19% of the air relief and combination valves had unspecified size attribute data.

Table 2.16 – 2021 Air Relief & Combination Valve Inventory

Valve Size (in)	Number of Air Relief Valves & Combination Valves
1	496
1 1/2	2
2	263
3	11
4 and larger	99
Unspecified	197
Total	**1,067**

2.5.3. Detector Check & Backflow Control Valves

Detector check valves and backflow control valves prevent reverse flow into the potable water system. Detector check valves are specific to prevent backflow from a fire suppression system, and backflow control valves prevent backflow from risk of cross-connection. **Table 2.17** lists the City's detector check & backflow control valves captured in the City's GIS database in 2021. As of 2021, 61% of the detector check and backflow control valves had unspecified size attribute data.

Table 2.17 – 2021 Detector Check & Backflow Control Valve Inventory

Size (in)	Number of Detector Check Valves
3/4	2
2	3
4	63
6	127
8	194
10	30
Unspecified	726
Total	**1,145**

2.5.4. Water System Valves

Main valves, zone valves, and fire hydrant valves control water flow within the distribution network and isolate sections for maintenance or firefighting. The main valves, zone valves, and fire hydrant valves are distinct from previously discussed valves that serve other functions like pressure management, air release, and backflow prevention.

2.5.4.1. Main Valves

In 2021, the City had 11,522 main valves throughout its potable water distribution system. **Table 2.18** lists the main valves and their sizes captured in the City's GIS database in 2021. The 8-inch valves represent 48% of the total main valves. 81% of the main valves were between 6 to 12 inches in size; however, approximately 10% of the City's main valves had unspecified size attribute data.

Table 2.18 – 2021 Main Valves Inventory

Size (in)	Number of Main Valves
1	6
1.25	1
1.5	7
2	105
2.5	30
4	218
6	1,176
8	5,603
10	1,066
12	1,461
14	50
16	355
18	29
20	77
24	75
27	4
30	38
36	2
Unspecified	1,219
Total	**11,522**

2.5.4.2. Zone Valves

Zone valves assist in controlling the pressures within the City's potable water supply systems and can be further classified as Zone Butterfly or Zone Gate Valves. In 2021, the City's potable water supply system had 147 zone valves, specifically 28 zone butterfly valves and 119 zone gate valves. **Table 2.19** lists the valve sizes for each of the valve types captured in the City's GIS database in 2021.

Table 2.19 – 2021 Zone Valves Inventory

Size	Zone Butterfly	Zone Gate
1	0	0
2	0	0
2.5	0	0
4	0	4
6	5	11
8	6	53
10	6	19
12	4	23
14	0	1
16	1	3
18	0	1
20	0	0
24	4	3
27	0	0
30	2	0
36	0	0
Unspecified	0	1
Total	**28**	**119**

2.5.4.3. Fire Hydrant Valves

Fire hydrant valves control the flow of water from the water pipeline to the fire hydrant, and the location of the fire hydrant valve varies based on the type of hydrant. In the City's GIS database from 2021, only approximately 1% of the fire hydrant valve sizes were captured.

2.5.5. Fire Hydrant Connections

Table 2.20 shows the number of fire hydrants connected to various pipeline diameters as captured in the City's GIS database in 2021.

The lowest required fire flow for residential communities is 1,500 gpm (1,000 gpm for county areas). However, several fire hydrants were placed before this requirement was set. At 1,100 locations, the City's 2021 GIS database includes fire hydrants without specifying the diameter of the pipeline.

Table 2.20 – 2021 Fire Hydrant Connection Inventory

Diameter of Pipeline (in)	Number of Hydrants
4	5
6	1,037
8	4,549
10	891
12	1,001
14	71
16	291
18	41
20	258
22	5
24	91
Unspecified	1,110
Total	**9,350**

2.6. Customer Services

2.6.1. Water Meters

In November 2021, the City had 45,863 water meters within the water service area. **Table 2.21** shows the sizes and number of meters captured in the City's GIS database in November 2021. More than 50% of the City's meters are 3/4-inch, which are predominantly for single-family residential units. Larger meters are used for high-density residential, commercial, and industrial users.

Table 2.21 – 2021 Water Meter Inventory

Meter Size	Number of Meters
5/8"	6,860
3/4"	28,797
1"	6,873
1-1/2	1,266
2"	1,772
3"	160
4"	57
6"	37
8"	41
Total	**45,863**

2.6.2. Service Valves

Service valves are installed on the potable water distribution system to allow servicing and/or disconnection of potable water meters. The service valves can be turned off during construction or maintenance or to prevent water losses if service is compromised at the user's property due to water leakage, theft, or delinquent payments. It is assumed that each water meter has a service valve.

2.7. Infrastructure Condition And Reliability Analysis

The condition and reliability of the existing infrastructure was evaluated through desktop analysis and WTP site visits described below.

- Desktop analysis of asset database including elements of the NEXGEN Enterprise Asset Management System and available SCADA data.
    - Existing GIS asset registers, inventories (including spatial location and attributes of assets) of all physical assets owned or managed by the City, developed prior to the Potable Water System Master Plan were evaluated.
- Site visit to four water treatment plants including photo log documentation of asset condition.

2.7.1. Condition and Reliability Analysis

The specific tasks executed to evaluate facility reliability for the potable water system infrastructure were as follows:

- Review City of Corona GIS inventory of facilities and map asset location based on available data.
- Review of the available as-built or other engineering drawings and specifications of the water supply
- Visual inspections of above-ground or visible assets as summarized in Appendix F and Appendix G
- Interview City maintenance and planning staff familiar with the construction activities and historic system knowledge.

2.7.1.1. Asset Age Assessment

The City's groundwater production wells, water treatment plants, storage tanks, pump stations, pressure reducing stations, and pipelines assessment are primarily based around a remaining service life analysis. The remaining service life analysis considers the age of the asset and the typical service life to determine the need for rehabilitation or replacement.

2.7.2. Groundwater Production Well Analysis

Pump Efficiency. Pump efficiency is a predictive indicator of the likelihood of mechanical and/or electrical equipment failures at production wells. Low efficiencies are indicative of aged and worn equipment, which is more likely to fail, whereas high efficiencies are indicative of newer and/or good condition equipment. As pump efficiency decreases, the pumping capacity may decrease and impact the City's ability to produce planned capacity.

SoCal Edison (SCE) efficiency tests determine pump efficiency.

- Five (5) wells (Well 27, 31, 33, Non-potable (NP) Well 1 and NP Well 2) have no SCE information.
- Four (4) wells (Wells 14, 15, 29 and 31) have recently been replaced or rehabilitated and are assumed to operate above 60% efficiency.
- Five (5) wells (Wells 9A, 8A, 11A, 12A and 28) operate above 60%.

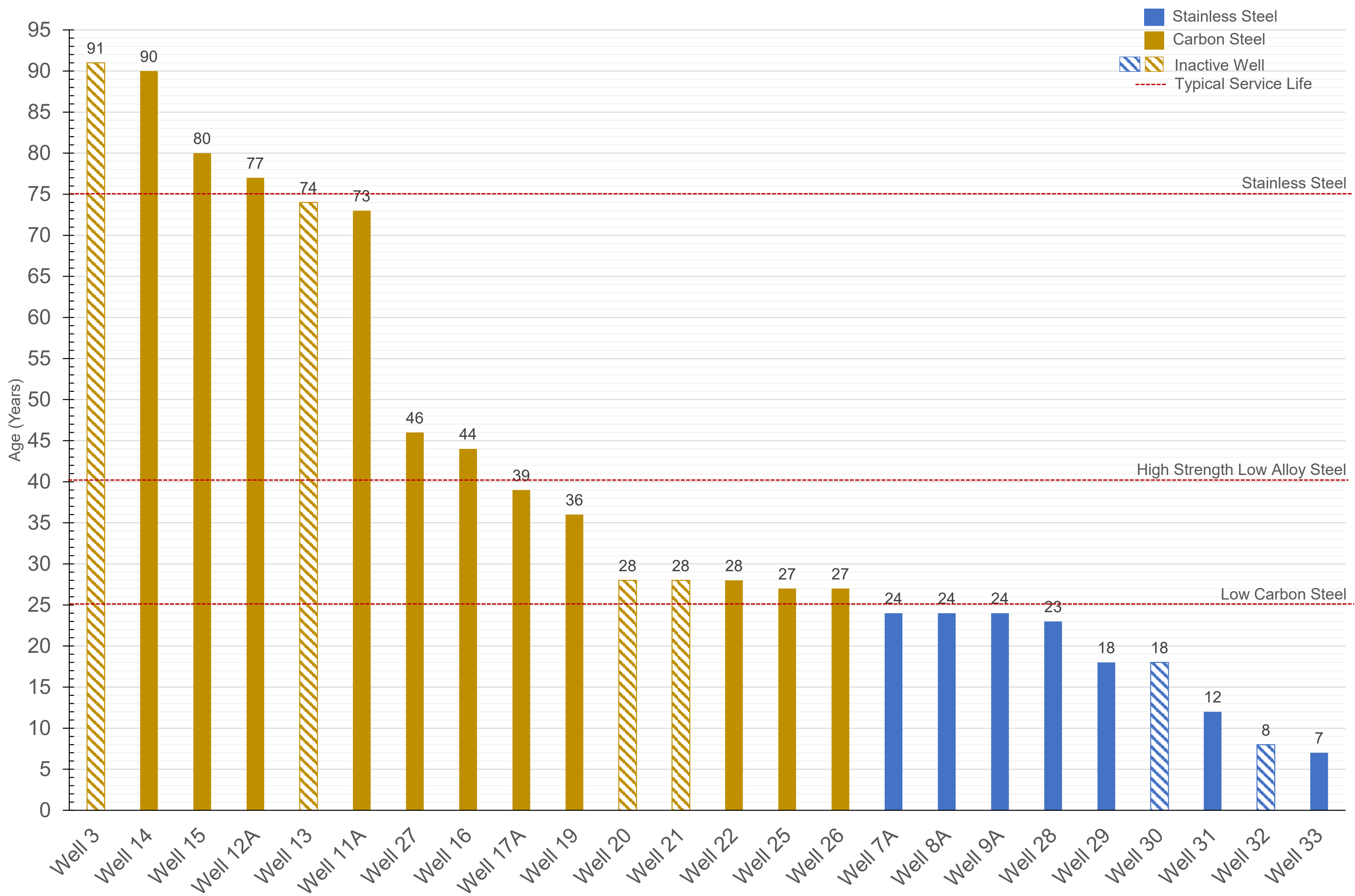
- Seven (7) wells (Wells 3, 7A, 17A, 20, 21, 22, and 25) operate between 50%-60% efficiency.
- Three (3) wells (Wells 13, 19, and 26) operate below 50%.

Pumps operating between 50% and 60% efficiency are an acceptable efficiency range but indicate that mechanical and electrical equipment may degrade and should be considered for replacement or rehabilitation. Any pumps operating below 50% efficiency require replacement of the mechanical and electrical equipment.

Casing. The age and material of the well casing is predictive of useful service life of the casing to preserve structural, seal, and condition integrity. Carbon steel well casings, both low carbon steel and high strength low alloy (HSLA) carbon steel, were installed until the late 1990s, and stainless steel well casings were installed after the late 1990s. The average service life of carbon steel wells is 25 years, and the average service life of stainless steel well casings is 75 years.

Figure 2.35 summarizes well age in 2026 and denotes well casing material.

Figure 2.35 – Age of Groundwater Production Wells in 2026 and Casing Material



- As of 2026, all carbon steel wells exceeded their expected service life. Wells 13 and 20 are inactive, and Wells 3 and 21 are standby wells.

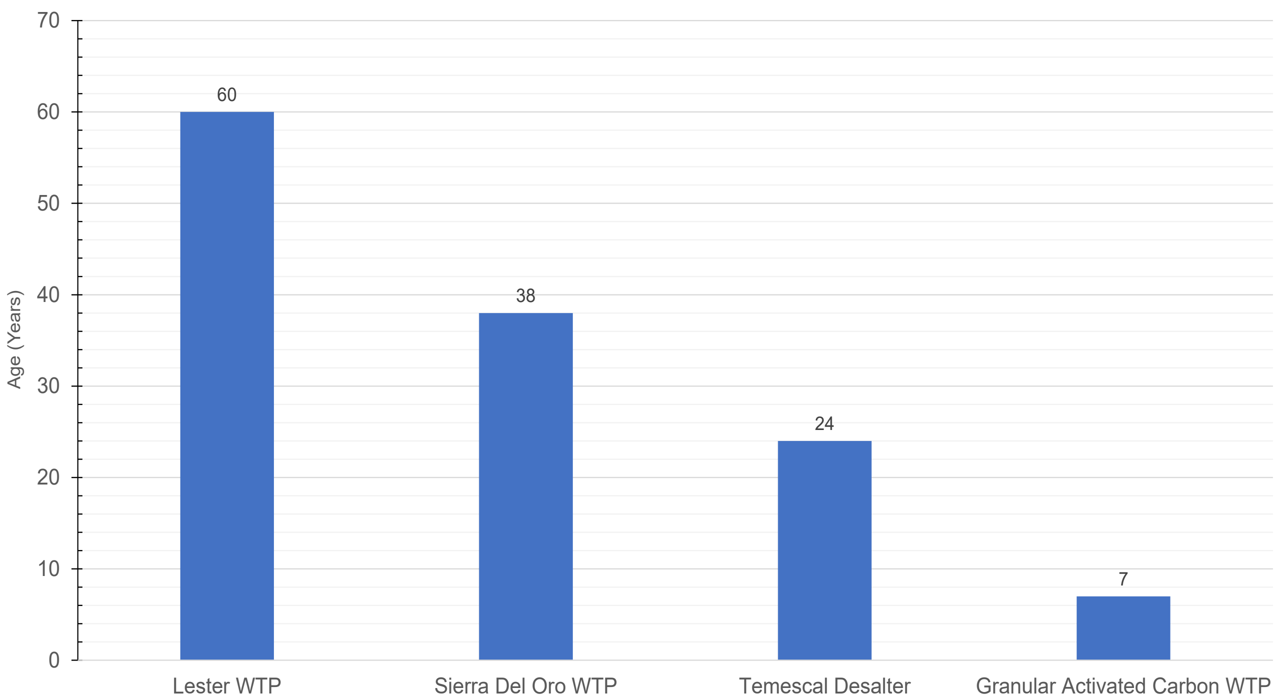
Boreholes. Boreholes should be inspected for any wells scheduled for casing rehabilitation. A thorough boring hole inspection is required to determine if the well requires redrilling or relocation.

2.7.3. Water Treatment Plant Analysis

Appendix F summarizes findings from 2021 site visits to the Lester Water Treatment Plant, the Sierra Del Oro Water Treatment Plant, the Temescal Desalter, and the GAC Water Treatment Plant. The condition of the water treatment plant assets was analyzed by visually inspecting plant components and documenting discussions with City operations staff. **Figure 2.36** is provided for reference to present the approximate age of the City's water treatment plant facilities.

More detailed evaluation studies could be completed to analyze assets within the water treatment plants.

Figure 2.36 – Age of Water Treatment Plants in 2026



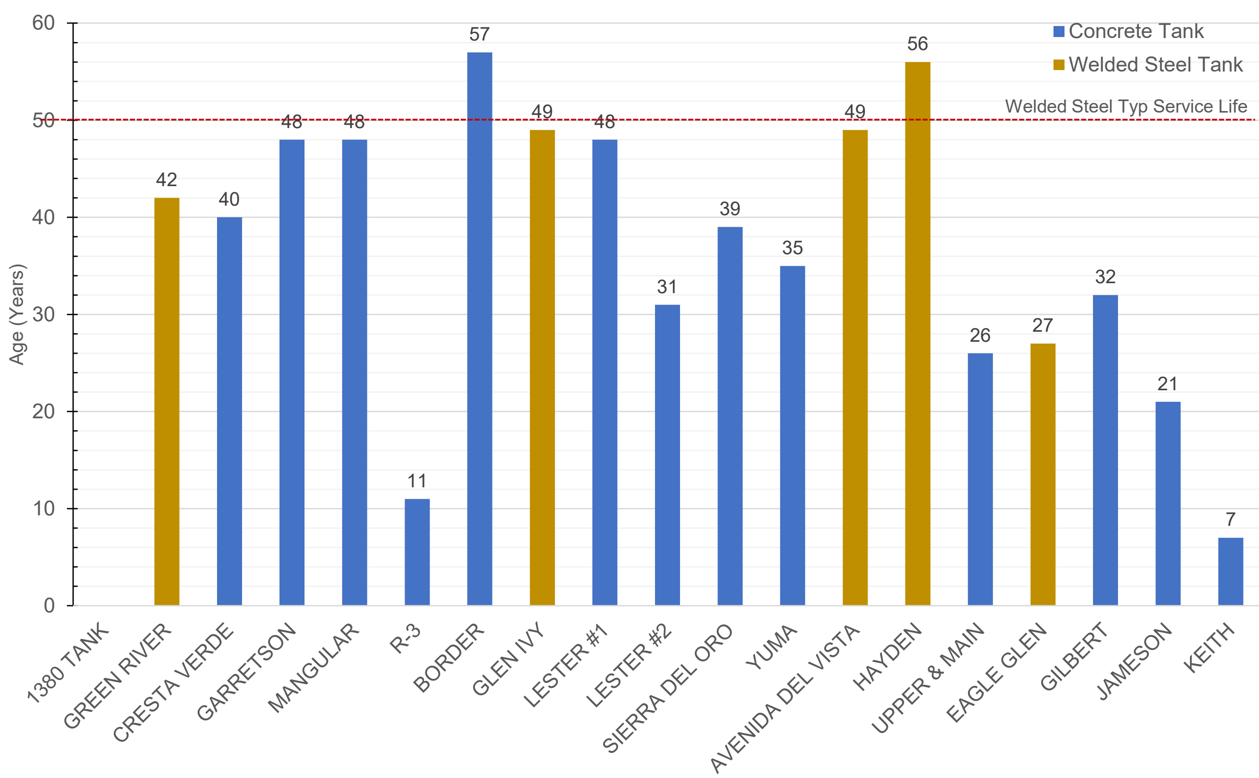
2.7.4. Storage Tank Analysis

Storage tanks should be inspected every three (3) to five (5) years for asset management purposes. Routine inspection, cleaning, and recoating can prolong the service life of tanks and should be prioritized as part of a maintenance budget.

Tank Material. The City owns and operates five steel tanks and thirteen concrete tanks constructed between 1954 and 2019. Tank material and typical service life alone do not indicate the need to replace a tank. The typical service life for a steel tank is 50 years. Visual inspections in 2021 determined Hayden Tank was in good condition with no signs of corrosion, exceeding 50 years of service life. The Avenida Del Vista and Green River steel tanks will exceed the 50-year typical service life by 2040, and the Glen Ivy tank has been removed from service. The typical service life for a concrete tank is 100 years, and the first concrete tank to reach the typical service life will be Border Tank in 2069. Unless an inspection finds damage, none of the City's concrete tanks will be considered a high risk of failure.

Figure 2.37 reflects that the R-3 tank was reconstructed in 2015.

Figure 2.37 – Age of Storage Tanks in 2026



2.7.5. Pump Station Analysis

As of 2026, most of the City's pump stations are between 20 and 40 years old. Typical service life on pumping electrical and mechanical equipment is approximately 20 years.

Pump Efficiency. Pump efficiency is a predictive indicator of the likelihood of mechanical and/or electrical equipment failures at production wells. Low efficiencies are indicative of aged and worn equipment, which is more likely to fail, whereas high efficiencies are indicative of newer and/or good condition equipment. As pump efficiency decreases, the pumping capacity may decrease and impact the City's ability to produce planned capacity.

SoCal Edison (SCE) efficiency tests determine pump efficiency.

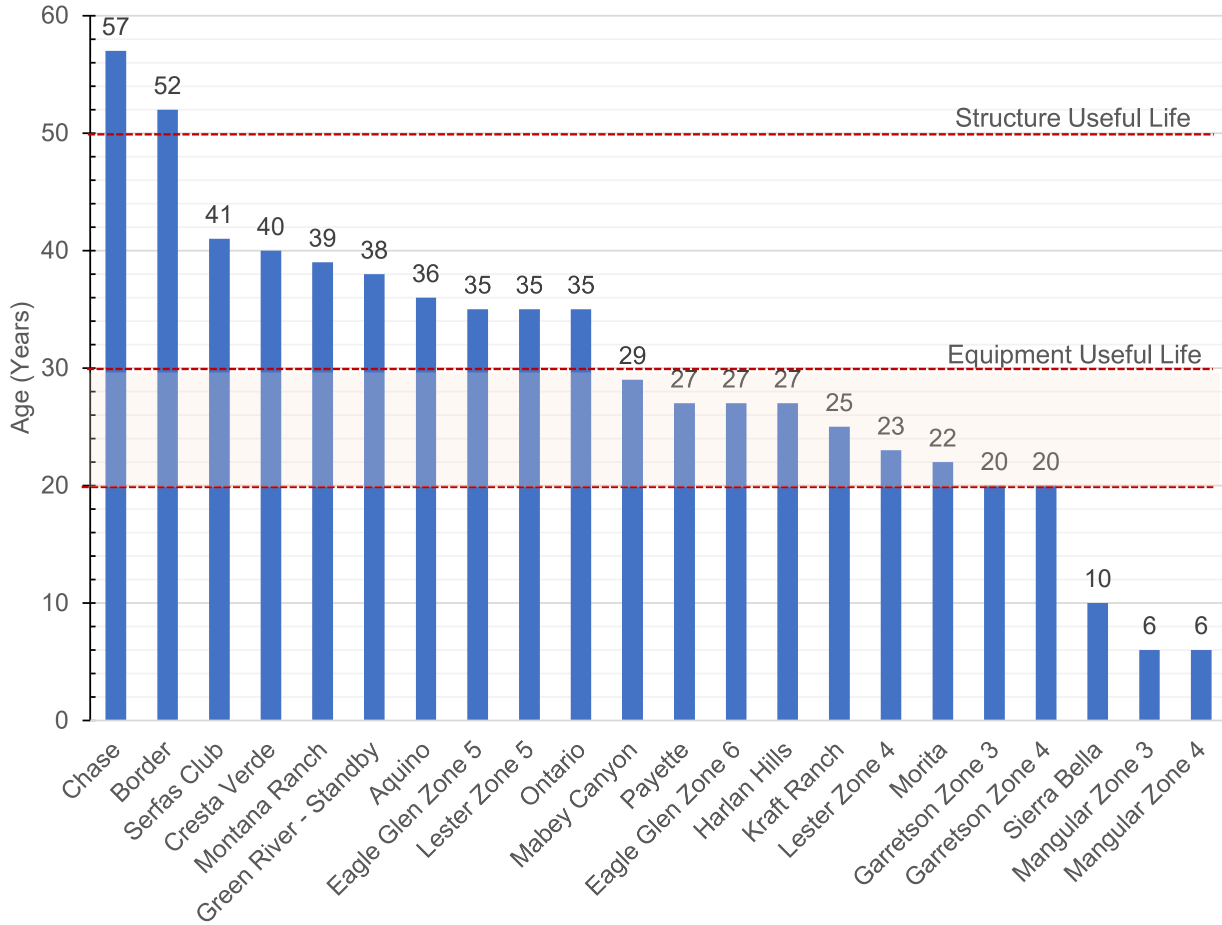
- One (1) pump station (Sierra Bella) has no SCE information.
- 17 pump stations (Stations Green River, Serfas Club, Lester Zone 4, Lester Zone 5, Garretson, Chase, Garretson Zone 4, Mangular, Border, Cresta Verde, Eagle Glen Zone 6, Payette, Montana Ranch, Kraft Ranch, Harlan Hills, Morita, and Mabey Canyon) operate above 60% efficiency.
- Two (2) pump stations (Eagle Glen Zone 5 and Aquino) operate below 50% efficiency.

Pumps operating between 50% and 60% efficiency are an acceptable efficiency range but indicate that mechanical and electrical equipment may degrade and should be considered for replacement or rehabilitation. Any pumps operating below 50% efficiency require replacement of the mechanical and electrical equipment.

Pump Age. Figure 2.38 shows the average age of each pump station in 2026 and associated service lives.

Wet Wells or Pump Vaults. Concrete structures are typically expected to outlive rotating mechanical equipment, but concrete structures require inspection and maintenance. Typical service life of a concrete structure is approximately 50 years. The Chase Pump Station and Border Pump Station structures have exceeded their service life. However, these structures could last longer if they are well maintained. If the structures begin to show signs of degradation, the structures should be replaced.

Figure 2.38 – Age of Pump Stations in 2026

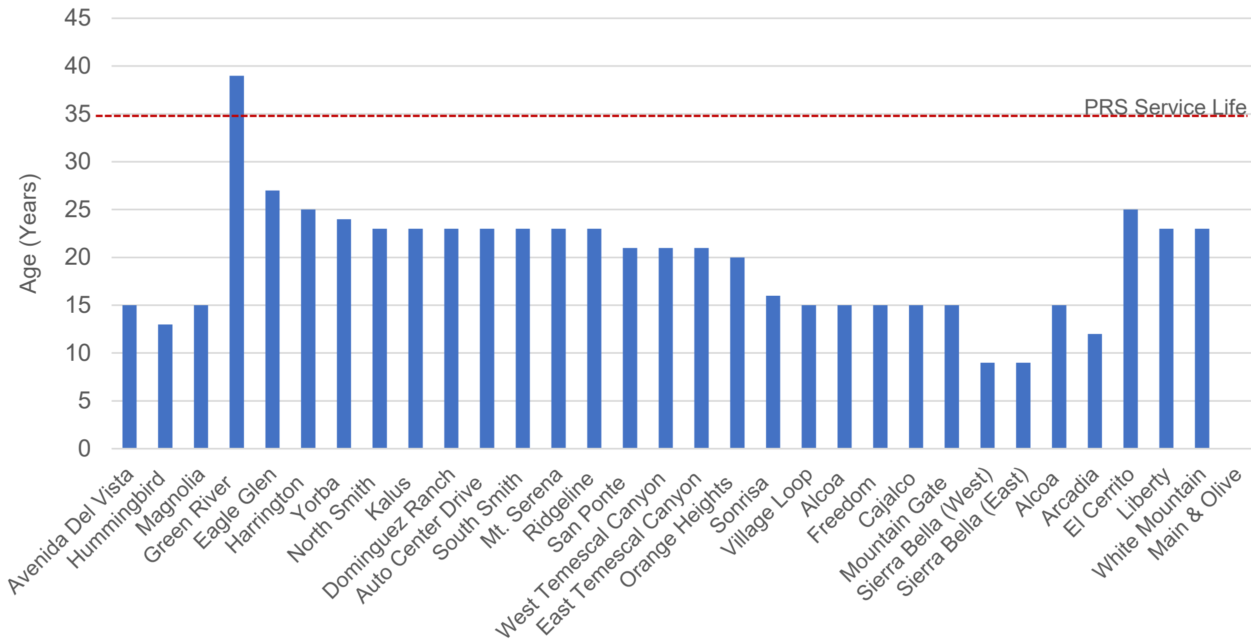


2.7.6. Pressure Reducing Station Analysis

As of 2026, most of the City's pressure reducing stations are between 15 and 27 years old. Typical service life on pressure reducing stations is approximately 35 years.

Age. Figure 2.39 shows the age of the City's PRS's in 2026. One (1) PRS has an unknown installation date, and a conditions assessment is recommended to gather information about Main & Olive. As of 2026, one (1) has reached its service life.

Figure 2.39 – Age of Pressure Reducing Stations in 2026



2.7.7. Pipeline Analysis

Asbestos Cement Pipe. Approximately one third of the City’s pipelines are constructed from asbestos cement pipe material. Asbestos cement pipe was widely utilized in the mid-20th century and is no longer favored due to health effects caused by asbestos fibers. Generally, asbestos cement pipes do not pose a significant health risk from asbestos fibers if they are not damaged. However, there are risks associated with cutting, repair, and removal of the material. Therefore, the City would benefit if the asbestos cement pipelines are replaced at the end of the service life or if the pipeline incurs structural damage. These pipelines have been identified in **Section 9**.

Hydraulic Capacity. Hydraulic capacity of pipelines is discussed along with hydraulic model results in **Sections 6 and 7**.

Pipe Service Life. For pipelines, the remaining service life analysis considers the age and material of the pipeline to estimate the typical service life for specific pipe material. For pipelines, the end of the service life is the age when pipe material could be expected to weaken, crack, or rupture. The typical service life for pipelines can vary from 40 to 100 years, but pipes can be utilized beyond their expected service life. It is recommended that once a pipeline reaches the end of its service life, a CCTV inspection be conducted to ascertain the pipeline's condition. If significant damage or degradation is found, pipeline replacement is recommended to maintain the integrity of the distribution system.

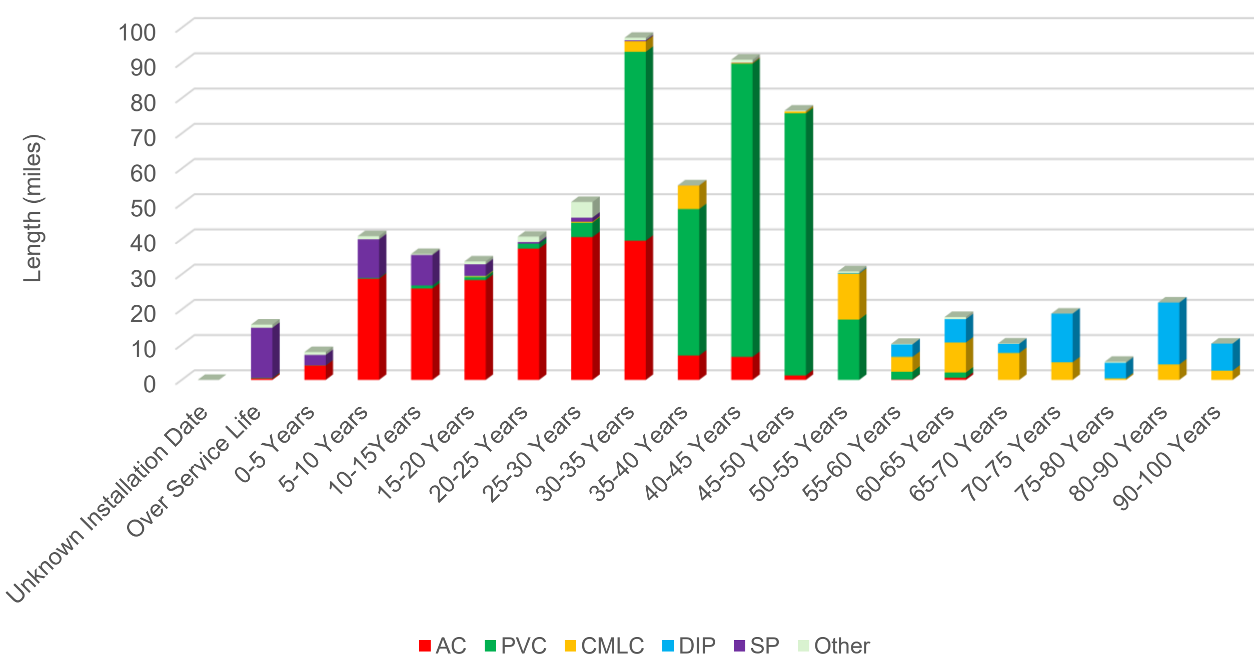
The expected service life for each pipeline material within the City’s distribution system is shown in **Table 2.22**.

Table 2.22 – Pipeline Service Life

Abv.	Material	Service Life	Length (miles)
AC	Asbestos Cement Pipe	70	219.94
CAS	Cast Iron Pipe	50	0.01
CEM	Cement Pipe	75	1.60
CIPP	Cast Iron Pipe	50	10.43
CMLC	Cement Mortar Lined and Coated Steel Pipe	100	56.82
CML-TW	Cement Mortar Lined and Tape Wrapped Steel Pipe	75	0.73
COP	Copper Pipe	50	0.13
DIP	Ductile Iron Pipe	100	57.75
GP	Galvanized Pipe	50	0.03
PEP	Polyethylene Pipe	75	0.17
PVC	Polyvinyl Chloride Pipe	70	279.16
RCP	Reinforced Concrete Pipe	100	0.00
SP	Steel Pipe	50	40.98
		Total	**667.75**

Figure 2.40 shows the quantity of pipeline in miles of pipeline and the remaining service life in 5-year increments. The figure also indicates the type of pipe material. As of 2026, approximately 16 miles of water pipelines have exceeded their service life, and approximately 118 miles are projected to reach the end of their service life within the next 20 years.

Figure 2.40 – Remaining Pipe Service Life as of 2026



2.7.7.1. Coronita (Unincorporated) Pipeline Analysis

Coronita is an unincorporated area within the City of Corona's boundaries. Coronita is a census-designated area in Riverside County. It is located in the western portion of the City.

Pipeline Diameters. The pipeline diameters vary from 4 inches up to 18 inches. Pipelines with diameters less than 8-inches are not up to City standards and should be replaced and upsized to a minimum diameter of 8-inches. **Figure 2.41** shows the pipelines with diameter sizes within Coronita. **Table 1** in Appendix H contains a list of deficient pipelines due to diameter size within Coronita.

Pipeline Materials. The pipeline materials in the Coronita area include asbestos cement (AC), cement mortar lined and coated (CMLC), ductile iron pipe (DIP), polyvinyl chloride (PVC), and steel (SP). As discussed in **Section 2.7.7.** asbestos cement and uncoated steel pipe should be replaced at the end of their service life. **Figure 2.42** shows the pipeline material types within Coronita. Please refer to **Table 2** in Appendix H, which contains a list of pipelines within Coronita.

Pipeline Age. Pipelines in the Coronita area were installed between 1946 and 2017. As shown on **Figure 2.43**. **Table 3** in Appendix H depicts the pipelines from the earliest year installed to the latest.

Figure 2.41 – Coronita Pipeline Diameters

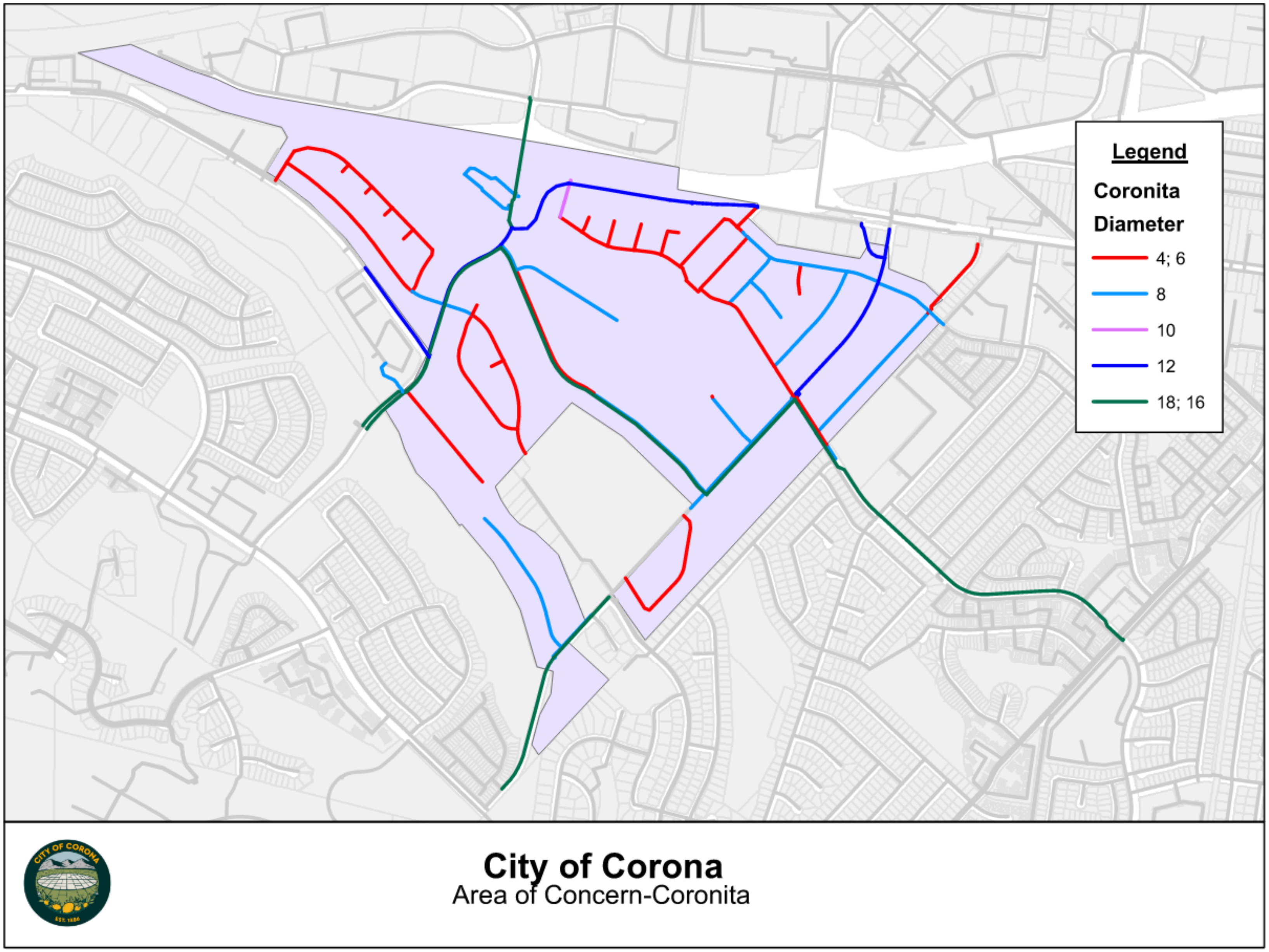


Figure 2.42 – Coronita Pipeline Materials

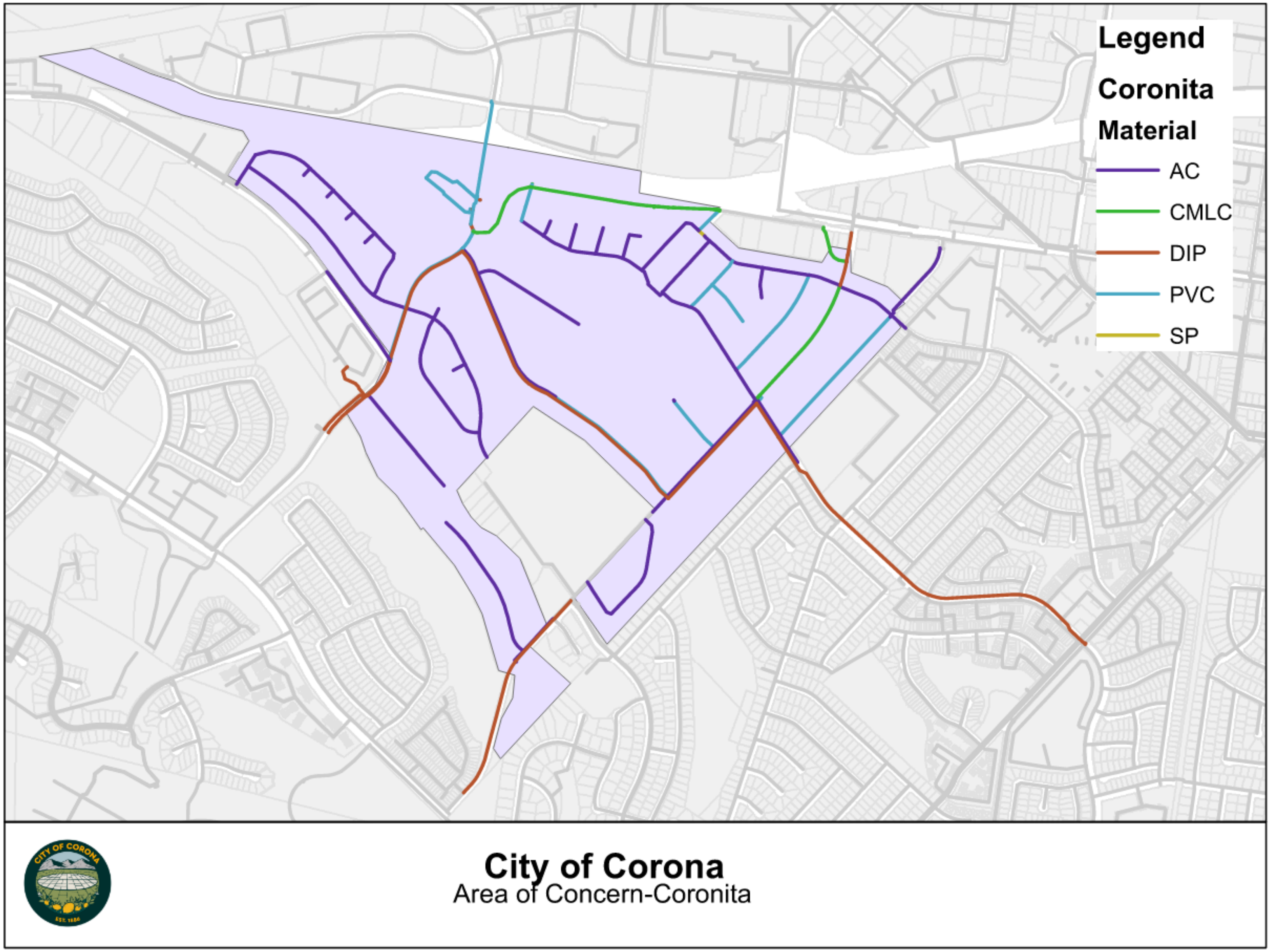
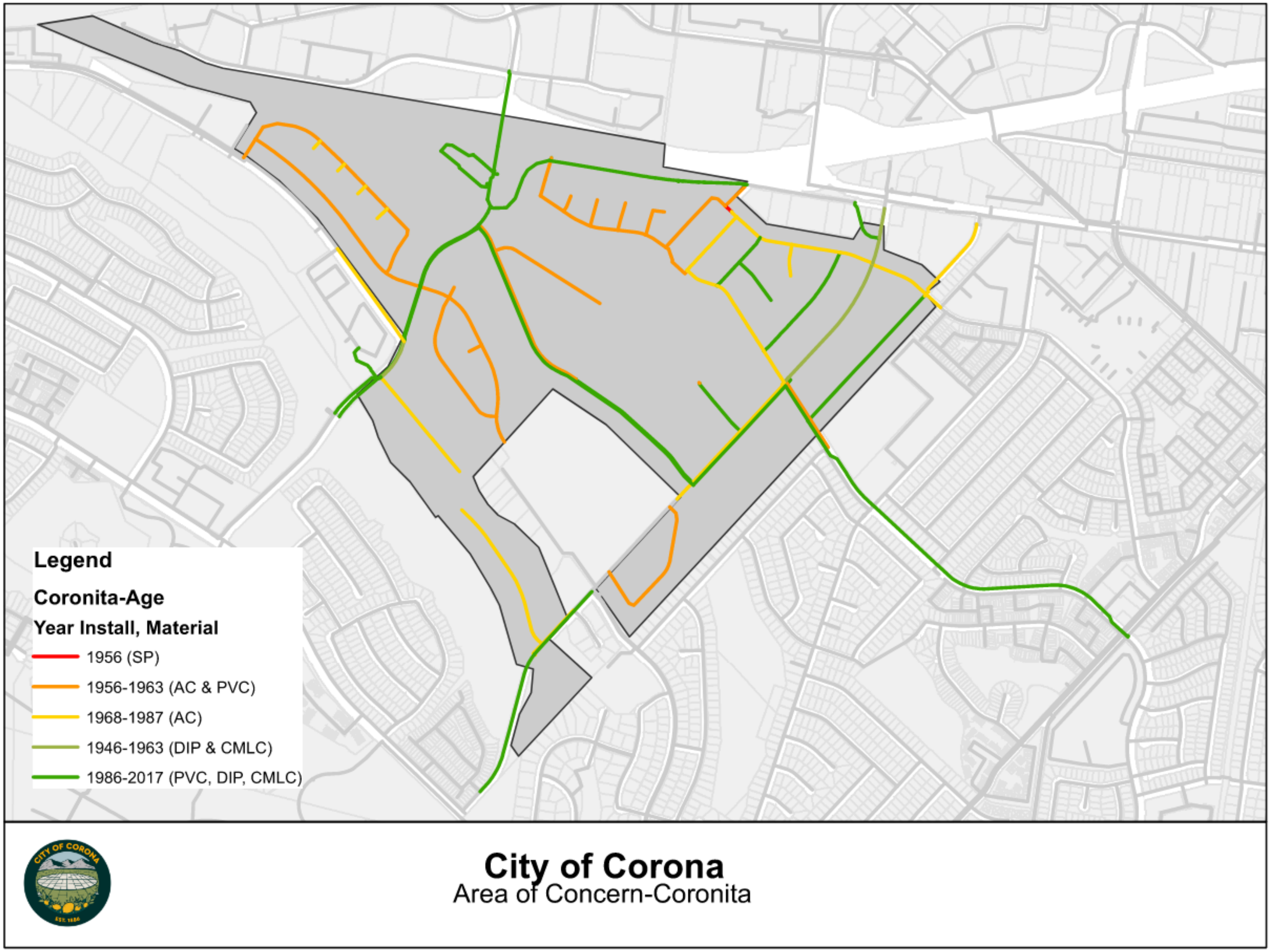


Figure 2.43 – Coronita Pipeline Age



2.7.7.2. Temescal Valley Pipeline Analysis

Temescal Valley is an area within the City of Corona's boundaries. It is a census-designated area in Riverside County in the southern portion of the City of Corona. Temescal Valley is roughly 19.3 square miles and hosts the Temescal Basin and Temescal Valley Water District (TVWD).

Pipeline Diameters. The pipeline diameters vary from 2 inches up to 18 inches. Pipelines with diameters less than 8 inches are not up to City standards and should be replaced and upsized to a minimum diameter of 8 inches. **Figure 2.44** shows the pipelines with diameter sizes within Temescal Valley. **Table 4** in Appendix H contains a list of deficient pipelines due to diameter size within Temescal Valley.

Pipeline Materials. The pipeline materials in the Temescal Valley area include asbestos cement (AC), cement mortar lined and coated (CMLC), ductile iron pipe (DIP), polyvinyl chloride (PVC), and steel (SP).

As discussed in **Section 2.7.7.** asbestos cement and uncoated steel pipe should be replaced at the end of their service life. **Figure 2.45** shows the pipeline material types within Temescal Valley. **Table 5** in Appendix H contains a list of Asbestos Cement and Steel pipelines.

Pipeline Age. Pipelines in the Temescal Valley area were installed between 1963 and 2007 as shown on **Figure 2.46**. **Table 6** in Appendix H contains a list of pipelines within Temescal Valley with pipeline installation years.

Figure 2.44 – Temescal Valley Pipeline Diameters

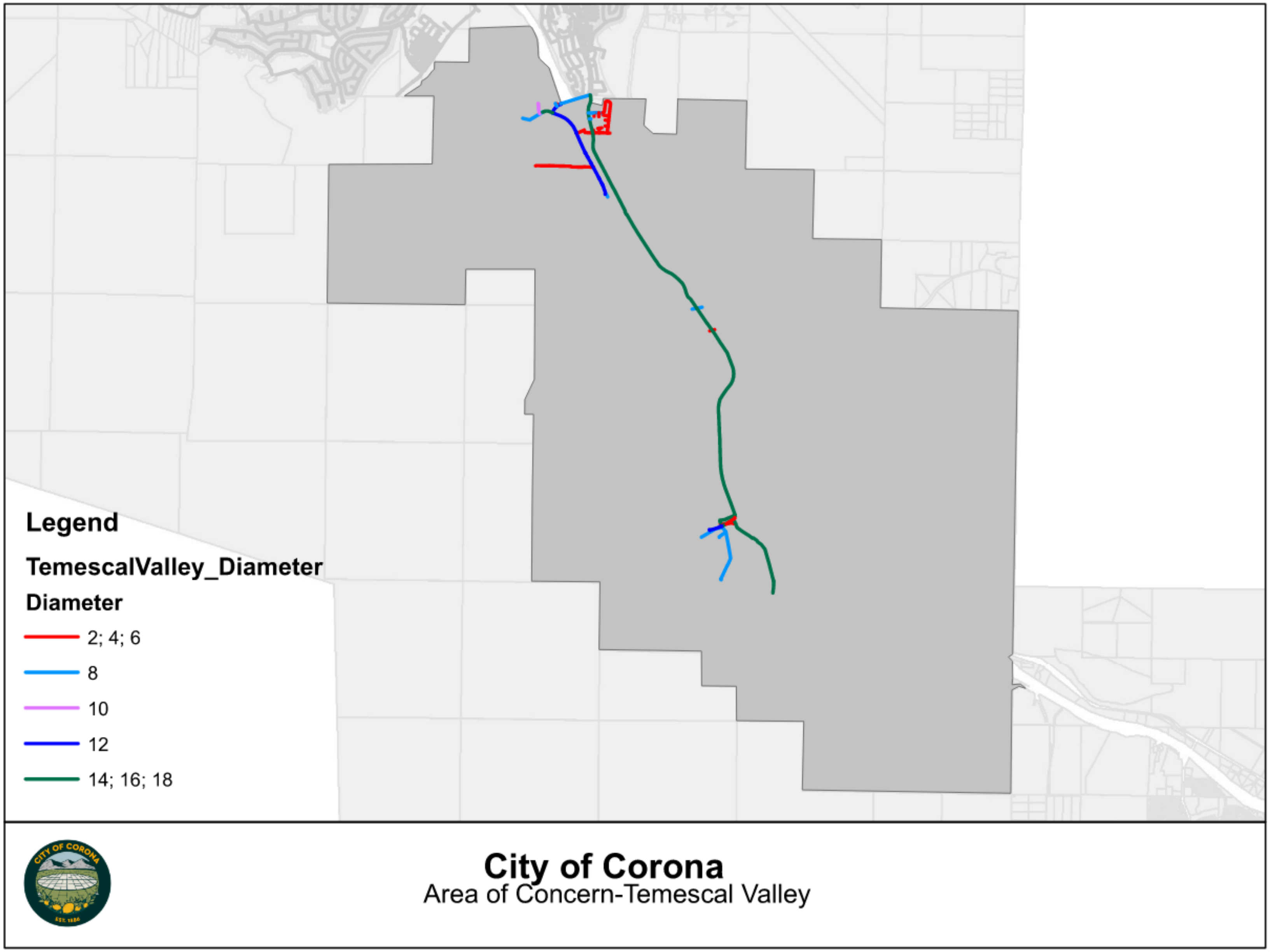


Figure 2.45 – Temescal Valley Pipeline Materials

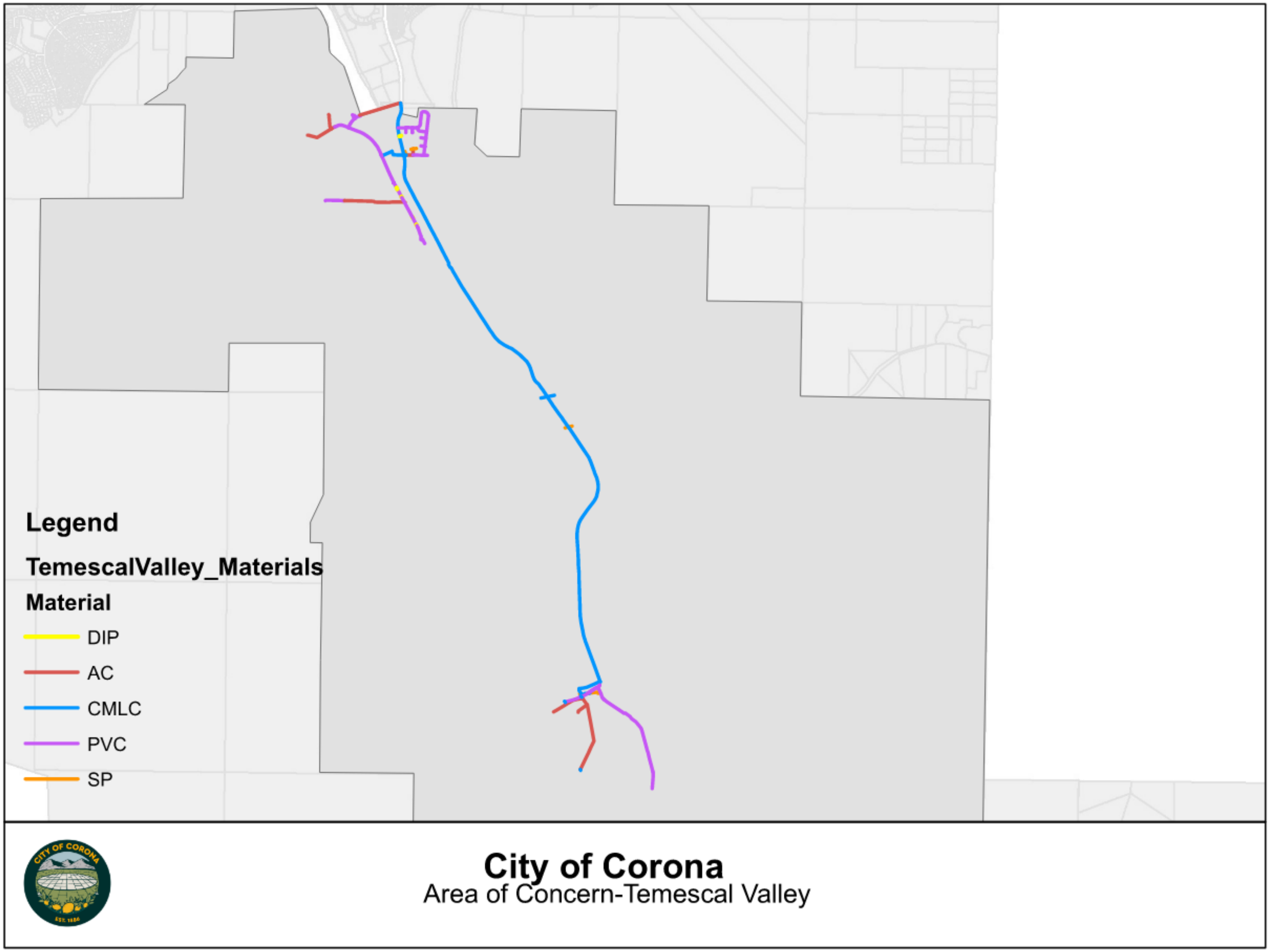
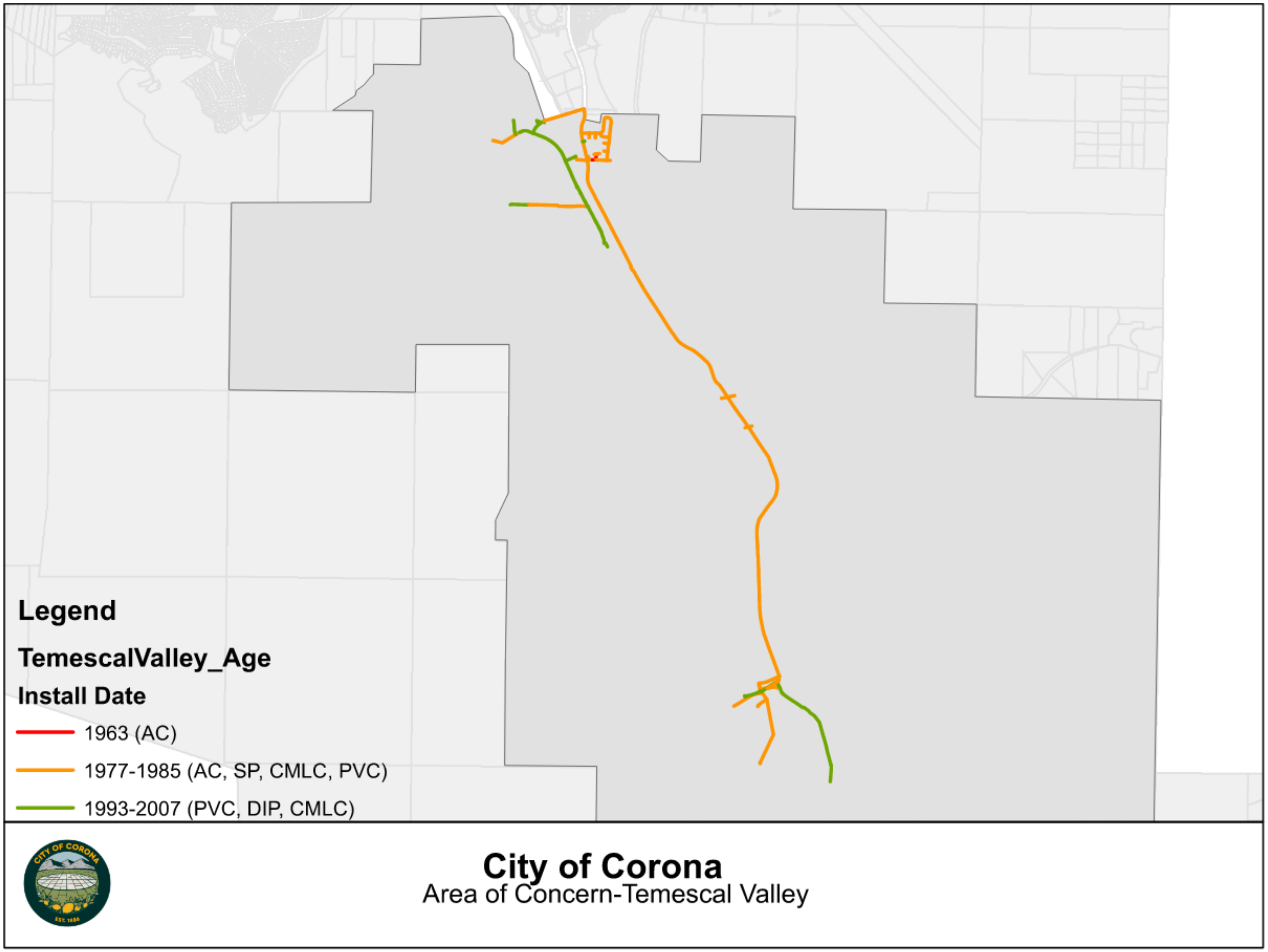


Figure 2.46 – Temescal Valley Pipeline Age



2.7.7.3. El Cerrito (Unincorporated) Pipeline Analysis

El Cerrito is an unincorporated area (roughly 2.8 square miles) mostly surrounded by the City of Corona. It is a census-designated area in Riverside County and is located in the southeastern portion of the City.

Pipeline Diameters. The pipeline diameters vary from 1 inch up to 30 inches. Pipelines with diameters less than 8 inches are not up to City standards and should be replaced and upsized to a minimum diameter of 8 inches. **Figure 2.47** shows the pipelines with diameter sizes within El Cerrito. **Table 7** in Appendix H contains a list of deficient pipelines due to diameter size within El Cerrito.

Pipeline Materials. The pipeline materials in the Temescal Valley area include asbestos cement (AC), cement mortar lined and coated (CMLC), ductile iron pipe (DIP), polyvinyl chloride (PVC), steel (SP), and cast-in-place pipe (CIPP).

As discussed in **Section 2.7.7.** asbestos cement and uncoated steel pipe should be replaced at the end of their service life. **Figure 2.48** shows the pipeline material types within El Cerrito. **Table 8** in Appendix H contains a list of pipelines based on material and life expectancy.

Pipeline Age. Pipelines in the El Cerrito area were installed between 1943 and 2020. as shown on **Figure 2.49**. **Table 9** in Appendix H contains a list of pipelines within El Cerrito based on installation year.

Figure 2.47 – El Cerrito Pipeline Diameters

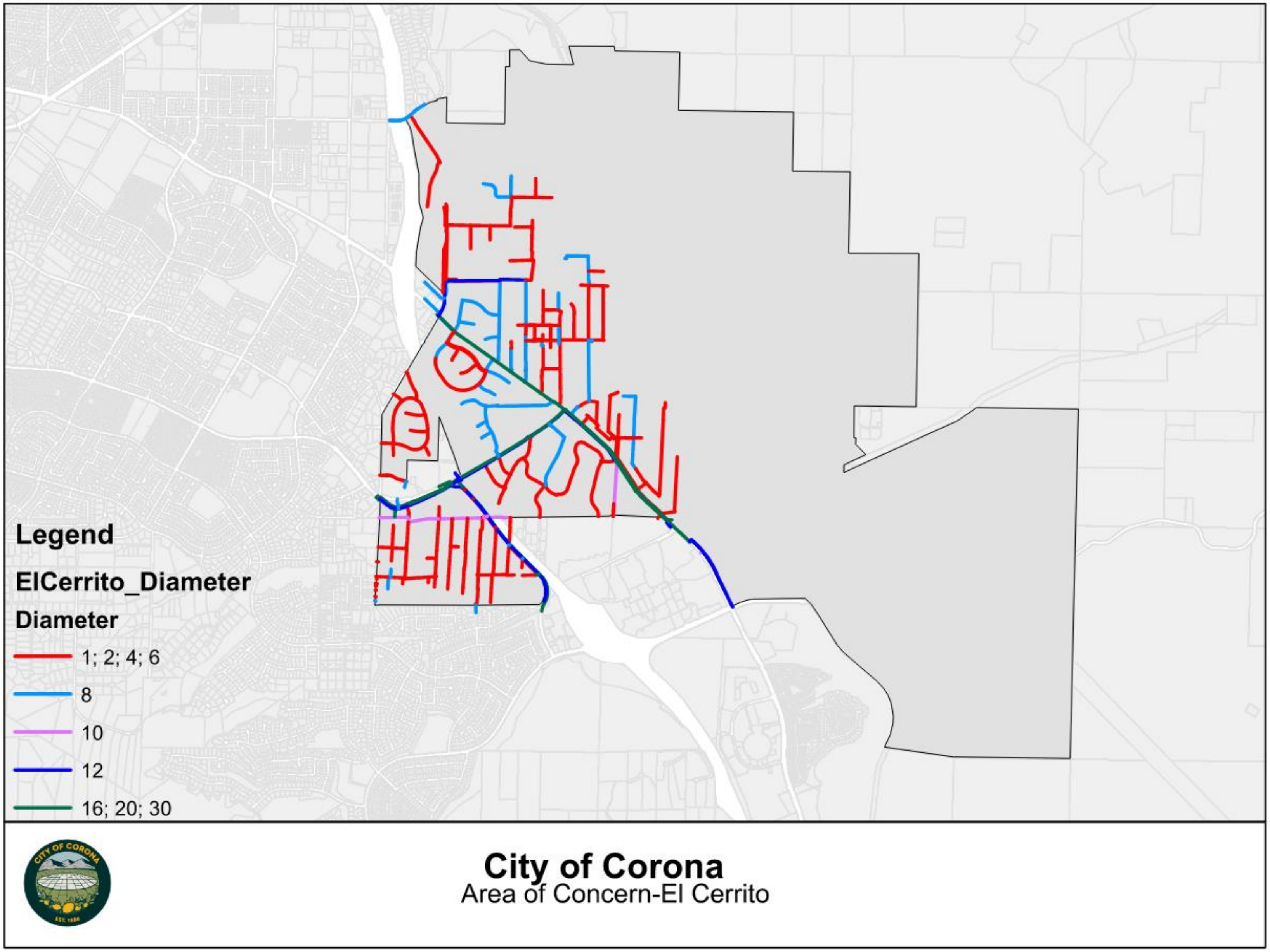


Figure 2.48 – El Cerrito Pipeline Materials

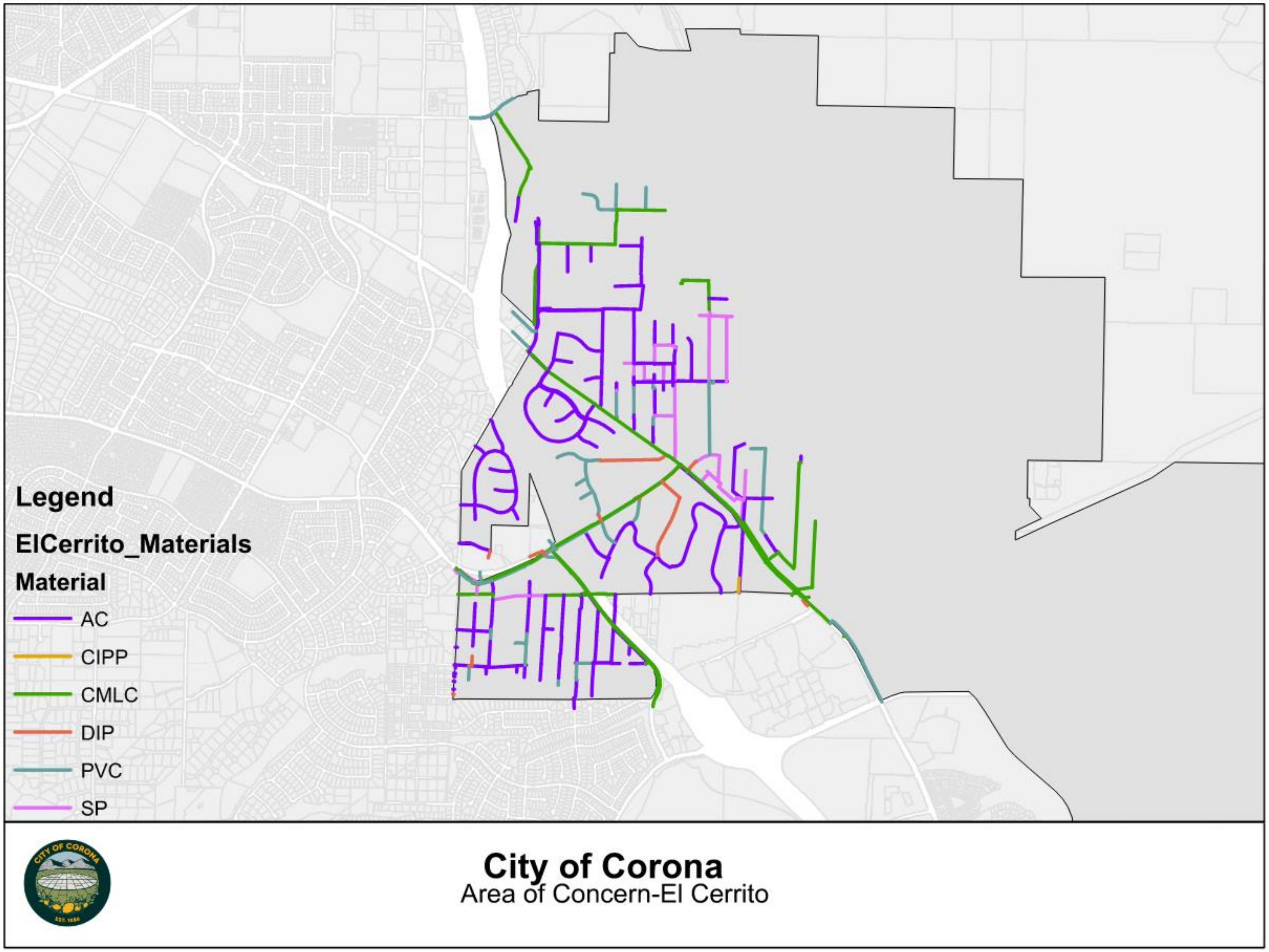
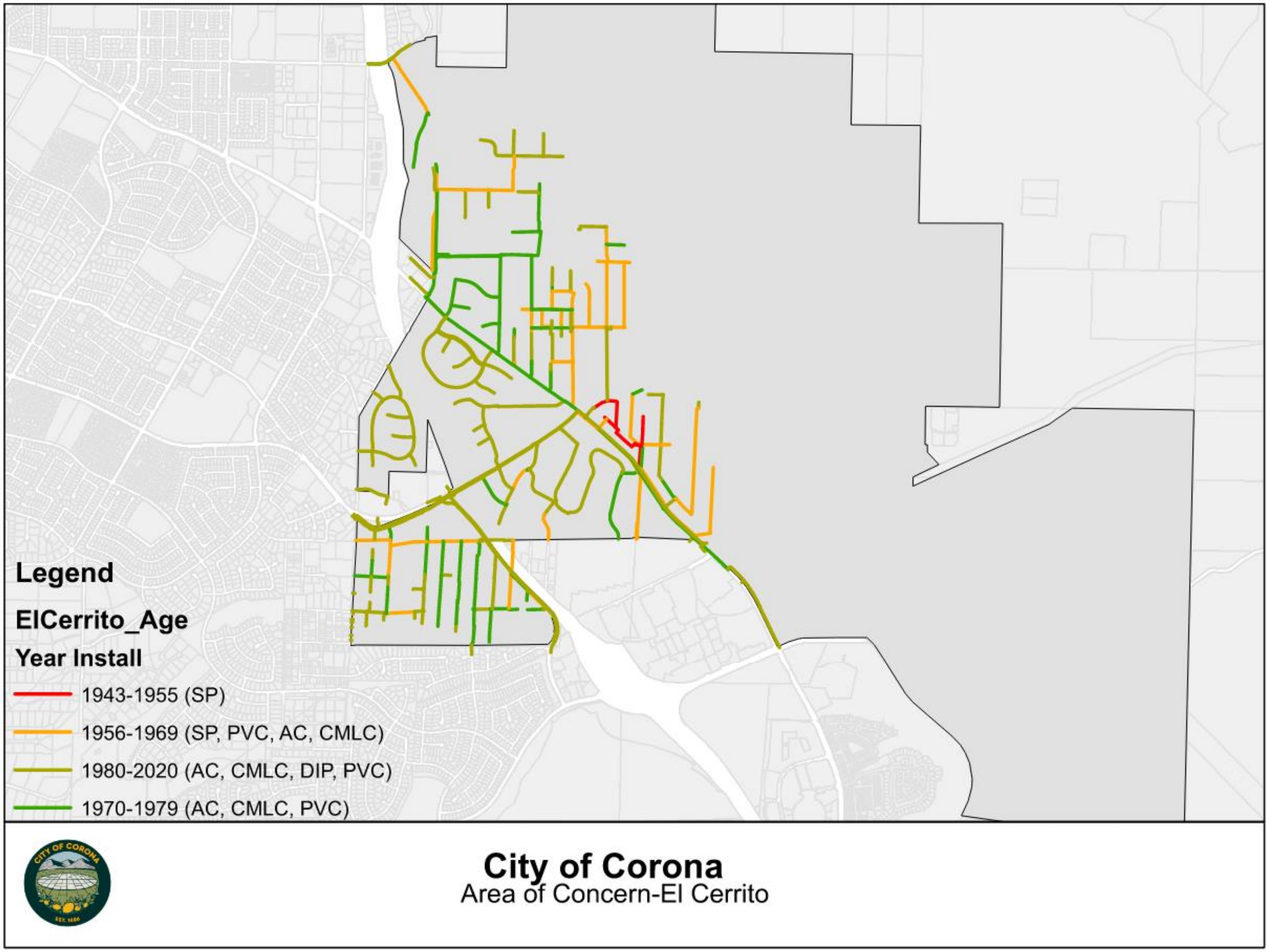


Figure 2.49 – El Cerrito Pipeline Age



2.7.7.4. Downtown Pipeline Analysis

The area identified as "Downtown" is referring to the area enclosed by the circular roadway known as Grand Boulevard. This area is within the City's boundaries and is under the City's jurisdiction and is roughly 0.6 square miles. It has been deemed an area of concern due to the materials, age, and diameters of the pipelines currently in use.

Pipeline Diameters. The pipeline diameters in the Downtown area vary from 2 inch up to 30 inches. Pipelines with diameters less than 8 inches are not up to City standards and should be replaced and upsized to a minimum diameter of 8 inches. **Figure 2.50** shows the pipelines with diameter sizes within Downtown. **Table 10** in Appendix H contains a list of deficient pipelines due to diameter size within Downtown.

Pipeline Materials. The pipeline materials in the Downtown area include asbestos cement (AC), cement mortar lined and coated (CMLC), ductile iron pipe (DIP), polyvinyl chloride (PVC), steel (SP), and cast-in-place pipe (CIPP), copper pipe (COP), and Polyethylene Pipe (PEP).

As discussed in **Section 2.7.7.** asbestos cement and uncoated steel pipe should be replaced at the end of their service life. **Figure 2.51** shows the pipeline material types within Downtown. **Table 11** in Appendix H contains a list of deficient pipelines due to pipe material.

Pipeline Age. Pipelines in the Downtown area were installed between 1924 and 2020 as shown in **Figure 2.52**. **Table** 12 in Appendix H contains a list of pipelines within Downtown with pipeline installation years.

Adopted June 17, 2026

Figure 2.50 – Downtown Pipeline Diameter

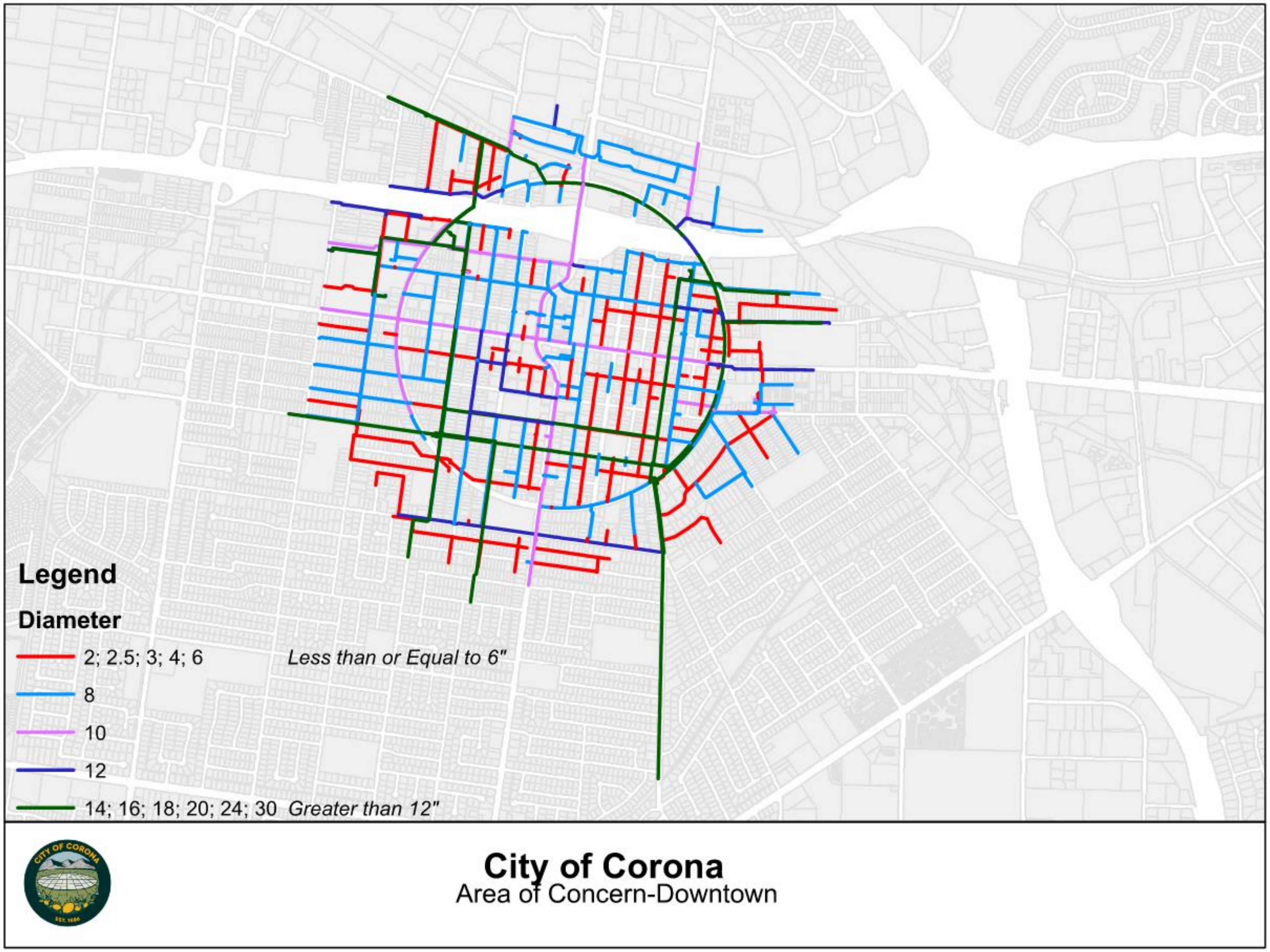


Figure 2.51 – Downtown Pipeline Materials

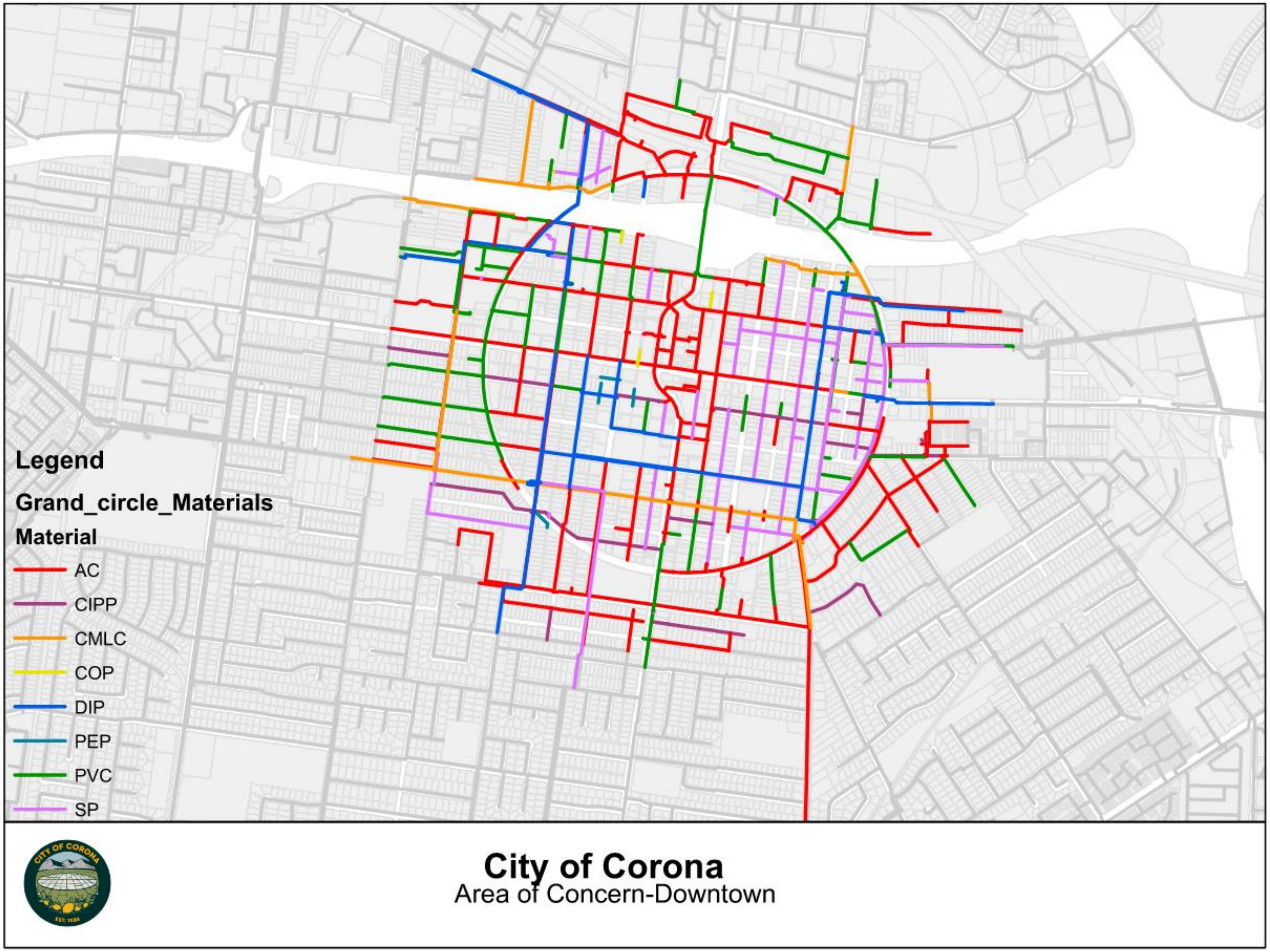
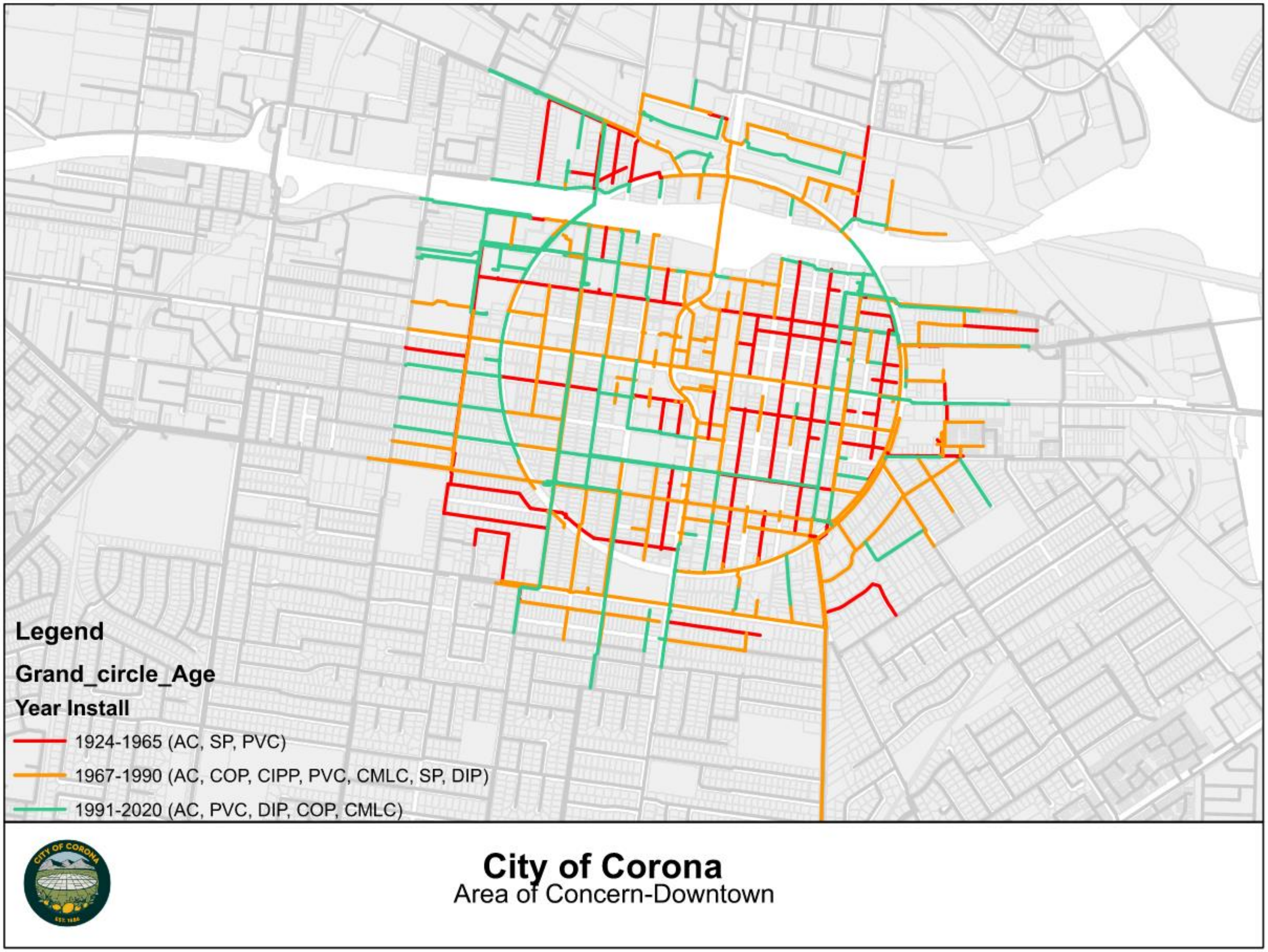


Figure 2.52 – Downtown Pipeline Age



SECTION 3 - WATER SUPPLY

3.1. GENERAL DESCRIPTION

The City's water supply is composed of groundwater (local supply) and imported water (treated and untreated). This section incorporates relevant information from existing City planning documents that guide the strategy for managing water supply from different sources, including the following plans listed by date of publication.

- City of Corona 2018 Reclaimed Water Master Plan. (*2018 Reclaimed Water Master Plan*)
- City of Corona Water Operations Blending Program Technical Report/Operations Plan, February 2020. (*2020 Blending Program Technical Report*)
- City of Corona 2020 Urban Water Master Plan, June 2021, Michael Baker International. *(2020 UWMP)*
- Groundwater Sustainability Plan Bedford-Coldwater Basin, November 2021, TODD Groundwater, Stantec, and H&H Water Resources. (*2021 GWSP: Bedford-Coldwater Basin*)
- Groundwater Sustainability Plan Temescal Basin, January 2022, TODD Groundwater and Carollo Engineers. (*2022 GWSP: Temescal Basin*)

Table 3.1 and **Table 3.2** summarize the historic water supply sources by groundwater and imported water for years 2016–2019 and 2020–2024, respectively, expressed in million gallons per day (MGD). These tables do not denote inactive and standby wells, but this information is included in **Section 2.3.1**. The groundwater is supplied from two (2) basins: the Temescal Basin and the Bedford-Coldwater Basin. The imported water is provided by the Metropolitan Water District (MWD) through the Colorado River and State Water Project. Imported water is delivered to the City by MWD's agency member the Western Municipal Water District (WMWD) through the Mills Pipeline (treated) and Lower Feeder Pipeline (untreated). Additional imported water from WMWD is treated at the Arlington Desalter and supplied through an interconnection. The City also maintains one interconnection to supply Home Gardens (Riverside County), and two interconnections with the City of Norco. During an emergency, the City can obtain water from the City of Riverside and Temescal Valley Water District (TVWD) through emergency interconnections. **Figure 3.1** provides a hydraulic schematic of the City's supply sources, and **Section 2.3** provides a detailed description of the water supply facilities.

Table 3.1 – Sources of Supply (MGD), 2016 - 2019

Water Source			2016	2017	2018	2019	Avg
Groundwater	Bedford-Coldwater Basin	Well No. 3	0.411	0.003	0	0	0.103
		Well No. 20	0	0	0	0	0
		Well No. 21	1.346	0.682	0.159	0	0.547
		Subtotal	***1.757***	***0.685***	***0.159***	***0.000***	***0.650***
	Temescal Basin	Well No. 7A	0.963	0.509	1.176	1.058	0.927
		Well No. 8A	1.557	1.864	1.610	1.332	1.591
		Well No. 9A	1.120	1.179	1.247	1.165	1.178
		Well No. 11A	0.471	0.356	0.717	0.503	0.512
		Well No. 12A	0.444	0.610	0.713	0.737	0.626
		Well No. 13	0.025	0	0	0	0.006
		Well No. 14	0.769	0.889	0.846	0.825	0.832
		Well No.15	0.981	1.129	0.788	1.187	1.021
		Well No. 17A	1.074	0.917	0.907	0.557	0.864
		Well No. 19	0	0	0.659	1.139	0.450
		Well No. 22	1.961	1.848	2.002	1.847	1.914
		Well No. 25	1.451	1.587	1.235	0.715	1.247
		Well No. 26	0.155	0	0	0	0.039
		Well No. 27	0.369	0.235	0.385	0.285	0.319
		Well No. 28	0.608	0.638	0.964	0.828	0.759
		Well No. 29	0.006	0	0	0	0.002
		Well No. 31	0	0	0.554	0.876	0.357
		Well No. 33	N/A	N/A	N/A	1.137	1.137
		Subtotal	***11.955***	***11.760***	***13.803***	***14.191***	***12.927***
Imported Water	MWD Colorado River	WR – 19	7.464	10.279	9.541	8.590	8.968
		WR – 33	4.420	4.075	3.949	4.057	4.125
		Subtotal	***11.884***	***14.354***	***13.490***	***12.647***	***13.093***
	MWD State Water Project	WR - 24	1.772	1.742	1.979	0.963	1.614
	WMWD	Arlington Desalter	0.270	0.587	0.446	0.000	0.326
Other [1]		Riverside Connection	0	0	0	0	0
		TVWD Connection	0	0	0	0	0
Total			**27.638**	**29.128**	**29.875**	**27.800**	**28.610**

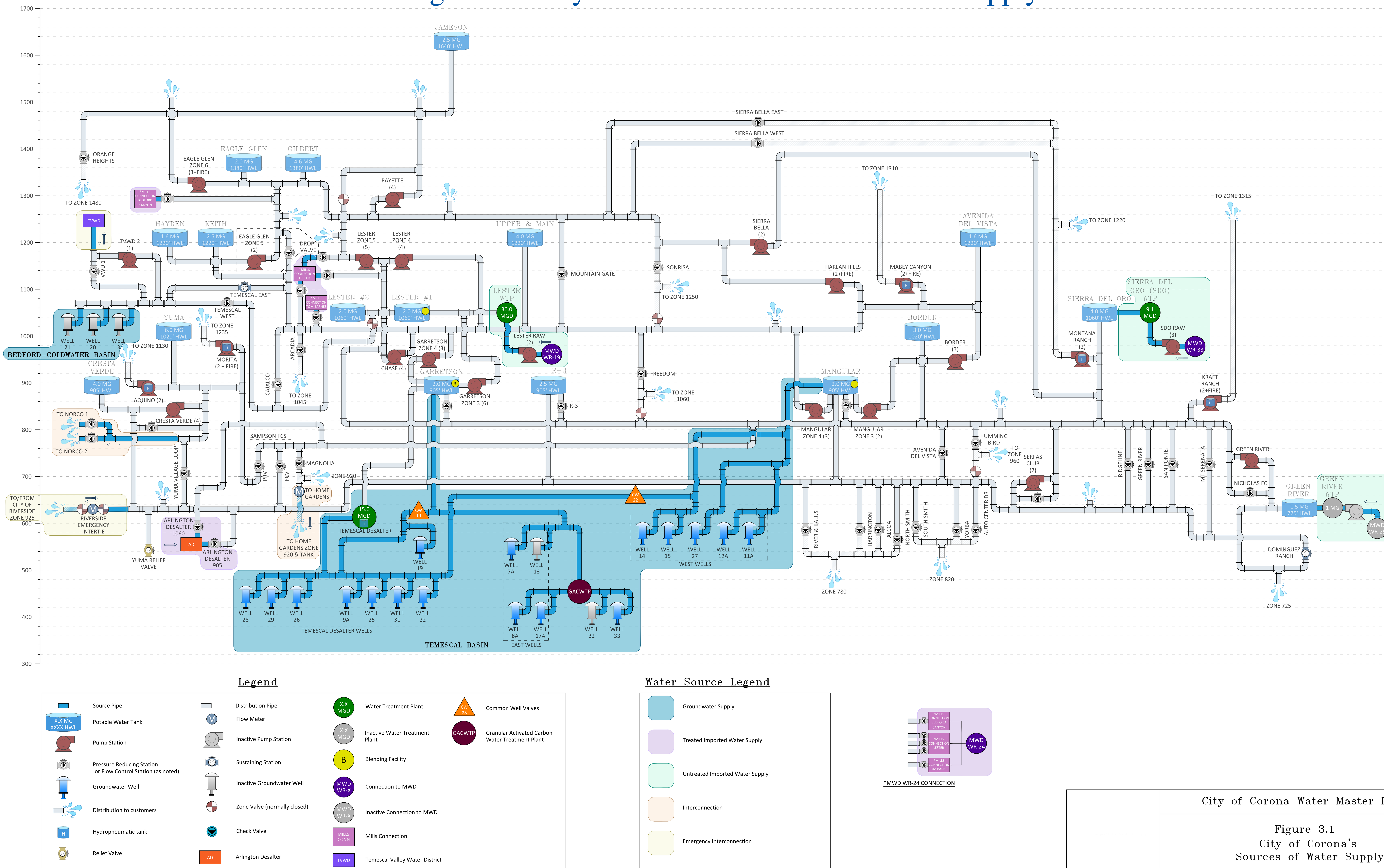
Note: Data source from City of Corona Water Production information
[1] Supply to Corona only during an emergency.

Table 3.2 – Sources of Supply (MGD), 2020 - 2024

Water Source			2020	2021	2022	2023	2024	Avg
Groundwater	Bedford-Coldwater Basin	Well No. 3	0	0	0	0	0	0
		Well No. 20	0	0	0	0	0	0
		Well No. 21	0	0	0	0	0	0
		Subtotal	***0***	***0***	***0***	***0***	***0***	***0***
	Temescal Basin	Well No. 7A	0.860	0.810	1.120	0.780	0.490	0.812
		Well No. 8A	1.200	0.960	0.100	1.060	0.910	0.846
		Well No. 9A	1.150	1.150	0.970	0.820	1.000	1.018
		Well No. 11A	0.960	1.090	0.810	0.740	0.710	0.862
		Well No. 12A	0.610	0.710	0.650	0.690	0.780	0.688
		Well No. 13	0	0	0	0	0	0
		Well No. 14	0.900	0.220	0	0	0	0.224
		Well No.15	1.110	1.120	0.910	0.690	0.640	0.894
		Well No. 17A	0.740	0.860	0.950	0.440	0.150	0.628
		Well No. 19	1.140	1.140	0.770	0.840	0.960	0.970
		Well No. 22	1.710	1.670	1.740	1.890	1.800	1.762
		Well No. 25	0.670	0.620	0.490	1.520	1.370	0.934
		Well No. 26	0.010	0.440	0.400	0.160	0.180	0.238
		Well No. 27	0.650	0.570	0.010	0	0	0.246
		Well No. 28	0.720	0.690	0.580	0.640	0.730	0.672
		Well No. 29	0	0.260	0.860	0.740	0.820	0.536
		Well No. 31	0.740	0.630	1.360	1.270	1.150	1.030
		Well No. 33	1.280	1.740	1.190	0.650	0.990	1.170
		Subtotal	***14.450***	***14.680***	***12.910***	***12.930***	***12.680***	***13.530***
Imported Water	MWD Colorado River	WR – 19	9.480	9.980	12.020	7.470	9.880	9.766
		WR – 33	5.420	4.750	4.160	4.880	4.850	4.812
		Subtotal	***14.900***	***14.730***	***16.180***	***12.350***	***14.730***	***14.578***
	MWD State Water Project	WR - 24	1.090	0.770	0.380	1.110	0.500	0.770
	WMWD	Arlington Desalter	0.030	0.090	0	0	0	0.024
Other [1]		Riverside Connection	N/A	N/A	N/A	N/A	N/A	N/A
		TVWD Connection	N/A	N/A	N/A	N/A	N/A	N/A
Total			**30.470**	**30.270**	**29.470**	**26.390**	**27.910**	**28.902**

Note: Data source from City of Corona Water Production information. Data was provided with precision to the hundredths decimal place and a trailing zero was added for consistency.
[1] Supply to Corona only during an emergency.

City of Corona
Figure 3.1 City of Corona's Sources of Water Supply



City of Corona Water Master Plan

Figure 3.1
City of Corona's
Sources of Water Supply

Adopted June 17, 2026

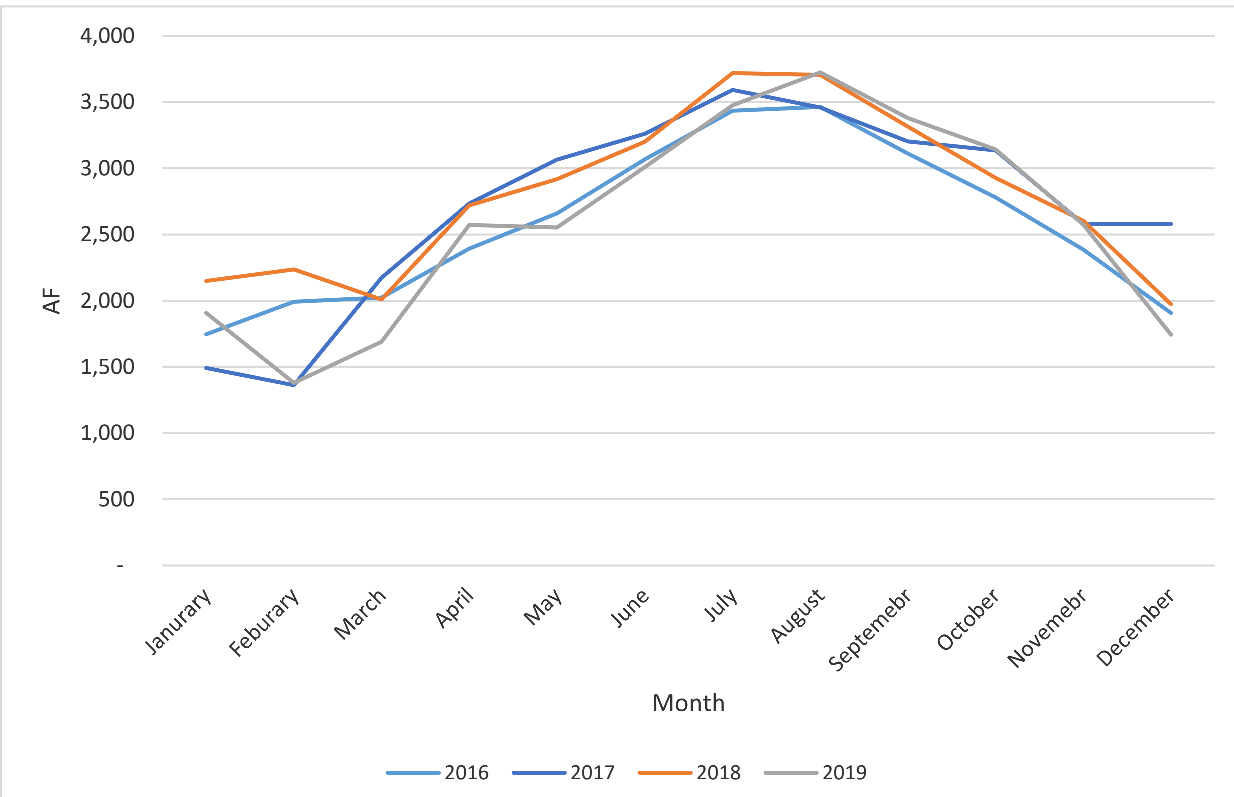
3.2. Monthly Production

The City's production of groundwater and the volume of imported water (purchased from and delivered by WMWD) varies throughout the year. For this section, imported water is included in the production totals. **Figure 3.2** shows the City's monthly production data from 2016 through 2019, and **Figure 3.3** shows the monthly production data for the subsequent period, 2020 through 2024. It should be noted that the majority of the groundwater goes through the Temescal Desalter Facility ,and **Figure 3.2** and **Figure 3.3** do not account for any losses from treatment at the Temescal Desalter.

It is expected that the production rate will be slightly higher than the demand rate; however, too much variation between the two would indicate the distribution system has deficiencies that need to be addressed, including but not limited to system leakage.

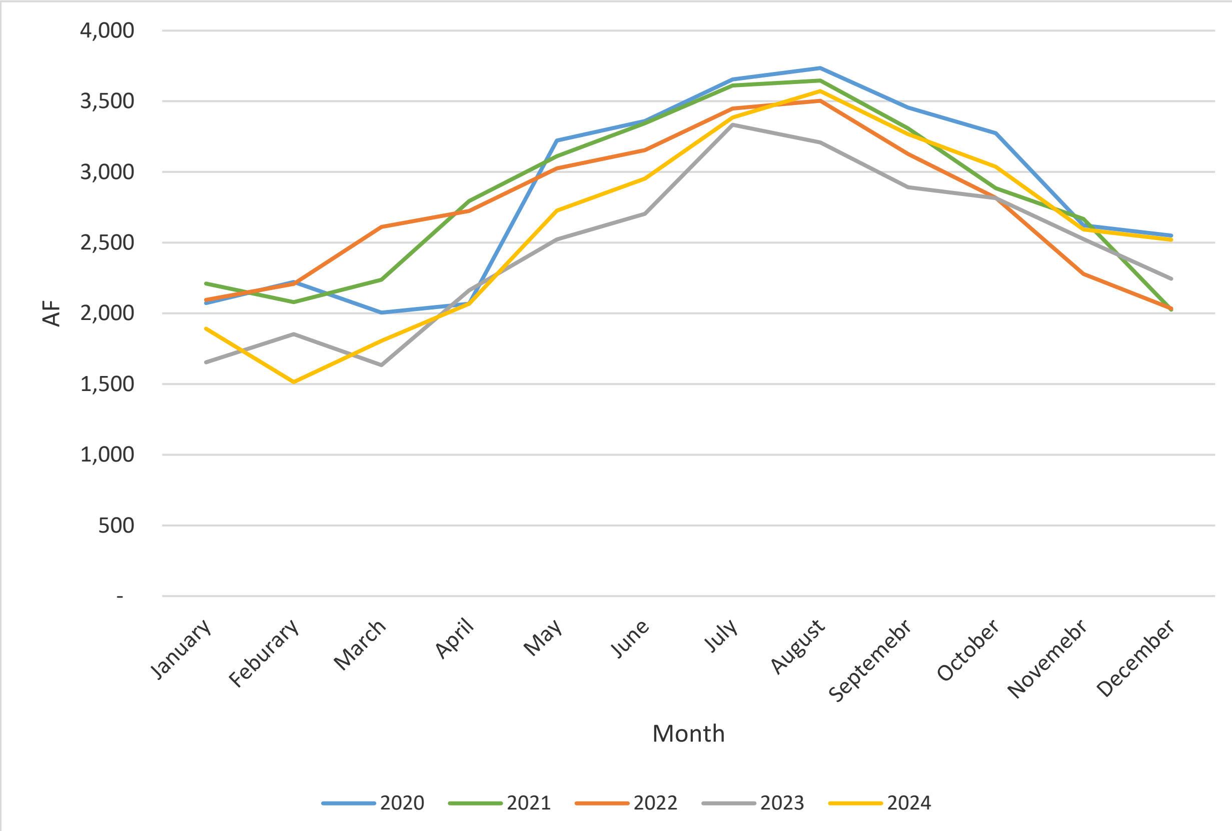
Summer water production is approximately twice the winter production, which is expected due to higher demand during hotter, drier months. The average production in 2016 through 2019 was 32,048 Acre-ft (28.61 MGD), and the average production in 2020 through 2024 was 32,419 AF (28.9 MGD).

Figure 3.2 – City of Corona's Monthly Production from 2016 - 2019



Note: Data source taken from Corona's Annual Production Recapitulation Data

Figure 3.3 – City of Corona's Monthly Production from 2020 - 2024



Note: Data source taken from Corona's Annual Production Recapitulation Data

3.3. GROUNDWATER

3.3.1. Basins

Groundwater wells extract groundwater from the Temescal and Bedford-Coldwater Basins. Each basin is managed by a Groundwater Sustainability Agency (GSA) and has a Groundwater Sustainability Plan (GSP) as mandated by the Sustainable Groundwater Management Act.

3.3.1.1. Temescal Basin

Description of Basin

The Temescal Basin, shown in **Figure 2.24**, is in the southwesterly region of the Santa Ana Valley Groundwater Basin. The Temescal Basin is bounded by the Santa Ana River to the North, the Riverside-Arlington Basin to the east, the Bedford-Coldwater Basin to the south, and the Santa Ana Mountains to the west.

The Temescal Basin Groundwater Sustainability Agency (Temescal GSA) is comprised of three water agencies: the City of Corona, the City of Norco, and Home Gardens County Water District (HGCWD). Currently, the City of Corona is the leading water purveyor within the Temescal Basin, and currently the only water agency that pumps groundwater from the Temescal Basin. The City of Corona supplies a portion of the City of Norco's imported water, and 100 percent of HGCWD's imported water (see **Section 2.3.2** for details on interconnections). The City of Corona's water production totals include the water delivered to the City of Norco and HGCWD. If the City of Norco or HGCWD were to begin pumping groundwater directly from the Temescal Basin in the future, the groundwater would likely require treatment.

Sustainability

The Temescal GSA's most recent Groundwater Sustainability Plan is the *2022 GWSP: Temescal Basin,* and the information in this section is largely reported from the *2022 GWSP: Temescal Basin.* The Temescal Basin can be recharged both naturally and through artificial recharge. Natural recharge includes subsurface inflow, return flow, dispersed recharge, and inflow from adjoining groundwater basins. According to the *2022 GWSP: Temescal Basin*, percolation from the City's reclaimed water, a form of artificial recharge, accounts for an estimated 25 percent of 2019 through 2068 baseline basin inflow. The City's Water Reclamation Facility (WRF) 1 and WRF 2 are used for Temescal Basin groundwater recharge through percolation ponds as explained in the City's *2020 UWMP* and in **Section 0** Baseline basin inflow is expected to remain relatively constant over time, but it can vary from year to year based on rainfall. Outflows from the Temescal Basin include natural outflows and water extracted from wells for potable and non-potable uses. Natural discharges include groundwater discharges to streams, riparian evapotranspiration, and outflow to adjoining basins. **Table 3.3** shows the comparison of inflows and outflows for the Temescal Basin as presented in the *2022 GWSP: Temescal Basin*.

Table 3.3 – Temescal Basin Sustainability

	AFY		MGD [1]	
Water Balance Items	**Baseline 2019-2068**	**Growth Plus Climate Change 2019-2068**	**Baseline 2019-2068**	**Growth Plus Climate Change 2019-2068**
Groundwater Inflow				
Percolation from Streams	7,918	8,817	7.07	7.87
Bedrock Inflow	1,084	1,314	0.97	1.17
Dispersed Recharge: Non-Irrigated Land	2,742	2,668	2.45	2.38
Dispersed Recharge: Irrigated Land	3,172	3,253	2.83	2.90
Pipe Leaks	2,151	2,174	1.92	1.94
Reclaimed Water Percolation	6,122	6,122	5.47	5.47
Inflow from Adjoining Basins	1,026	126	0.92	0.11
Inflow Total	***24,213***	***24,473***	***21.62***	***21.85***
Groundwater Outflow				
Wells: Municipal, Industrial, and Domestic	15,615	15,615	13.94	13.94
Wells: Agricultural	22	23	0.02	0.02
Groundwater Discharge to Streams	1,739	1,504	1.55	1.34
Riparian Evapotranspiration	4,538	4,997	4.05	4.46
Outflow to Adjoining Basins	2,364	2,301	2.11	2.05
Outflow Total	***24,278***	***24,439***	***21.67***	***21.82***

Note: Data from 2022 Groundwater Sustainability Plan: Temescal Basin

[1] Flows presented as MGD are for conceptual purposes only, the actual rate of flow may not be constant during the year.

Since the Glen Ivy Wells are no longer active due to water quality issues, the City has extracted more water from the Temescal Basin wells. Based on the pumping rates in **Table 3.3**, Temescal Basin has a slight overdraft in the baseline 2019 through 2068, and no further increases in well production are manageable without putting the basin in overdraft unless additional water recharge to the Temescal Basin occurs including increased reclaimed water recharge.

Groundwater Quality

Groundwater quality in the Temescal Basin is characterized by elevated levels of nitrate, total dissolved solids, perchlorate, and emerging contaminants such as PFOS and PFOA in several wells. Detailed water quality data, monitoring results, treatment descriptions, and state and federal standards are provided in **Section 8** of this report.

3.3.1.2. Bedford-Coldwater Basin

Description of Basin

Previously, the Bedford-Coldwater Basin was represented as two distinct basins, Bedford Basin and Coldwater Basin, but it has been combined into one basin. The Bedford-Coldwater Basin, shown in **Figure 2.25,** is a part of the Elsinore Valley Groundwater Basin and covers approximately 6,300 acres. The Bedford-Coldwater Basin is bounded by the Temescal Basin to the northwest, Estelle Mountain to the east, the Lake Elsinore Basin to the southeast, and Santa Ana Mountain to the west.

The Bedford-Coldwater Groundwater Sustainability Agency (Bedford-Coldwater GSA) is comprised of three water agencies: the City of Corona, Elsinore Valley Municipal Water District, and the Temescal Valley Water District. All three water agencies pump groundwater from the Bedford-Coldwater Basin. Only the City of Corona's wells are shown in **Figure 2.25**. During routine operations, these agencies do not exchange water; however, Temescal Valley Water District maintains an emergency connection that can supply the City of Corona.

Sustainability

The Bedford-Coldwater GSA's most recent Groundwater Sustainability Plan is the *2021 GWSP: Bedford-Coldwater Basin*, which divides the Bedford-Coldwater Basin into the Bedford Management Area and the Coldwater Management Area. Both management areas have an inflow from subsurface inflows, percolation from streams, bedrock inflow, dispersed recharge, and leaks. The Bedford Management Area also has recharge from a quarry and the Temescal Valley Water District's WRF, and the Coldwater Management Area has no artificial recharge. Natural outflows from the Bedford and Coldwater Management Areas include subsurface outflow, groundwater discharge to streams, riparian evapotranspiration, and quarry operation losses. **Table 3.4** shows the comparison of inflows and outflows for the Temescal Basin as presented in the *2021 GWSP: Bedford-Coldwater Basin*.

Table 3.4 – Bedford-Coldwater Basin Sustainability

Water Balance Items	Bedford Management Area				Coldwater Management Area			
	AFY		MGD [1]		AFY		MGD [1]	
	Baseline 2019-2068	Growth Plus Climate Change 2019-2068	Baseline 2019-2068	Growth Plus Climate Change 2019-2068	Baseline 2019-2068	Growth Plus Climate Change 2019-2068	Baseline 2019-2068	Growth Plus Climate Change 2019-2068
Groundwater Inflow								
Subsurface Inflow	102	93	0.09	0.08	34	48	0.03	0.04
Percolation from Streams	1,661	1,714	1.48	1.53	2,780	2,779	2.48	2.48
Bedrock Inflow	776	828	0.69	0.74	467	435	0.42	0.39
Dispersed Recharge: Non-Irrigated Land	929	1,031	0.83	0.92	1,164	1,575	1.04	1.41
Dispersed Recharge: Irrigated Land	559	940	0.50	0.84	289	396	0.26	0.35
Pipe Leaks	33	92	0.03	0.08	17	32	0.02	0.03
Reclaimed Water Percolation	1,868	2,161	1.67	1.93	0	0	0.00	0.00
Inflow from Adjoining Basins	162	471	0.14	0.42	0	0	0.00	0.00
Inflow Total	***6,090***	***7,330***	***5.44***	***6.54***	***4,751***	***5,265***	***4.24***	***4.70***
Groundwater Outflow								
Subsurface Outflow	498	423	0.44	0.38	15	7	0.01	0.01
Wells: Municipal, Industrial, and Domestic	1,315	1,895	1.17	1.69	3,002	3,072	2.68	2.74
Wells: Agricultural	0	0	0.00	0.00	40	88	0.04	0.08
Groundwater Discharge to Streams	990	1380	0.88	1.23	2	1	0.00	0.00
Riparian Evapotranspiration	760	1015	0.68	0.91	154	168	0.14	0.15
Outflow to Adjoining Basins	2,422	2,466	2.16	2.20	0	0	0.00	0.00
Outflow Total	***5,985***	***7,179***	***5.34***	***6.41***	***3,213***	***3,336***	***2.87***	***2.98***

Note: Data from 2021 Groundwater Sustainability Plan: Bedford-Coldwater Basin

[1] Flows presented as MGD are for conceptual purposes only, the actual rate of flow may not be constant during the year.

There are no potable wells within the Bedford Management Area, however there are non-potable wells used for irrigation. The City extracts non-potable water from the Bedford management area using two non-potable wells, extracting approximately 336 AFY for non-potable use. Based on the *2021 GWSP: Bedford-Coldwater Basin*, the Bedford management area could have a sustainable yield of 2,047 AFY. In comparison, the Coldwater management area can have a sustainable yield of 5,088 AFY.

Groundwater Quality

Groundwater quality in the Bedford-Coldwater Basin is characterized by historic elevated levels of nitrate and some exceedances of total dissolved solids. Detailed water quality data, monitoring results, treatment descriptions, and state and federal standards are provided in **Section 8** of this report.

3.3.2. Wells

Section 2.3.1 summarizes specific well information including well locations, capacities, pumping facilities, and operational characteristics.

3.3.2.1. Drinking Water Source Assessment and Protection (DWSAP) Program

The City has completed a Drinking Water Source Assessment and Protection (DWSAP) Program for each well in the potable water system as required by the State Board's Division of Drinking Water (DDW). The DWSAP includes general information on each well including identification number, location, sanitary conditions, enclosure/housing, construction features, and production.

3.3.2.2. Temescal Basin Wells

Eighteen (18) of the City's potable wells are located in the Temescal Basin. The water from these wells is treated at the Granular Activated Carbon (GAC) WTP and the Temescal Desalter. Based on the January 2018 flows presented in the City's *2020 Blending Program Technical Report (Appendix A)*, the average flow of the Temescal Desalter is approximately 10.2 MGD. This accounts for about 80% of the City's groundwater supply from the Temescal Basin. **Section 2.3.1** includes a well inventory and specifications.

3.3.2.3. Bedford-Coldwater Basin Wells

Three (3) of the City's potable wells and two (2) non-potable wells are located in the Bedford-Coldwater Basin. Potable Well 3, 20, and 21 are currently inactive, but historically supplied the 1136 Glen Ivy Zone. **Section 2.3.1** includes a well inventory and specifications.

3.3.2.4. Well Production Analysis

A well production analysis assesses the amount of water a well can produce over time. **Table 3.5** shows the production capacity of each of the City's wells based on their design capacity and the most current SCE efficiency test reports (included in Appendix C). The efficiency of each pump deteriorates over time, reducing its pumping capacity. The total design capacity for all wells is 32,082 GPM (46.20 MGD). The total design capacity for active wells is 25,272 GPM (36.39 MGD). The total most current capacity (SCE Efficiency Tests) for active wells is 12,347 GPM (17.78 MGD).

Table 3.5 – Well Production Capacity (GPM)

Wells	Efficiency Test Date	Most Current Capacity (SCE Capacity Tests) (gpm)	Normal Operation (Hz)	Design Capacity (gpm)
Well #3 [2]	January 20, 2015	564 [3]	Varies	1,060
Well #7A	April 9, 2024	741	50	1,000
Well #8A	April 9, 2024	656	43.5	1,650
Well #9A	April 23, 2024	706	49.4	1,500
Well #11A	April 17, 2024	524	50.7	700
Well #12A	April 17, 2024	517 [3]	Varies	1,100
Well #13 [1]	March 15, 2015	365 [3]	Varies	1,000
Well #14	August 28, 2017	726	Not Noted	1,000
Well #15	April 17, 2024	524 [3]	Varies	1,100
Well #17A	May 8, 2024	1,127 [3]	Varies	1,400
Well #19	May 8, 2024	477	50.4	2,100
Well #20 [1]	February 17, 2015	311 [3]	Varies	2,500
Well #21 [2]	January 20, 2015	1,138 [3]	Varies	2,250
Well #22	May 2, 2024	1,421 [4][3]	Varies	3,500
Well #25	April 23, 2024	1,210	57.1	3,500
Well #26	December 1, 2022	273	51.9	1,000
Well #27	October 30, 2019	563 [3]	Varies	500
Well #28	May 2, 2024	670 [3]	Varies	2,000
Well #29	May 2, 2024	640 [3]	Varies	750
Well #31	April 23, 2024	907 [3]	Varies	1,000
Well #32 [1]	No pumping equipment installed			
Well #33	April 9, 2024	665	47	1,472
Total Capacity (Active Only)		**12,347**		**25,272**
Total Capacity		**14,724**		**32,082**

[1] Inactive Wells
[2] Standby Wells
[3] Well Pump Efficiency Test did not include a normal operating hertz, so the average capacity of the well tests was used as the Most Current Capacity.

3.4. Imported Water

The City's untreated imported water and treated imported water are described below. **Figure 3.4** shows the locations of the untreated water turnouts and associated City WTPs, the treated water turnout from the Henry J. Mills WTP (WR-24), and the treated water interconnection from the Arlington Desalter. **Section 2** provides detailed information on imported water supply locations, pressures zones, and water treatment plant (WTP) capacities.

3.4.1. Untreated Imported Water

The Lower Feeder Pipeline supplies most of the City's untreated imported water, accounting for approximately 91% of the City's total imported water supply. **Section 2.3.2.1** details three turnouts that connect the City to the Lower Feeder Pipeline and subsequent treatment provided by the City's system.

- WR-19 gravity feeds to the Lester WTP
- WR-29 can be pumped through the Green River Raw Booster Pump Station to the Green River WTP, but WR-29, the Green River Raw Booster Pump Station, and the Green River WTP are currently inactive.
- WR-33 can be pumped through the Sierra Del Oro Raw Water Booster Pump Station to the Sierra Del Oro (SDO) WTP.

3.4.2. Treated Imported Water

The City receives treated imported water from WMWD through both the Arlington Desalter Interconnection and from the Mills Pipeline turnout (WR-24).

- WMWD treats water from the State Water Project at the Henry J. Mills WTP and supplies it to the City through Mills Pipeline turnout (WR-24).
- WMWD treats groundwater at the Arlington Desalter and supplies it to the City through the Arlington Desalter interconnection. Typically, the Arlington Desalter is not used year-round and is primarily utilized to supplement supply in the summer months.

Table 3.6 and **Table 3.7** show the treated and untreated imported water supplied for years 2016–2019 and 2020–2024, respectively. **Figure 3.5** and **Figure 3.6** shows the distribution of imported water supplied by each imported water source.

Figure 3.4 – Map of Imported Water Supply Locations

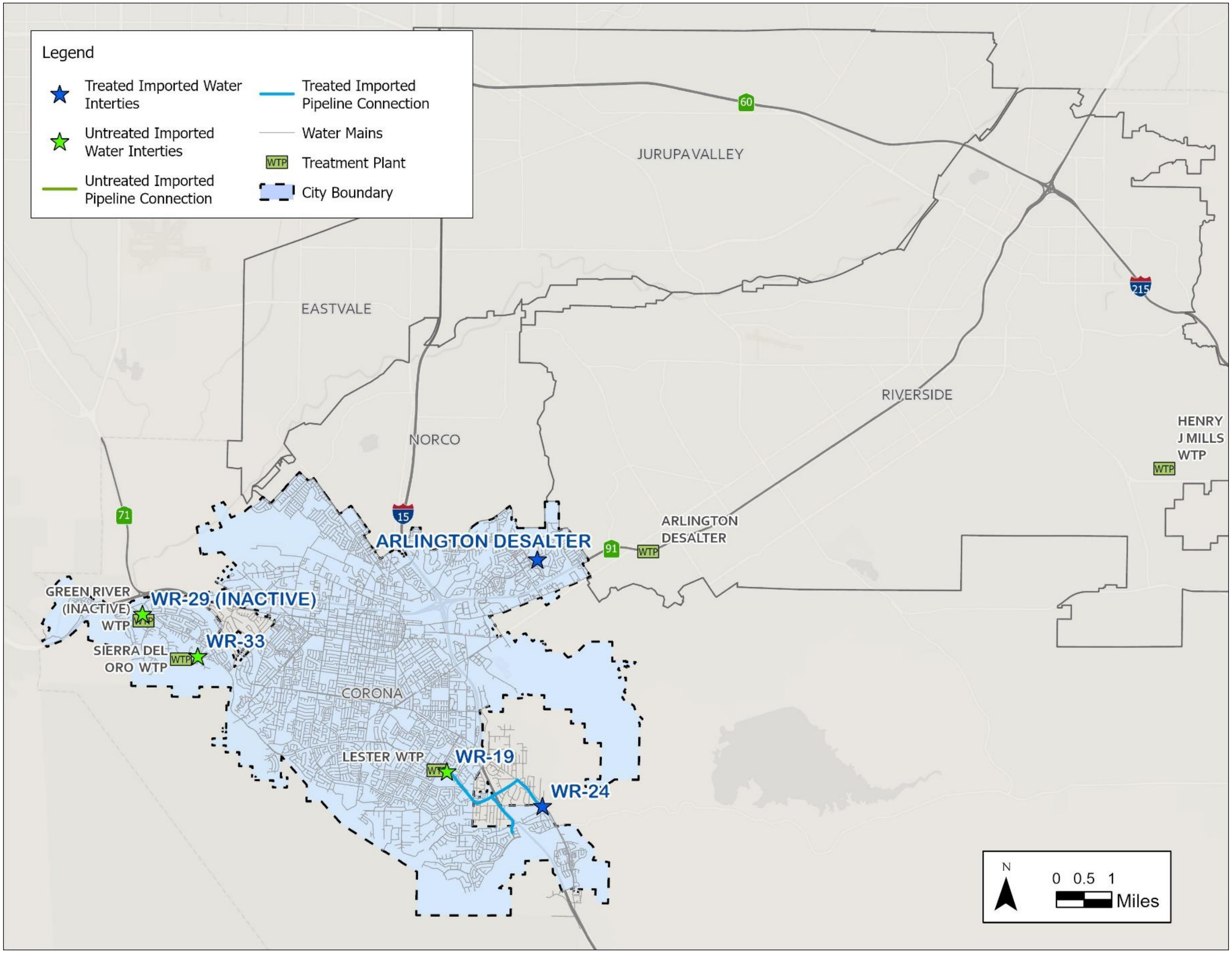


Table 3.6 – Imported Water Capacity and Historical Use (Acre-ft/Yr.), 2016 - 2019

Source		2016	2017	2018	2019	Average
Untreated Imported Water	WR - 19 (Lester WTP)	8,362	11,514	10,688	9,622	10,046
	WR – 33 (SDO WTP)	4,951	4,565	4,423	4,545	4,621
Treated Imported Water	WR – 24 (Henry J Mills WTP)	1,985	1,951	2,217	1,079	1,808
	Arlington Desalter	302	658	500	-	365
Total Imported Water	Total	15,600	18,688	17,828	15,246	16,840
	Total (MGD)	13.89	16.68	15.91	13.61	15.02

Based on City of Corona's Annual Production Recapitulation Data

Table 3.7 – Imported Water Capacity and Historical Use (Acre-ft/Yr.), 2020 - 2024

Source		2020	2021	2022	2023	2024	Average
Untreated Imported Water	WR - 19 (Lester WTP)	10,619	11,179	13,464	8,367	11,067	10,939
	WR – 33 (SDO WTP)	6,071	5,321	4,660	5,466	5,433	5,390
Treated Imported Water	WR – 24 (Henry J Mills WTP)	1,221	863	426	1,243	560	863
	Arlington Desalter	34	101	-	-	-	27
Total Imported Water	Total	17,945	17,463	18,550	15,077	17,060	17,219
	Total (MGD)	15.98	15.55	16.51	13.42	15.19	15.33

Based on City of Corona's Annual Production Recapitulation Data

Figure 3.5 – Average Imported Water by Supply Source (2016 - 2019 Average)

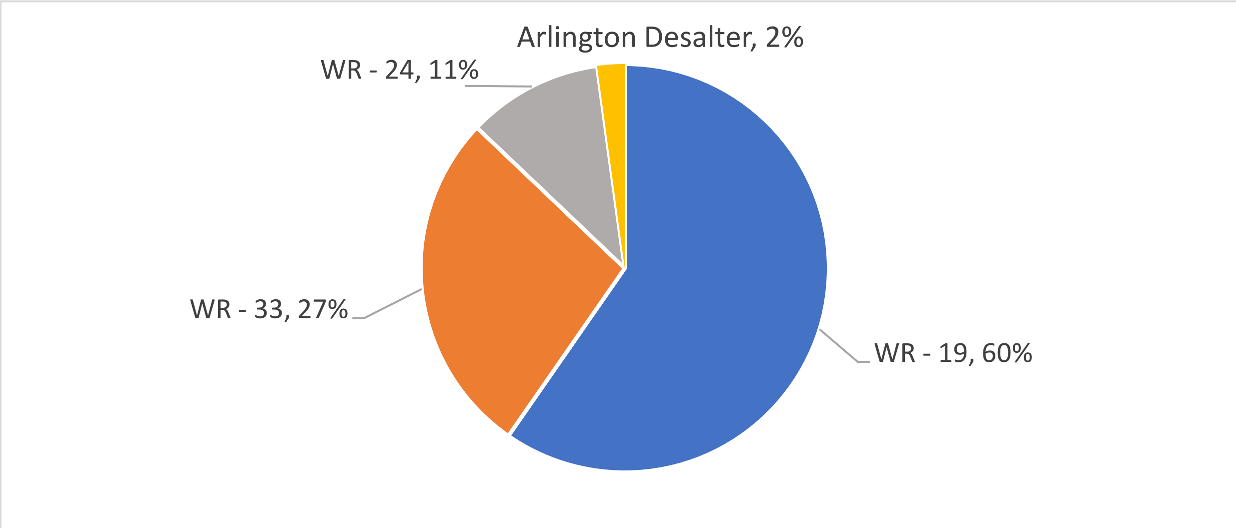
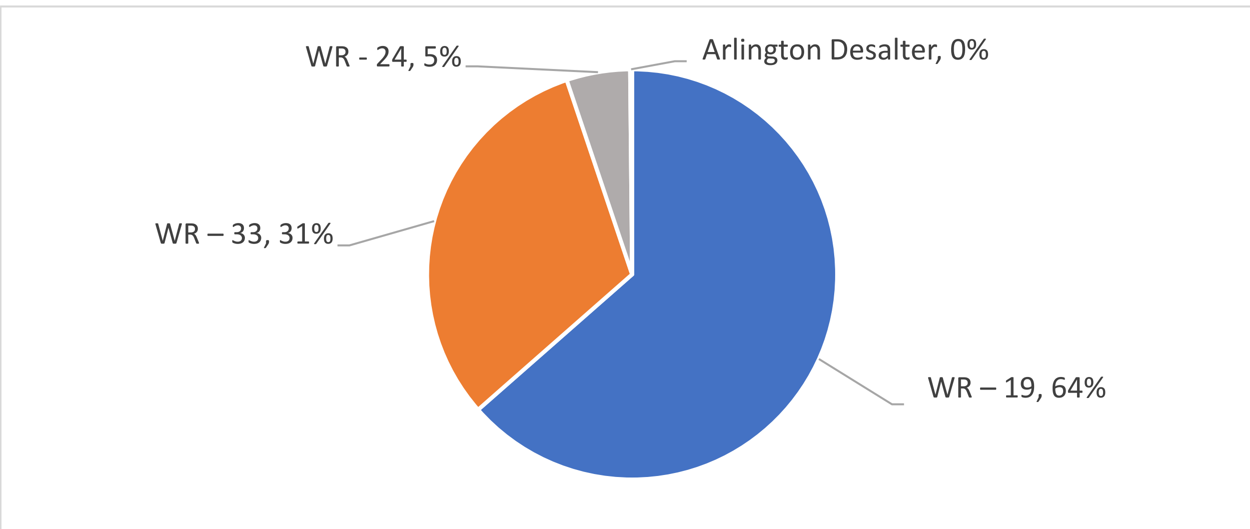


Figure 3.6– Average Imported Water by Supply Source (2020 - 2024 Average)



3.5. Water Treatment Facilities

Section 2.3.3, Figure 2.28, and Appendix G include detailed information on the water treatment facilities and capacities of each facility.

3.6. Reclaimed Water

3.6.1. Existing Reclaimed Water System

The City's reclaimed water goals are documented in the *2018 Reclaimed Water Master Plan*, and the information in this section is largely reported from the plan. Per Ordinance 2854 (Recycled Water Rules and Regulations): It is the policy of the City of Corona that recycled water be used for any purposes or project approved for recycled water use, when it is economically, financially and technically feasible, as mandated by the Recycled Water Ordinance.

3.6.1.1. Reclaimed Water Supply

As shown in **Table 3.8**, the City's reclaimed water sources of supply are three water reclamation facilities (WRF 1, WRF 2, and WRF 3) and two non-potable wells (non-potable wells 1 and 2), and the average annual production from these sources is approximately 11.64 MGD (approximately 13,038 AFY). According to the *2018 Reclaimed Water Master Plan*, WRF 1 and WRF 2 are conventional treatment plants, and WRF 3 is a membrane bioreactor (MBRs). WRF 3 may be decommissioned in the future.

Table 3.8 – Reclaimed Water Supply (from *2018 Reclaimed Water Master Plan*)

Source	Permitted Capacity (MGD)	Average Production (MGD)
WRF 1	11.5 [1]	8.61
WRF 2	3	2.05 [2]
WRF 3	1	0.68
Non-potable Well	N/A	0.30
Western Riverside County Regional Wastewater Authority (WRCRWA) [3]	2.62	N/A
Total	**18.12**	**11.64**

[1] Permitted capacity is 11.5 MGD. The design capacity is 11.5 MGD for secondary treatment, and 15.0 MGD for tertiary filtration.
[2] Average production excludes required return flows within WRF 2.
[3] Future booster pump station capacity.

The WRCRWA Southerly Pipeline, completed in 2024, extends from the WRCRWA plant and connects to the City's existing recycled water system within River Road in the City of Norco. This pipeline can potentially convey an additional capacity up to 5.46 MGD once the future pump station is commissioned.

3.6.1.2. Reclaimed Water Demand

Reclaimed water demand is the contractually required discharge to the Santa Ana River watershed, the Temescal Basin recharge through percolation ponds, and the City's reclaimed water distribution system.

Table 3.9 – Reclaimed Water Demand

Demand	Reclaimed Water Supply Source	Average Demand Volume
Santa Ana River Watershed	WRF 1 at FCS-Creek	1,625 AFY (1.45 MGD) [1]
Temescal Basin Groundwater Recharge	Treated at WRF 1 and WRF 2 and discharged through North Cota, South Cota, and Lincoln percolation ponds	6.5 MGD
City's Non-potable system	WRF 1, WRF 2, WRF 3, and Non-potable wells	Varies based on non-potable production

[1] In accordance with the 1968 Agreement between the City and Western Municipal Water District Discharge from Lincoln/Cota percolation ponds supplied by WRF 1 and 2 must be 1,625 AFY (1.45 MGD) from the Temescal Wash into the Prado Wetlands.

Santa Ana River Watershed. The City is obligated under a 1968 agreement with the WMWD, known as the Prado Settlement, to discharge an annual average of 1,625 acre-feet per year (AFY) (1.45 MGD) of reclaimed water to the Santa Ana River Watershed. This discharge is a legal requirement to maintain minimum base flows in the Santa Ana River at Prado Dam, ensuring downstream water users receive adequate water quantity and quality. Reclaimed water (WRF 1 effluent) is discharged Flow Control Station (FCS-Creek). According to the *2018 Reclaimed Water Master Plan*, this mandated discharge represents approximately 12.8% of the City's reclaimed water production and is not available for other City uses.

Temescal Basin Recharge Through Percolation Ponds. In addition to the mandated Santa Ana River Watershed discharge, the City also discharges reclaimed water for Temescal Basin groundwater recharge. WRF 1 and WRF 2 discharge to the City's three (3) percolation ponds (Cota North, Cota South, and Lincoln). California's State Water Resources Control Board (SWRCB) requires tertiary effluent quality for discharge to the City's percolation ponds. Initially, the SWRCB only permitted the City a tertiary effluent capacity of 9 MGD; however, the Water Board has recently increased this capacity to 15.5 MGD based on the treatment capacity of the WRFs.

Reclaimed Water Distribution System. The remaining production enters the reclaimed distribution system to help offset the use of potable water for irrigation. By using reclaimed water for irrigation systems previously supplied with potable water, the City effectively augments its potable water supply. This strategy conserves potable water by substituting it with reclaimed water for irrigation purposes.

The primary demand of the reclaimed water distribution system is irrigation which occurs at city parks, schools, and other City and private landscaping. A small amount of reclaimed water serves industrial dual plumbing (e.g. toilet flushing), sewer flushing, street sweeping, replenishment of cooling water, replenishment of recreational impoundment, firefighting training, and construction needs (e.g. dust control and soil compaction).

3.7. WATER CONSERVATION

Water conservation is an integral component of long-term water resource planning in California and within the City of Corona. State legislation and local programs require urban water suppliers to improve water use efficiency, reduce per-capita water demand, and promote sustainable water use practices. These efforts help maintain water supply reliability, reduce strain on imported water sources, and minimize the need for costly infrastructure expansion.

California has adopted several statewide initiatives to improve water use efficiency. A key policy framework is the Water Conservation Act of 2009, which established a statewide goal to reduce urban per-capita water use by 20 percent by 2020. The legislation requires urban retail water suppliers to establish baseline water use, adopt interim targets, and implement conservation programs to achieve long-term efficiency goals.

More recently, California adopted additional efficiency standards through AB 1668 and SB 606, commonly referred to as the "Make Water Conservation a California Way of Life" framework. These regulations establish long-term water use objectives for urban water suppliers, including indoor residential efficiency standards and landscape irrigation efficiency requirements. These state mandates are implemented through local planning efforts such as an Urban Water Management Plan and local water conservation programs. Compliance with these requirements ensures eligibility for state funding programs and helps agencies maintain resilient water supply portfolios.

The City of Corona has implemented a variety of conservation measures designed to reduce water demand while maintaining reliable service to residents and businesses. The City's water conservation program includes both permanent efficiency measures and drought response actions that can be implemented during periods of water shortage. Corona's municipal code establishes a multi-stage water conservation and drought response framework, consisting of five conservation stages that correspond to varying levels of water supply conditions. Each stage includes progressively stricter conservation requirements intended to reduce demand and protect available water supplies.

Under normal water supply conditions, the City promotes efficient water use through public education, landscape irrigation management, and enforcement of wasteful water use restrictions. Examples of standard conservation requirements include:

- Prohibition of irrigation during or shortly after measurable rainfall
- Requirements to repair leaks and malfunctioning irrigation systems
- Restrictions on water runoff from irrigation systems
- Limitations on outdoor water uses such as washing hard surfaces or overfilling decorative water features
- Use of shut-off nozzles when washing vehicles

In addition to regulatory measures, the City encourages water efficiency through outreach programs, conservation incentives, and promotion of water-efficient technologies for residential, commercial, and institutional customers.

Water conservation reduces overall system demand and helps defer the need for additional supply development or distribution system expansion. Through implementation of state-mandated efficiency targets and locally administered conservation programs, the City of Corona continues

SECTION 4 - WATER USE

4.1. GENERAL DESCRIPTION

Section 4 presents the current water-use characteristics within the City's service area and develops future water-demand projections through buildout, currently anticipated around 2040 per the City's latest General Plan. This section also evaluates hourly demand variations, diurnal curves, and historical consumption trends.

The analysis relies on City water-meter billing records, production-flow data from the City's water treatment and groundwater facilities, and GIS-based land-use categories used for demand allocation. Production data used in this section were obtained from calibrated flow meters at the City's water-supply facilities. A detailed summary of water-supply production is provided in **Section 3**.

Historical and projected water use is categorized by land-use type, consistent with the City's planning datasets. The methodology for each component of the demand analysis is described in the subsections that follow.

4.1.1. Selection of Representative Demand Year

Water-use patterns during 2020 and the subsequent years were influenced by COVID-19 pandemic conditions, including temporary business closures, work-from-home patterns, and behavioral changes that altered typical water-demand profiles.

To avoid COVID-related anomalies, the City's 2024 metered consumption data were selected as the representative demand year for this Master Plan. The 2024 dataset reflects stabilized community behavior, post-pandemic economic normalization, and typical commercial and residential occupancy patterns. These data were therefore used to determine the City's average water demand and to calculate historical peaking factors.

4.1.2. Historical Water Use

A review of the City's historical annual water use shows that system-wide water demand has varied over time in response to population growth, economic cycles, and statewide conservation efforts. Annual water use increased through the 1990s and early 2000s, reaching a peak of approximately 42 MGD in 2007. Water use then declined significantly beginning in 2008, influenced by the economic recession, multiple statewide drought-response measures, and long-term conservation trends. In recent years, average annual water use has stabilized at approximately 28 to 30 MGD despite continued population growth, indicating improved water-use efficiency throughout the community.

Historical water-use records were compiled from multiple sources, including the City of Corona's 2020 Urban Water Management Plan (UWMP) and annual production records. The 2020 UWMP provided historical records for 1990–2010 and quantified water use for 2016–2020, in accordance with the Water Code requirements to report a five-year range of data. Water use records for 2020 through 2024 were developed using City's annual production recapitulation datasets.

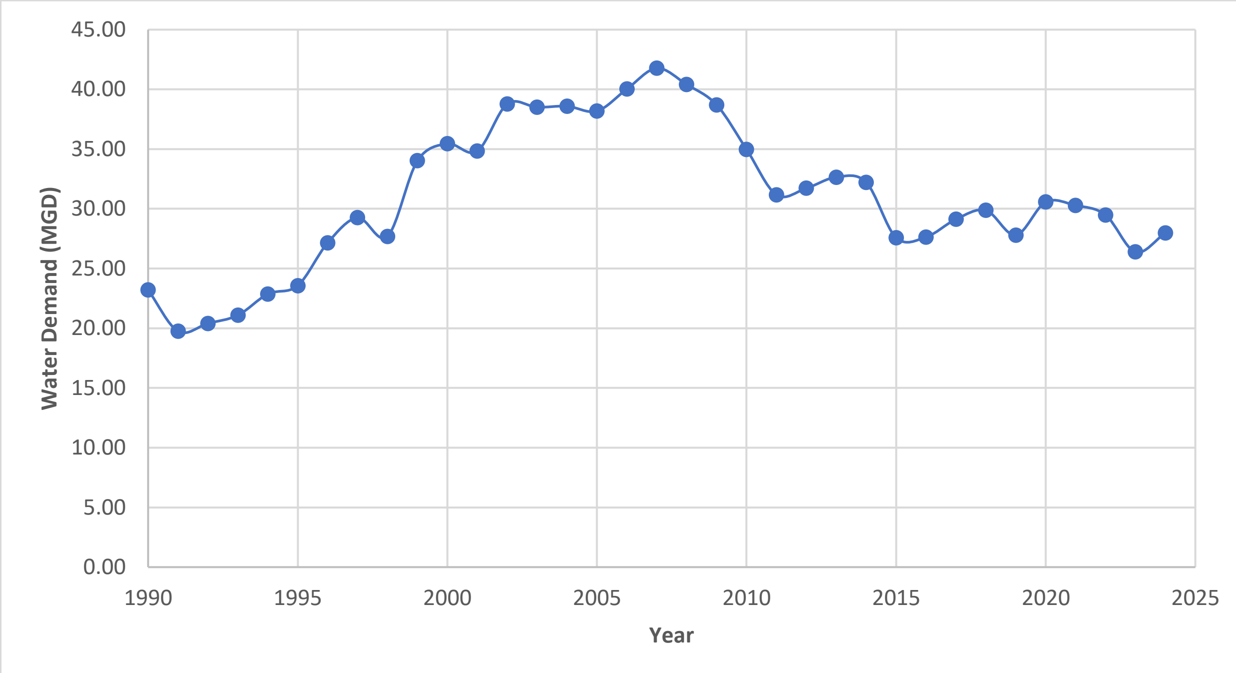
For this Master Plan, these datasets were consolidated to develop a continuous historical record and to illustrate long-term water-use trends. A tabulated summary of historical consumption is presented in **Table 4.1**, and the data are shown graphically in **Figure 4.1**.

Table 4.1 – Historical Water Demand

Year	AFY	MGD
1990	25,992	23.20
1991	22,123	19.75
1992	22,861	20.41
1993	23,624	21.09
1994	25,621	22.87
1995	26,402	23.57
1996	30,416	27.15
1997	32,770	29.25
1998	31,022	27.69
1999	38,113	34.02
2000	39,705	35.44
2001	39,012	34.83
2002	43,436	38.77
2003	43,131	38.50
2004	43,228	38.59
2005	42,771	38.18
2006	44,834	40.02
2007	46,788	41.77
2008	45,265	40.41
2009	43,351	38.70
2010	39,185	34.98

Year	AFY	MGD
2011	34,918	31.17
2012	35,534	31.72
2013	36,574	32.65
2014	36,087	32.21
2015	30,902	27.59
2016	30,958	27.64
2017	32,626	29.12
2018	33,464	29.87
2019	31,138	27.80
2020	34,241	30.57
2021	33,924	30.28
2022	33,031	29.49
2023	29,555	26.38
2024	31,338	27.97

Figure 4.1 – Historical Water Demands (MGD)



4.2. Correlation between Meters, Parcels, and Land Use

4.2.1. Methodology

To evaluate water use by land use type, historical meter-read data were correlated with associated parcel information and land use designations. Each meter was assigned a land use type using a combination of billing database attributes and geospatial information within the City's GIS.

The primary source of meter information was the City of Corona's monthly billing database, which includes account numbers, parcel numbers, designated land use types, meter addresses, meter sizes and types, and other attributes. However, not all meters contained complete or current information regarding parcel identification or land use designation. Missing or inconsistent records were resolved using geospatial analysis.

To ensure each meter was geographically matched to the correct parcel, the parcel number or physical meter address was first used to place the meter in the City's GIS. Once positioned, the County assessor parcel map was overlaid, allowing each meter to be linked to the parcel on which it is located. Some meters required individual review to confirm or correct their placement. After the meter locations were finalized, the City's land use layers were overlaid to associate each meter with its appropriate land use category.

This correlation between meter location, parcel number, and land use enabled the assignment of historical water-use records to specific land uses. These data were then used to develop per-land-use demand factors for projecting future water needs, as discussed in **Section 4.3.** and **Section 4.9.** The geospatial meter locations also allowed each meter to be incorporated correctly into the hydraulic model, ensuring the model reflects these spatial demand distributions.

4.2.2. Database Attributes

The City of Corona maintains two related datasets for water meters. The first contains basic meter information for each individual meter and its associated account. The second dataset contains meter-read data, including read dates and consumption values tied to a unique meter identifier. When these two datasets are combined, a complete record can be developed for each meter that includes both account characteristics and historical water use.

These datasets are maintained in the City's billing database, and key fields are imported into the GIS for planning and modeling purposes. GIS entries for each meter include meter size, installation date, latitude, longitude, land use type, parcel number, and other fields needed for hydraulic modeling and inventory management.

4.2.3. Protocol for Future Meters

It is recommended that the City continue to maintain and update the meter information database for all new meter installations. New meters should be entered with complete account information, parcel number, meter size, land use type, and location coordinates to ensure seamless integration with the GIS and hydraulic model.

When a meter is retired or replaced, the associated database entries should be updated accordingly. The City is developing a standardized protocol for entering or modifying meter data, including a required form that will be completed before any changes are finalized. This protocol will ensure that missing fields are minimized and that data integrity is maintained across all planning and operational systems.

4.3. Water Demands

For the water demand evaluation, water meter-read data from the year 2024 was selected as the representative historical period. Data from 2020–2023 were excluded because water use during those years was influenced by COVID-19 pandemic conditions, including temporary business closures, shifts to work-from-home practices, and other atypical water-use behaviors. These factors made 2020–2023 unrepresentative of long-term, stable water demand patterns.

Meter-read data includes consumption for each meter based on its individual read cycle. Most meters are read monthly though some reading cycles vary slightly. For each year of analysis, the total read volume and total read-cycle days were summed to determine the average-day demand for each meter. Meter demands were then aggregated by land use category and by pressure zone to support subsequent modeling and planning tasks.

The average annual demands for 2016–2024 are summarized in **Table 4.2.**

Table 4.2 – Yearly Meter Demands

Year	Average Demand (AFY) [1]	Average Demand (MGD)
2016	21,108	18.84
2017	24,719	22.07
2018	27,384	24.45
2019	27,480	24.53
2020	30,318	27.07
2021	31,431	28.06
2022	29,562	26.39
2023	25,468	22.74
2024	26,914	24.03
Average [2]	**27,154**	**24.24**

Note: Hydrant meter demand is excluded from the average demand calculation. When hydrant meter demand is included, the 2024 average demand is 25.05 MGD.

[1] Data is derived from the City of Corona water meter data.

[2] The average of each year's (2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, and 2024) average demand.

4.3.1. Demands from Hydrant Meters

Yearly meter demand shown in **Table 4.2** excludes water demands associated with hydrant meters. A hydrant meter is a temporary meter connected to a fire hydrant and is typically used for temporary operation and maintenance activities, including main flushing, temporary construction water use, and sewer jetting and inspection. In most cases, the location of the hydrant meter is not specified; therefore it cannot be attributed to a specific land use designation or specific pressure zone. As a result, in **Sections 4.3.2.** and **4.3.3.** hydrant meter demand is assigned a separate designation. This is also discussed in **Section 5.2.2**.

4.3.2. Demand by Land Use

To further evaluate the City's average water demand, meter-read data were analyzed based on land use type. This analysis provides a baseline of existing water use by aggregating the average-day demands of all meters assigned to each land use category. These averages form the foundation for projecting future water demands.

Each meter was assigned a land use classification through the meter information database and the GIS correlation process described earlier. This assignment allowed the calculated average-day demand for each meter to be grouped by land use. The resulting land-use-specific average demands can be used in future development projections, with the assumption that the designated land use types will remain generally consistent with the City's General Plan.

Meters were evaluated both within City boundaries and within the City's sphere of influence (SOI). Twenty-six land use categories exist for meters located in the City, and eighteen exist for meters located in the SOI. These land use categories align with the land use designations maintained in the City's planning documents.

The total average demand for each land use type within the City is shown in **Table 4.3**, and the corresponding SOI values are summarized in **Table 4.4**. These tables present the aggregate sum of the average day demand for all meters in each land use type; they do not represent a per-meter or per-parcel average.

Table 4.3 – City of Corona's Demand by Land Use

City of Corona Aggregate Sum of Average Demands				
Land Designation		2024 Aggregate Average Demand [1]		
Abbreviation	**Description**	**MGD**	**GPM**	**AFY**
C	Commercial	1.66	1149.91	1854.82
CP	Commercial/Professional	0.25	176.75	285.11
FC	Flood Control	0.06	43.19	69.66
GI	General Industrial	0.81	561.13	905.11
I	Institutional	0.42	293.95	474.14
LI	Light Industrial	0.82	570.68	920.51
AG	Agriculture	0.12	81.70	131.79
R/R	Rural Residential	0.43	299.37	482.89
E	Estate Residential	2.07	1438.77	2320.75
LDR	Low Density Residential	8.67	6020.47	9711.09
LMDR	Low Medium Density Residential	2.25	1561.23	2518.29
MDR	Medium Density Residential	1.71	1186.13	1913.23
HDR	High Density Residential	0.37	254.31	410.21
MFR	Multi-Family Residential	2.61	1809.47	2918.70
MFR-MH	Multi-Family Residential-Mobile Homes	0.12	84.55	136.38
OS-P	Open Space-Park	0.11	75.16	121.23
OS-R	Open Space-Recreational	0.12	81.46	131.39
QP	Quasi-Public	0.08	58.20	93.87
ROW	Right of Way	0.02	13.22	21.32
VA	Vacant	0.01	10.03	16.18
VC	Vacant Commercial	0.04	29.86	48.16
VI	Vacant Industrial	0.00	0.16	0.25
VR	Vacant Residential	0.06	38.41	61.95
Other	*Primarily areas under development*	0.00	2.14	3.45
Total		**22.81**	**15840.25**	**2550.48**

Note: MGD values are rounded to two decimals; GPM and AFY are calculated from unrounded MGD. Rows showing 0.00 MGD represent very small demands. Aggregate totals are approximate and may differ slightly from the sum of displayed values due to rounding adjustments.

[1] The total average demand (City of Corona's boundary plus Sphere of Influence) totals to 24.03 MGD. This demand does not include hydrant meter demand. See Section 4.3.1.

Figure 4.2 – City of Corona's Demand (AFY) by Land Use

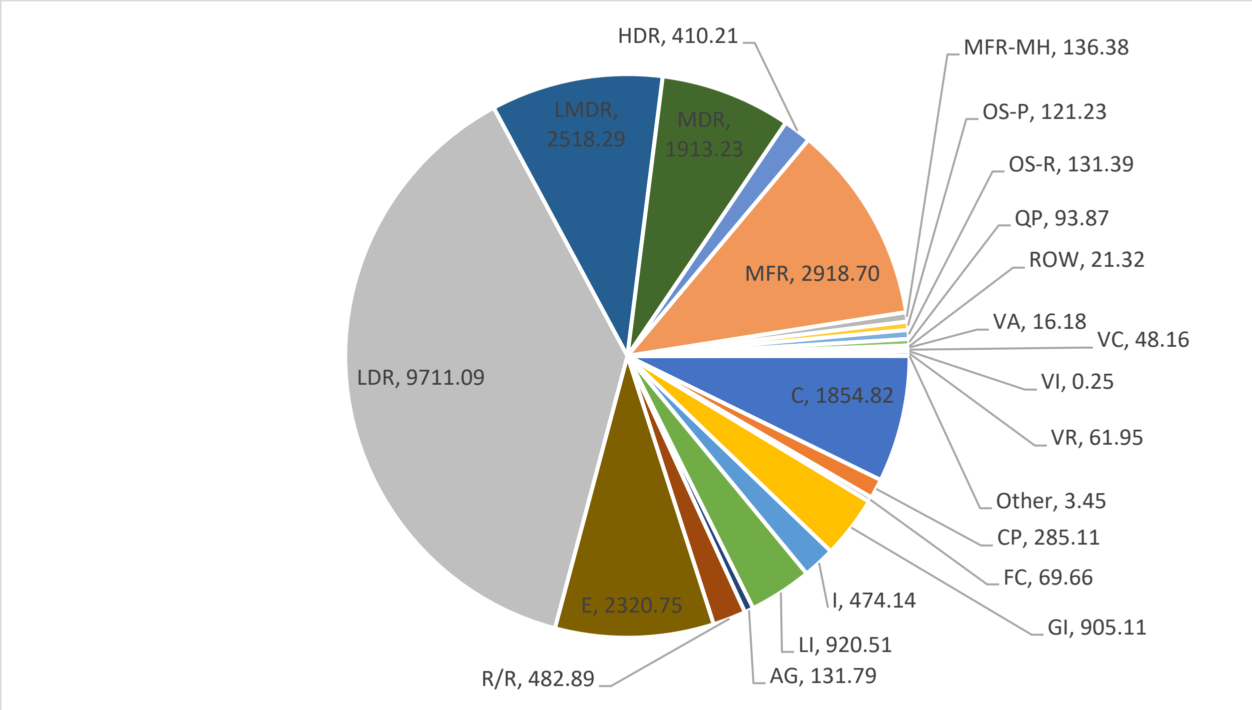


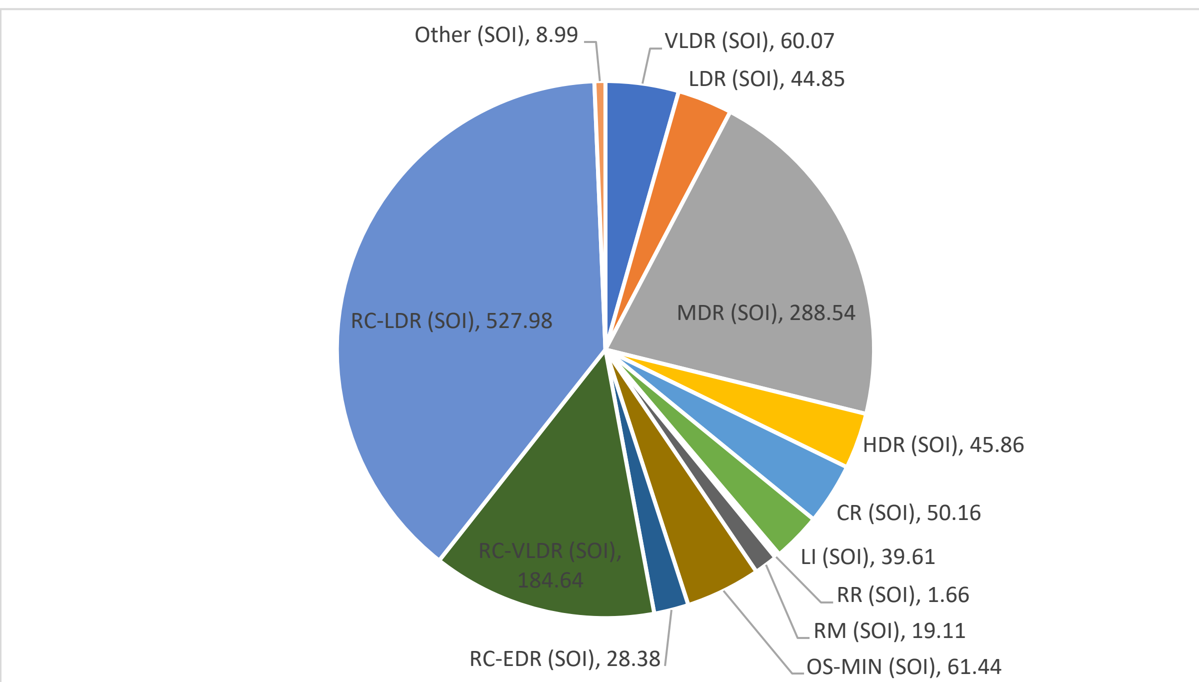
Table 4.4 – Sphere of Influence Demand by Land Use

Sphere of Influence Aggregate Sum of Average Demands				
Land Designation		2024 Aggregate Average Demand [1]		
Abbreviation	**Description**	**MGD**	**GPM**	**AFY**
VLDR (SOI)	Very Low Density Residential	0.05	37.24	60.07
LDR (SOI)	Low Density Residential	0.04	27.80	44.85
MDR (SOI)	Medium Density Residential	0.26	178.88	288.54
HDR (SOI)	High Density Residential	0.04	28.43	45.86
CR (SOI)	Commercial Retail	0.04	31.10	50.16
LI (SOI)	Light Industrial	0.04	24.55	39.61
BP (SOI)	Business Park	0.00	1.53	2.47
RR (SOI)	Rural Residential	0.00	1.03	1.66
RM (SOI)	Rural Mountainous	0.02	11.84	19.11
OS-MIN (SOI)	Conservation	0.05	38.09	61.44
RC-EDR (SOI)	Rural Community-Estate Density Residential	0.03	17.60	28.38
RC-VLDR (SOI)	Rural Community-Very Low Density Residential	0.16	114.47	184.64
RC-LDR (SOI)	Rural Community-Low Density Residential	0.47	327.33	527.98
Other (SOI)	*Primarily areas under development*	0.01	5.58	8.99
	Total	**1.22**	**845.48**	**1,363.76**

Note: MGD values are rounded to two decimals; GPM and AFY are calculated from unrounded MGD. Rows showing 0.00 MGD represent very small demands. Aggregate totals are approximate and may differ slightly from the sum of displayed values due to rounding adjustments.

[1] The total average demand (City of Corona's boundary plus Sphere of Influence) totals to 24.03 MGD. This demand does not include hydrant meter demand. See Section 4.3.1.

Figure 4.3 – Sphere of Influence Demand (AFY) by Land Use



The water meter-read data show that residential customers, including rural community, represent the majority of water deliveries. Combined potable water delivery to Single-Family and Multi-Family residential land uses accounted for approximately 81 percent of all water delivered within the City in 2024, which is consistent with the City's predominantly residential character.

4.3.3. Demand by Pressure Zone

In addition to analyzing water deliveries by land use type, demands were also evaluated by pressure zone to understand how water use is distributed across the City's hydraulic system. This evaluation provides insight into zone-level loading conditions and supports the calibration and application of the hydraulic model.

The City of Corona operates seven primary pressure zones (725, 905, 1020, 1060, 1220, 1380, and 1640) with several subzones that operate at hydraulic grades similar to their parent zones. Additional connections exist for service to the City of Norco and the Home Gardens community, though these areas are not treated as traditional City pressure zones for demand evaluation.

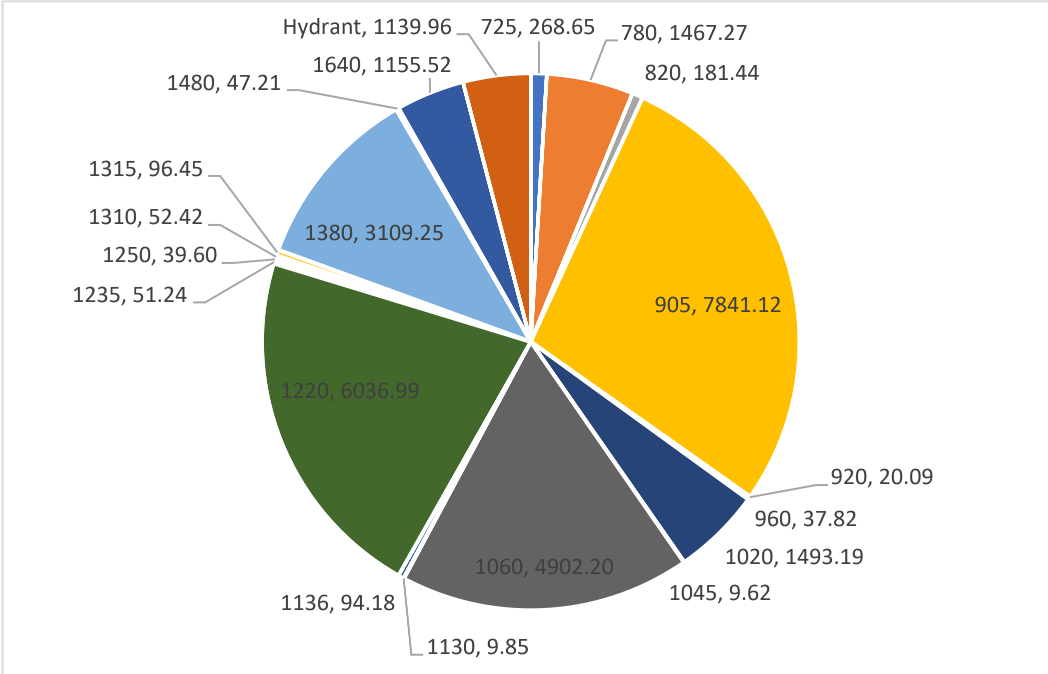
Metered water use was spatially assigned to the appropriate pressure zone using the GIS meter-placement methodology described in **Section 4.2.** The resulting average-day demands for each pressure zone are shown in **Table 4.5**, with corresponding spatial distribution illustrated in **Figure 4.4.** Pressure Zone 1320 is not shown because it represents the Temescal Valley Water District (TVWD) pressure-reducing station connection and does not contain City-metered retail water demand.

Table 4.5 – Average Demand By Pressure Zone

DEMANDS BASED ON METER BILLING DATA (YEAR 2024)			
ZONE	Aggregate Average Demand		
	GPM	MGD	AFY
725	166.55	0.24	268.65
780	909.66	1.31	1,467.27
820	112.48	0.16	181.44
905	4,861.20	7.00	7,481.12
920	12.45	0.02	20.09
960	23.44	0.03	37.82
1020	925.72	1.33	1,493.19
1045	5.96	0.01	9.62
1060	3,039.18	4.38	4,902.20
1130	6.11	0.01	9.85
1136	58.39	0.08	94.18
1220	3,742.71	5.39	6,036.99
1235	31.77	0.05	51.24
1250	24.55	0.04	39.60
1310	32.50	0.05	52.42
1315	59.79	0.09	96.45
1380	1,927.62	2.78	3,109.25
1480	29.27	0.04	47.21
1640	716.38	1.03	1,155.52
Hydrant [1]	706.73	1.02	1139.96
Totals	**17,392.48**	**25.05** [2]	**28,054.07**

[1] Hydrant locations are not assigned to specific zones. See Section 4.3.1.
[2] Total flow without hydrant demand is 24.03 MGD.

Figure 4.4 – Average Demand (AFY) By Pressure Zone



Pressure Zone 905 had the highest overall demand, consistent with its size and density. Pressure Zones 1220 and 1060 had the next highest levels of demand, each with approximately two-thirds to three-fourths the volume of Zone 905. Demand increases in Zones 1380 and 1640 are expected over time as undeveloped land in the southern part of the City is built out. Demand in Zones 1060 and 1220, which are both largely built out, is expected to remain stable.

4.4. Water Production

The preceding sections summarized the distribution of water demand by land use and pressure zone. The following section presents an overview of the City's water production, including groundwater extraction, treatment plant deliveries, monthly production patterns, and the relationship between production and demand.

The City's water production is supplied through a combination of groundwater wells and treated surface water produced at the City's water treatment facilities. Between 2016 and 2019, groundwater accounted for approximately 48 percent of total production. Of the groundwater extracted during this period, roughly 80 percent was treated at the Temescal Desalter prior to entering the distribution system.

For the 2016–2019 baseline period, the City's average annual production from all sources was 32,048 acre-feet per year (AFY), or approximately 28.6 MGD. Monthly production followed expected seasonal patterns. January and February represented the lowest-demand months, averaging approximately 1,824 AF and 1,742 AF, respectively. Summer months exhibited the highest production, with August averaging 3,587 AF or approximately 38.2 MGD. Monthly production values for the 2016–2019 period are provided in **Table 4.6**, along with the corresponding four-year monthly averages.

Beginning in 2020, water production continued to reflect a comparable split between groundwater and treated surface water. Between 2020 and 2024, groundwater contributed approximately 47 percent of annual production, with about 70 percent of that groundwater treated at the Temescal Desalter before entering the distribution system. During this more recent period, the City's average annual production was 32,419 AFY, or approximately 29.0 MGD.

Production reached its highest level during the entire 2016–2024 timeframe in 2020, when the City produced 34,245 AFY (30.6 MGD). Production remained elevated through 2021 before decreasing in 2022–2024 as water use patterns began returning closer to long-term historical norms. Seasonal variability remained consistent with the earlier period, with January averaging 1,985 AF and August averaging 3,533 AF (37.7 MGD) for the 2020–2024 period. Monthly water production for these years is also shown in **Table 4.7**.

Table 4.6 –Water Production by Month (AF), 2016 - 2019

Month	2016	2017	2018	2019	Average [1]
January	1,746	1,491	2,150	1,908	1,824
February	1,993	1,362	2,235	1,379	1,742
March	2,024	2,173	2,007	1,689	1,974
April	2,392	2,733	2,718	2,571	2,604
May	2,659	3,066	2,918	2,551	2,798
June	3,067	3,259	3,200	3,009	3,134
July	3,434	3,591	3,718	3,475	3,555
August	3,463	3,459	3,704	3,723	3,587
September	3,111	3,201	3,313	3,378	3,251
October	2,780	3,135	2,926	3,141	2,996
November	2,384	2,579	2,602	2,573	2,535
December	1,906	2,578	1,973	1,743	2,050
Total (AFY)	**30,958**	**32,628**	**33,465**	**31,140**	**32,048**

Note: Based on City of Corona's Annual Production Recapitulation Data
[1] The average of each month from the years 2016 to 2019.

Table 4.7– Water Production by Month (AF), 2020 - 2024

Month	2020	2021	2022	2023	2024	Average [1]
January	2,072	2,211	2,095	1,655	1,891	1,985
February	2,223	2,078	2,209	1,853	1,514	1,975
March	2,005	2,238	2,612	1,634	1,807	2,059
April	2,068	2,795	2,726	2,164	2,069	2,364
May	3,223	3,111	3,025	2,524	2,726	2,922
June	3,360	3,346	3,154	2,704	2,953	3,103
July	3,655	3,611	3,450	3,334	3,387	3,487
August	3,735	3,647	3,504	3,208	3,572	3,533
September	3,455	3,308	3,127	2,892	3,268	3,210
October	3,275	2,886	2,817	2,816	3,037	2,966
November	2,623	2,668	2,279	2,526	2,594	2,538
December	2,550	2,026	2,035	2,246	2,521	2,275
Total (AFY)	**34,245**	**33,924**	**33,031**	**29,555**	**31,338**	**32,419**

Note: Based on City of Corona's Annual Production Recapitulation Data
[1] The average of each month from the years 2020 to 2024.

4.5. Reconciliation of Deliveries and Production

Water deliveries discussed in **Section 4.3.** represent the volume of water recorded at customer meters—water taken out of the distribution system. The other side of the system balance is the volume of water produced at the City's water treatment facilities and groundwater wells, as discussed in **Section 4.4.** Ideally, total system production would equal total system deliveries. However, differences between these two values are expected due to unavoidable system losses, meter inaccuracies, and operational practices.

Water loss is the difference between the amount of water produced and the amount of water delivered. Losses may result from distribution system leaks, illegal connections, unmetered fire use, meter calibration drift, data reporting inaccuracies, or other operational factors. Industry practice considers water losses of less than 5 percent to be acceptable for a well-maintained municipal water system. Losses below 3 percent are considered excellent and indicative of a highly efficient system.

The City performs annual water audits to quantify total production, billed consumption, and unbilled authorized uses. These audits form the basis of the loss estimates presented in **Table 4.8** and **Table 4.9**. The City's water losses have steadily declined over time, decreasing from approximately 9.5 percent in FY 2015/2016 to 4.9 percent in FY 2018/2019. This improvement aligns with industry expectations for systems with ongoing meter replacement programs and pipeline rehabilitation activities.

From FY 2019/2020 through FY 2023/2024, losses remained consistently below the 5 percent benchmark, ranging between 3.26 percent and 4.17 percent, further indicating stable system performance and continued reliability in the City's distribution network.

4.5.1. Methodology

The reconciliation process compared total annual demands (based on the meter-read database) to total annual water production (based on flow data from treatment facilities, groundwater wells, and import meters). For each fiscal year, the following values were compiled:

1. Total Water Production – Sum of all sources entering the distribution system, including treatment plants, groundwater wells, and imported water, minus water exported to other agencies.
2. Billed Authorized Consumption – Sum of all metered customer consumption, aggregated from the City's billing database.
3. Unbilled Authorized Consumption – Hydrant use, system flushing, construction meters, and other approved non-revenue uses.
4. Calculated System Losses – Difference between total production and the sum of billed and unbilled authorized consumption.

This methodology is consistent with AWWA M36 water auditing procedures and reflects standard practice among California water purveyors. Loss percentages were calculated by dividing total system losses by total system production.

The results of these analyses for fiscal years 2015/2016 through 2023/2024 are summarized in **Table 4.8** and **Table 4.9**, which presents total production, total recorded demand, total calculated loss, and the corresponding loss percentage for each year.

Table 4.8 – Water Demand and Inefficiencies (AFY), 2016 - 2019

	2015/2016	2016/2017	2017/2018	2018/2019	Average
Total Demands [1]	26,364	27,023	30,217	27,570	27,794
Total Production [1]	29,138	28,856	31,499	28,988	29,620
Water System Inefficiencies [1]	2,774	1,834	1,282	1,419	1,827
Water System Inefficiencies (%)	9.52%	6.35%	4.07%	4.89%	6.21%

[1] Based on Water Audits

Table 4.9 – Water Demand and Inefficiencies (AFY), 2020 - 2024

	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	Average
Total Demands [1]	29,088	31,050	30,452	26,233	26,196	28,604
Total Production [1]	30,196	32,339	31,477	27,163	27,337	29,702
Water System Inefficiencies [1]	1,108	1,289	1,025	930	1,141	1,099
Water System Inefficiencies (%)	3.67%	3.99%	3.26%	3.42%	4.17%	3.70%

[1] Based on Water Audits

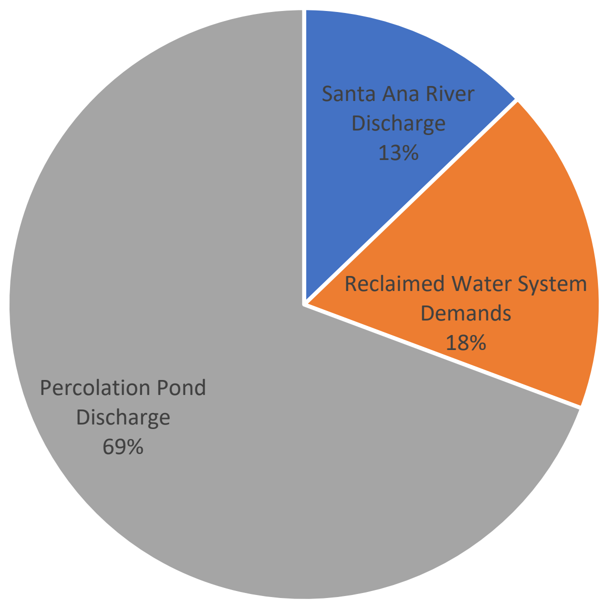
4.6. Reclaimed Water Use

Reclaimed water provides an opportunity to reduce the City's potable water demand by converting selected potable-metered accounts, primarily irrigation and agricultural users, to the reclaimed water distribution system. Any such conversion requires expansion of the City's reclaimed water infrastructure and must comply with the State of California's Title 22 Water Recycling Criteria, which require tertiary treatment for all landscape irrigation uses. Reclaimed water used for irrigation may serve City parks, schools, roadway medians, golf courses, commercial landscaping, and other large irrigated parcels. A detailed description of reclaimed water demand is included in **Section 3.6**.

Based on the *2018 Reclaimed Water Master Plan (RWMP),* in 2018, the reclaimed water distribution system delivered an average of 1,411 gpm (2,276 AFY) to end users. These users included irrigation for 26 City parks, 17 schools, and numerous commercial, industrial, and multifamily developments. As identified in the *2018 RWMP*, additional reclaimed water demand could be realized through the conversion of properties adjacent to existing or planned reclaimed water pipelines. Potential future irrigation-use conversions were estimated at 139.9 gpm (226.5 AFY) from adjacent commercial, industrial, and multifamily parcels. Further expansion of reclaimed water pipelines could ultimately add 735.2 gpm (1,185.5 AFY) of additional reclaimed water demand.

At the time of the *2018 RWMP*, direct potable reuse (DPR) was not evaluated in detail due to evolving statewide regulations. As described in **Section 3**, California has since adopted a statewide DPR regulatory framework. Any future consideration of DPR would require additional engineering analysis, regulatory coordination, and long-term planning.

Figure 4.5 – City of Corona's Reclaimed Water Use (2018)



Data sourced from City's *2018 Reclaimed Water Master Plan*

4.7. Demand Variability

Water demand fluctuates daily and seasonally, with peak usage typically occurring during early morning and evening hours and increasing significantly in summer months due to higher irrigation and cooling needs. Characterization of the City's diurnal and seasonal demand variation is necessary to calibrate the hydraulic model discussed in **Sections 6 and 7**.

4.7.1. Reference Year

This Master Plan uses 2024 as the reference year to analyze the City's water demand. Hourly demands were calculated using tank level and flow data recorded by Corona's SCADA system.

4.7.2. Existing System Demands and Peaking Factors

Identifying average day, maximum day, and peak hour demands is valuable for operating a reliable water system, as these benchmarks ensure adequate capacity for routine use, seasonal fluctuations, and short-term surges without compromising service or system integrity. Peaking factors further characterize existing demand data.

Existing Maximum Day Demand (MDD) Peaking Factor was determined by dividing the observed MDD by existing Average Day Demand (ADD).

Peak Hour Demand (PHD) Peaking Factor was determined by dividing the observed maximum hourly demand by the average hourly demand (ADD/24).

4.7.2.1. Average Day Demand

The existing Average Day Demand (ADD) was established by using the City's 2024 meter read-data and calculating the demand per land use and pressure zone, as explained in **Section 4.2.** The calculated ADD is 24.03 MGD.

4.7.2.2. Maximum Day Demand

The Maximum Day Demand (MDD) is the highest single-day production recorded during the reference year. The MDD, based on SCADA data, occurred on September 3, 2024, with a total system demand of 41.2 MGD. **Figure 4.6** presents the diurnal curve observed on the maximum day.

The Existing MDD Peaking Factor is 1.7. A more conservative MDD Peaking Factor of 1.8 is recommended. The City has historically used an MDD peaking factor of 1.8, and this value is retained for consistency.

4.7.2.3. Peak Hour Demand

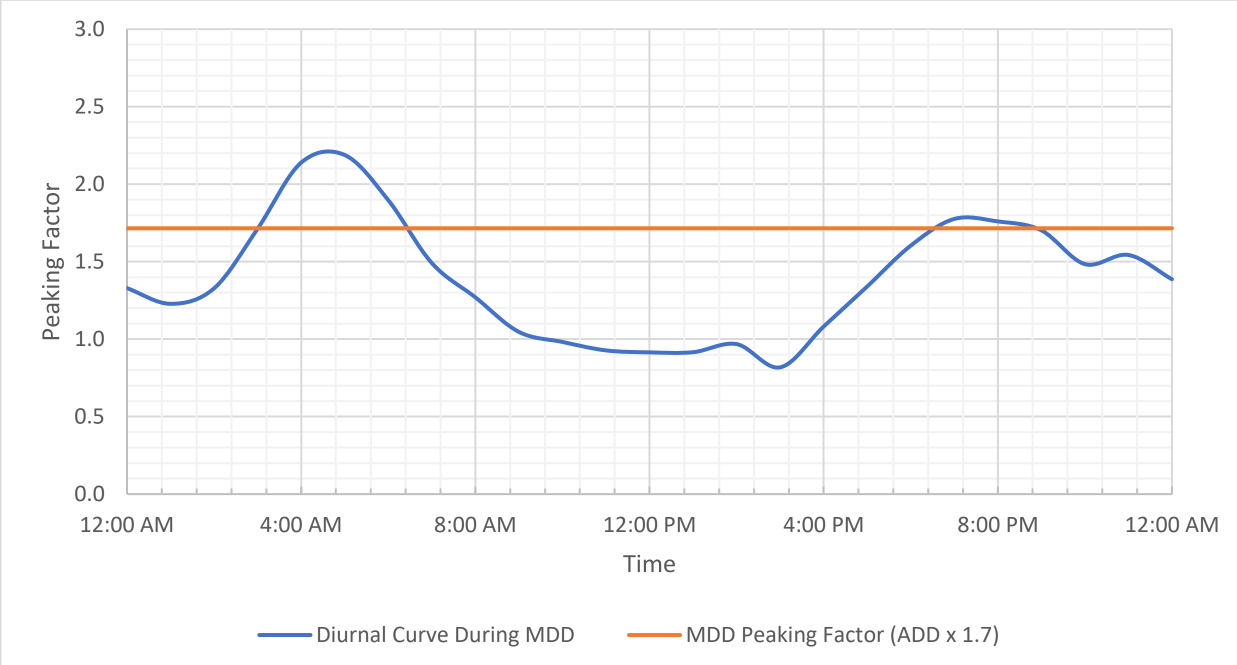
According to SCADA data, the PHD of 68.4 MGD occurred on September 9, 2024. The Existing PHD Peaking Factor is 2.8.

For planning purposes, it is recommended to use a more conservative peaking factor than the value derived from SCADA data. The PHD should be calculated with a peaking factor of 3.0 (PHD = 3 x ADD).

Table 4.10 – Existing Demand and Peaking Factors

Load Demand	Existing Demand (MGD)	Peaking Factors	Existing Factor
Average Day Demand	24.0	-	-
Maximum Day Demand	41.2	1.8	1.7
Peak Hour Demand	68.4	3.0	2.8

Figure 4.6 – Diurnal Curve During the Maximum Day Demand (September 3, 2024)



4.8. Existing Area-Based Demand Factors

Demand factors are used for planning future expansion of the water system, and to determine the existing system would have the capacity needed for a new development. This section presents the demand factors and the method that was used for their development. Please refer to **Section 4.9.** for more information on demand projections.

4.8.1. Methodology

For this Master Plan, demand factors were determined based on land use type and average meter connection demand, providing values on both a per-acre and per-connection basis for each land use category.

4.8.2. Area-Based Demand Factors

The area-based demand factor uses demand data presented in **Table 4.2**, land use categories, and total acreage of each land use category. A GIS spatial analysis tool calculated the area (in acres) served by each land use category. The demand (in gpd) was divided by the land use area (in acres) or the total dwelling units (DU), to produce a gpd/acre or gpd/DU demand factor shown in **Table 4.11**.

Single Family Residential (SFR) assumed 1 (one) meter per dwelling unit (DU). However, Multi-Family Residential, in some cases, used 1 (one) meter for multiple dwelling units, and therefore demand per acreage was used for MFRs unit factor.

Table 4.11 – Demand Factors for City of Corona and Sphere of Influence

Abbreviation	Description	2024 Demand Factor	Units (GPD/Acre or GPD/DU)
C	Commercial	1,880	GPD/Acre
CP	Commercial/Professional	2,230	GPD/Acre
FC	Flood Control	N/A	N/A
GI	General Industrial	850	GPD/Acre
I	Institutional	660	GPD/Acre
LI	Light Industrial	920	GPD/Acre
AG	Agriculture	370	GPD/Acre
R/R	Rural Residential	1,720	GPD/du
E	Estate Residential	930	GPD/du
LDR	Low Density Residential	480	GPD/du
LMDR	Low Medium Density Residential	380	GPD/du
MDR	Medium Density Residential	300	GPD/du
HDR	High Density Residential	200	GPD/du
MFR	Multi-Family Residential	4,050 [1]	GPD/Acre
MFR-MH	Multi-Family Residential-Mobile Homes	1,910 [1]	GPD/Acre
OS-P	Open Space-Park	1,000	GPD/Acre
OS-R	Open Space-Recreational	1,000	GPD/Acre
QP	Quasi-Public	1,000	GPD/Acre
ROW	Right of Way	N/A	N/A
VA	Vacant	N/A	N/A
VC	Vacant Commercial	N/A	N/A
VI	Vacant Industrial	N/A	N/A
VR	Vacant Residential	N/A	N/A
Other	*Primarily areas under development*	N/A	N/A
VLDR (SOI)	Very Low Density Residential	580	GPD/du
LDR (SOI)	Low Density Residential	850	GPD/du
MDR (SOI)	Medium Density Residential	390	GPD/du
HDR (SOI)	High Density Residential	420	GPD/du
CR (SOI)	Commercial Retail	770	GPD/Acre
LI (SOI)	Light Industrial	190	GPD/Acre
BP (SOI)	Business Park	260	GPD/Acre
RR (SOI)	Rural Residential	690	GPD/Acre
RM (SOI)	Rural Mountainous	160	GPD/Acre
OS-MIN (SOI)	Conservation	330	GPD/Acre
OS-R (SOI)	Open Space Recreation	1,000	GPD/Acre
RC-EDR (SOI)	Rural Community-Estate Density Residential	1,100	GPD/du
RC-VLDR (SOI)	Rural Community-Very Low Density Residential	770	GPD/du
RC-LDR (SOI)	Rural Community-Low Density Residential	460	GPD/du
Other (SOI)	*Primarily areas under development*	N/A	N/A

[1] MFR and MFR-MH demand factors were calculated using GPD/Acre because an accurate dwelling unit count was unable to be obtained using the meter read-data.

4.9. Demand Projection

This Master Plan does not use existing peaking factors calculated in **Section 4.7.2.** to calculate future ADD, MDD, and PHD. Future ADD, MDD, and PHD are estimated using the area-based demand factors calculated in **Section 4.8.2.** and the assumption that the City will be built out completely by the year 2040.

4.9.1. Methodology

Demand projections are used to evaluate future demands on the City of Corona's water system. The demand projections are based on future planned or anticipated growth, and the area-based demand factors developed in **Section 4.8.** Future growth is expected to increase the demands placed on the City's water system. The projections evaluated in this Master Plan are based on expected acreage of development in the City over the next 16 years, assuming full buildout by 2040.

It is important to recognize that these projections are estimates based on historical trends and current conditions and are subject to change. Factors that may influence future demand include City and State-mandated water conservation measures, conversion of potable water meters to reclaimed water for irrigation, changes in land use designations, climate variability, economic conditions, and emerging technologies. Accordingly, the demand projections presented in this Master Plan should be viewed as planning-level estimates that will require periodic updates as conditions evolve.

4.9.2. Demand Associated with Infill and Densification

Most infill and densification within the City are expected to occur in the City's outer regions and the City's sphere of influence of Coronita, El Cerrito, and the northern part of Temescal Valley. Demand associated with future infill and densification is evaluated at a planning level. Developers will determine connection points and site-specific system sizing through project-level studies.

4.9.3. Demand Projection

Future demand projections were developed for the City of Corona using the area-based demand factors outlined in **Section 4.8.2** and the anticipated acreage for each land use category through 2040. These projections assume that land use designations established by the City will be fully developed by 2040 and the land use designation will not change. Any modifications to land use designation within the service area would affect these estimates. **Table 4.11** does not include demands for Home Gardens or the City of Norco. This Master Plan assumes that the City of Corona will not supply more water to Home Gardens or the City of Norco than the City of Corona currently supplies in 2024.

Table 4.12 summarizes projection demands, and based on this approach, the total Average Day Demand (ADD) in 2040 is projected to be 32.42 MGD.

Table 4.12 – 2040 Average Demand Based on Demand Factors (City and SOI *COMBINED)*

Abbreviation	Description	2024			2040 (Buildout)		
		Area (Acres)	DU	MGD	Area (Acres)	DU	MGD
C	Commercial	883	-	1.66	2,271	-	4.27
CP	Commercial/Professional	114	-	0.25	131	-	0.29
FC	Flood Control	818	-	0.06	N/A	-	N/A
GI	General Industrial	953	-	0.81	2,359	-	2.01
I	Institutional	643	-	0.42	734	-	0.48
LI	Light Industrial	897	-	0.82	1,051	-	0.97
AG	Agriculture	320	-	0.12	379	-	0.14
R/R	Rural Residential	414	251	0.43	875	592	1.02
E	Estate Residential	1,122	2,241	2.07	1,599	3,193	2.97
LDR	Low Density Residential	3,759	18,437	8.67	4,021	19,724	9.47
LMDR	Low Medium Density Residential	882	5,950	2.25	900	6,070	2.31
MDR	Medium Density Residential	592	5,692	1.71	639	6,141	1.84
HDR	High Density Residential	95	1,872	0.37	155	3,067	0.61
MFR	Multi-Family Residential	643	-	2.61	800	-	3.24
MFR-MH	Multi-Family Residential-Mobile Homes	64	-	0.12	98	-	0.19
OS-P	Open Space-Park	113	-	0.11	200	-	0.20
OS-R	Open Space-Recreational	389	-	0.12	389	-	0.39
QP	Quasi-Public	96	-	0.08	127	-	0.13
ROW	Right of Way	33	-	0.02	N/A	-	N/A
VA	Vacant	9	-	0.01	N/A	-	N/A
VC	Vacant Commercial	9	-	0.04	N/A	-	N/A
VI	Vacant Industrial	4	-	0.00	N/A	-	N/A
VR	Vacant Residential	227	-	0.06	N/A	-	N/A
Other	*Primarily areas under development*	19	-	0.00	N/A	-	N/A
VLDR (SOI)	Very Low Density Residential	56	93	0.05	61	101	0.06
LDR (SOI)	Low Density Residential	43	47	0.04	99	351	0.30
MDR (SOI)	Medium Density Residential	154	668	0.26	161	696	0.27
HDR (SOI)	High Density Residential	20	98	0.04	20	73	0.04
CR (SOI)	Commercial Retail	58	-	0.04	73	-	0.06
LI (SOI)	Light Industrial	188	-	0.04	188	-	0.04
BP (SOI)	Business Park	9	-	0.00	26	-	0.01
RR (SOI)	Rural Residential	2	-	0.00	3	-	0.00
RM (SOI)	Rural Mountainous	110	-	0.02	110	-	0.02
OS-MIN (SOI)	Conservation	165	-	0.05	165	-	0.05
OS-R (SOI)	Open Space - Recreation	-	-	-	266	-	0.27
RC-EDR (SOI)	Rural Community-Estate Density Residential	75	23	0.03	126	38	0.04
RC-VLDR (SOI)	Rural Community-Very Low Density Residential	199	214	0.16	263	282	0.22
RC-LDR (SOI)	Rural Community-Low Density Residential	458	1,035	0.47	489	1,107	0.51
Other (SOI)	*Primarily areas under development*	5	-	0.01	N/A	-	N/A
			Totals (MGD)	**24.03**			**32.42**

Note: Values shown may not agree with calculated values due to rounding.
2040 land use areas include developed land uses only, while 2040 land use areas reflect buildout conditions.

4.9.4. Future Demands

The future demands can be projected assuming full City build out by 2040. The existing demand from reference year 2024 is known from water meter data, and the demand for 2040 was calculated using area-based demand factors with the assumption the City will be built out. The demand in intermediate years between 2024 and 2040 was interpolated assuming annual demand will increase at a constant linear rate.

Table 4.13 shows the expected future water demand at ADD, MDD, and PHD system demands.

Table 4.13 – Future Water Use and Demands (MGD)

Year	2025	2030	2035	2040
ADD	24.55	27.18	29.80	32.42
MDD [1]	44.20	48.92	53.64	58.36
PHD [2]	73.66	81.53	89.39	97.26

[1] The MDD peaking factor used is 1.8 multiplied by the ADD.
[2] The PHD peaking factor used is 3.0 multiplied by the ADD.

SECTION 5 - SERVICE CRITERIA

5.1. GENERAL DESCRIPTION

This section establishes the service criteria that form the basis for evaluating the performance of the City's potable water system. These criteria define expectations for system pressures, storage capacity, supply reliability, and operational performance. They are developed from American Water Works Association (AWWA) design and operational standards, California Department of Water Resources (DWR) guidance, California Waterworks Standards (Title 22), and the City's historical operating experience.

The criteria are used in the hydraulic model, assessment of the existing system, and planning of future improvements. Requirements related to supply, storage, water quality, system reliability, and fire protection are described in the subsections that follow. Recommendations for system improvements identified through application of these criteria are presented in **Section 9**, Master Plan Improvements.

5.2. DESIGN CRITERIA

The City's potable water system must be capable of reliably meeting customer demand under Average Day Demand (ADD), Maximum Day Demand (MDD), Peak Hour Demand (PHD), and fire-flow conditions. Consistent with AWWA M31 and DWR reliability guidance, the total available supply, including imported water, groundwater, and storage, must meet or exceed the Maximum Day Demand (MDD) at all times.

The City meets MDD requirements through a combination of:

- Imported water from Western Municipal Water District (WMWD)
- Local groundwater production
- Operational and emergency storage in the distribution system
- Blending and transmission capacity across pressure zones

Storage plays a critical role in reliable system performance. Storage reservoirs are required to:

- Balance hourly fluctuations in system demand
- Provide available volume for required fire-flow events
- Supply emergency storage during a temporary loss of a major supply source
- Maintain system pressures during peak-hour operation

Detailed criteria for pressures, storage volumes, fire flows, supply reliability, and hydraulic modeling assumptions are provided in the subsections that follow.

5.2.1. Wells

New potable water wells should be designed in accordance with California Department of Water Resources (DWR) Bulletin 74, AWWA standards, and California Division of Drinking Water (DDW) requirements.

Well casings must be sized and constructed in accordance with California DWR Bulletin 74, AWWA A100, and DDW Waterworks Standards. Bulletin 74 recommends that well casings be large enough to accommodate the pump, column pipe, and appurtenances while maintaining sufficient annular space for proper placement of the gravel pack and sanitary seal. Casings should be designed to ensure that upward water velocity inside the casing does not exceed 0.1 feet per second at maximum pumping rates to reduce turbulence, minimize entrained gas, and extend both pump and well life.

Casing material selection should consider site-specific geologic and chemical conditions. Bulletin 74 allows the use of carbon steel, stainless steel, or PVC for appropriate portions of the well, although stainless steel is generally required by the City in corrosive formations or areas where long service life is required. Wall thickness must be adequate to withstand external formation pressure, corrosion, and long-term structural loads. Joints must be watertight and meet structural integrity requirements to prevent cross-flow between zones and protect water quality.

Well screens should be designed to match the transmissive water-bearing zones identified during well siting and test drilling. Under Bulletin 74 guidance, screens must:

- Provide adequate open area to minimize entrance velocity (typically <0.1 ft/s)
- Be constructed of materials resistant to corrosion and incrustation
- Maintain structural stability under anticipated formation loads
- Utilize slot sizing based on sieve analyses of formation samples
- Be positioned only within productive aquifer intervals to exclude fine material

Gravel pack design is also governed by Bulletin 74 requirements. Gravel must be clean, well-graded, and compatible with formation grain size to prevent migration of fine particles. The pack should fully envelope the screen and be emplaced in a controlled manner to avoid bridging or segregation. A proper gravel pack is essential for maintaining yield and minimizing sediment.

Above the gravel pack, the well must incorporate a sanitary seal, typically neat cement or bentonite, extending to the ground surface to prevent surface water intrusion and contamination from shallow zones. Vent piping, casing heads, well pads, and surface completions must also comply with Bulletin 74 construction details.

It should be emphasized that these elements do not represent the full list of regulatory or engineering requirements for new potable production wells. Final well design must comply with:

- All applicable provisions of DWR Bulletin 74-81 and 74-90
- AWWA A100 well design and construction standards
- California Code of Regulations, Title 22
- County Environmental Health requirements
- DDW Source Water Assessment and permitting criteria
- City of Corona design requirements

- Industry best practices for groundwater extraction and wellhead protection

These standards collectively ensure that new wells provide reliable long-term production, maintain drinking-water quality, and protect groundwater resources from contamination and cross-connection hazards.

Permitting of new wells requires completion of a Source Water Assessment for the proposed well location. This assessment includes evaluation of:

- Site characteristics and hydrogeologic conditions
- Well construction design and materials
- Nearby Possible Contaminating Activities (PCAs) and potential contaminant pathways

The inventory of PCAs must be reviewed for both existing and new wells to identify vulnerable areas and ensure compliance with DDW drinking-water source protection standards. This process helps prevent the siting of potable wells near incompatible land uses and supports long-term protection of public health.

A monitoring and test-well phase should be conducted before final well construction. Installing and operating a test or monitoring well early in the design process verifies that the site has adequate groundwater quality and sustainable capacity. Assessment of test well performance also provides insight into site-specific vulnerabilities, informs final well design (screen intervals, casing materials, pump sizing), and supports completion of the source-water evaluation required for DDW permitting.

5.2.2. Tank Storage

The City's storage criteria are based on the combined requirements for operational storage, fire suppression storage, and terminal (or emergency) storage, consistent with AWWA M31, AWWA G200, and California DWR system reliability guidance.

These components ensure that the distribution system can meet daily fluctuations in demand, provide adequate fire flow, and maintain service during outages or supply interruptions. The total existing storage capacity for the City is approximately 44.9 million gallons (MG) distributed across multiple pressure zones. Although the system has 47.9 MG of total tank volume, the Border Tank is excluded from the storage calculations because of the mismatch between the tank HGL and the zone HGL, as described in **Section 2.2.4**. Due to this elevation difference, the Border Tank cannot reliably feed the zone under normal operating conditions and therefore does not contribute to usable storage. **Table 5.1** summarizes the required and existing storage volumes for each pressure zone and identifies any deficits or surpluses.

Operational storage represents the volume required to manage normal diurnal fluctuations between low nighttime demand and higher daytime consumption. This storage supports efficient operation of supply facilities, maintains stable pressures, and prevents excessive pump cycling. Operational storage volumes are typically determined as a percentage of Maximum Day Demand (MDD) and reflect system-wide diurnal demand patterns.

Operational storage calculations include hydrant meter use; however, operational storage is not intended to accommodate temporary construction or maintenance-related water demands. Because the specific locations of the hydrant meters were not provided and most of the usage came from a single "floater" meter used for maintenance and inspection activities throughout the City, the total hydrant demand was aggregated and evenly distributed across all zones for operational storage calculations.

Fire suppression storage is the volume required to sustain the necessary fire flow rate and duration established by the California Fire Code and local fire authority requirements. Required fire flows can range from 1,000 gpm to more than 4,000 gpm depending on land use, occupancy type, and building density. Fire storage must be available simultaneously with Maximum Day Demand (MDD) and without allowing system pressure to fall below 20 psi.

Terminal storage is the volume reserved to ensure that a tank is never completely emptied during normal or peak operating conditions. For planning purposes, the City maintains a minimum 10% of total tank capacity as terminal storage. This volume is not intended to be used for operational, fire, or emergency supply. It provides hydraulic stability, prevents air entrainment, maintains minimum pressures at the tank outlet. Terminal storage serves as a physical buffer to maintain reliable service and prevent tanks from being drawn down to levels that could compromise system performance.

Table 5.1 consolidates these storage components by pressure zone and compares them to the existing storage volumes. The City's total required storage across all pressure zones is 32.44 MG, while the existing tank capacity is 44.9 MG, resulting in an overall surplus of 12.46 MG. Each zone has sufficient water storage, even when hydrant meter demand is included.

Table 5.1 – Storage Volume by Zone

Pressure Zones	Existing Tank Storage (MG)	Terminal Storage (MG)	Operational Storage (MG)	Fire Flow (MG)	Storage Needed (MG)	Storage Surplus (MG)
725	1.5	0.15	0.35	0.84	1.34	0.16
905	10.5	1.05	7.76	0.84	9.65	0.85
1020 [1]	6	0.6	1.38	0.72	2.70	3.30
1060	8	0.8	4.19	0.84	5.83	2.17
1220	9.7	0.97	5.11	0.72	6.80	2.90
1380	6.7	0.67	2.66	0.72	4.05	2.65
1640	2.5	0.25	1.10	0.72	2.07	0.43
Total	**44.9**	**4.49**	**22.55**	**5.4**	**32.44**	**12.46**

Note: For detailed information on the location, capacity, and material of the tanks within each pressure zone, please refer to Section 2.4.1 of this master plan.
[1] Border tank is not included in storage volume calculations because of the mismatch between the tank HGL and the Zone HGL.

The City's pressure zones shown in **Table 5.1** are organized according to the hydraulic grade lines (HGLs) of the existing storage tanks. **Table 5.2** provides additional detail regarding each zone, including the associated tanks and any subzones that operate at modified HGLs within the larger pressure zone.

Based on the storage criteria summarized in **Table 5.1**, Zone 905 is one of the largest storage zones in the City, with a total of 10.5 MG of existing storage compared to 9.65 MG of required storage, resulting in a storage surplus of 1.36 MG. Zone 1020 has a surplus as well, with 3.34 MG of storage above the minimum requirement.

Table 5.2 – Zone Details

Pressure Zones	Alias	Tanks within Zone	Subzones
725	Zone 1	Green River Tank	-
905	Zone 2	Mangular Tank, R-3 Tank, Cresta Verde Tank	Subzones 780 and 820
1020	-	Yuma Tank, Mangular Tank, R-3 Tank, Cresta Verde Tank	Subzones 1130 and 1235
1060	Zone 3	Lester Tank #1, Lester Tank #2, SDO Tank, Border Tank [1]	Subzones 920, 960, 1220 and 1315
1220	Zone 4	Hayden Tank, Keith Tank, Upper & Main Tank, ADV Tank, Glen Ivy Tank	Subzones 1045, 1060, 1136 [2], 1220 and 1310
1380	Zone 5	Eagle Glen Tank, Gilbert Tank	Subzone 1250
1640	Zone 6	Jameson Tank	Subzone 1480

[1] Border tank has an HGL of 1020 but is connected to Zone 1060.
[2] Zone 1136 is included with Zone 1220 because the Glen Ivy Tank is currently out of service, and the 1220 Zone directly serves this zone.

5.2.2.1. Operational Storage Recommendations

Operational storage is the volume of water required to meet normal fluctuations in system demand throughout the day. It provides a buffer between low nighttime demand and higher daytime consumption, stabilizes system pressures, and reduces excessive pump cycling.

Based on industry practice and consistent with AWWA M31, the City defines operational storage as 50 percent of the Maximum Day Demand (MDD) for each pressure zone. As summarized in **Table 5.3**, the total recommended operational storage for the City is 22.55 MG.

The MDD values used in **Table 5.3** are based on meter-billing data from the 2024 calendar year, using a peaking factor of 1.8 (MDD = 1.8 × ADD), consistent with previous Water Master Plan assumptions. Only pressure zones with existing storage tanks are shown in the table.

Table 5.3 – Operational Storage

Pressure Zone	Average Day Demand (MG)	Maximum Day Demand (MG)	Recommended Operational Storage (MG) [1]
725	0.39	0.69	0.35
905	8.62	15.51	7.76
1020	1.53	2.76	1.38
1060	4.66	8.39	4.19
1220	5.67	10.21	5.11
1380	2.96	5.32	2.66
1640	1.22	2.19	1.10
Total	**25.05**	**45.07**	**22.55**

Note: Please refer to Section 4.3 for detailed information on water demands.

[1] Recommended Operational Storage is 50% of the MDD. The MDD was calculated using a peaking factor of 1.8 (MDD = 1.8* ADD). The peaking factor was taken from Section 4.7.2 of this master plan.

5.2.2.2. Fire Suppression Storage

Fire suppression storage represents the volume of water needed to sustain the required fire flow for the required duration while the system continues to meet peak-hour demands. The fire-flow requirements for each land-use category are shown in **Table 5.4**. These storage volumes are derived from the applicable fire flow rates and durations established by the California Fire Code and local fire authority requirements.

Fire storage requirements for typical land use are as follows:

- Single-Family Residential: 0.18 MG
- Multi-Family Residential: 0.30 MG
- Schools/Commercial: 0.72 MG
- Industrial: 0.84 MG

Each pressure zone must maintain a minimum fire-suppression storage volume equal to the highest fire-flow requirement associated with the land use within that zone.

Table 5.4 – Fire Suppression Storage

Land Use	Fire Suppression Storage (MG) [1]
Single Family Residential	0.18
Multi-Family Residential	0.30
Schools/Commercial	0.72
Industrial	0.84

[1] Fire Suppression Storage is derived from the required fire flow and duration. For a description of the required fire flow, duration, and residual pressure criteria refer to 5.2.7. Fire Suppression.

5.2.2.3. Emergency System Storage

Emergency system storage is the volume of water required to supply the system during an interruption of the primary water supply. Interruptions may result from pipeline failures, outages, treatment-plant shutdowns, imported water disruptions, or natural disasters.

The City uses an emergency-storage criterion of seven (7) times the Average Day Demand (ADD) for the system. This seven-day period corresponds to DWR's planning guidance and reflects the assumption that most outages can be resolved or mitigated within one week. Using this criterion, the total recommended emergency system storage for the City is approximately 175 million gallons (MG).

The City currently maintains 44.9 MG of existing tank storage, which satisfies a portion of the total requirement. To meet the remaining emergency storage needs, groundwater production would supply the additional volume. Based on pump-capacity testing (**Section 3.3.2.4**), the City can produce approximately 17.8 MGD from active groundwater wells. Over a seven-day period, this equates to 124.6 MG. When combined with existing tank storage, this provides approximately 170 MG of emergency supply, equivalent to approximately 6.8 times the ADD, with ADD inclusive of hydrant meter demands. This capacity demonstrates that groundwater sources can reliably meet emergency demand during interruptions of imported water delivery. In addition, the City maintains emergency interconnections with the City of Riverside and the Temescal Valley Water District, providing supplemental redundancy and resilience.

5.2.3. Booster Pump Stations

Booster pump stations are required to deliver the Maximum Day Demand (MDD) to the service area they supply. For pressure subzones served exclusively by a booster pump station, the station must be capable of supplying MDD plus fire flow to ensure adequate pressure and flow during fire-flow events. Each station should include appropriate fire-flow pumping capability and, where applicable, a hydro-pneumatic tank to supply small demands, reduce pump cycle time, and to stabilize pressures during transient conditions when needed.

5.2.3.1. Pump Station Configuration

To meet the City's reliability requirements, all booster stations must include a standby pump with a capacity equal to the largest duty pump. This ensures uninterrupted operation if the lead pump is offline, undergoing maintenance, or requires replacement because these activities can result in extended downtime.

Pump stations should also be equipped with aboveground suction and discharge connections that allow the entire facility to be bypassed with temporary, portable pumping equipment. This feature provides operational flexibility and ensures that water service to the zone can be maintained during emergencies or extended maintenance periods.

5.2.3.2. Pump Station Details

Pump stations must be equipped with modern pump controllers, flow meters, suction and discharge pressure gauges, motor-protection equipment, isolation valves, and telemetry systems. Telemetry must provide continuous monitoring of station status, alarms, pump performance, and operational conditions, with notification routed to staff through the City's SCADA system. All mechanical and electrical equipment should be selected and installed in accordance with AWWA and industry best practices for reliability, maintainability, and energy efficiency.

5.2.3.3. Pump Station Fireproofing

Pump stations must be constructed with fire-resistant materials and designed to minimize vulnerability during a fire event. In non-urban or high-risk wildfire areas, pump stations should also be equipped with peripheral sprinkler systems and other protective features as required by the local fire authority. High-risk areas may also require a site-specific risk analysis and mitigation measures that may include fuel modification or heat-deflecting site walls. The electrical service should be installed underground where feasible to reduce fire exposure and improve reliability.

5.2.3.4. Pump Station Backup Power

To maintain operation during power outages, booster pump stations must be equipped with a standby generator sized to operate all essential pumps and controls. Automatic transfer switches (ATS) are required to ensure that power is restored without manual intervention, enabling the pump station to remain in continuous service during electrical disruptions. Backup power facilities should comply with local air-quality regulations, NFPA standards, City requirements, and AWWA G200 reliability guidelines.

5.2.4. Pressure Reducing Stations (PRS)

Pressure-reducing stations regulate the flow of water between pressure zones to maintain stable hydraulic grade lines and protect the distribution system from excessive pressure. PRS facilities ensure that flows transfer reliably between higher and lower zones under varying demand conditions. Criteria for PRS capacity, configuration, and operation are provided in the following subsections.

5.2.4.1. PRS Capacity

Pressure-reducing stations shall be designed with sufficient valving and hydraulic capacity to deliver the full range of anticipated demands within the receiving pressure zone, up to and including Maximum Day Demand (MDD) and associated fire-flow requirements. Flow control and pressure reduction must remain stable under low, moderate, and high-flow conditions.

5.2.4.2. PRS Details

PRS facilities should include multiple pressure-reducing valves (typically a high-flow and a low-flow PRV) to maintain accurate pressure control across a broad range of operational conditions. Each PRV station should incorporate a pressure relief valve or similar overpressure protection at the downstream end of the valve station. This feature prevents excessive pressures in the receiving zone if a PRV fails in the open position or malfunctions.

Each PRS must be equipped with:

- Flow meters on each reducing valve
- Pressure gauges upstream and downstream
- Isolation valves
- Telemetry for real-time monitoring
- SCADA integration for alarm notifications and status reporting

PRS facilities must be designed to allow safe and reliable maintenance access and must comply with AWWA and DDW guidelines for pressure-zone management.

5.2.5. System Pressures

The City's potable water distribution system must deliver stable and reliable pressures under all operating conditions. Pressure requirements are based on California Waterworks Standards, AWWA design guidance, and City operational experience.

For the existing system, the City will maintain:

- Minimum static pressure: 50 psi
- Preferred static pressure range: 60–120 psi

Future developments will be required to maintain:

- Minimum static pressure: 60 psi
- Preferred static pressure range: 60–120 psi
- For multi-story buildings, a minimum pressure of 60 psi must be maintained at the building, and a minimum pressure of 25 psi is required at the top floor.
- When static pressures exceed 80 psi, a pressure regulator must be installed at the property in accordance with plumbing code requirements.

Pressure outside this range may require additional infrastructure such as PRVs, pumping improvements, or private booster systems for individual properties. Developers are responsible for installing private booster pumps where needed to meet minimum building pressures.

Residual system pressures must meet the following minimums at the condition specified:

- Peak Hour Demand (PHD): 40 psi minimum
- MDD + Fire Flow: 20 psi minimum

To achieve adequate fire-flow performance, hydrants must maintain at least 20 psi residual pressure during MDD plus fire-flow events.

All new water mains and service connections shall satisfy the following pressure requirements. The City's water distribution system is sized to provide the following pressure requirements during different demand conditions as summarized in **Table 5.5**, which presents both existing and future development criteria.

Table 5.5 – Potable Distribution System Pressure Requirements

Pressure Required (psi)		
Condition	**Existing System**	**Future Development**
Minimum Static Pressure Allowed	50	60
Maximum Static Pressure Allowed [1]	120	120
Minimum Residual Pressure for PHD	40	60
Minimum Residual Pressure for MDD plus Fire Flow	20	20

[1] Pressure Zones 1380, 1480, and 1640 may have static pressure ranges that exceed the maximum static pressure listed in the table above.

Maximum distribution system pressures shall be based on static operating conditions. In accordance with the Uniform Plumbing Code, individual pressure valves shall be installed on all services where the static pressure exceeds 80 psi. Pressure regulators shall be installed and maintained by property owner.

5.2.6. Transmission and Distribution Pipelines

Transmission and distribution pipelines must be designed to reliably convey water throughout the service area and maintain adequate pressure, flow, and water quality. Pipelines should be looped wherever feasible to improve system reliability and reduce water age. Each service area should have a minimum of two points of connection to support redundancy and hydraulic flexibility.

5.2.6.1. Pipe Velocity

To minimize the risk of pipeline wear, reduce transient pressures, and reduce the risk of internal deterioration, pipe velocities shall not exceed the limits shown in **Table 5.6**. These velocity thresholds are consistent with AWWA recommendations for distribution systems.

Table 5.6 – Potable Distribution System Velocity Requirements

Maximum Velocity Required (fps)	
Condition	**Feet per Second (fps)**
Peak Hour Demand (PHD)	5
Maximum Day Demand (MDD) plus Fire Flow	12

5.2.6.2. Pipeline Redundancy and Looping

New developments must provide at least two independent points of connection to the distribution system to maintain hydraulic reliability and redundancy. Looping improves operational flexibility, reduces customer outages during pipeline breaks or maintenance, and mitigates water quality degradation by reducing stagnant water and sediment accumulation. Dead-end mains should be avoided whenever possible. Where unavoidable, dead-end pipelines shall be incorporated into flushing programs to maintain adequate chlorine residual and water quality.

5.2.6.3. Required Pipeline Spacing

Separation between potable water pipelines and pipelines conveying wastewater, recycled water, or other hazardous fluids shall meet the requirements of the California Code of Regulations, Title 22, Division 4, Chapter 16, Article 4.

Current horizontal and vertical separation requirements include:

- Potable water mains must be located at least 10 feet horizontally from sanitary sewer, recycled water, or other hazardous pipelines.
- When crossing, potable water mains must maintain at least 1 foot of vertical separation above the non-potable pipeline.
- Crossings must be constructed at a minimum 45-degree angle and shall avoid fittings (tees, valves, or tap assemblies) for at least 8 horizontal feet on either side of the crossing, as required by Title 22.

Current exceptions to Title 22 requirements include:

- The City may grant an exception to the spacing requirements when strict compliance is not feasible. Title 22 allows exceptions if the following conditions are satisfied:
- The pipeline being replaced is less than 1,320 feet in length.
- The new pipeline diameter is within 6 inches of the existing pipeline diameter.
- The new pipeline is installed using methods that minimize contamination risk, including but not limited to:
  - Sleeving the newly installed main, or
  - Using upgraded piping materials that provide equivalent protective measures.

Any exceptions must be applied exactly as permitted under Section §64572 of Title 22 and must be approved by the California Water Board prior to construction.

5.2.6.4. Pipeline Sizing

The minimum diameter for new distribution mains shall be 8 inches, consistent with AWWA distribution standards and the City’s hydraulic performance requirements. Larger diameters may be required in transmission corridors or where needed to meet future fire flow, MDD, or system development demands.

5.2.7. Fire Suppression

Fire flow requirements support public fire protection and ensure the distribution system can deliver adequate water during fire emergencies. The City’s required fire flows and hydrant spacing criteria are summarized in **Table 5.7**. These criteria are consistent with the California Fire Code and may be subject to adjustment based on local Fire Department requirements.

A note is provided for industrial facilities because their required fire flow varies depending on specific building size, construction type, and hazard classification. When an industrial development requires a flow exceeding 3,500 gpm, the higher fire-flow value shall be used. If the required fire flow is less than 3,500 gpm, a minimum of 3,500 gpm shall be used.

Table 5.7 – Fire Flow Requirements and Fire Hydrant Location Criteria

Land Use	Required Fire Flow (gpm)	Duration (hrs)	Residual Pressure (psi)	Average Spacing Between Hydrants [2] (ft)
Single Family Residential	1,500	2	20	300
Multi-Family Residential	2,500	2	20	250
Schools	3,000	4	20	250
Commercial	3,000	4	20	250
Industrial [1]	3,500	4	20	250

[1] Industrial building fire flow shall be determined by a qualified fire suppression company and submitted to the City for approval. If the calculated fire flow exceeds 3,500 gallons per minute (gpm), the greater value shall be utilized. If the required fire flow is less than 3,500 gpm, a minimum of 3,500 gpm shall be used.

[2] Unless otherwise approved by the City of Corona Fire Department.

5.2.7.1. Fire Department Requirements for Accessory Dwelling Units (ADUs)

An Accessory Dwelling Unit (ADU) is a secondary housing unit located on the same parcel as a primary residential structure and includes complete independent living facilities. For fire-flow purposes, ADUs associated with one- or two-family homes fall under the Single-Family Residential land-use category. If the total number of dwellings on the parcel becomes three (3) or more, the Fire Department classifies the development as Multi-Family Residential.

Additional requirements include:

- ADUs located within a Very High Fire Hazard Severity Zone (VHFHSZ) must comply with full fire-hardening and vegetation-management requirements under the CFC and local ordinances.
- An ADU must be located within 150 feet of a fire access road with all portions of exterior walls accessible from the access road. The fire access road shall be:
  - at least 20 feet wide,
  - paved with concrete or asphalt, and
  - with slopes not exceeding 10 percent.

5.2.7.2. ADU Fire Sprinkler Requirements

Newly constructed ADUs must comply with the California Residential Code (CRC), which requires an automatic residential fire sprinkler system whenever the primary residence is required to be sprinklered. If the primary unit requires sprinklers, the ADU must also be protected, regardless of ADU size.

Fire sprinklers are not required for an ADU when:

- The ADU is 1,200 square feet or less, and
- The ADU would not otherwise require sprinklers under CRC Section R313, and

- The primary residence is not required to install a sprinkler system.

Fire sprinkler systems must be designed and installed per the following standards:

- NFPA 13 – Installation of Sprinkler Systems
- NFPA 13D – Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes
- NFPA 13R – Installation of Sprinkler Systems in Low-Rise Residential Occupancies

5.2.7.3. JADU Fire Sprinkler Requirements

A Junior Accessory Dwelling Unit (JADU) is located within the existing footprint of a residence. Fire sprinklers are not required for a JADU unless fire sprinklers are installed, or required to be installed, in the primary residence.

5.2.8. Summary of Design Criteria

Table 5.8 provides a summarized list of all design criteria presented in **Section 5**. These criteria reflect a combination of:

- California Fire Code (CFC)
- California Residential Code (CRC)
- NFPA Standards (NFPA 13, 13D, 13R)
- AWWA distribution system guidelines
- City of Corona Fire Department requirements
- City of Corona Department of Water and Power (DWP) Design Policy (November 2012)
- Industry standard practices and City standards

Table 5.8 – Summary of Design Criteria

Focus	Design Criteria
Total Supply	
Maximum Day Demand (MDD)	The total supply to the system is equal to the total demand, defined as MDD.
Average Day Demand (ADD)	The average day demand is determined using the demand factors specified in **Table 4.8** located in **Section 4 - Water Use**. These demand factors are provided on a per-acre and per-connection basis, tailored to specific land use types.
Storage	
Tank Capacity	Sum of Operational, Fire, and Terminal Storage
Operational Storage	50% of Maximum Day Demand (MDD)
Fire Suppression Storage	Each pressure zone shall contain fire suppression storage at least equal to the highest fire flow storage volume required in the zone based on actual land use in the zone. Refer to **Table 5.7** to calculate the highest fire demand in the Zone.
Terminal Storage	10% of Tank Capacity
Emergency System Storage	7 days of ADD (7 times ADD)
Booster Pump Station	
Pump Station Capacity	Pump Stations must supply maximum day demand (MDD). Note: The booster pump stations must supply MDD plus fire flow in subzones served exclusively by a hydro-pneumatic booster pump station.
Pump Station Configuration	At least one duty and one standby pump in parallel. The standby pump must be of the same size as the largest duty pump to maintain operations in the event the duty pump is offline.
Pump Station Details	Pump stations should be equipped with modern pump controllers, flow meters, suction and discharge pressure gauges, proper isolation valves, and telemetry equipment to control operations through SCADA.
Pump Station Fireproofing	Pump stations should be constructed of fireproof materials and provided with peripheral sprinkler systems.
Pump Station Backup Power	They are equipped with a standby generators and automatic transfer switches to operate during power outages.
Pressure Reducing Station (PRS)	
PRS Capacity	Should deliver the entire range of demands and fire flows
PRS Details	PRS should be constructed with a pressure relief valve to preclude excessive pressures in the service area. Each PRS should be equipped with flow meters and telemetry equipment to control operation through SCADA. Each PRS should have two pressure reducing valves (sized typically for high and low flows per service area).
Pipe Size and Velocity	
Minimum Pipe Size	8-inch (12-inch where required by the City's DWP Design Policy)
Maximum Pipe Velocities PHD	5 fps
Maximum Pipe Velocities MDD + Fire Flow	12 fps

Table 5.8 – Summary of Design Criteria

Focus	Design Criteria
System Pressures	
Minimum Static Pressure	Existing System: 50 psi Future System: 60 psi
Maximum Static Pressure	120 psi
Preferred Static Pressure	60 psi – 120 psi
Minimum Residual Pressure	Existing System: 40 psi during PHD Future System: 60 psi during PHD Existing & Future System: 20 psi during MDD + Fire Flow
Energy Conservation	SCE operates Time-of-Use (TOU) rate schedules with evening on-peak periods (typically a 5-hour peak demand window between 4 PM and 9 PM or a 3-hour peak demand window between 5 PM and 8 PM). Pumping should be scheduled outside of the on-peak periods defined in the current SCE schedule, when practical.
Water Quality	
Blending	Blending stations are used to meet regulatory limits and internal targets for constituents identified in **Section 8** (Water Quality).
Fire Flow Requirements	
Single Family Residential	1,500 gpm for 2 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 300 ft. [1]
Multi-Family Residential	2,500 gpm for 2 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 250 ft. [1]
Schools/Commercial	3,000 gpm for 4 hours with 20 psi residual pressure at a fire hydrant. The average spacing between hydrants is 250 ft. [1]
Industrial	Min. 3,500 gpm for 4 hours with 20 psi residual pressure at a fire hydrant. If building Needed Fire Flow (NFF) is more than 3,500 gpm, then use NFF. The average spacing between hydrants is 250 ft. [1]

[1] Hydrant spacing shall apply as listed unless otherwise approved by the City of Corona Fire Department.

5.3. Unincorporated Areas Design Criteria

The unincorporated communities within the City's service boundary, El Cerrito, Temescal Valley, Coronita, and Home Gardens, are under the jurisdiction of Riverside County for planning and fire protection standards. Design criteria for water system improvements in these areas shall follow Riverside County standards, including fire flow requirements established by Riverside County Fire Department (RCFD) and infrastructure requirements outlined in applicable County ordinances and development guidelines.

5.3.1. Fire Flow Requirements for Unincorporated Areas

Fire flow requirements for unincorporated areas are governed by the Riverside County Fire Department, which follows the California Fire Code with local amendments. To obtain the most current fire flow requirements and hydrant spacing criteria, designers shall refer directly to the Riverside County Fire Department's published standards and the most recent County Fire Ordinance, available on the RCFD website.

5.4. Planning Criteria

5.4.1. Methodology

The planning criteria in this section provide guidance for evaluating the repair, replacement, and long-term reinvestment needs of City water system facilities. These criteria support the development of the Capital Improvement Program (CIP) by identifying the expected service life, condition, and performance trends of key infrastructure components. The criteria will be used to prioritize projects based on asset age, remaining useful life, operational risk, and the criticality of each facility to overall system reliability.

5.4.2. Average Service Life

The average service life for water system facilities is summarized in **Table 5.9**. These values are based on recommendations from the California State Water Resources Control Board (SWRCB) and typical service-life guidance from industry sources, including AWWA manuals and standards. **Table 5.10** presents the average service life specifically for pipelines, based on AWWA recommendations. Understanding the typical lifespan of each facility type allows the City to forecast repair and replacement needs, identify assets at risk of failure, and plan for timely reinvestment. Replacing or rehabilitating facilities before the end of their service life is essential for maintaining the reliability, performance, and regulatory compliance of the City's water system.

Table 5.9 – Average Service Life of Facilities

Equipment	Average Service Life (Years)
Source of Supply	
Wells	60 – 70
Well Casing (carbon steel)	30
Well Transmission Mains (steel)	35 – 40
Pump Stations	
Pumping Equipment	10 – 15
Structures	30 – 60
Treatment Plants	
Chlorination Equipment	10 – 15
Equipment	10 – 15
Structures	30 – 60
Transmission/Distribution	
Structures (well maintained)	70
Structures (poorly maintained)	40
Steel Tanks (with recoating cycles)	60
Concrete Tanks	100
Steel Tank Coatings	20
Transmission and Main Distribution Pipes	35 – 40
Service Laterals	30 – 50
Valves	30
Backflow Prevention Assemblies	35 – 40
Blow-offs	35 – 40
Meters	10 – 15
Hydrants	40 – 60
General	
Structures	30 – 40
Electrical Systems	7 – 10
Equipment	10 – 15
Transportation Equipment	10
Computers	5
Lab/Monitoring Equipment	5 – 7
Tools and Shop Equipment	10 – 15
Mechanical Equipment	25
Electrical Equipment	15
Communication Equipment	10

Note: Information from California State Water Resources Control Board's Typical Equipment Life Expectancy Table.

Table 5.10 – Average Service Life of Pipelines

Abbreviation	Material	Service Life
AC LSL	Asbestos Concrete Pipe (Long Service Life)	105
AC SSL	Asbestos Concrete Pipe (Short Service Life)	75
CIP	Cast Iron Pipe	75
CMLC	Cement Mortar Lined and Coated	100
CMLDIP	Cement Mortar Lined Ductile Iron Pipe	100
CMLSTL	Cement Mortar Lined Steel Pipe	100
CON	Concrete	100
COP	Copper	50
DIP	Ductile Iron Pipe	100
HDPE	High Density Polyethylene	50
DIP LSL	Ductile Iron Pipe (Long Service Life)	110
DIP SSL	Ductile Iron Pipe (Short Service Life)	60
OTH	Other	40
PVC	Polyvinyl Chloride	100
RCP	Reinforced Concrete Pipe	100
SP	Steel Pipe	50
CEM	Cement Pipe	75
GP	Galvanized Pipe	50
PEP	Polyethylene Pipe	100
CML-TW	Cement Mortar Lined Pipe	75

5.4.3. Performance Indicators

Performance indicators are used to assess the condition, reliability, and effectiveness of the City's water system assets. These indicators include routine maintenance findings, structural condition, corrosion activity, main breaks, leaks, and other reliability concerns observed during system operations. Tracking these indicators over time provides the basis for identifying infrastructure in need of rehabilitation, replacement, or enhanced maintenance.

5.4.4. Distribution System Maintenance Program

A comprehensive distribution system maintenance program is essential for preserving the integrity of the City's water infrastructure and extending the useful life of its assets. Routine maintenance activities include valve and hydrant exercising, system flushing, leak detection, and the targeted replacement of deteriorated pipeline segments and associated appurtenances. These activities support reliable system performance, protect water quality, and reduce the risk of unexpected failures.

5.4.4.1. Flushing

Sediment, biofilm, and other deposits can accumulate within pipelines over time, reducing water quality and potentially affecting system performance. Routine flushing removes accumulated debris, restores disinfectant residuals, and helps maintain clarity and taste. Flushing must also accompany new pipeline disinfection procedures before a pipeline is placed into service, in accordance with state regulatory requirements (California Code of Regulations, Title 22).

5.4.4.2. Exercising and Servicing of Valves and Hydrants

Valves and hydrants must be exercised and inspected on a routine basis to ensure proper operation during both normal and emergency conditions. Regular exercising prevents seizing, verifies operability, and identifies components in need of repair or replacement. This program is critical to maintaining system reliability, ensuring adequate fire protection, and supporting effective system isolation during repairs or outages.

5.4.4.3. Leak Detection

The Utilities Maintenance Division performs leak detection activities on an as-needed basis and in response to observed or suspected leaks. Leak detection may involve acoustic monitoring, pressure zone evaluations, or targeted surveys. Early identification of leaks helps reduce water loss, prevent damage to surrounding infrastructure, and identify areas where aging pipelines may require replacement.

5.4.4.4. Water Main Replacement and Repair

Water meters, service laterals, and pipelines require periodic replacement as they reach the end of their service life or exhibit recurring failures. Damaged pipelines may be repaired using sleeves, clamps, or replacement of the affected segment, depending on the severity and cause of the failure. Decisions regarding repair versus replacement consider the pipeline’s age, material, history of breaks, corrosion conditions, hydraulic importance, and its criticality within the distribution system. Proactive replacement of aging or high-risk segments reduces long-term maintenance costs and improves overall system reliability.

5.5. Criteria for Using Reclaimed Water for Future Potable Reuse

The criteria in this section outline planning considerations for potential future potable reuse. At present, the City uses recycled water for non-potable uses. As statewide regulations continue to evolve, the City may incorporate future potable reuse options into long-term supply planning.

5.5.1. Methodology

Potable reuse in California is regulated primarily by the State Water Resources Control Board (SWRCB), including both the Division of Drinking Water (DDW) and the Regional Water Quality Control Boards (RWQCBs). These agencies jointly develop and enforce criteria for the treatment, monitoring, permitting, and operation of potable reuse facilities.

The criteria for potable reuse must align with those for the potable water system, including requirements for water quality, pressure, velocities, pipeline condition, pumping systems, and facility age. Potable reuse projects must comply with:

- California Code of Regulations (CCR), Title 22 – Water Recycling Criteria
- Direct Potable Reuse Regulations (effective December 2023)

- NPDES permitting for systems that include surface-water augmentation
- DDW water treatment standards for safe, reliable drinking water

Before a permit is issued, DDW requires the applicant to demonstrate compliance with all treatment, water-quality, pathogen-reduction, and monitoring criteria. RWQCB review ensures protection of groundwater and surface waters where applicable. These combined requirements ensure that potable reuse water meets all drinking water standards before it enters the public distribution system.

5.5.2. Direct Use

In December 2023 the State Water Resources Control Board unanimously adopted California's first uniform regulations for Direct Potable Reuse (DPR) under Title 22, which become effective October 1, 2024. These regulations establish the stringent multi-barrier treatment, monitoring, operator certification, source-control, and real-time process-control requirements necessary for recycling wastewater directly into a public drinking-water system or upstream of one. For the City of Corona, the new DPR framework presents a potential long-term opportunity to diversify and enhance water supply reliability by enabling highly purified recycled water to be counted as a legitimate potable source. At the same time, the regulatory, capital, and operational-oversight commitments are significant; moving toward DPR would require updates to the City's supply planning, facilities strategy, and stakeholder communication to ensure regulatory compliance, public acceptance, and cost-effectiveness.

These DPR regulations govern the direct introduction of highly treated recycled water:

- Either directly into a potable water distribution system, or
- Upstream of a drinking water treatment plant (raw water augmentation)

DPR requires multiple, independent treatment barriers to achieve the necessary pathogen log-reduction values (LRVs) and contaminant removal. These include, depending on project type:

- Microfiltration or ultrafiltration
- Reverse osmosis (RO)
- Ultraviolet advanced oxidation processes (UV-AOP)
- Advanced disinfection
- Real-time monitoring and fail-safe shutdown systems
- Continuous integrity verification for pressure-driven membranes

Continuous monitoring for pathogens, regulated contaminants, and indicator chemicals is required to demonstrate treatment performance. DPR facilities must also prepare:

- Operations plans
- Source control programs
- Consumer Confidence Reports

- Emergency and response plans for treatment failures

These requirements ensure that DPR water meets or exceeds all primary drinking water standards at all times. DPR diversifies the water supply and enhances long-term independence from imported sources.

5.5.3. Indirect Use

California's Indirect Potable Reuse (IPR) regulations fall under the Title 22 Water Recycling Criteria and involve introducing treated recycled water into an environmental buffer before it enters the potable supply. Environmental buffers can include:

- Groundwater replenishment (GWR)
- Surface water augmentation (reservoirs, lakes)

IPR relies on the environmental buffer to provide retention time, dilution, and additional environmental barriers, which distinguish it from DPR and add an additional layer of protection. As with DPR, IPR must follow strict Title 22 treatment requirements, which typically include:

- Reverse osmosis
- UV-AOP
- Multi-stage disinfection
- Continuous online monitoring

5.5.3.1. Use of Reclaimed Water in the City of Corona

The City currently uses recycled water for non-potable uses. A portion of recycled water is conveyed to the Cota percolation ponds, where it can percolate to recharge the Temescal Subbasin.

SECTION 6 - HYDRAULIC MODEL DEVELOPMENT AND EXISTING SYSTEM ANALYSIS

6.1. General Description

Section 6 discusses the development, calibration, and application of the City of Corona's hydraulic model used to evaluate the City's existing potable water system. The hydraulic model provides a representation of the City's pipelines, storage facilities, pump stations, valves, and supply sources, allowing for a detailed assessment of how the system operates under a range of conditions. The calibrated hydraulic model serves as a key planning tool for identifying hydraulic deficiencies within the existing potable water system- based on the pressure, velocity, and fire flow limitations using service criteria documented in **Section 5**. Projects identified based on hydraulic deficiencies within the existing system (**Section 6**) and the future system (**Section 7**) are incorporated into Master Plan Improvements in **Section 9**.

6.2. Hydraulic Model Development

6.2.1. Hydraulic Model Formulation Steps

A detailed hydraulic model is a valuable tool used to analyze the complex operation of the City's water system. The general steps of hydraulic model formulation are:

1. Inputting the system's physical data in GIS format.
2. Obtaining meter data to set boundary conditions in the model.
3. Translating the physical data into a network of nodes and links.
4. Inputting accurate water demands.
5. Calibrating the model to simulate actual field conditions and system performance.
6. Performing model runs based on current and future system conditions to analyze performance.

For the City, a new hydraulic model was developed using Innovyze InfoWater modeling software.

6.2.2. Physical Data Inputs

The physical data required for the hydraulic model includes a geographic network of pipes, nodes, tanks, pump stations, valves, and supply sources that would represent the City's potable water system. This network defines the connectivity of system components used to hydraulically link the model.

- **Junctions:** Locations where pipe size changes, pipe intersections, or critical hydraulic information (low/high points and demand) occur.
- **Pipes:** Transmission and distribution system piping with information including the pipe diameter, length, material, and associated roughness coefficient. The roughness coefficient function, known as the Hazen-Williams "C" factor (when the Hazen-Williams head loss formula is used), estimates friction losses in the system. The "C" factor is assigned based on the diameter, material, and, when

known, pipe age. However, "C" factors are subjective and based on industry best practices and operations input.

- **Storage Tanks:** Distribution system storage reservoirs with information representing base elevation, minimum and maximum water levels, initial water level, and type of storage.
- **Pumps:** Pumps are represented as nodes with information on pumping parameters (flow and head), diameter, and elevation.
- **Reservoirs:** Reservoirs are used to represent where flow enters the system, such as wells or wholesale connections. Input parameters include a flow rate (steady or variable curve), elevation. These locations usually include at least one control valve.
- **Valves:** Specialty system valves, such as pressure-reducing/sustaining, flow-control, and altitude valves are included with diameter and type. Some valves require set points (pressure or tank level) and/or curves. Common system valves, such as gate valves, are not typically included in the model.

6.2.3. Initial Boundary Conditions

Initial hydraulic boundary conditions must be entered into the model database. The initial water level for tanks and the initial open/closed setting for control valves and pumps are of particular importance. City water supply sources, such as pumps from groundwater wells, can be modeled as varied or constant supplies into the water system. Accurate representation of boundary conditions is critical to the successful calibration of the model.

6.2.4. Water Demand Data

Determining accurate water demands is crucial to developing an accurate hydraulic model. Metered demands, water supplies, pumped flows, and changes in tank volumes are reviewed over a given period to determine daily demand patterns. Annual consumption by metered account provides a spatial distribution of demand and average system usage. Typically, nodes along transmission mains and those near critical facilities (tanks, wells, pumps, valves) are excluded from demand allocation.

6.2.5. System Operations Integration

Node elevations were updated using current topographic layers in GIS. As-built information was used to update the model to match existing conditions where necessary. Storage tanks were annotated with ground elevation, diameter, and height. Operational settings in the model were verified during workshops with City Operations staff and through a detailed review of SCADA operational data. These settings were updated in the hydraulic model. The locations of normally closed valves were also confirmed and identified in the model using a combination of operator input and atlas maps review.

The current operational status and functionality for the City's pressure-reducing stations (PRS) were obtained from staff and updated in the hydraulic model. Settings provided by City staff represent typical conditions and may vary depending on the season, system demands, and storage conditions. For example, operations staff may change the settings to allow more water into a particular part of the system to fill a tank or less water to turn over the tank.

6.3. Hydraulic Model History

At the time this Potable Water Master Plan commenced, a fully updated hydraulic model for the potable water system was not yet in place. City staff initiated the development of a new hydraulic model, specifically gathering the physical data inputs to the model from the City's GIS database. The City provided a preliminary GIS database to the MBI team to finalize, calibrate, and apply for system analysis.

6.4. Hydraulic Model Calibration

Achieving a high level of model calibration is necessary to ensure that simulated system behavior aligns with real-world operating conditions. A properly calibrated model provides the confidence needed to make planning decisions and provides a planning tool to guide operational decisions.

6.4.1. Calibration Approach

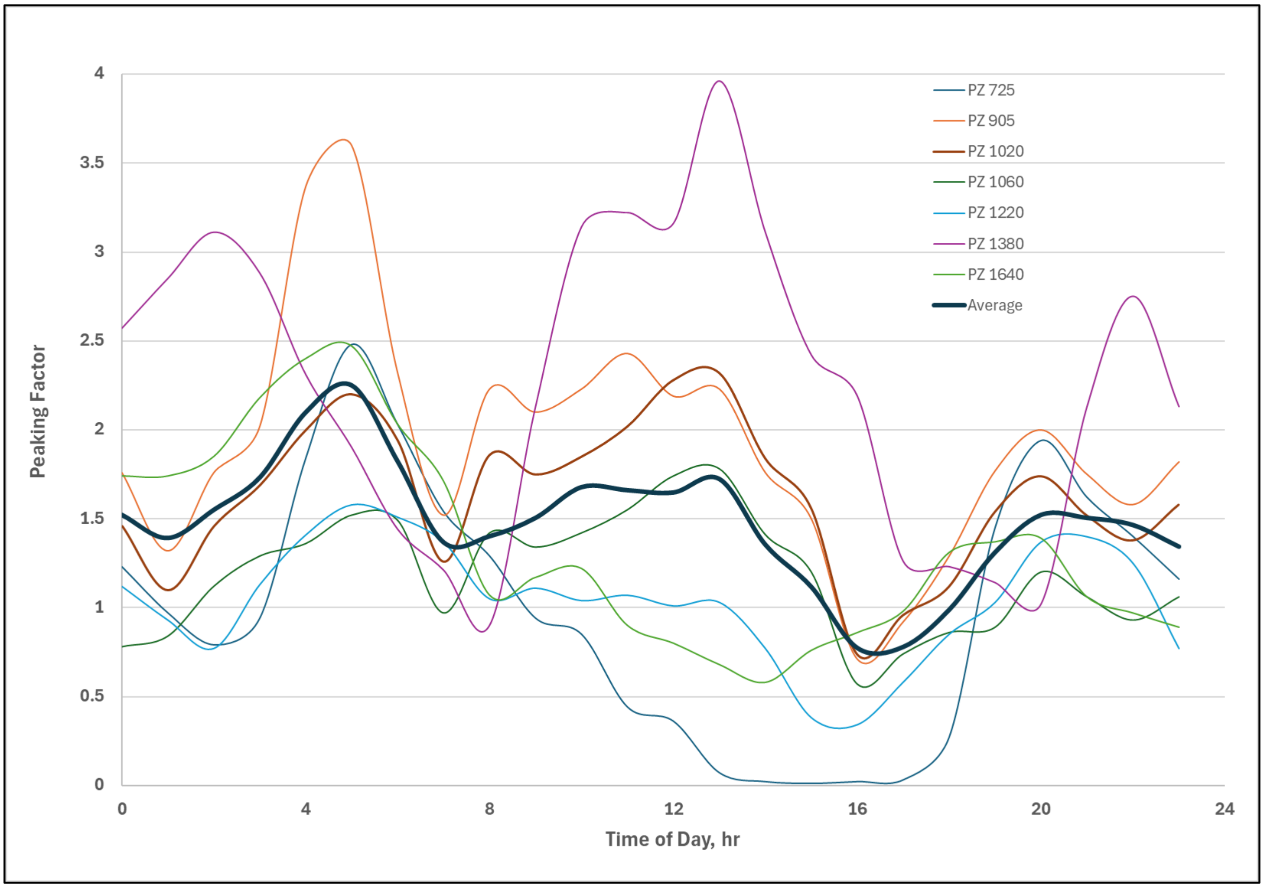
"Macro"-level calibration procedures use continuous monitoring to obtain data points to simulate system operations over an extended period. Actual tank levels, field pressures, and flow over time can be obtained using SCADA records or by placing monitoring equipment in the system. For this model, SCADA data for a one-month period was provided for model calibration.

The hydraulic model was calibrated for an extended period simulation (EPS). EPS calibration was performed to ensure the model accurately reflected how the overall system operated over time regarding transmission mains, pumps, tanks, and treatment plant operations under normal operating conditions. Precise duplication of the data recorded at all locations within the water distribution system during extended period calibration is unrealistic due to many factors influencing the results. Model calibration aims to minimize the discrepancies between the SCADA and the model simulations and create a "best fit" at as many locations as possible. Some discrepancies between the SCADA and model simulations are expected; however, limits to allowable discrepancies must be made to ensure the calibrated model accurately represents the existing water distribution system. Based upon the size and number of facilities in the developed model, the desired accuracies of the extended period calibration for the hydraulic model are:

1. A minimum simulation duration of 24 hours.
2. Tank levels within 2 feet between field data and model simulations at least 80% of the time.
3. Tank levels within 5 feet between field data and model simulations for the entire time.

Extended period simulations were performed on the City's water system using the diurnal demand curves presented in **Figure 6.1**. The SCADA points used to generate these curves generally yielded trending patterns in the model comparable to the field data collected. Tank and pump station trending graphs resulting from the extended period calibration are included in Appendix I.

Figure 6.1 – Time of Day Demand Curve



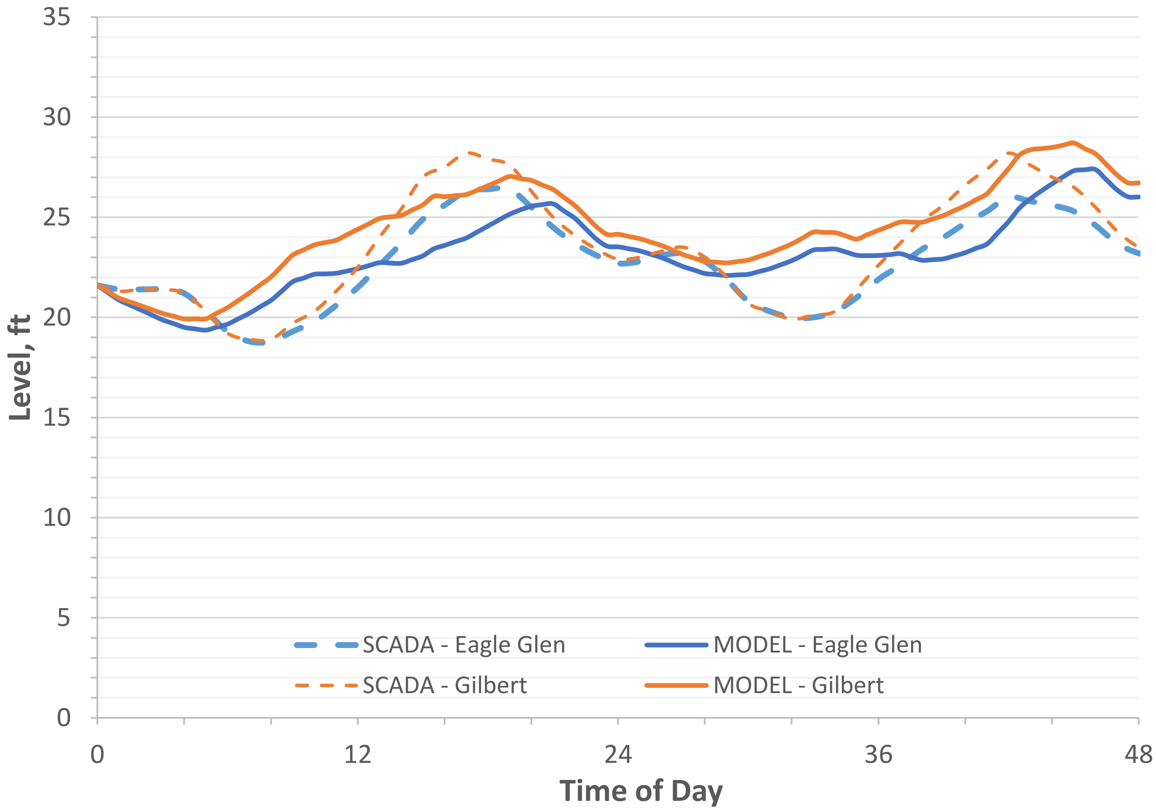
6.4.2. Evaluating Calibration

Hydraulic model calibration is an iterative process of refining data and evaluating whether the hydraulic model captures the key operational characteristics of the potable water system. Graphical representations of Pressure Zone 1380 tank levels and pump station operations are included in **Figure 6.2** and **Figure 6.3,** respectively, to demonstrate examples of the calibration process. Similar graphical representations were reviewed for various locations within other pressure zones.

It is important to note that some localized differences between modeled and field data points are expected. In complex potable water systems where looping and connectivity allows for numerous flow pathways, achieving an exact one-to-one alignment with every field data point is unlikely. However, the graphical representations offer valuable insight into how well the hydraulic model is calibrated to the existing system conditions. **Figure 6.2** and **Figure 6.3** demonstrate how closely the model tracks actual field-observed levels and operational patterns.

Based on the information presented in **Figure 6.2** and **Figure 6.3** and similar graphical representations in other zones (which are contained in Appendix I), the calibrated model successfully reproduces the behaviors of the system and closely reflects the SCADA-recorded conditions over the calibration period. The model captures the major system trends and indicating a high degree of calibration.

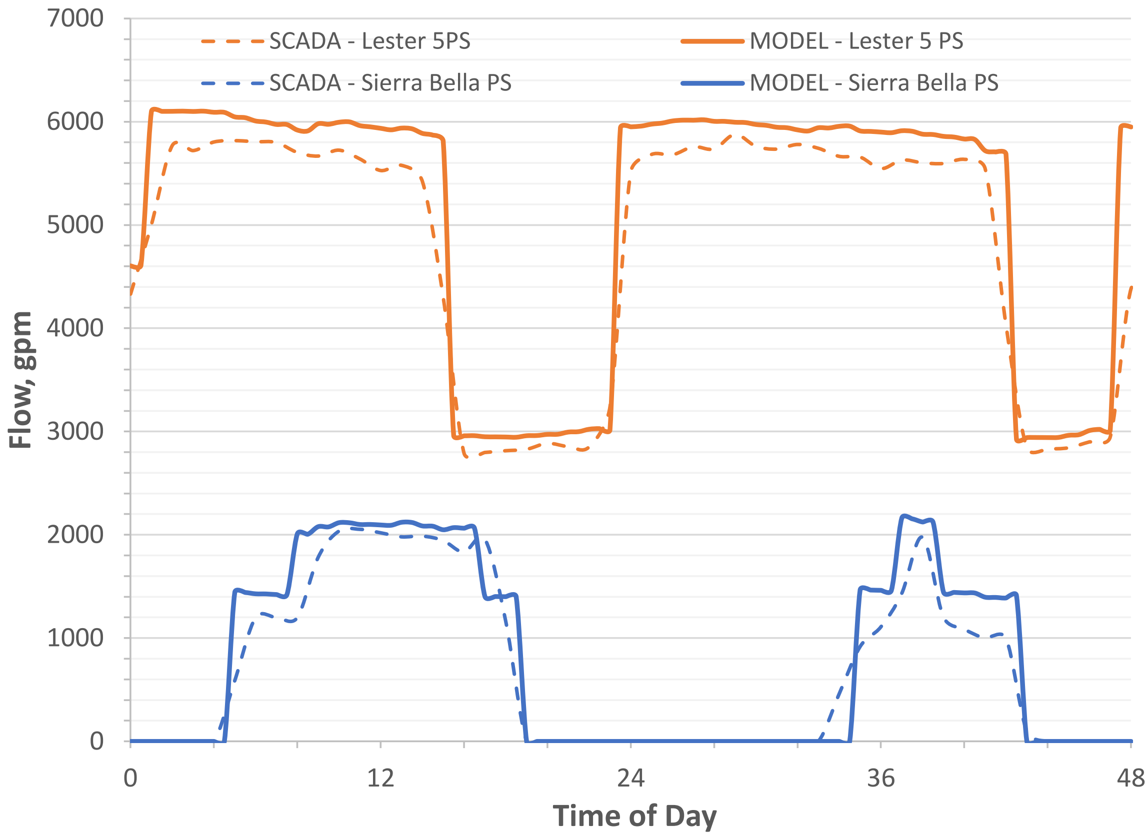
Figure 6.2 – Calibration Results for the 1380 Zone Tanks



For the City's complex system, storage tanks are not controlled solely by tank level, but rather by system performance on a daily or even hourly basis. Therefore, setting model controls to a consistent level in this case was not practical. As shown in **Figure 6.2**, the two tanks in the 1380 Zone fill and drain at different levels and times throughout the 48-hour period. However, the model is able to mimic field conditions considerably well, achieving a reasonably-high level of calibration accuracy.

Similarly, limitations within the hydraulic model software cannot accurately simulate soft starts, stops, and delays for pumps. This is depicted in **Figure 6.3** for the Sierra Bella PS.

Figure 6.3 – Calibration Results for the 1380 Zone Pump Stations



6.4.3. Hydraulic Model Calibration Results Summary

Based on the information presented in **Section 6.4.2.** , the calibrated model reproduces the key operational behaviors of the system and closely aligns with the actual field conditions recorded by SCADA over the calibration period. The model accurately reflects overall system trends including tank filling and drawdown patterns, pump station operation sequences, and system pressure responses. It is important to note that some localized differences between modeled and observed data are expected due to operational variability, field measurement limitations, and the precision of the demand curves.

The difference between field measured storage tank levels and hydraulically modeled tank levels is a common parameter used to assess the accuracy of calibration. A guideline for assessing hydraulic model calibration is less than two (2) foot difference between field measured and hydraulically modeled tank levels 80 percent of the time, and less than five (5) foot difference 100% of the time. However, further refinement of the model must be balanced with the practical limitations of available data, staff effort, and project resources, recognizing that beyond a certain point, additional calibration effort yields diminishing improvements in accuracy relative to the cost and effort required.

Table 6.1 summarizes that the hydraulic model is close to these guidelines throughout the entire potable water system. The primary locations where the City's hydraulic model sees larger differences between field measured tank levels and hydraulically modeled tanks levels are near the Garretson and Mangular Sites and blending facilities due to the complexity of these sites, which is rather common for such models.

The iterative nature of these models reached a point where further refinement of the hydraulic model is not beneficial to achieve minimal calibration increases.

Table 6.1: Model Calibration Accuracy

Parameter	Allowable Deviation	Guideline	Level Achieved
Tank level Differential between field and model	2 feet	80%	65%
Tank Level Differential between field and model	5 feet	100%	95%

6.5. Existing Water Distribution Analysis

The calibrated hydraulic model was used to analyze the existing potable water system to determine areas of hydraulic deficiency based on City planning criteria as identified in **Section 5**. System operating conditions were obtained for the maximum day demand (MDD) and used in the calibrated hydraulic model. Potable water system pressure, pipeline capacity, and fire flow capabilities were evaluated based on planning criteria and are presented in the following sections.

6.5.1. System Pressures Analysis

The calibrated hydraulic model was reviewed to identify areas of low pressure. Low pressures tend to occur during high demand periods, tank low water levels, and/or fire flow events. In addition, low pressures tend to occur near tanks and pump station and valve facility suctions and are typically ignored if no services (demand) are in the area. Demand nodes that occur at high points may experience low pressures, but these are not typically addressed by facility improvements.

The City's water system as modeled exhibits excellent pressure contours throughout. As expected, there are small areas around tanks and suction sides of pump stations and valving facilities, as well as at high points, where pressures are less than 40 psi. However, none of these areas are cause for improvements.

6.5.2. Pipeline Capacity Analysis

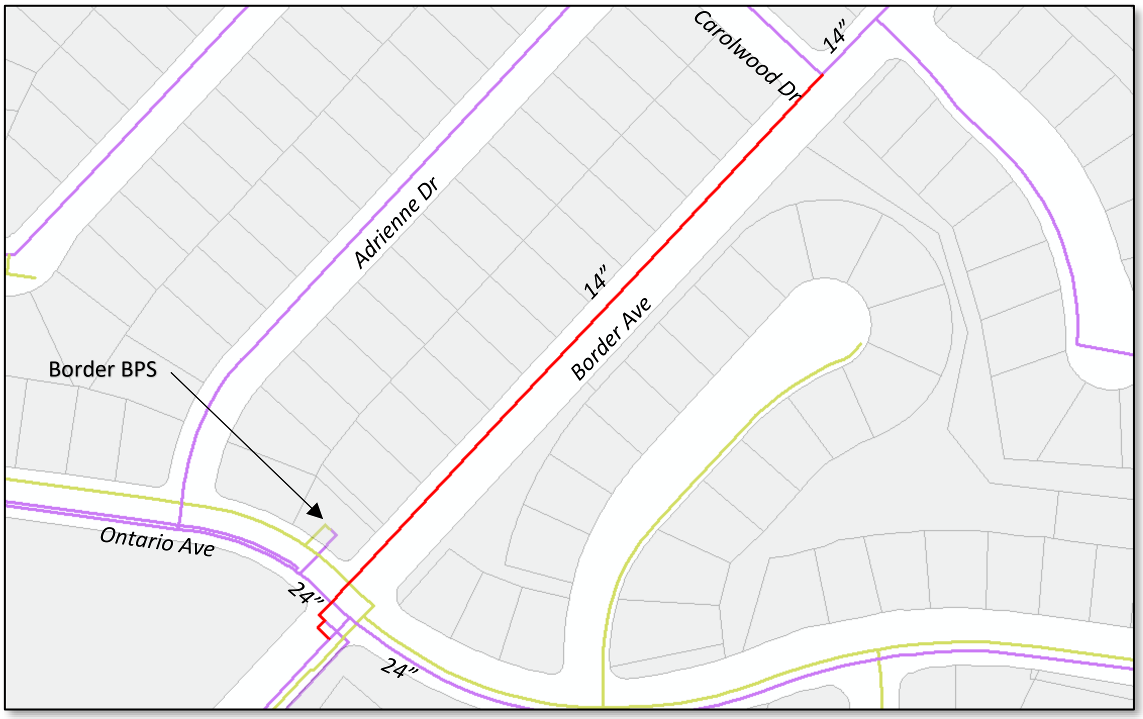
Velocity is a key component of pipeline capacity because it reflects how efficiently a pipe can convey flow under high-demand conditions; as flow approaches the pipe's hydraulic capacity, velocities increase, making velocity exceedances a practical indicator that the pipe is operating beyond its intended capacity. Pipelines were evaluated during peak hour demand and maximum day demand plus fire conditions to identify velocities that exceed the 5 feet per second (fps) and 12 fps criteria explained in **Section 5**.

6.5.2.1. Peak Hour Conditions

The peak hour condition revealed that the system generally exhibits velocities less than the maximum 5 fps criteria, with exception of Project 1060-1. Similar to the low-pressure criteria, there are areas where high velocities are expected to occur, such as pump station and valving station suction and discharge piping, which is typically sized smaller than the transmission main feeding the station. These areas are typically not of concern.

- **Project 1060-1:** During peak hour demands, the 14-inch main in Border Avenue between Carolwood Drive to the north and Ontario Avenue to the south exceeds the maximum 5 fps. The total length of this section is 1,000 LF and extends north from the existing 24-inch main in Border Avenue. The maximum velocity during the calibration MDD event was less than 8.5 fps. This pipeline was constructed in 1965 and is considered a low-priority project at this time. This segment will be further analyzed as part of the ultimate system analysis in **Section 7**.

Figure 6.4 – Project 1060-1



6.5.2.2. Maximum Day Demand Plus Fire Flow Conditions

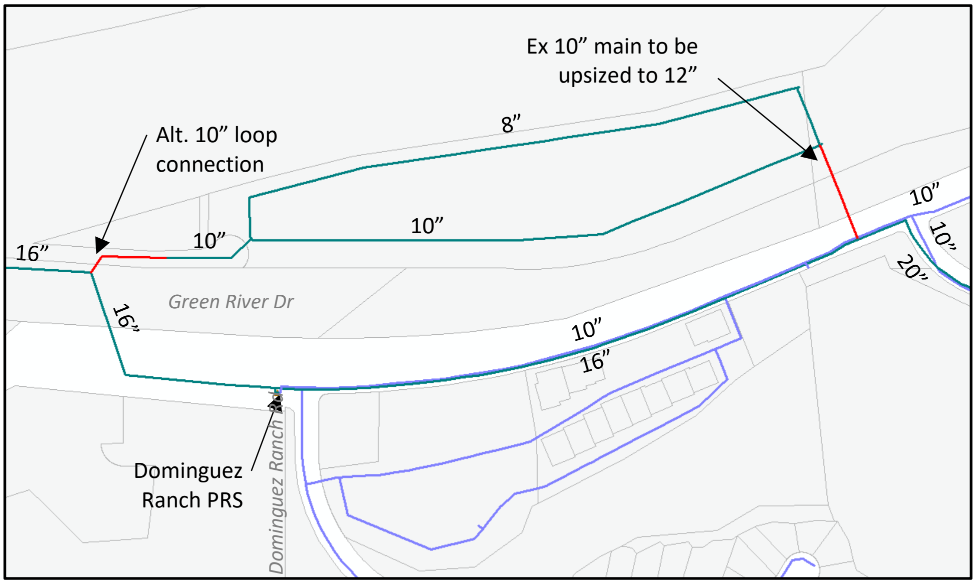
The MDD plus fire flow condition revealed known conditions:

- minimum pipe diameter of 8-inches for a single-family fire.
- areas of dead-end residential services up to a hydrant that are 4- and 6-inches in diameter, necessitating upsizing of these mains.

However, these are generally considered lower-priority projects and should be scheduled in conjunction with condition replacement, maintenance, and/or paving schedules as the City deems necessary. These areas are discussed in more detail in **Section 9**. The specific projects identified through the pipeline capacity analysis based on MDD plus fire flow conditions are presented hereafter:

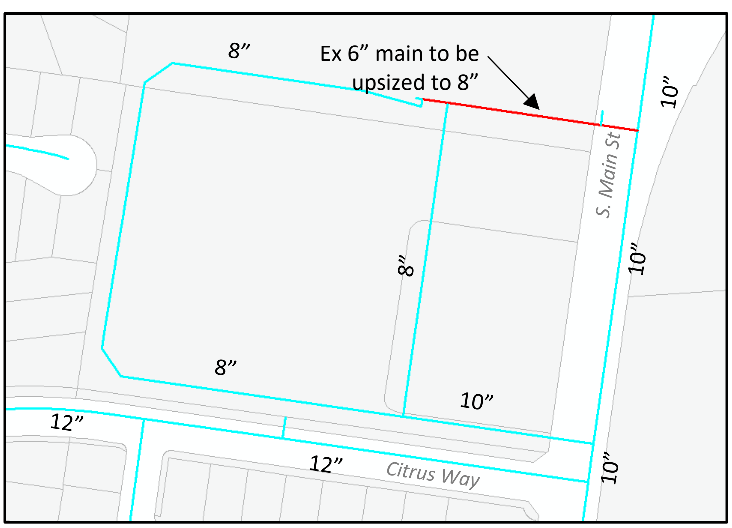
- **Project 725-1 (725FireFlow1):** Industrial fire flow results in a velocity in the 10-inch main in excess of 12 fps. Maximum fire flow with existing piping is 2,925 gpm. Upsize the existing 10-inch main along the easterly border of the project OR complete 10-inch loop to the west to connect to the existing 16-inch main in Green River Dr.

Figure 6.5 – Project 725-1



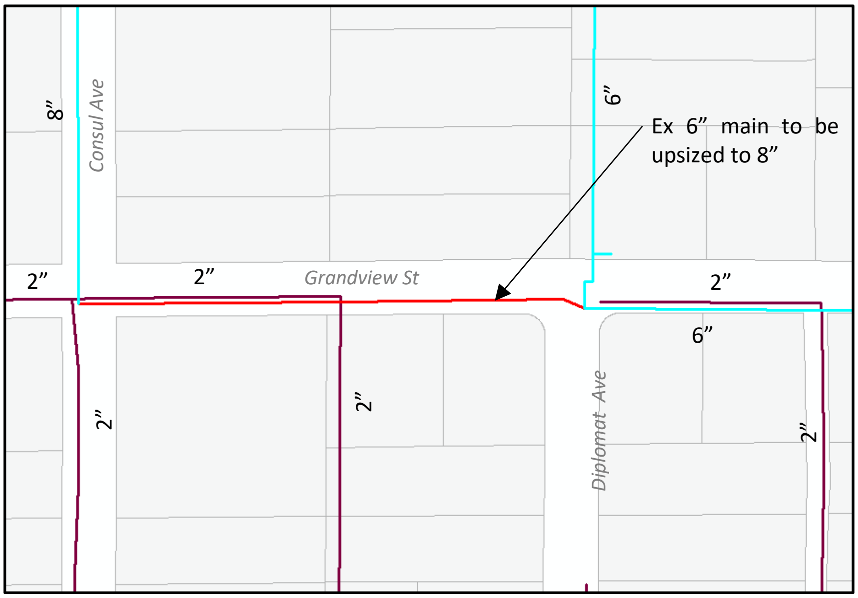
- **Project 1220-2 (1220FireFlow1):** Industrial fire flow results in a velocity in the 6-inch main in excess of 12 fps. Maximum fire flow with existing piping is 2,300 gpm. Upsize the existing 6-inch to 8-inch minimum; however, the City Department of Water and Power (DWP) Design Policy (Nov 2012) requires a 12-inch minimum in industrial areas and in areas with fire flow greater than 1,500 gpm.

Figure 6.6 – Project 1220-2



- **Project 1220-3 (1220FireFlow2):** Residential fire flow results in a velocity in the 6-inch main in excess of 12 fps. Maximum fire flow with existing piping is 1,050 gpm. Upsize the existing 6-inch to 8-inch minimum to meet residential fire flow requirements.

Figure 6.7 – Project 1220-3



6.5.3. Pumping System Analysis

The City’s existing potable water distribution system includes multiple booster pump stations operating within interconnected pressure zones supported by storage facilities and pressure- and flow-regulating valves. System operations allow water to move through different pathways depending on system demands, storage levels, and control settings.

This analysis evaluates existing booster pump capacity by comparing pumping capacity to the MDD of the pressure zone(s) served by the pump station. Because pressure zones are interconnected and multiple supply and transfer pathways exist, flow distribution among individual pump stations varies with system operating conditions. Accordingly, this analysis provides a systemwide overview. **Table 6.2** indicates that, in general, booster station capacity appears sufficient when compared with existing maximum day demands, recognizing that pump operation varies based on operational configuration and real-time system conditions.

Table 6.2: Existing Pumping System Analysis

Pump Station Name	From Zone	To Zone	Pump No.	Capacity (gpm)	Firm Zone Capacity (gpm)	Zones Included	ADD (gpm)	MDD (gpm)	Surplus / (Deficit)
Cresta Verde	905	1020	1	1,350	2,700	1020, 1130, 1235	964	1,734	966
			2	1,350					
			3	1,350					
Green River	725	1060	1	850	19,850	1045, 1060, 1220, 1250, 1310, 1315, 1380, 1480, 1640	9,578	17,240	2,610
Garretson Zone 3	905	1060	1	2,500					
			2	2,500					
			3	2,500					
			4	2,500					
			5	2,500					
			6	2,500					
Serfas Club	905	1060	1	1,500					
			2	-					
Mangular	905	1060	1	2,500					
			2	2,500					
Mangular	905	1220	1	1,250					
			2	1,250					
			3	1,250					
Garretson Zone 4	905	1220	1	1,250					
			2	1,250					
			3	1,250					
Border	1060	1220	1	400					
			2	1,200					
			3	900					
Chase	1060	1220	1	800					
			2	800					
			3	900					
			4	1,500					
Lester Zone 4	1060	1220	1	1,600					
			2	1,600					
			3	1,600					
			4	1,600					
Lester Zone 5	1060	1380	1	1,365	8,560	1250, 1380, 1480, 1640	2,698	4,856	3,704
			2	1,365					
			3	1,365					
			4	1,365					
Eagle Glen Zone 5	1220	1380	1	800					
			2	800					
Sierra Bella	1060	1380	1	1,500					
			2	1,500					

Table 6.2: Existing Pumping System Analysis

Pump Station Name	From Zone	To Zone	Pump No.	Capacity (gpm)	Firm Zone Capacity (gpm)	Zones Included	ADD (gpm)	MDD (gpm)	Surplus / (Deficit)
Eagle Glen Zone 6	1380	1640	1	230	2,946	1640, 1480	746	1,342	1,604
			2	236					
			3	230					
Payette	1380	1640	1	750					
			2	750					
			3	750					
			4	750					

[1] Largest pump per zone is assumed to be out of service.

6.6. Summary of Existing System Hydraulic Deficiencies

Due to the highly gridded, looped, and efficient potable water system, only five (5) projects were identified as hydraulically deficient within the existing system. These projects are summarized in **Table 6.3**.

- **Hydraulically Deficient Pipes-** Hydraulic deficiencies were identified by the hydraulic model based on high velocities, low pressures, inadequate fire flows, and high velocities during fire flows. These deficiencies are identified and summarized into specific projects in **Sections 6 and 7**. Cutsheets for the projects are included in Appendix K.

Additional system deficiencies were identified and included in Appendix L.

- **Size-Deficient Pipes-** The City Department of Water and Power (DWP) Design Policy (Nov 2012), Section B.6 requires minimum pipeline sizes, as discussed in **Section 5.2.6.4**. Not all pipelines under 8-inches are considered size-deficient (see Dead-End Pipelines discussion). Appendix L includes figures and tables identifying size-deficient pipes which were determined based on City design standards independent of hydraulic modeling results. The identified pipelines include dead-end mains less than 8-inches that serve hydrants and are therefore expected to meet the minimum size criteria. **Section 9** discusses recommendations for upsizing size-deficient pipes in accordance with City design standards.

- **Pipelines Beyond Typical Service Life-** Pipeline material affects typical service life of pipelines. Appendix L includes figures and tables identifying pipelines that have exceeded, or will exceed, their typical service life by the end of the 2040 planning period. The identification of pipelines beyond their typical service life is independent of hydraulic modeling results.

Reference-Only (Not Recommended for Improvement): Dead-End Pipelines (Non-deficient)

Dead-end pipelines less than 8-inches in diameter are not always characterized as size-deficient. Specifically, Appendix M summarizes pipelines less than 8 -inches in diameter that extend past the last fire hydrant on a main and primarily serve residential connections. These dead-end mains function as service extensions and are not recommended for upsizing. These dead-end pipelines (non-deficient) are provided for reference only.

Table 6.3 – Existing System Hydraulically Deficient Pipes

Zone	Project No.	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Deficiency	Priority	Pavement Rehab Zone	Comments
725	725-1	(10") 12"	Green River Road at Dominguez Ranch	290	Fire Velocity > 12 fps	Existing System	Low	9	Industrial fire flow of 3,500 gpm required. Max Flow available existing is 2,925 gpm.
905	905-4	(12") 16"	Small segment in Railroad St east of Alcoa Cir	21	Fire Velocity > 12 fps	Existing System	Low	4	Small reduced diameter section of pipe
		(10") 16"	Alcoa Cir north of Railroad up to Alcoa PRS	1,025	Fire Velocity > 12 fps				Major feed to Alcoa PRS, but flow could be offset by other stations to limit velocity.
1060	1060-1	(14") 16"	Border Ave between Ontario Ave and Carolwood Dr	994	Velocity > 5 fps *(Ultimate 5.6 fps)*	Existing System	Low	5	Transmission main, marginally above criteria at ultimate buildout
1220	1220-2	(6") 12" [1]	400' South of Magnolia Ave and S Main Street	380	Fire Velocity > 12 fps	Existing System	Med	10	Industrial fire flow of 3,500 gpm required. Max Flow available existing is 2,300 gpm.
	1220-3	(6") 8"	Grandview St between Consul Ave and Diplomat Ave	380	Fire Velocity > 12 fps	Existing System	Med	2	Single family residential fire flow 1,500 gpm required. Max Flow available existing is 1,050 gpm.

[1] Based on the existing system hydraulic model, Project 1220-2 proposed diameter would be 8-inch to achieve fire flow criteria of <12 fps velocity. However, City Department of Water and Power (DWP) Design Policy (Nov. 2012) B.6 requires 12-inch diameter for industrial projects and where fire flows are greater than 1,500 gpm.

SECTION 7 - FUTURE SYSTEM MODELING AND ANALYSIS

7.1. General Description

Section 7 evaluates the performance of the City of Corona's potable water system under projected 2040 buildout conditions using the hydraulic modeling framework (**Section 6**) and service criteria documented in **Section 5**. The future system analyses were conducted by adding the projected water demands at their anticipated model nodes and zones. Initially, the model does not include system improvements identified as part of the existing system deficiencies in order to determine if the same project would be identified as hydraulically deficient. Using the hydraulic model under various operating conditions, this section assesses the adequacy of future water supply, storage, pumping capacity, and conveyance under maximum day and peak hour operating conditions, providing a system-wide understanding of how the distribution network will perform as demands increase. Projects identified based on hydraulic deficiencies within the existing system (**Section 6**) and the future system (**Section 7**) are incorporated into Master Plan Improvements in **Section 9**.

7.2. Future Hydraulic Model

The hydraulic model for the future system was developed using the existing system calibrated hydraulic model and incorporating the existing system hydraulically deficient projects identified in **Section 6** as a baseline. Hydraulically deficient projects identified in **Section 6** were also evaluated under future demand conditions to confirm that the proposed pipe diameter provides sufficient capacity for both existing and future project needs.

The future model does not include upsizing all legacy undersized pipelines to meet minimum diameter City standards as outlined in the City's DWP Design Policy (2012). Even though **Section 9** identifies specific legacy undersized pipelines as size-deficient, complete replacement of size-deficient pipelines represents a significant capital expenditure that may not be completed within the planning period. Therefore, retaining existing pipe diameters within the future hydraulic model results in a more conservative representation of the future system performance.

Water demands were assigned as follows:

- **Within existing system and SOI.** Water demands were assigned based on future demands as discussed in **Section 4**.
- **Future development, including residential subdivisions, within the City and in the SOI that have conceptual plans.** Projected water demands for future development were incorporated into the hydraulic model by assigning flows at the anticipated points of connection to the existing transmission system. These demands were applied directly to the model at representative nodes within the appropriate pressure zones. New transmission mains to specifically serve future development areas were not sized as part of this model. This approach ensures that the existing system's ability to support new development is appropriately assessed without defining or designing the off-site transmission facilities required to serve those areas.

- **On the northeastern side of the City where conceptual plans have not been developed at the time of this Master Plan.** Water demands were assigned based on future land use designation as described in **Section 4**.

7.3. Future Potable Water System Analysis

7.3.1. Water Supply Analysis

As previously described in **Section 3**, the City's water supply is provided through a combination of groundwater production from local wells and imported water supplies. The future system analysis evaluates water supply under projected 2040 buildout demand. Both groundwater and imported water supplies are included in the evaluation to provide an understanding of how the overall water system supports future demand conditions based on the currently available supply sources.

Demands for 2024 and the 2040 maximum day demand (MDD) projections were compared to the currently available supply sources using both design capacity and actual capacity. The maximum day demand values are calculated using the average day demand values in **Table 4.10** and using the peaking factor calculated in **Section 4.7**. The actual capacity is the capacity of the groundwater wells based on SCE pump test information. Based on the currently available supply, the City has sufficient supply sources to meet maximum day demands in buildout conditions. These supply sources do not include supply from the Arlington Desalter, which is used to offset peak summer demand conditions. The results are shown in **Table 7.1**. The available supply sources, including design and actual capacity values, are shown in **Table 7.2**. Based on this analysis, the City has adequate capacity to meet the City's projected demands through 2040 with the current supply sources.

Table 7.1 – 2040 Water Supply Analysis

Demand Scenario	Demand (MGD)	Available Supply (MGD)
2024 Max Day Demand	43.2	65.7
2040 Max Day Demand	58.4	65.7

Table 7.2 – 2040 Water Supply Analysis

Water Source			Design Capacity (GPM)	Actual Capacity (GPM)	Notes
Groundwater	Bedford-Coldwater Basin	Well No. 3	1060	564	Standby
		Well No. 20	2,500	0	Inactive
		Well No. 21	2,250	1,138	Standby
		Subtotal (GPM)	**5,810**	**1,702**	
		Subtotal (MGD)	**8.4**	**2.5**	
	Temescal Basin	Well No. 7A	1,000	741	Active
		Well No. 8A	1,650	656	Active
		Well No. 9A	1,500	706	Active
		Well No. 11A	700	524	Active
		Well No. 12A	1,100	517	Active
		Well No. 13	1,000	0	Inactive
		Well No. 14	1,000	726	Active
		Well No.15	1,100	524	Active
		Well No. 17A	1,400	1,127	Active
		Well No. 19	2,100	477	Active
		Well No. 22	3,500	1,421	Active
		Well No. 25	3,500	1,210	Active
		Well No. 26	1,000	273	Active
		Well No. 27	500	500	Active
		Well No. 28	2,000	670	Active
		Well No. 29	640	640	Active
		Well No. 31	907	907	Active
		Well No. 33	665	665	Active
		Subtotal (GPM)	**25,262**	**12,284**	
		Subtotal (MGD)	**36.4**	**17.7**	
Imported Water	MWD Colorado River	WR – 19 (MGD)	30.0	30.0	Lester TWP
		WR – 33 (MGD)	9.1	9.1	Sierra Del Oro WTP
		Subtotal (MGD)	**39.1**	**39.1**	
	MWD State Water Project	WR - 24 (MGD)	6.5	6.5	Mill's Connection
	WMWD	Arlington Desalter (MGD)	0	0	Peaking Supply
Other		Riverside Connection	0	0	Emergency Connection
		TVWD Connection	0	0	Emergency Connection
Total (MGD)			**90.3**	**65.7**	

7.3.2. Storage Analysis

Storage capacity is evaluated against projected 2040 buildout demands using the storage calculation methodology and criteria described in **Section 5.2.2**. The analysis considers operational, fire flow, and terminal storage requirements by zone and compares these requirements to available storage volumes under future conditions. The results of the future storage analysis are summarized in **Table 7.3**.

Table 7.3 – 2040 Storage Analysis

Pressure Zones	2040 Tank Storage (MG)	Terminal Storage (MG)	Operational Storage (MG)	Fire Flow (MG)	Storage Needed (MG)	Storage Surplus / (Deficit) (MG)
725	1.5	0.15	0.43	0.84	1.42	0.08
905	10.5	1.05	9.21	0.84	11.10	(0.6)
1020 [1]	6	0.6	1.43	0.72	2.75	3.25
1060	8	0.8	7.42	0.84	9.06	(1.06)
1220	9.7	0.97	6.11	0.72	7.80	1.90
1380 [2]	9.2	0.92	2.96	0.72	4.60	4.60
1640	2.5	0.25	1.34	0.72	2.31	0.19
New 1560 [3]	0.6	0.06	0.25	0.3	0.61	(0.01)
Total	**48.0**	**4.8**	**29.2**	**5.7**	**39.7**	**8.3**

[1] Border tank is not included in storage volume calculations because of the mismatch between the tank HGL and the Zone HGL.
[2] Future 1380 Tank is included in the storage volume calculations. The proposed storage volume for the future 1380 Tank is 2.5 MG.
[3] Future 1560 Tank to serve a new zone 1560 is included in the storage volume calculations.

Individual tank sizing is evaluated based on projected water demands for 2040 buildout. However, the timing of storage improvements should coincide with future improvements and development-driven demand increases that will increase storage requirements of the system.

The storage deficit is anticipated to be mitigated by facilities proposed by the developer, as identified in their specific planning studies, once the development occurs.

7.3.3. Pumping System Analysis

The City's potable water distribution system consists of ten primary pressure zones (22 total pressure zones), each supplied by one or more direct sources, including groundwater wells, treatment facilities, and imported supplies. In addition, booster pump stations and pressure-reducing valves provide interconnections that allow water to move between zones through multiple potential flow paths depending on system operating conditions.

Due to this interconnected configuration, booster pump stations were not evaluated by direct comparison of pumping capacity to the maximum day demand of an individual pressure zone. Under normal and peak demand conditions, water may enter or leave a zone through a combination of direct supply, pumped transfers, and pressure-regulated connections. As a result, a simple capacity-to-demand comparison does not reliably indicate whether a booster station provides adequate support to the system.

Instead, booster pump stations were evaluated using the hydraulic model, which reflects actual system topology, operational controls, and available supply pathways. A booster pump station was considered capacity-deficient only when hydraulic modeling indicated operational limitations, including one or more of the following conditions under maximum demand scenarios:

- Storage tanks supplied by the booster station were unable to refill or maintain minimum operating levels.
- Booster pumps were required to operate continuously with no recovery period.
- System pressures could not be maintained within acceptable ranges.
- Other abnormal operational indicators were observed in the model that would limit system reliability or operational flexibility.

This model-based approach aligns with standard water system planning practice by evaluating booster pump performance based on observed system behavior, rather than isolated capacity metrics. Booster stations did not exhibit operational deficiencies in the hydraulic model and were considered to provide adequate support under projected buildout demand conditions.

The only instances where a traditional booster station analysis works are for the 1380 and 1640 zones and the subzones they serve as these areas are not directly connected to a supply source. **Table 7.4** below demonstrates the booster station analysis and shows that the booster stations have ample capacity to lift water into the higher zones.

Table 7.4 – 2040 Booster Pump Station Analysis

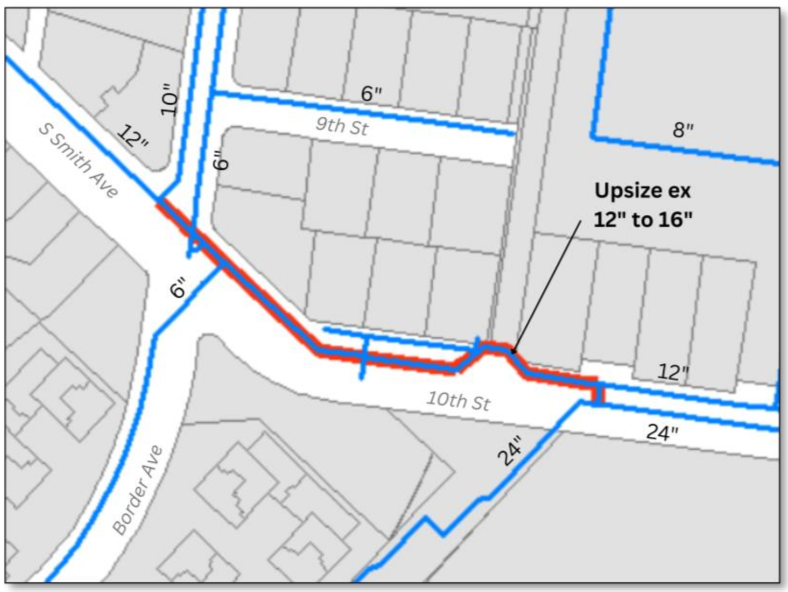
Pump Station Name	From Zone	To Zone	Pump No.	Capacity (gpm)	Firm Zone Capacity (gpm)	Zones Included	ADD (gpm)	MDD (gpm)	Surplus / (Deficit)
Lester Zone 5	1060	1380	1	1,365	8,560	1250, 1380, 1480, 1640	3,411	6,139	2,421
			2	1,365					
			3	1,365					
			4	1,365					
Eagle Glen Zone 5	1220	1380	1	800					
			2	800					
Sierra Bella	1060	1380	1	1,500					
			2	1,500					
Eagle Glen Zone 6	1380	1640	1	230	2,946	1640, 1480	997	1,795	1,151
			2	236					
			3	230					
Payette	1380	1640	1	750					
			2	750					
			3	750					
			4	750					

7.3.4. Pipeline Capacity Analysis

Velocity is a key component of pipeline capacity because it reflects how efficiently a pipe can convey flow under high-demand conditions; as flow approaches the pipe's hydraulic capacity, velocities increase, making velocity exceedances a practical indicator that the pipe is operating beyond its intended capacity. Pipelines were evaluated during peak hour demand and maximum day demand plus fire conditions to identify velocities that exceed the 5 feet per second (fps) and 12 fps criteria explained in **Section 5**. Specific velocities for each project are summarized in **Table 7.5**.

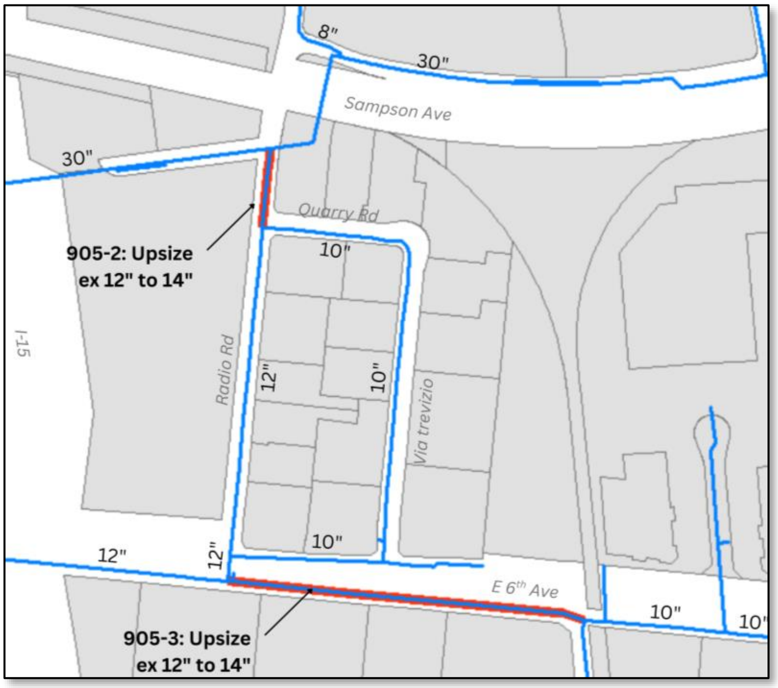
- **Project 905-1:** Project 905-1 is identified as the existing 12-inch main in Smith Avenue and 10th Street between Border Avenue and the 24-inch transmission main connection to the east. This segment exhibits velocities higher than the 5 fps criteria and is a low-priority project.

Figure 7.1 – Project 905-1



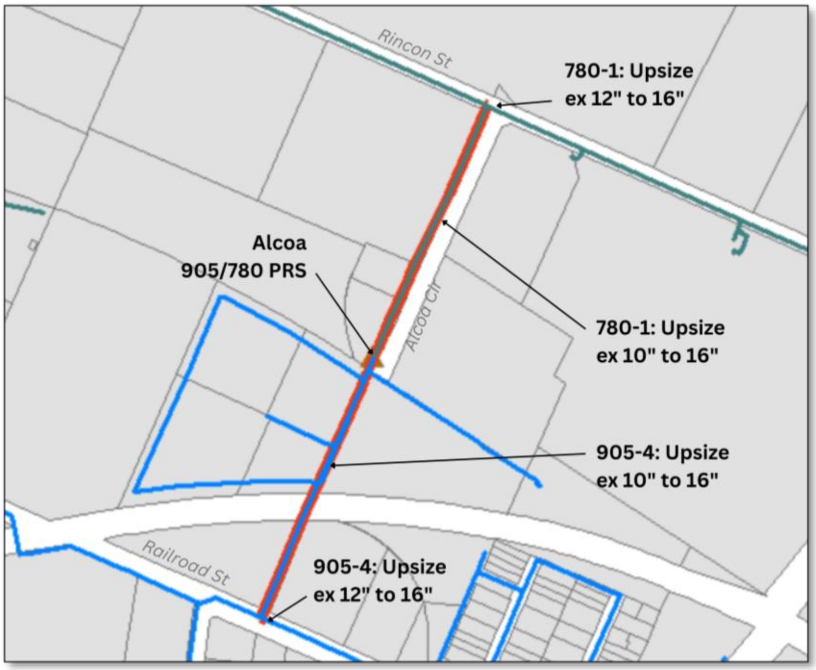
- **Projects 905-2 and 905-3:** Project 905-2 is identified as the existing 12-inch main in Radio Road north of Quarry Road. This segment exhibits velocities slightly higher than the 5 fps criteria during peak hour demands ultimately and is as a low-priority project. Similarly, the segment of 12-inch main E 6th Ave (905-3) between Radio Road and Compton Avenue is also slightly higher than 5 fps and is a low-priority project.

Figure 7.2 – Projects 905-2 and 905-3



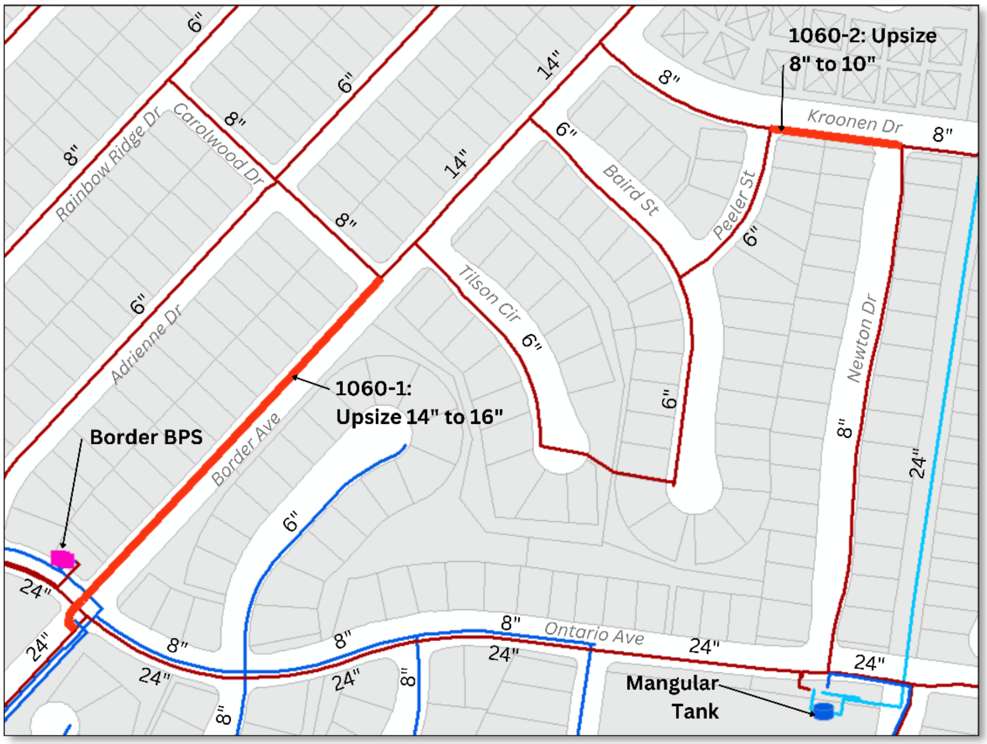
- **Projects 905-4 and 780-1:** Project 905-4 is identified as the existing 10-inch and 12-inch mains in Railroad Street and Alcoa Circle up to the Alcoa PRS. Project 780-1 includes the existing 10-inch and 12-inch mains from the Alcoa PRS north to Rincon Street. These segments exhibit velocities higher than the 5 fps criteria during peak hour demands ultimately but also exceed the 12 fps MDD plus fire flow velocity criteria. These projects are currently identified as low priority as service to the lower zone could be fed through combination of other PRS facilities until such time that these pipelines could be improved.

Figure 7.3 – Projects 905-4 and 708-1



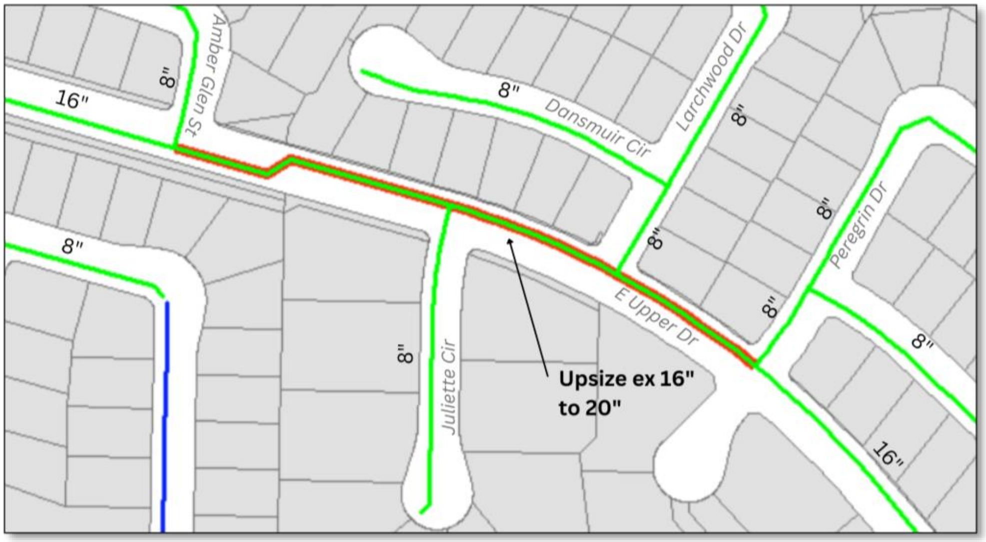
- **Projects 1060-1 and 1060-2:** Project 1060-1 was identified in Section 6 as an existing system deficiency. The 14-inch main in Border Avenue between Ontario Avenue and Carolwood Drive exhibits velocities slightly higher than the 5 fps criteria, making it a low-priority project. Ultimate demand conditions also indicate that a section of piping (1060-2) in Kroonen Drive between Newton Drive and Peeler Street is also marginally over 5 fps and is also a low-priority project.

Figure 7.4 – Projects 1060-1 and 1060-2



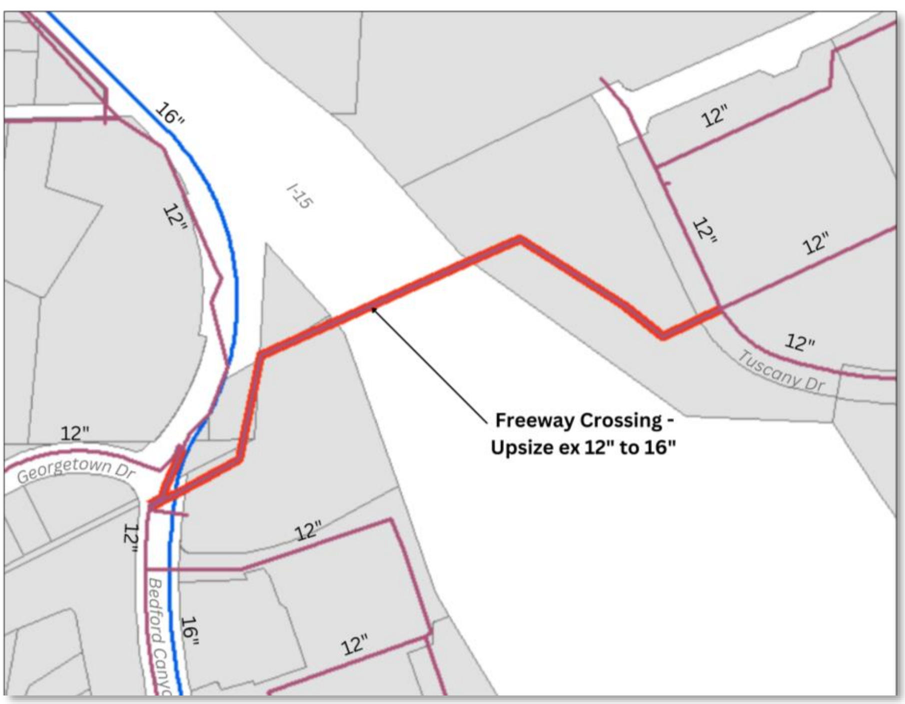
- **Project 1380-1:** This is medium priority project located in Upper Drive from Amber Glen Dr to Peregrin Dr. Ultimate velocities in this main are 6.8 fps under ultimate-demand, which exceeds the 5 fps criteria.

Figure 7.5 – Project 1380-1



- **Project 1220-1:** This is a low priority project due to the freeway-crossing aspect, located between Bedford Canyon Road and Tuscany Drive. Velocities in the existing 12-inch segment under the freeway are approximately 8.6 fps under ultimate demands, which exceeds the 5 fps criteria.

Figure 7.6 – Project 1220-1



7.4. Summary of Future (Buildout) Hydraulic Deficiencies

Due to the highly gridded, looped, and efficient potable water system, only eight (8) projects were identified as hydraulically deficient for the future system at buildout (2040).

For the majority of projects identified in **Section 7**, the velocity under peak hour demands is marginally above the 5 fps threshold as shown below in **Table 7.5**. A low priority was placed on these projects. If the City moves forward with these projects, the projects should coincide with street paving activities, where possible.

Table 7.5 – Future System Hydraulically Deficient Pipes (Buildout Conditions: 2040)

Zone	Project No.	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Deficiency	Priority	Pavement Rehab Zone	Comments
905	905-1	(12") 16"	Smith Ave between Sherman Ave and Border Ave connection to existing 24" main	622	Velocity > 5 fps *(Ultimate 5.5 - 6.9 fps)*	Future System	Low	5	Transmission main, marginally above criteria at ultimate buildout
	905-2	(12") 14"	Radio Rd south of Quarry St	233	Velocity > 5 fps *(Ultimate 5.1 fps)*	Future System	Low	7	Transmission main, marginally above criteria at ultimate buildout
	905-3	(12") 14"	6th Ave between Radio Rd and Compton Ave	1,052	Velocity > 5 fps *(Ultimate 6.1 fps)*	Future System	Low	7	Transmission main, marginally above criteria at ultimate buildout
	905-4	(12") 16"	Small segment in Railroad St east of Alcoa Cir	21	Velocity > 5 fps *(Ultimate 5.8 fps)*	Future System	Low	4	Small reduced diameter section of pipe
					Fire Velocity > 12 fps	Existing System			
		(10") 16"	Alcoa Cir north of Railroad up to Alcoa PRS	1,025	Velocity > 5 fps *(Ultimate 12.0 fps)*	Future System	Low		Major feed to Alcoa PRS, but flow could be offset by other stations to limit velocity.
					Fire Velocity > 12 fps	Existing System			
(Sub zone) 780	780-1	(10") 16"	Alcoa Cir north of PRS to Rincon St	1,094	Velocity > 5 fps *(Ultimate 12.0 fps)*	Future System	Low	4	Major feed from Alcoa PRS, but flow could be offset by other stations to limit velocity.
		(10") 12"	Segment in Rincon St west of Alcoa Cir	14	Velocity > 5 fps *(Ultimate 6.9 fps)*	Future System	Low		Small reduced diameter section of pipe
1060	1060-2	(8") 10"	Kroonen Dr between Newton Ln and Peeler St	380	Velocity > 5 fps *(Ultimate 5.3 fps)*	Future System	Low	5	Distribution main, marginally above criteria at ultimate buildout
1220	1220-1	(12") 16"	I-15 crossing between Bedford Canyon Road and Tuscany St	1,644	Velocity > 5 fps *(Ultimate 6.1 - 8.6 fps)*	Future System	Low	10	This is a major freeway crossing
1380	1380-1	(16") 20"	Upper Dr from Orange Crest St to Peregrin Dr	938	Velocity > 5 fps *(Ultimate 6.8 fps)*	Future System	Med	6	Transmission main, marginally above criteria at ultimate buildout

SECTION 8 - WATER QUALITY

8.1. Methodology

The City of Corona Utilities Department is committed to providing safe, reliable drinking water by maintaining compliance with all applicable water quality standards established by the U.S. Environmental Protection Agency (EPA) and the California State Water Resources Control Board (SWRCB). Routine water quality monitoring and assessments are conducted to evaluate clarity, organic and inorganic constituents, and other regulated parameters. The results of these assessments are summarized annually in the City's Consumer Confidence Report (CCR), which provides transparency and ensures ongoing compliance with state and federal drinking water regulations.

8.2. Regulatory Requirements

The U.S. EPA and the State of California have established enforceable standards for a wide range of drinking water contaminants. These standards are published under primary and secondary drinking water regulations and codified within the California Code of Regulations. In addition, the City participates in the Unregulated Contaminant Monitoring Rule (UCMR) program administered by the EPA, which identifies and tracks emerging contaminants that do not yet have health-based regulatory limits under the Safe Drinking Water Act (SDWA). This proactive monitoring supports early detection and data collection for potential future regulation of emerging contaminants.

8.2.1. Primary Drinking Water Standards

Primary drinking water standards are legally enforceable limits designed to protect public health. The EPA and SWRCB have determined that the consumption of water with contaminates exceeding these standards may result in adverse health effects. Specific contaminants of concern to the City of Corona are located within the Temescal and Bedford–Coldwater subbasins and are monitored in accordance with these standards.

Table 8.1 lists the primary contaminants of concern and compares the Maximum Contaminant Levels (MCLs) established by the U.S. EPA and the State of California. These values are also reported annually in the City's CCR.

Table 8.1 – Primary Drinking Water Contaminants of Concern

Contaminant	U.S. EPA	California
	MCL	MCL
Clarity		
Turbidity (Unfiltered)	TT	5
Microbiological Contaminant		
Total Coliform Bacteria	5%	5%
Fecal Coliform and E. Coli [1]	0	0
Heterotrophic Plate Count (HPC)	TT	TT
Radioactive Contaminant		
Gross Alpha Particle Activity	15 pCi/L	15 pCi/L
Uranium	30 µg/l	20 pCi/L
Inorganic Contaminant		
Arsenic	0.010 mg/L	0.010 mg/L
Barium	2 mg/L	1 mg/L
Fluoride	4 mg/L	2 mg/L
Chromium (hexavalent)	N/A	10 µg/L
Nitrate (as Nitrogen)	10 mg/L (as N)	45 mg/L (as NO3)
Perchlorate	N/A	6 µg/L
Synthetic Organic Contaminants		
123-TCP – 123-Trichloropropane	N/A	5 ppt
Volatile Organic Contaminants		
PCE – Tetrachloroethylene	5 µg/L	5 µg/L
TCE – Trichloroethylene	5 µg/L	5 µg/L

[1] U.S. EPA and California drinking water regulations regulate E.Coli. Fecal coliform has no MCL and appears in the contaminant name for consistency with the Consumer Confidence Report terminology.

Note: Abbreviations used in this table are defined in the list of abbreviations at the end of Section 8.

Tables 8.2 through **8.8** summarize the primary water quality contaminants detected within the City's potable water system. The data are based on results reported in the City of Corona's 2025 Consumer Confidence Report for Calendar Year 2024.

These tables categorize the monitored constituents into six key groups: clarity, microbiological contaminants, radioactive contaminants, inorganic contaminants, synthetic organic contaminants, and volatile organic contaminants. Together, they provide a comprehensive overview of water quality parameters used to evaluate compliance with state and federal drinking water standards.

Table 8.2 presents the turbidity levels measured within the City's treated water supply. Turbidity is an indicator of water clarity and treatment effectiveness, reflecting the concentration of suspended particles that can interfere with disinfection and aesthetic quality. For combined filter effluent water, turbidity must remain at or below 0.3 NTU in at least 95 percent of all monthly measurements. This performance criterion serves as an indicator that the treatment processes are operating correctly, and consistently produce clear, particle-free water.

Table 8.2 – Primary Standards: Clarity

Parameter	Units	State MCL	PHG	State DLR	Range Average		Water Source
Combined Filter Effluent Turbidity	%	95 [1]	NA	-	% < 0.3	100%	Metropolitan Water District Henry J. Mills Water Treatment Plant
	NTU	TT 0.3			Highest	0.08	
Combined Filter Effluent Turbidity	%	95 [1]	NA	-	% < 0.3	100%	City of Corona, Lester & Sierra Del Oro Water Treatment Facilities
	NTU	TT 0.3			Highest	0.05	

[1] The turbidity level of the filtered water shall be less than or equal to 0.3 NTU in 95% of the measurements taken each month and shall not exceed 1 NTU at any time.

Table 8.3 presents the primary microbiological contaminants detected in the City's water system. These contaminants are typically microorganisms that occur naturally in the environment or originate from human and animal fecal sources. Their presence serves as an indicator of potential contamination and the effectiveness of the treatment and disinfection processes.

Routine monitoring is conducted throughout the distribution system to verify the absence of total coliform bacteria, E. coli, and other microbiological indicators. Treatment and disinfection processes are designed to remove or inactivate these organisms from the water supply.

Table 8.3 – Primary Standards: Microbiological Contaminants

Parameter	Units	State MCL	PHG	State DLR	Range Average	Regulated in Distribution System
Total Coliform Bacteria [1]	%	5.0 [3]	(0)	-	-	Highest % of positive samples collected in any one month = 0%
Fecal Coliform and E. Coli [1]	[4]	[4]	(0)	-	-	Total number of positive samples collected in 2024 = 0
Total Coliform Bacteria [2]	%	TT [5]	-	-	-	Highest % of positive samples collected in any one month = 0%
Fecal Coliform and E. Coli [2]	[6]	[6]	(0)	-	-	Total number of positive samples collected in 2024 = 0
Heterotrophic Plate Count (HPC)	CFU/mL	TT	NA	NA	Range	Distribution System Wide: ND-969
					Average	Distribution System Wide: 25

[1] State Total Coliform Rule
[2] Federal Total Coliform Rule
[3] Total coliform MCLs: No more than 5.0% of the monthly samples may be total coliform positive.
[4] *E. coli* MCL: The occurrence of two consecutive total coliform-positive samples, one of which contains E. coli, constitutes an acute MCL violation.
[5] Total coliform TT trigger, Level 1 assessments, and total coliform TT violations: More than 5.0% of total coliform-positive samples in a month trigger Level 1 assessment. Failure to conduct assessments and correct findings within 30 days is a total coliform violation. No triggers, Level 1 assessments, or violations occurred.
[6] E. coli MCL and Level 2 TT triggers for assessments: Routine and repeat samples are total coliform-positive, and either sample is E. coli-positive, or the system fails to collect all repeat samples following an E. coli-positive sample or fails to test for E. coli when the repeat sample is total coliform-positive.

Table 8.4 summarizes the radioactive contaminants monitored within the City's water sources. These constituents generally occur due to the natural erosion of mineral deposits; however, localized mining activities in surrounding areas may also contribute to elevated concentrations. Parameters such as Gross Alpha Particle Activity and Uranium are tracked to confirm compliance with state and federal standards and to safeguard long-term public health.

Table 8.4 – Primary Standards: Radioactive Contaminants

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater
Gross Alpha Particle Activity	pCi/L	15	(0)	3	Range	ND	ND – 3.2	ND – 7.5
					Average		ND	3.84
Uranium	pCi/L	20	0.43	1	Range	ND	2.8 – 3.1	ND – 16.8
					Average		2.9	4.71

Table 8.5 summarizes the inorganic contaminants detected within the City's water supply. These constituents may originate from natural geological sources; however, in most cases, elevated concentrations result from surface runoff or discharges associated with industrial and agricultural activities. Groundwater in select areas of the City has exhibited elevated levels of nitrate and perchlorate. Ongoing monitoring, treatment and blending ensures that these parameters are within the Maximum Contaminant Levels established by state and federal regulations in the treated water system.

Table 8.5 – Primary Standards: Inorganic Contaminants

	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
Arsenic	ug/L	10	0.004	2	Range	ND	2	ND – 6.5	ND - 2
					Average			ND	ND
Barium	mg/L	1	2	0.1	Range	ND	0.13	ND – 0.13	ND – 0.13
					Average			ND	ND
Chromium (hexavalent)	ug/L	10	0.02	0.1	Range	ND	ND	ND-8.2	ND
					Average			ND	
Fluoride	mg/L	2.0	1	0.1	Range	0.6-0.9	0.3-0.4	0.26-2.0	ND - 0.78
					Average	0.7	0.3	0.4	0.22
Nitrate (as Nitrogen)	mg/L	10 (as N)	10 (as N)	0.4	Range	0.6	ND	ND - 20	ND – 5.9
					Average			9.5	2.3
Perchlorate	ug/L	6	1	1	Range	ND	ND	ND – 9.4	ND – 2.9
					Average			3.3	ND

Table 8.6 presents the synthetic organic contaminants, which include manmade compounds used in agricultural and industrial applications. These substances often originate from pesticides and solvents, and migrate into groundwater through runoff, infiltration, or improper disposal. The City conducts routine sampling, treatment, blending and analysis to ensure that synthetic organic contaminants remain below regulatory thresholds, maintaining compliance with applicable drinking water standards.

Table 8.6 – Primary Standards: Synthetic Organic Contaminants & Pesticides/PCBs

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
123-TCP [1]	ug/L	0.005	0.0007	0.005	Range	ND	ND	ND – 0.02	ND
					Average			ND	

[1] 123-TCP – 1,2,3-Trichloropropane

Table 8.7 summarizes the volatile organic contaminants (VOCs) detected within the City's water system. These compounds are typically associated with household, commercial, and industrial discharges and can enter groundwater through spills, improper disposal, or infiltration from contaminated soils. Routine sampling ensures VOC levels remain below state and federal Maximum Contaminant Levels, confirming that the City's treated water continues to meet regulatory requirements for safe consumption.

Table 8.7 – Primary Standards: Volatile Organic Contaminants

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
PCE [1]	ug/L	5	0.06	0.5	Range	ND	ND	ND - 1	ND
					Average			ND	
TCE [2]	ug/L	5	1.7	0.5	Range	ND	ND	ND – 1.1	ND
					Average			ND	

[1] PCE – Tetrachloroethylene
[2] TCE – Trichloroethylene

Table 8.8 presents the results of the Lead and Copper Rule (LCR) monitoring program, based on samples collected from 53 residential taps within the City's distribution system. The LCR establishes Action Levels (ALs) to minimize the presence of lead and copper leached from household plumbing materials. Action levels are set at 15 parts per billion (ppb) for lead and 1.3 parts per million (ppm) for copper, evaluated using the 90th percentile of collected samples. The City conducts this testing on a three-year cycle, in accordance with regulatory requirements, to verify compliance and protection of public health.

Table 8.8 – Lead and Copper Rule Monitoring

Parameter	Units	State MCL	PHG	State DLR	Date Sampled	90th Percentile	No. Sites Sampled	No. Sites Exceeding AL
Lead	ppb	AL=15	0.2	5	2023	5	53	3
Copper	ppm	AL=1.3	0.3	0.05	2023	0.17	53	0

Table 8.9 identifies the primary standards parameters and their corresponding sources of occurrence within the environment. The table outlines the principal origins of each contaminant detected or monitored in the City's water supply, as reported in the CCR. These sources include both natural processes, such as erosion of mineral deposits, and anthropogenic activities, including industrial discharges, agricultural runoff, and plumbing system corrosion. Understanding these sources helps guide the City's water quality management strategies and supports continued protection of public health and regulatory compliance.

Table 8.9 – Primary Standards: Major Sources in Drinking Water

Parameter	Major Sources in Drinking Water
Microbiological Contaminants	
Total Coliform Bacteria	Naturally present in the environment
Fecal Coliform and E. Coli	Human and animal fecal waste
Heterotrophic Plate Count (HPC)	Naturally present in the environment.
Radioactive Contaminants	
Gross Alpha Particle Activity	Erosion of natural deposits
Uranium	Erosion of natural deposits
Inorganic Contaminants	
Arsenic	Erosion of natural deposits; runoff from orchards; glass and electronics production wastes
Barium	Discharges of oil drilling wastes and from metal refineries; erosion of natural deposits
Chromium (hexavalent)	Erosion of natural deposits; transformation of naturally occurring trivalent chromium to hexavalent chromium by natural processes and human activities such as discharges from electroplating factories, leather tanneries, wood preservation, chemical synthesis, refractory production, and textile manufacturing facilities.
Fluoride	Erosion of natural deposits; water additive that promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate (as Nitrogen)	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Perchlorate	Perchlorate is an inorganic chemical used in solid rocket propellant, fireworks, explosives, flares, matches, and a variety of industries. It usually gets into drinking water as a result of environmental contamination from historic aerospace or other industrial operations that used or use, store, or dispose of perchlorate and its salts.
Synthetic Organic Contaminants & Pesticides/ PCBs	
1,2,3-Trichloropropane (1,2,3-TCP)	Discharge from industrial and agricultural chemical factories; leaching from hazardous waste sites; used as cleaning and maintenance solvent, paint and varnish remover, and cleaning and degreasing agent; byproduct during the production of other compounds and pesticides.
Volatile Organic Contaminants	
Tetrachloroethylene (PCE)	Discharge from factories, dry cleaners, and auto shops (metal degreaser)
Trichloroethylene (TCE)	Discharge from metal degreasing sites and other factories
Other Contaminants	
Lead	Primarily from materials and components associated with service lines and home plumbing
Copper	Primarily from materials and components associated with service lines and home plumbing

8.2.2. Secondary Drinking Water Standards

Secondary drinking water standards are non-enforceable guidelines established to address the aesthetic qualities of drinking water. Specifically, this includes taste, color, and odor. These parameters do not pose direct health risks but are important for maintaining customer confidence in the quality and safety of the water supply. Exceeding a secondary standard may cause water to appear cloudy or discolored, or to develop an unpleasant taste or odor, even though it remains safe for consumption. Adhering to these standards ensures that the City continues to provide water that meets both regulatory expectations and community satisfaction.

The contaminants regulated under secondary standards, along with their respective Maximum Contaminant Levels established by the U.S. EPA and the State of California, are listed in **Table 8.10**. Reported concentrations are based on the City's 2025 CCR.

During the 2024 monitoring period, aluminum exceeded the individual secondary MCL but remained within compliance when evaluated under the maximum running annual average (Max RAA). All other constituents were measured below their respective secondary standard limits.

Table 8.11 summarizes the likely sources of contamination for each secondary drinking water standard as reported in the City's CCR.

Table 8.10 – Secondary Drinking Water Standards

Parameter	Unit	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
Aluminum	ug/L	200	600	50	Range	ND - 110	ND	ND	ND - 230
					Max RAA [1]	ND			120
Chloride	mg/L	500	NA	NA	Range	41-67	108	110-210	16-120
					Average	54	-	162	71
Color	units	15	NA	(1)	Range	1-2	3	ND-3	-
					Average	2		ND	
Corrosivity	AI	NA	NA	NA	Range	12.2-12.3	-	12-13	10-12
					Average	12.2		13	12
Foaming Agents – MBAS [2]	ug/L	500	NA	(50)	Range	ND	ND	ND - 120	ND
					Average			36	
Manganese	ug/L	50	NL= 500	(5)	Range	ND	ND	ND - 580	ND
					Average			49	
Odor Threshold	Units	3	NA	1	Range	1	5	ND - 2	ND - 1
					Average			ND	ND
Specific Conductance	uS/cm	1,600	NA	NA	Range	317-466	1,040-1,050	1,011-1,180	115-3,037
					Average	392	1,050	1,374	655
Sulfate	mg/L	500	NA	0.5	Range	21-47	231-240	140-260	3.0-240
					Average	34	236	197	127
Total Dissolved Solids	mg/L	1,000	NA	NA	Range	178-263	663-696	610-1,200	64-700
					Average	220	680	872	408
Turbidity	NTU	5	NA	0.1	Range	ND	0.6-1.3	0.1-0.55	0.15-0.2
					Average		0.9	0.18	0.17

[1] RAA – Running annual average
[2] MBAS – Methylene Blue Active Substances
Note: Abbreviations used in this table are defined in the list of abbreviations at the end of Section 8.

Table 8.11 – Secondary Standards: Major Sources in Drinking Water

Parameter	Major Sources in Drinking Water
Aluminum	Erosion of natural deposits; residual from some surface water treatment processes
Chloride	Runoff/leaching from natural deposits; seawater influence
Color	Naturally-occurring organic materials
Corrosivity	Elemental balance in water; is affected by temperature and other factors
Foaming Agents - MBAS	Municipal and industrial waste discharges
Manganese	Leaching from natural deposits
Odor Threshold	Naturally occurring organic materials
Specific Conductance	Substances that form ions when in water; seawater influence
Sulfate	Runoff/leaching from natural deposits; industrial wastes
Total Dissolved Solids	Runoff/leaching from natural deposits
Turbidity	Soil Runoff

8.2.3. Unregulated Contaminants

Unregulated contaminants are substances that currently lack established Maximum Contaminant Levels under federal or state drinking water regulations. Although these constituents are not subject to mandatory treatment requirements, their presence in drinking water is monitored to support the U.S. Environmental Protection Agency (EPA) and the State of California in assessing potential risks and determining whether regulatory standards may be warranted in the future.

Monitoring and reporting of unregulated contaminants enhance the understanding of emerging water quality issues and help protect public health by providing early data on substances that could become regulated.

Table 8.12 lists the unregulated contaminants detected in the City's water supply that are routinely monitored and reported through the City's sampling program.

Table 8.13 summarizes the potential health implications and other relevant information associated with these constituents.

Table 8.12 – Unregulated Contaminants with no MCLs

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
Boron	mg/L	NL=1	NA	0.1	Range	0.13	0.15	0.29-3.4	0.11-0.41
					Average			1.33	0.24
Vanadium	ug/L	NL=50	NA	3	Range	ND	ND	ND-19	ND-3.9
					Average			6.39	ND

Table 8.13 – Unregulated Contaminants with no MCL: Health Effects

Parameter	Health Effects
Boron	Boron exposures resulted in decreased fetal weight (developmental effects) in newborn rats.
Vanadium	Vanadium exposures resulted in developmental and reproductive effects in rats.

Table 8.14 summarizes the unregulated contaminants that the City has monitored and reported in compliance with the Unregulated Contaminant Monitoring Rule (UCMR), administered by the U.S. Environmental Protection Agency (EPA).

The UCMR program requires public water systems to sample for a defined list of emerging contaminants that do not yet have established regulatory limits. The purpose of this program is to collect nationwide occurrence data that can inform the EPA's evaluation of potential health impacts and guide decisions on whether future regulatory standards should be adopted.

By participating in the UCMR program, the City contributes to a broader national effort to improve understanding of unregulated contaminants and to ensure that future drinking water standards are supported by reliable, science-based data.

Table 8.14 – Federal Unregulated Contaminants Monitoring Rule

Parameter	Units	State MCL	PHG	State DLR	Range Average	Distribution System
Haloactic Acid (HAA) Group						
HAA5	ug/L	NA	NA	NA	Range	ND-15.8
					Average	5.9
HAA6Br	ug/L	NA	NA	NA	Range	ND-17.3
					Average	6.1
HAA9	ug/L	NA	NA	NA	Range	ND-28
					Average	10.2
Total Organic Carbon	ug/L	NA	NA	NA	Range	ND-2,600
					Average	1,925
Bromide	ug/L	NA	NA	NA	Range	ND-32
					Average	15.3
Metals and Metalloids Group						
Manganese	ug/L	NA	NA	NA	Range	ND-62
					Average	2
Lithium by ICP						
Lithium	ug/L	NA	NA	9	Range	ND-55.1
					Average	16
EPA 533						
PFBA	ug/L	NA	NA	0.005	Range	ND-0.0076
					Average	ND
PFHxA	ug/L	NA	NA	0.003	Range	ND-0.0038
					Average	ND
PFHxS	ug/L	NA	NA	0.003	Range	ND-0.0033
					Average	ND
PFPeA	ug/L	NA	NA	0.003	Range	ND-0.0061
					Average	ND

Table 8.15 summarizes additional water quality parameters that are routinely monitored and reported by the City. While these constituents are not regulated by enforceable drinking water standards, they are important indicators of overall water chemistry and usability.

Parameters such as alkalinity, hardness, pH, and mineral content influence both aesthetic quality and operational considerations, including corrosion control, scaling potential, and treatment optimization. Regular monitoring of these parameters allows the City to maintain balanced water chemistry throughout the distribution system and to ensure compatibility between imported, treated, and groundwater supplies.

Table 8.15 – Other Parameters

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Ground water	Treated Average System Water
Alkalinity	mg/L	NA	NA	(1)	Range	68-71	123-128	120-390	16-130
					Average	70	126	230	79
Bicarbonate	mg/L	NA	NA	NA	Range	-	-	120-390	14-130
					Average			230	78
Calcium	mg/L	NA	NA	(0.1)	Range	15-22	72-75	55-170	1.6-83
					Average	18	74	118	43
Hardness	mg/L	NA	NA	(1)	Range	68-99	291-296	200-590	5.5-320
					Average	84	294	419	171
Magnesium	mg/L	NA	NA	(0.01)	Range	8.4-11	28-29	15-45	0.37-30
					Average	9.7	28	30	15
pH	pH units	NA	NA	NA	Range	8.7-8.8	8.1-8.2	7.7-8.0	7.4-10.2
					Average	8.7	8.1	7.9	7.5
Potassium	mg/L	NA	NA	(0.2)	Range	1.9-3.1	5.4	1.9-14	ND-6
					Average	2.5		5.4	3.3
Sodium	mg/L	NA	NA	(1)	Range	35-54	104-108	54-180	21-110
					Average	44	106	118	67

Table 8.16 summarizes the Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) monitored and reported by the City. PFAS are a class of synthetic organic compounds widely used in industrial and consumer products for their resistance to heat, water, and oil. Although these substances are not currently regulated under federal or state drinking water standards, they are monitored under precautionary Notification Levels (NLs) established by the State of California.

Notification Levels represent concentration thresholds for unregulated contaminants that do not pose an immediate health risk but warrant communication to governing agencies and the public when detected. Monitoring PFAS supports ongoing statewide and national efforts to evaluate potential health impacts and to assess whether formal Maximum Contaminant Levels should be developed in the future.

Table 8.17 summarizes the potential health effects associated with these PFAS compounds and provides context for their environmental occurrence and monitoring significance.

Table 8.16 – Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) with Notification Levels, Analyzed by EPA Methods 533 and 537.1

Parameter	Units	State MCL	PHG	State DLR	Range Average	State Project Water	Colorado River Water	Groundwater	Treated Average System Water
Perfluorobutane Sulfonic (PFBS)	ng/L	NL=500	NA	NA	Range	ND	ND	ND-52	ND-2.2
					Average			20	ND
Perfluorohexane Sulfonic Acid (PFHxS)	ng/L	NL=3	NA	NA	Range	ND	ND	ND-68	ND
					Average			22	
Perfluorooctanoic Acid (PFOA)	ng/L	NL=5.1	0.007	4	Range	ND	ND	ND-300	ND-4.3
					Average			80	ND
Perfluorooctanesulfonate (PFOS)	ng/L	NL=6.5	1	4	Range	ND	ND	ND-330	ND-4.2
					Average			93	ND

Table 8.17 – Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS): Health Effects

Parameter	Health Effects
Perfluorobutane Sulfonic (PFBS)	Perfluorobutane sulfonic acid exposures resulted in decreased thyroid hormone in pregnant female mice.
Perfluorohexane Sulfonic Acid (PFHxS)	Perfluorohexane sulfonic acid exposures resulted in decreased total thyroid hormone in male rats.
Perfluorooctanoic Acid (PFOA)	Perfluorooctanoic acid exposures resulted in increased liver weight in laboratory animals.
Perfluorooctanesulfonate Acid (PFOS)	Perfluorooctanesulfonic acid exposures resulted in immune suppression, specifically, a decrease in antibody response to an exogenous antigen challenge.

8.2.4. Disinfectants and Disinfection Byproducts Rule

The Disinfectants and Disinfection Byproducts Rule (DBPR), established by the U.S. Environmental Protection Agency (EPA), regulates the allowable levels of byproducts formed during the drinking water disinfection process. When disinfectants, such as chlorine, react with naturally occurring organic matter in source water, they can form chemical byproducts that may pose potential health risks with long-term exposure. The EPA developed the DBPR to balance effective microbial disinfection with the minimization of disinfection byproducts (DBPs), thereby reducing public health risks while maintaining microbial safety.

Table 8.18 lists the primary disinfectants and disinfection byproducts of concern, including their corresponding Maximum Contaminant Levels established by both the U.S. EPA and the State of California. These constituents are also reported annually in the City's CCR to ensure transparency and continued compliance with federal and state drinking water standards.

Table 8.18 – Disinfection Byproducts of Concern

Contaminant	U.S. EPA	California
	MCL	MCL
Disinfection Byproducts		
TTHMs – Total Trihalomethanes	0.080 mg/L	0.080 mg/L
HAA5 – Halo acetic acids	0.060 mg/L	0.060 mg/L
Bromate	0.010 mg/L	0.010 mg/L
Disinfectants		
Chloramines (as Cl_2)	MRDL=4.0	4.0 (as Cl_2)
TOC – Control of DBP precursors	TT	TT

Table 8.19 summarizes the disinfection byproducts, disinfectant residuals, and precursor parameters that are routinely monitored by the City in accordance with the Disinfectants and Disinfection Byproducts Rule. The data are evaluated using Locational Running Annual Averages (LRAAs) to ensure compliance with established Maximum Contaminant Levels and Maximum Residual Disinfectant Levels (MRDLs).

Table 8.19 – Disinfection Byproducts, Disinfectant Residuals, and Disinfection Byproduct Precursors Federal Rule

Parameter	Units	State MCL	PHG	State DLR	Range Average/LRAA/RAA [1][2]	Distribution System Wide
Total Trihalomethanes (TTHMs)	ug/L	80	NA	1	Range	ND-34
					LRAA	29.3
Halo acetic Acids (HAA5)	ug/L	60	NA	1	Range	ND-11
					LRAA	9.7
Bromate (Mills - WR-24 Conn.)	ug/L	10	0.1	1	Range	ND-19
					Max RAA	7.9
Chloramines	mg/L	4 as Cl_2	4 as Cl_2	NA	Range	1.21-2.8
					Max RAA	2.0
Control of DBP precursors (TOC)	mg/L	TT	NA	0.3	Range	2.2-2.7
					Average	2.4

[1] LRAA – Locational Running Annual Average
[2] RAA – Running Annual Average

Table 8.20 outlines the major sources and potential health effects of these byproducts. Long-term exposure to concentrations exceeding the MCLs may increase the risk of liver, kidney, or nervous-system effects, and in some cases, elevated cancer risk. Short-term overexposure to disinfectants such as chloramines may cause eye or respiratory irritation and stomach discomfort. The City's monitoring results show levels remain below regulatory limits, demonstrating continued compliance with both state and federal drinking-water standards.

Table 8.20 – Disinfection Byproducts: Sources and Health Effects

Parameter	Major Sources in Drinking Water	Health Effects
Total Trihalomethanes (TTHMs)	Byproduct of drinking water disinfection	Long-term consumption of water containing trihalomethanes in excess of the MCL may cause liver, kidney, or central nervous system problems, and may increase cancer risk.
Haloacetic Acids (HAA5)	Byproduct of drinking water disinfection	Long-term consumption of water containing haloacetic acids in excess of the MCL may increase cancer risk.
Bromate (Mills - WR-24 Conn.	Byproduct of drinking water disinfection	Long-term consumption of water containing bromate in excess of the MCL may increase cancer risk.
Chloramines	Drinking water disinfectant added for treatment	Some people who use water containing chloramines in excess of the MRDL could experience irritating effects to the eyes and nose. Some people who drink water containing chloramines in excess of the MRDL could experience stomach discomfort or anemia.
Control of DBP precursors (TOC)	Various natural and manmade sources	Total organic carbon (TOC) itself has no health effects. However, total organic carbon provides a medium for the formation of disinfection byproducts. These byproducts include trihalomethanes (THMs) and haloacetic acids (HAAs). Drinking water containing these byproducts in excess of the MCL may lead to adverse health effects, liver or kidney problems, or nervous system effects, and may lead to an increased risk of cancer.

8.3. Groundwater Quality

8.3.1. Nitrate

The State of California has established a Maximum Contaminant Level of 45 mg/L as nitrate, approximately equivalent to the U.S. EPA MCL of 10 mg/L as nitrogen. To maintain a safety margin below the regulatory limit, the City of Corona has adopted an internal goal of not exceeding 38 mg/L as nitrate within the water distribution system.

According to the City's Water Operations Blending Program Technical Report/Operations Plan dated February 2020 (2020 Blending Report), nitrate concentrations in the City's groundwater sources range from 18 to 99 mg/L. Two wells, Wells 13 and 20, were inactive and four wells, Wells 3, 21, 26, and 29 were standby when the blending report was prepared and therefore have no associated nitrate data. Of the wells active when the blending report was prepared, six exhibited nitrate concentrations below the State MCL, including Wells 11A, 15, 17A, 27, 28, and 31. Among these wells, Wells 15, 28, and 31 also met the City's more stringent internal nitrate goal of 38 mg/L. The remaining wells, Wells 7A, 8A, 9A, 12A, 14, 19, 22, 25, and 33, exceeded the State MCL.

As of 2024, Wells 26 and 29 have been reactivated. Nitrate levels from Well 26 are below the State MCL, while Well 29 remains below the 45 mg/L limit but above the City's target concentration of 38 mg/L.

Groundwater pumped from the Temescal Subbasin is treated at the Temescal Desalter and/or blended at the Garretson and Mangular Tanks with imported water from the Western Municipal Water District (WMWD), Temescal Desalter effluent, and Lester effluent. The blended product at the Garretson Tank has an average nitrate concentration of approximately 30 mg/L, which is below State MCL of 45 mg/L.

8.3.2. Turbidity

According to the City of Corona's 2025 CCR, turbidity levels in the City's raw groundwater range from 0.1 to 0.55 NTU. Turbidity, a measure of water clarity, reflects the presence of suspended particles and serves primarily as an indicator of treatment performance rather than a direct health concern. Regulatory requirements specify that the combined filter effluent turbidity must not exceed 0.3 NTU in at least 95 percent of monthly measurements, and must never exceed 1 NTU at any time. These criteria apply to the treatment process and are used to verify effective filtration. The averages and ranges of turbidity shown in **Table 8.10** correspond to treatment plant effluent data collected during the reporting period.

For water distributed to customers, the State of California secondary MCL for turbidity, which serves as an aesthetic standard rather than a health-based limit, is 5 NTU. The City's groundwater consistently remains well below this threshold, indicating effective treatment and stable water quality across the distribution system.

8.3.3. Perchlorate

Based on the City's 2020 Water Operations Blending Report, perchlorate was detected in 10 of the 21 active wells maintained by the City of Corona. Six of these wells, Wells 9A, 12A, 14, 19, 25, and 33, recorded concentrations above the State of California's MCL of 6 µg/L, with measured values ranging from 6.4 to 10 µg/L.

Water produced from Wells 9A, 19, and 25 is treated at the Temescal Desalter, while water from other affected wells is blended with lower-concentration sources to maintain perchlorate levels below 4 µg/L. Through this combined strategy of targeted treatment and blending, the City ensures that all groundwater supplied to the distribution system remains in full compliance with State regulatory limits for perchlorate.

8.3.4. Trichloro propane (1,2,3-TCP)

The State of California has established a MCL of 5 parts per trillion (ppt) for 1,2,3-Trichloropropane (TCP). To ensure a margin of safety, the City of Corona maintains an internal target of 3 ppt or less to provide the highest quality drinking water to all service areas.

According to the 2020 Water Operations Blending Report, four of the City's 21 wells, Wells 7A, 8A, 17A, and 25, have recorded concentrations above the State MCL, ranging from 5.37 ppt to 25.8 ppt. Additionally, recent data available for Well 33 from 2023 through 2025 show 1,2,3-TCP concentrations above the State MCL, ranging from 9 ppt to 20 ppt.

Wells 8A, 17A, and 33 receive treatment at the Granular Activated Carbon (GAC) Water Treatment Plant. Well 25 receives treatment at the Temescal Desalter, while Well 7A is either routed through the CW19 valve or blended at the Garretson Blend Station.

These combined treatment approaches and blending processes achieve finished water concentrations below 3 ppt, keeping the City's supply in compliance with State standards.

8.3.5. Total Dissolved Solids (TDS)

Based on the City's 2025 CCR, Total Dissolved Solids (TDS) concentrations in the City's groundwater supply range from 610 to 1,200 mg/L.

TDS affects the taste, odor, and aesthetic quality of drinking water. Elevated TDS may influence corrosion and scaling tendencies within the distribution system.

Although there is no primary health-based limit for TDS, there are secondary maximum contaminant level goals set by the EPA and the State of California that recommend maintaining concentrations below 500 mg/L is to preserve water quality and minimize aesthetic impacts. The City continues to monitor and manage blending operations to reduce TDS levels wherever feasible.

8.3.6. Manganese

Manganese is classified as a secondary drinking water standard by both the U.S. EPA and the State of California, with an MCL of 0.05 mg/L established primarily for aesthetic concerns such as discoloration and staining.

According to the 2020 Blending Report, Well 28 recorded a manganese level of 0.062 mg/L. Historically, Well 29 has shown manganese levels between 0.29 and 0.32 mg/L, but it was inactive during the most recent monitoring period presented in the report. When operational, groundwater from Wells 28 and 29 is treated at the Temescal Desalter, producing finished water with a maximum manganese level below 0.02 mg/L.

8.3.7. Perfluorooctane sulfonic Acid (PFOS) and Perfluorooctanoic Acid (PFOA)

In 2024, the U.S. Environmental Protection Agency (EPA) established Maximum Contaminant Levels for PFOS and PFOA at 4.0 parts per trillion (ppt) each. While these federal standards are now in effect, water systems are not required to achieve full compliance until 2031, allowing time for treatment system upgrades and operational planning.

The State of California has also set Notification Levels (NLs) of 6.5 ppt for PFOS and 5.1 ppt for PFOA, along with Response Levels (RLs) of 40 ppt for PFOS and 10 ppt for PFOA. Exceeding an RL requires utilities to take action, such as removing the source from service or providing treatment.

Based on the 2020 Blending Report, PFOS was detected in 11 of the City's wells, with 7 wells exceeding the response level of 40 ppt. Specifically, Wells 7A, 8A, 9A, 17A, 19, 22, and 25 recorded concentrations above the RL, ranging from 102 to 240 ppt. The remaining four wells measured PFOS concentrations between 50 and 80 ppt.

PFOA was detected in 12 wells, with 8 wells exceeding the RL of 10 ppt. These include Wells 7A, 8A, 9A, 11A, 17A, 19, 22, 25, and 31.

Groundwater from affected wells is treated at the Temescal Desalter. Following treatment and blending with Temescal Desalter, Lester, and Sierra Del Oro (SDO) effluents at the Mangular and Garretson Tank, the finished water consistently meets targets with PFOS and PFOA levels below 10 ppt. This blending strategy ensures all distributed water remains well below both State and federal regulatory thresholds.

8.4. Imported Water Quality

The City of Corona supplements its local groundwater supplies with both treated and untreated imported water purchased from the Western Municipal Water District (WMWD) to meet system demand. WMWD obtains this water from the Metropolitan Water District of Southern California (MWD), which sources its supply from the Colorado River and the State Water Project.

Approximately 91 percent of the City's imported water is untreated and delivered to the Lester and SDO water treatment plants. Raw water imported from the Colorado River typically exhibits elevated turbidity, total dissolved solids (TDS), metals, microbial constituents, and other impurities that require treatment prior to distribution. Following treatment, the finished effluent is blended with the City's treated and untreated groundwater to create a compliant blended supply that meets all State Water Resources Control Board (SWRCB) and U.S. EPA drinking water standards.

8.5. Blending

The City of Corona operates several treatment and blending facilities designed to optimize water quality and maintain nitrate, PFAS and 1,2,3 TCP concentrations below the Maximum Contaminant Level. Lower-concentration water is blended with higher-concentration groundwater sources to produce a consistent supply that meets all state and federal regulatory standards.

The City currently operates five (5) blending facilities, summarized below:

1. Lester Tank #1 – Blends water from the Garretson Tank with effluent from the Lester Treatment Plant and Mills Zone 3 (WR-24) water. The blended water is sent to Lester Tank #2.
2. Lester 1220 Pump Station – Blends Lester Tank #1 effluent with Mills 1220 Zone (WR-24) water.
3. Lester 1380 Pump Station – Blends Lester Tank #1 effluent with Mills 1380 Zone (WR-24) water.
4. Garretson Tank – Blends Temescal Desalter effluent with 1060 Zone water and potential groundwater contributions from Wells 7A, 13, 8A, 17A, 32, and 33.
5. Mangular Tank – Blends 1060 Zone water with potential groundwater contributions from Wells 11A, 12A, 14, 15, and 27.

A detailed description of each blending facility is provided in the City of Corona Utilities Department Water Operations Blending Program/Operational Plan (February 2020), included as Appendix A. Refer to **Figure 2.1** in this Master Plan for the Existing Water System Hydraulic Schematic showing blending interconnections and operational zones.

8.6. Water Age

Water age affects water quality within the distribution system. The City address these impacts through operational practices such as storage tank cycling, active mixing and routine system flushing.

8.6.1. Tank Turnover

The City monitors water storage tank cycling to ensure each zone is efficiently and effectively cycled. In addition, the City has installed mixers in each of its existing water storage tanks. The PAX Water Mixer from PAX Water Technologies is a powerful active mixing system that circulates the entire tank volume which eliminates thermal stratification, improves disinfectant residual levels, lowers disinfection byproducts and nitrifying bacteria, and protects the tank from corrosion. The mixer prevents stagnant water which reduces variability in water taste and odor and lowers surface water temperature to combat the potential of biofilm growth.

8.6.2. Flushing

Hydrant flushing is an essential maintenance practice that preserves water quality throughout the City's distribution network. Flushing removes stagnant water, accumulated sediments, and excess disinfectant byproducts from dead-end mains while restoring chlorine residuals.

The City conducts flushing programs on weekly, biweekly, monthly, quarterly, and annual schedules, based on water-quality monitoring results and operational priorities. Under routine conditions, one location is flushed twice each week, one location weekly, eighteen locations monthly, fourteen locations quarterly, and approximately 106 locations annually. These locations are distributed as follows:

- Pressure Zone 1: 4 locations
- Pressure Zone 2: 30 locations
- Pressure Zone 3: 12 locations
- Pressure Zone 4: 19 locations
- Pressure Zone 5: 10 locations
- Hydro-Zone: 6 locations
- Water Truck Zone: 12 locations

The biweekly and weekly flushing locations are shown in **Figure 8.1**, with biweekly and weekly flushing data summarized in **Table 8.21**. Monthly flushing data are summarized in **Table 8.22** and mapped in **Figure 8.2**. Quarterly flushing data are summarized in **Table 8.23** and illustrated in **Figure 8.3**. Annual flushing locations are provided in **Figure 8.4** and summarized in **Table 8.24**.

Figure 8.1 – Weekly Water Quality Flushing Locations

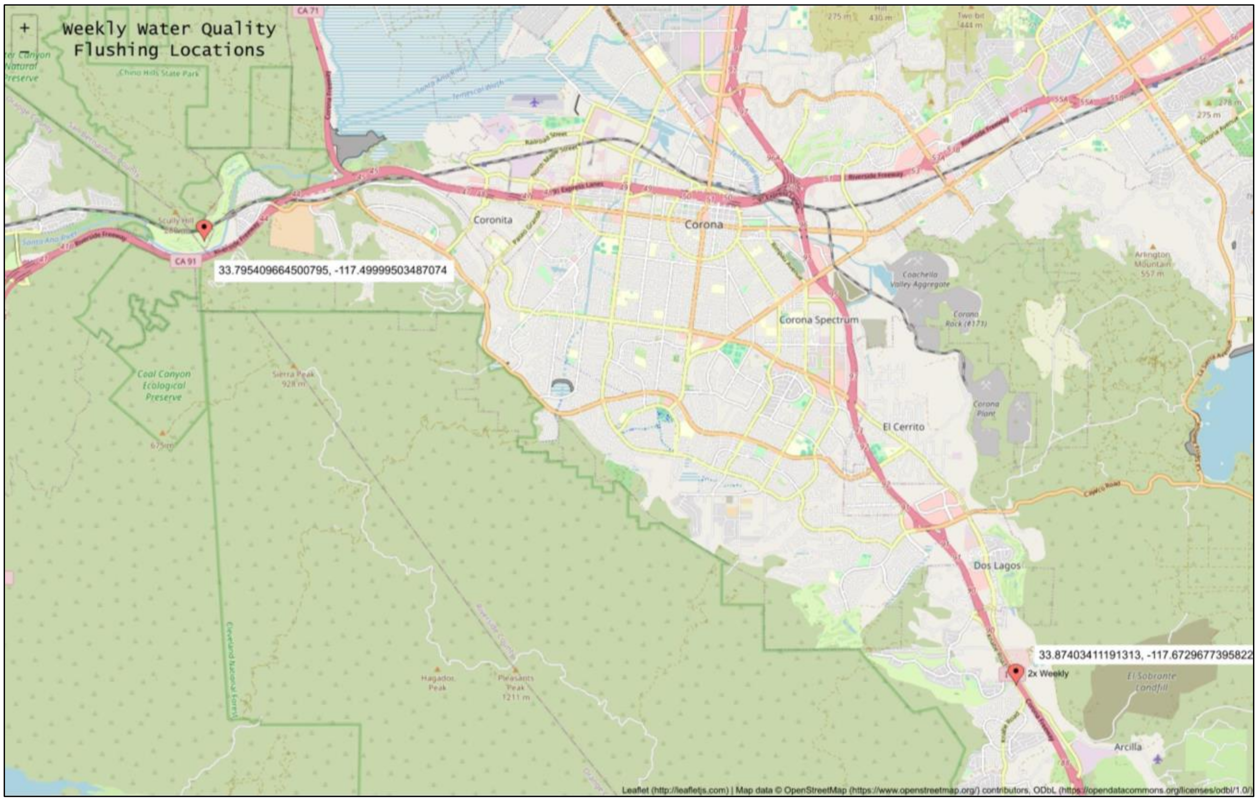


Table 8.21 – Weekly Low Chlorine

Location	Date	Time	Total Gallons	TIME (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
Temescal	1/1/2025	12:45	31,500	90	350	1.22	1.57	0.00	22%	0.04	Y
Temescal	1/3/2025	0:00	37,500	75	500	1.07	1.86	0.00	42%	0.07	Y
Green River	1/5/2025	4:30	40,000	80	500	0.75	1.63	0.00	54%	0.02	Y
Temescal	1/7/2025	13:00	12,250	35	350	1.56	1.64	0.00	5%	0.03	Y
Temescal	1/10/2025	3:30	34,000	68	500	1.32	1.96	0.00	33%	0.05	Y
Green River	1/13/2025	4:25	31,500	90	350	0.41	1.77	0.00	77%	0.03	Y
Temescal	1/17/2025	4:05	37,500	75	500	0.88	1.71	0.00	49%	0.04	Y
Temescal	1/21/2025	10:54	38,000	76	500	1.11	1.67	0.00	34%	0.02	Y
Green River	1/20/2025	4:20	45,000	90	500	0.17	1.87	0.00	91%	0.03	Y
Temescal	1/23/2025	10:05	35,000	70	500	1.05	1.67	0.00	37%	0.02	Y
Temescal	1/26/2025	14:10	40,000	80	500	1.18	1.45	0.00	19%	0.05	Y
Green River	1/27/2025	3:35	35,000	70	500	0.16	1.72	0.00	91%	0.02	Y
Temescal	1/31/2025	2:45	32,500	65	500	1.13	1.28	0.00	12%	0.05	Y
Temescal	2/4/2025	11:00	35,000	70	500	1.06	1.33	0.00	20%	0.01	Y
Green River	1/3/2025	3:50	45,000	90	500	0.56	1.55	0.00	64%	0.02	Y

Table 8.21 – Weekly Low Chlorine

Location	Date	Time	Total Gallons	TIME (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
Temescal	2/9/2025	0:00	40,000	80	500	1.08	1.52	0.00	29%	0.05	Y
Temescal	2/13/2025	12:00	36,500	73	500	1.22	1.35	0.00	10%	0.04	Y
Green River	1/10/2025	4:50	45,000	90	500	0.10	1.48	0.00	93%	0.04	Y
Temescal	2/15/2025	12:45	42,500	85	500	0.82	1.28	0.00	36%	0.06	Y
Temescal	2/16/2025	13:55	22,500	45	500	0.71	1.26	0.00	44%	0.04	Y
Green River	2/17/2025	3:50	45,000	90	500	0.56	1.42	0.00	61%	0.04	Y
Temescal	2/19/2025	13:20	32,500	65	500	0.86	1.17	0.00	26%	0.05	Y
Temescal	2/21/2025	9:25	22,500	45	500	1.25	1.25	0.00	0%	0.04	Y
Green River	2/23/2025	6:10	45,000	90	500	0.52	1.42	0.00	63%	0.01	Y
Temescal	2/25/2025	14:15	60,000	120	500	0.90	1.44	0.00	38%	0.05	Y
Temescal	2/26/2025	9:20	22,500	45	500	1.38	1.42	0.00	3%	0.04	Y
Green River	3/3/2025	4:05	45,000	90	500	0.06	1.41	0.00	96%	0.04	Y
Temescal	3/2/2025	12:20	60,000	120	500	0.78	1.19	0.00	34%	0.04	Y
Temescal	3/8/2025	16:25	47,500	95	500	0.68	1.29	0.00	47%	0.03	Y
Green River	3/10/2025	4:16	45,000	90	500	0.39	1.41	0.00	72%	0.03	Y
Temescal	3/9/2025	15:20	62,500	125	500	1.20	1.51	0.00	21%	0.05	Y
Temescal	3/13/2025	14:20	30,000	60	500	1.01	1.12	0.00	10%	0.02	Y
Green River	3/16/2025	21:30	45,000	90	500	0.07	1.60	0.00	96%	0.03	Y
Temescal	3/23/2025	11:15	57,500	115	300	0.93	1.52	0.00	39%	0.04	Y
Temescal	3/27/2025	12:30	42,500	85	500	1.01	1.48	0.00	32%	0.02	Y
Green River	3/24/2025	4:00	45,000	90	500	0.67	1.34	0.00	50%	0.02	Y
Temescal	3/29/2025	10:30	40,000	80	500	1.05	1.57	0.00	33%	0.06	Y
Temescal	4/1/2025	15:20	22,500	45	500	1.13	1.28	0.00	12%	--	Y
Green River	3/31/2025	4:00	45,000	90	500	0.07	1.63	0.00	96%	0.03	Y
Temescal	4/4/2025	13:15	43,500	87	500	0.77	1.43	0.00	46%	0.05	Y
Temescal	4/6/2025	10:50	67,500	135	500	1.42	1.70	0.00	16%	0.02	Y
Green River	4/7/2025	3:40	45,000	90	500	0.69	1.53	0.00	55%	0.04	Y
Temescal	4/9/2025	13:25	12,000	60	200	1.35	1.39	0.00	3%	0.02	Y
Temescal	4/11/2025	15:45	47,500	95	500	0.99	1.65	0.00	40%	0.06	Y
Green River	4/14/2025	4:00	45,000	90	500	0.08	1.37	0.00	94%	0.04	Y
Temescal	4/13/2025	11:15	45,000	90	500	1.40	1.74	0.00	20%	0.03	Y
Temescal	4/18/2025	8:40	30,000	60	500	1.16	1.28	0.00	9%	0.06	Y
Green River	4/21/2025	3:45	45,000	90	500	0.13	1.44	0.00	91%	0.03	Y
Temescal	4/23/2025	12:45	30,000	60	500	1.14	1.22	0.00	7%	0.04	Y
Temescal	4/26/2025	13:10	47,500	95	500	1.05	1.35	0.00	22%	0.02	Y
Green River	4/28/2025	3:50	45,000	90	500	0.12	1.42	0.00	92%	0.02	Y
Temescal	4/30/2025	11:15	60,000	120	500	0.96	0.97	0.00	1%	0.02	Y

Table 8.21 – Weekly Low Chlorine

Location	Date	Time	Total Gallons	TIME (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
Temescal	5/2/2025	11:40	60,000	120	500	0.78	1.49	0.00	48%	0.06	Y
Green River	5/4/2025	4:00	36,000	90	400	0.10	1.12	0.00	91%	0.02	Y
Temescal	5/8/2025	11:20	60,000	120	500	0.68	1.35	0.00	50%	0.04	Y
Temescal	5/10/2025	10:20	50,000	100	500	0.86	1.39	0.00	38%	0.06	Y
Green River	5/12/2025	3:50	47,500	95	500	0.06	1.11	0.00	95%	0.01	Y
Temescal	5/15/2025	10:50	N/A	N/A	500	0.68	1.17	0.00	42%	0.02	Y
Temescal	5/17/2025	11:00	35,574	98	363	0.81	1.28	0.00	37%	0.05	Y
Green River	5/19/2025	4:00	42,500	85	500	0.09	1.15	0.00	92%	0.05	Y
Temescal	5/23/2025	11:50	57,500	115	500	0.92	1.30	0.00	29%	0.03	Y
Temescal	5/25/2025	11:15	55,000	110	500	0.85	1.40	0.00	39%	0.05	Y
Green River	5/26/2025	3:50	48,000	120	400	0.10	1.29	0.00	92%	0.02	Y
Temescal	5/28/2025	2:55	45,000	90	300	1.23	1.39	0.00	12%	0.01	Y
Temescal	5/30/2025	11:45	55,000	110	500	0.89	1.43	0.00	38%	0.06	Y
Green River	6/2/2025	4:00	37,500	75	500	0.07	1.15	0.00	94%	0.03	Y
Temescal	6/4/2025	0:00	60,000	120	500	0.53	0.61	0.00	13%	0.06	Y
Temescal	6/6/2025	11:30	60,000	120	500	0.65	1.44	0.00	55%	0.05	Y
Green River	6/9/2025	0:00	40,000	80	500	0.17	1.22	0.00	86%	0.03	Y
Temescal	6/11/2025	13:05	57,500	115	500	0.58	1.31	0.00	56%	0.02	Y
Temescal	6/13/2025	10:25	57,500	115	500	0.46	1.43	0.00	68%	0.03	Y
Green River	6/16/2025	3:50	34,000	85	400	0.06	1.45	0.00	96%	0.01	Y

Figure 8.2 – Monthly Water Quality Flushing Locations

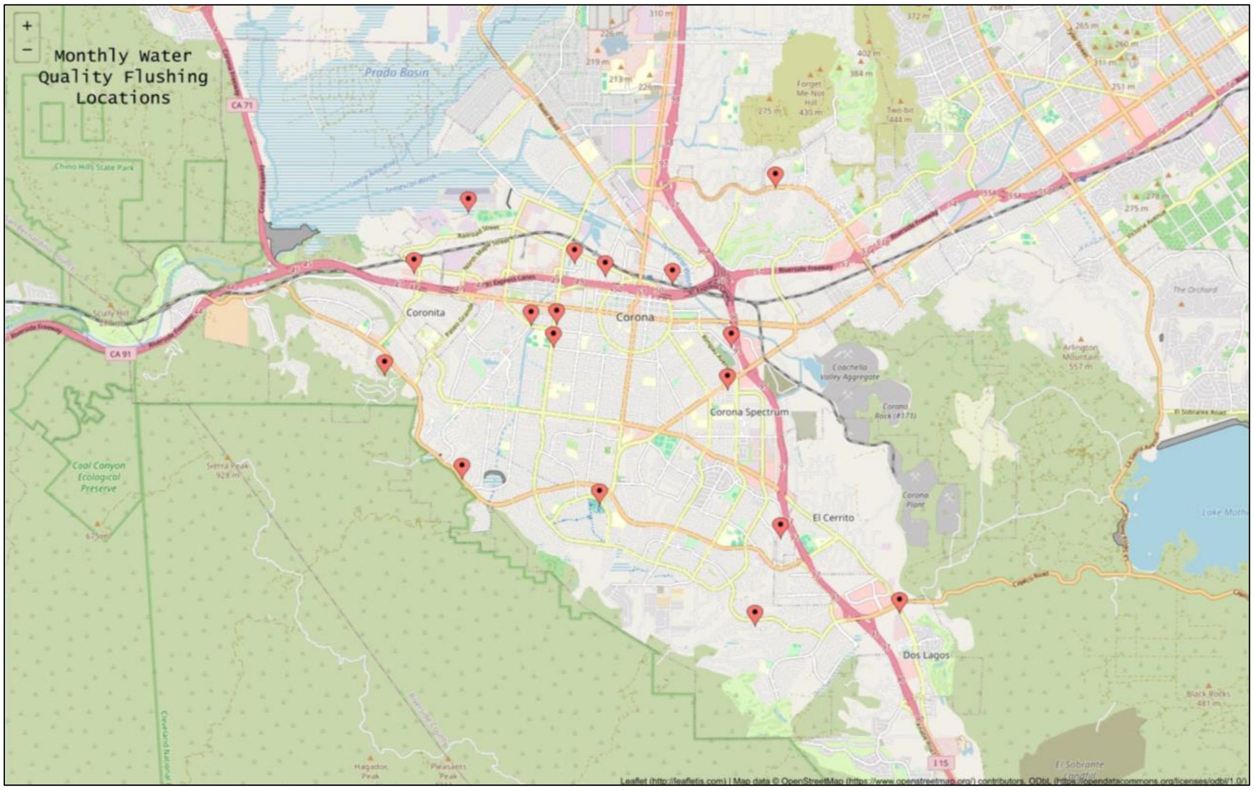


Table 8.22 – Monthly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
2550 SAN GABRIEL	1/9/2025	14:49	1,272	7	182	0.07	2.44	0.00	97%	0.03	Y
2003 AVIATION DR	1/7/2025	11:50	23,487	65	361	0.07	1.51	0.00	95%	0.01	Y
155 AUTO CENTER DR	1/2/2025	9:48	2,768	10	277	0.17	1.89	0.00	91%	0.03	Y
2121 MOUNTAIN VIEW	1/7/2025	11:11	524	6	87	0.73	1.85	0.00	61%	0.03	Y
815 SHERMAN	1/11/2025	15:30	898	11	82	0.09	1.93	0.00	95%	0.03	Y
1020 RAILROAD ST	1/15/2025	8:40	2,020	7	289	0.29	1.91	0.00	85%	0.04	Y
260 W FOOTHILL PKY	1/2/2025	16:05	3,890	11	354	0.15	1.79	0.00	92%	0.02	Y
650 E HARRISON ST	1/5/2025	23:05	2,468	13	190	0.42	2.22	0.00	81%	0.03	Y
842 EL SOBRANTE	1/3/2025	11:05	1,496	8	187	0.55	2.11	0.00	74%	0.04	Y
1187 MAGNOLIA AVE	1/6/2025	16:41	1,870	8	234	1.63	2.13	0.00	23%	0.04	Y
3584 NELSON ST.	1/2/2025	15:28	4,488	12	374	0.12	1.87	0.00	94%	0.03	Y
1070 AQUINO CIRCLE	1/11/2025	2:36	1,646	9	183	0.41	2.36	0.00	83%	0.03	Y

Table 8.22 – Monthly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
18648 STATE ST	1/12/2025	14:12	1,197	5	239	0.17	2.46	0.00	93%	0.04	Y
8540 CAJALCO RD	1/7/2025	15:10	4,264	11	388	1.85	2.03	0.00	9%	0.04	Y
Desalter B.O. 1 - #3315	2/2/2025	17:10	224	10	22	--	--	--	--	--	Y
Desalter B.O. 2 - #3317	2/2/2025	17:35	524	10	52	--	--	--	--	--	Y
Desalter B.O. 4	2/2/2025	18:00	2,094	20	105	--	--	--	--	--	Y
2550 SAN GABRIEL	2/14/2025	12:20	2,394	13	184	0.24	2.10	0.00	89%	0.01	Y
2003 AVIATION DR	2/5/2025	15:20	43,085	95	454	0.04	1.40	0.00	97%	0.02	Y
155 AUTO CENTER DR	2/18/2025	4:14	1,870	7	267	0.04	1.41	0.00	97%	0.02	Y
2121 MOUNTAIN VIEW	2/25/2025	13:20	8,602	45	191	1.02	1.65	0.00	38%	0.03	Y
815 SHERMAN	2/14/2025	14:30	449	2	224	0.66	1.79	0.00	63%	0.04	Y
1020 RAILROAD ST	2/14/2025	14:45	1,421	4	355	0.97	1.99	0.00	51%	0.02	Y
260 W FOOTHILL PKY	2/14/2025	14:15	748	3	249	0.33	2.00	0.00	84%	0.03	Y
650 E HARRISON ST	2/14/2025	16:45	1,795	10	180	0.21	1.90	0.00	89%	0.02	Y
842 EL SOBRANTE	2/9/2025	16:25	4,787	20	239	0.80	1.71	0.00	53%	0.03	Y
1187 MAGNOLIA AVE	2/12/2025	23:38	2,842	10	284	1.54	1.94	0.00	21%	0.04	Y
3584 NELSON ST.	2/1/2025	12:00	3,964	10	396	0.04	1.56	0.00	97%	0.02	Y
1070 AQUINO CIRCLE	2/14/2025	10:03	4,338	20	217	0.88	1.57	0.00	44%	0.03	Y
18648 STATE ST	2/18/2025	10:35	3,441	15	229	1.54	2.16	0.00	29%	0.04	Y
8540 CAJALCO RD	2/14/2025	12:45	8,228	25	329	1.68	1.80	0.00	7%	0.03	Y
Desalter B.O. 1 - #3315	2/26/2025	16:00	150	10	15	--	--	--	--	--	Y
Desalter B.O. 2 - #3317	2/26/2025	16:25	823	10	82	--	--	--	--	--	Y
Desalter B.O. 4	2/26/2025	16:50	299	11	27	--	--	--	--	--	Y
2550 SAN GABRIEL	3/26/2025	10:25	3,815	20	191	0.28	2.16	0.00	87%	0.05	Y
2003 AVIATION DR	3/11/2025	12:00	34,707	90	386	0.05	0.97	0.00	95%	0.04	Y
155 AUTO CENTER DR	3/15/2025	12:25	3,665	10	367	0.06	1.90	0.00	97%	0.03	Y
2121 MOUNTAIN VIEW	3/21/2025	15:30	598	2	299	1.41	1.99	0.00	29%	0.05	Y
815 SHERMAN	3/15/2025	16:00	374	2	187	0.06	2.30	0.00	97%	0.05	Y
1020 RAILROAD ST	3/14/2025	14:20	1,197	4	299	1.15	1.40	0.00	18%	0.04	Y
260 W FOOTHILL PKY	3/14/2025	13:50	598	2	299	0.36	2.30	0.00	84%	0.05	Y
650 E HARRISON ST	3/19/2025	15:30	1,272	4	318	0.23	1.83	0.00	87%	0.03	Y
842 EL SOBRANTE	3/2/2025	16:10	4,712	35	135	0.77	1.80	0.00	57%	0.04	Y

Table 8.22 – Monthly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
1187 MAGNOLIA AVE	3/3/2025	22:45	1,571	6	262	1.34	1.96	0.00	32%	0.03	Y
3584 NELSON ST.	3/14/2025	13:25	1,197	4	299	0.03	1.63	0.00	98%	0.03	Y
1070 AQUINO CIRCLE	3/19/2025	15:50	2,319	7	331	0.53	1.68	0.00	68%	0.04	Y
18648 STATE ST	3/23/2025	14:05	1,272	5	254	2.00	2.18	0.00	8%	0.03	Y
8540 CAJALCO RD	3/25/2025	15:45	2,394	10	239	0.22	1.94	0.00	89%	0.06	Y
3097 BONNYVIEW Cir	3/4/2025	8:55	1,646	12	137	1.29	1.70	0.00	24%	0.05	Y
Desalter B.O. 1 - #3315	3/24/2025	10:25	299	20	15	--	--	--	--	--	Y
Desalter B.O. 2 - #3317	3/24/2025	11:05	1,272	10	127	--	--	--	--	--	Y
Desalter B.O. 4	3/24/2025	11:30	4,264	20	213	--	--	--	--	--	Y
2550 SAN GABRIEL	4/3/2025	15:40	2,169	8	271	0.06	2.17	0.00	97%	0.04	Y
2003 AVIATION DR	4/2/2025	9:45	18,999	45	422	0.15	1.88	0.00	92%	0.02	Y
155 AUTO CENTER DR	4/9/2025	11:34	2,468	11	224	0.04	1.88	0.00	98%	0.04	Y
2121 MOUNTAIN VIEW	4/7/2025	16:05	4,862	25	194	0.49	2.01	0.00	76%	0.03	Y
815 SHERMAN	4/2/2025	15:20	374	1	374	0.17	2.20	0.00	92%	0.02	Y
1020 RAILROAD ST	4/2/2025	12:30	1,646	4	411	0.29	1.78	0.00	84%	0.03	Y
260 W FOOTHILL PKY	4/2/2025	12:00	823	2	411	0.06	2.04	0.00	97%	0.05	Y
650 E HARRISON ST	4/4/2025	13:00	1,945	12	162	0.02	2.38	0.01	99%	0.03	Y
842 EL SOBRANTE	4/2/2025	10:05	3,740	18	208	0.83	1.96	0.00	58%	0.05	Y
1187 MAGNOLIA AVE	4/2/2025	16:00	1,197	4	299	1.18	2.20	0.00	46%	0.02	Y
3584 NELSON ST.	4/2/2025	11:40	2,244	5	449	0.01	2.07	0.00	100%	0.05	Y
1070 AQUINO CIRCLE	4/2/2025	11:10	5,311	27	197	0.29	1.77	0.00	84%	0.01	Y
18648 STATE ST	4/8/2025	13:10	3,067	15	204	2.08	2.20	0.00	5%	0.07	Y
8540 CAJALCO RD	4/8/2025	13:40	3,516	20	176	0.42	2.07	0.00	80%	0.04	y
3097 BONNYVIEW Cir	4/6/2025	17:00	4,488	25	180	0.18	2.11	0.00	91%	0.04	Y
Desalter B.O. 1 - #3315	4/14/2025	16:05	500	10	50	--	--	--	--	--	Y
Desalter B.O. 2 - #3317	4/14/2025	16:35	1,500	10	150	--	--	--	--	--	Y
Desalter B.O. 4	4/14/2025	17:05	3,000	15	200	--	--	--	--	--	Y
2550 SAN GABRIEL	5/8/2025	17:10	3,815	20	191	0.19	1.79	0.00	89%	0.02	Y
2003 AVIATION DR	5/1/2025	10:25	17,653	55	200	0.04	1.19	0.00	97%	0.03	Y
155 AUTO CENTER DR	5/9/2025	14:19	10,173	24	424	0.27	1.80	0.00	85%	0.03	Y

Table 8.22 – Monthly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
2121 MOUNTAIN VIEW	5/9/2025	11:30	2,842	11	258	0.03	1.46	0.00	98%	0.02	Y
815 SHERMAN	5/8/2025	11:40	299	1	299	0.12	1.43	0.00	92%	0.05	Y
1020 RAILROAD ST	5/2/2025	15:50	1,646	5	329	0.17	1.80	0.00	91%	0.03	Y
260 W FOOTHILL PKY	5/2/2025	14:00	1,122	3	374	0.16	1.62	0.00	90%	0.05	Y
650 E HARRISON ST	5/2/2025	15:25	1,496	6	249	0.11	1.82	0.00	94%	0.05	Y
842 EL SOBRANTE	5/8/2025	15:10	1,646	5	329	0.17	2.00	0.00	92%	0.04	Y
1187 MAGNOLIA AVE	5/8/2025	15:30	898	3	299	0.17	2.11	0.00	92%	0.02	Y
3584 NELSON ST.	5/2/2025	14:30	1,945	5	389	0.12	1.81	0.00	93%	0.02	Y
1070 AQUINO CIRCLE	5/8/2025	11:05	2,543	7	363	0.16	1.44	0.00	89%	0.03	Y
18648 STATE ST	5/5/2025	11:15	5,086	20	254	0.86	2.19	0.00	61%	0.03	Y
8540 CAJALCO RD	5/5/2025	11:55	3,516	20	176	1.66	1.93	0.00	14%	0.02	Y
3097 BONNYVIEW Cir	5/8/2025	14:40	823	2	411	0.27	1.42	0.00	81%	0.05	Y
Desalter B.O. 1 - #3315	5/24/2025	9:00	4,712	10	471	--	--	--	--	--	Y
Desalter B.O. 2 - #3317	5/24/2025	9:35	1,047	10	105	--	--	--	--	--	Y
Desalter B.O. 4	5/24/2025	8:55	1,000	8	125	--	--	--	--	--	Y
2550 SAN GABRIEL	6/9/2025	17:15	2,468	15	200	2.08	2.16	0.00	4%	0	Y
2003 AVIATION DR	6/5/2025	13:15	18,999	55	345	0.02	1.22	0.00	98%	0.03	Y
155 AUTO CENTER DR	6/13/2025	13:15	5,760	15	384	0.02	1.94	0.00	99%	0.03	Y
2121 MOUNTAIN VIEW			0		-				-		
815 SHERMAN	6/6/2025	15:50	374	1	374	0.08	1.65	0.00	95%	0.03	Y
1020 RAILROAD ST	6/6/2025	14:50	1,720	5	344	0.19	1.85	0.00	90%	0.02	Y
260 W FOOTHILL PKY	6/1/2025	8:55	3,366	10	337	0.03	1.50	0.00	98%	0.02	Y
650 E HARRISON ST	6/6/2025	15:10	1,870	5	374	0.03	1.63	0.00	98%	0.05	Y
842 EL SOBRANTE	6/11/2025	10:25	2,319	8	290	0.03	1.85	0.00	98%	0.01	Y
1187 MAGNOLIA AVE	6/12/2025	13:25	598	2	299	0.19	2.02	0.00	91%	0.02	Y
3584 NELSON ST.	6/6/2025	17:25	4,488	19	236	0.07	1.83	0.00	96%	0.02	Y
1070 AQUINO CIRCLE	6/11/2025	11:25	4,189	15	279	0.07	1.49	0.00	95%	0.02	Y
18648 STATE ST	6/12/2025	13:50	150	1	150	0.82	2.01	0.00	59%	0.04	Y
8540 CAJALCO RD	6/12/2025	14:15	1,272	3	424	0.04	1.39	0.00	97%	0.03	Y

Figure 8.3 – Quarterly Water Quality Flushing Locations

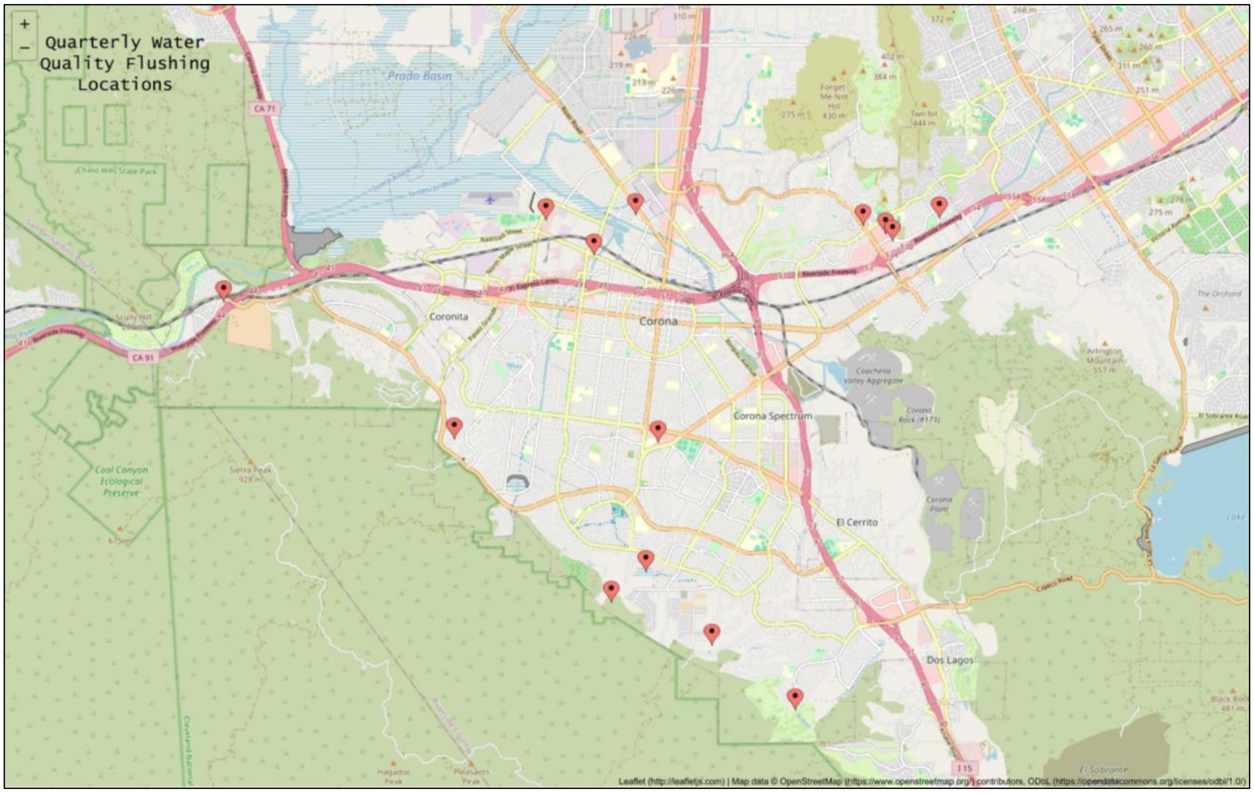


Table 8.23 – Quarterly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	CL2 Residual (Before)	CL2 Residual (After)	Disch. CL2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
345 ADAMS CI	2/19/2025	13:40	2,394	6	399	0.30	1.71	0.00	82%	0.02	Y
4000 S MAIN ST	1/2/2025	16:26	1,945	10	195	1.98	2.04	0.00	3%	0.02	Y
827 RIVER RD	2/19/2025	14:05	748	2	374	0.26	1.66	0.00	84%	0.04	Y
3795 TRINITY CI	1/17/2025	11:45	2,094	8	262	0.55	2.01	0.00	73%	0.03	Y
2584 AVENIDA DEL VISTA	1/11/2025	10:45	2,094	14	150	0.25	1.97	0.00	87%	0.01	Y
215 N SMITH AVE	2/24/2025	16:30	12,791	45	200	0.11	1.46	0.00	92%	0.03	Y
2214 VESPER CI	1/17/2025	10:53	2,842	10	284	0.40	2.07	0.00	81%	0.04	Y
CASPER CI	1/4/2025	14:50	3,441	11	312	0.19	1.73	0.00	89%	0.02	Y
2215 LAKESIDE DR	2/19/2025	14:50	673	2	337	1.45	1.45	0.00	0%	0.02	Y
2365 MILLCREEK PL	1/2/2025	14:49	823	5	165	1.90	2.38	0.00	20%	0.03	Y
2950 PEMBROKE CI	2/19/2025	14:30	2,543	5	509	1.47	1.45	0.00	-1%	0.03	Y

Table 8.23 – Quarterly Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	CL2 Residual (Before)	CL2 Residual (After)	Disch. CL2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
2320 RICHEY ST	1/2/2025	14:26	1,496	10	150	2.40	2.40	0.00	0%	0.03	Y
1764 SANDTRAP DR	2/16/2025	15:15	3,740	15	200	1.27	1.74	0.00	27%	0.02	Y
4657 VALLEY GLEN DR	1/11/2025	10:25	1,571	14	112	0.50	1.81	0.00	72%	0.04	Y
345 ADAMS CI	5/16	11:55	5,610	27	207	0.23	1.47	0.00	84%	0.04	Y
4000 S MAIN ST	4/4	15:45	3,964	22	180	0.88	2.05	0.00	57%	0.04	Y
827 RIVER RD	4/8	11:30	1,272	10	200	0.20	2.06	0.00	90%		Y
3795 TRINITY CI	4/5	13:20	1,945	12	162	0.85	2.28	0.00	63%	0.04	Y
2584 AVENIDA DEL VISTA	5/16	16:10	1,720	8	215	0.07	1.36	0.00	95%	0.03	Y
215 N SMITH AVE	4/15	10:10	3,964	20	200	0.10	1.85	0.00	95%	0.02	Y
2214 VESPER CI	4/15	12:05	1,346	6	200	1.75	2.01	0.00	13%	0.02	Y
CASPER CI	4/16	13:35	449	2	225	1.67	1.65	0.00	-1%	0.04	Y
2215 LAKESIDE DR	4/17	14:30	4,488	20	200	0.00	1.69	0.00	100%	0.04	Y
2365 MILLCREEK PL	4/22	10:30	3,665	20	200	0.06	1.68	0.00	96%	0.04	Y
2950 PEMBROKE CI	4/17	11:20	2,992	10	299	1.10	1.78	0.00	38%	0.04	Y
2320 RICHEY ST	4/17	15:10	3,516	20	200	1.61	1.67	0.00	4%	0.05	Y
1764 SANDTRAP DR	4/8	14:15	4,862	20	200	1.20	2.09	0.00	43%	0.03	Y
4657 VALLEY GLEN DR	4/15	15:25	7,704	45	250	1.32	1.47	0.00	10%	0.03	Y

Figure 8.4 – Annual Water Quality Flushing Locations

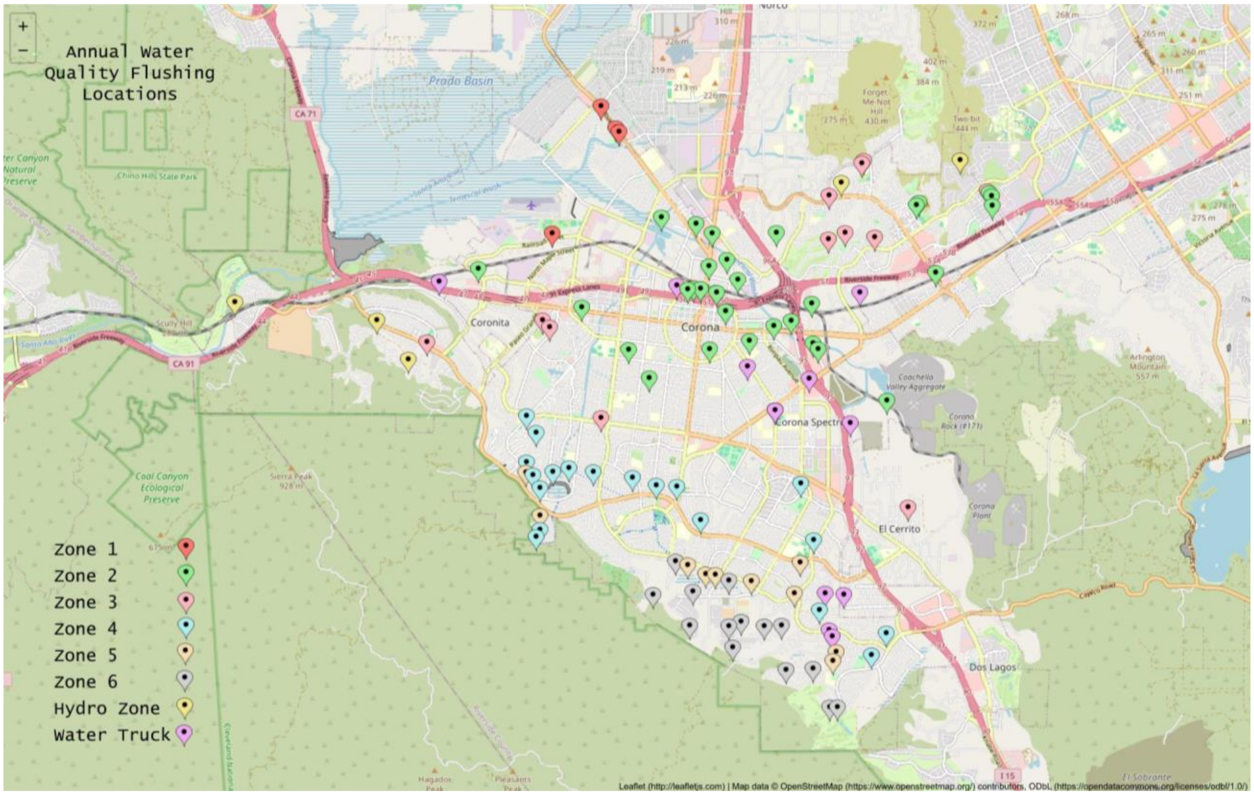


Table 8.24 – Annual Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
1820 RAILROAD ST	1/2/2025	9:00	3,740	12.00	311.67	0.22	1.70	0.00	87%	0.02	Y
1368 OLEANDER CIR	1/4/2025	12:19	748	6.00	124.67	0.26	2.18	0.00	88%	0.03	Y
1278 CANYON CIR	1/2/2025	10:20	2,394	9.00	265.96	0.37	2.18	0.00	83%	0.02	Y
1296 DALE CIR	1/4/2025	10:31	898	6.00	149.6	1.66	2.08	0.00	-25%	0.04	Y
155 AUTO CENTER DR	3/15/2025	12:25	3,665	10	366.52	0.06	1.90	0.00	97%	0.03	y
1380 W SIXTH ST	3/19/2025	0:00	1,945	13	149.6	1.01	1.81	0.00	44%	0.04	y
1001 ALTA LOMA DR	3/14/2025	14:10	3,815	15	254.32	1.68	1.84	0.00	9%	0	y
1662 MELODY Cir	4/10/2025	11:40	2,169	13	166.86	1.75	1.97	0	11%	0.03	Y
482 RIO CT	2/26/2025	13:30	224	1	224.4	1.86	1.88	0.00	1%	0.02	Y
WILLOW CREEK DR	3/29/2025	13:48	898	7	128.23	2.12	2.18	0.00	3%	0.03	Y
107 N SHERIDAN ST	2/26/2025	13:55	1,047	3	349.07	1.86	1.82	0.00	-2%	0.03	Y
104 N BELLE AV	2/26/2025	14:05	898	2	448.8	1.89	1.90	0.00	1%	0.02	Y

Table 8.24 – Annual Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
716 N MAIN ST	2/26/2025	14:20	1,870	5	374	2.02	1.99	0.00	-2%	0.05	Y
391 N MAIN ST	2/26/2025	14:30	1,870	5	374	0.35	1.64	0.00	79%	0.03	Y
355 E RINCON ST	2/26/2025	14:45	449	2	224.4	0.50	2.00	0.00	75%	0.02	Y
133 WASHBURN Cir	3/29/2025	13:10	1,496	10	149.6	0.60	2.30	0.00	74%	0.03	y
235 N JOY ST	2/26/2025	15:00	224	1	224.4	1.74	2.13	0.00	18%	0.04	Y
103 N VICTORIA AV	2/26/2025	15:10	898	3	299.2	1.99	2.07	0.00	4%	0.03	Y
1011 S VICTORIA AV	4/10/2025	12:10	2,992	15	199.47	0.03	2.12	0.00	99%	0.04	Y
690 TAMPICO Cir	4/21/2025	16:35	2,244	10	224.4	1.94	2.04	0.00	5%	0.05	Y
650 E HARRISON ST	4/29/2025	8:40	6,807	30	226.89	0.05	1.96	0.00	97%	0.03	Y
1250 WEBB Cir	1/17/2025	14:24	2,468	8	308.55	0.32	1.98	0.00	84%	0.03	Y
1201 E 6TH ST	4/10/2025	12:50	13,314	50	266.29	0.75	2.32	0.00	68%	0.04	Y
914 PINE ST	4/23/2025	11:30	1,945	10	194.48	1.53	2.05	0.00	25%	0.05	Y
100 RADIO RD	1/17/2025	14:07	2,468	9	274.27	0.45	2.11	0.00	79%	0.02	Y
955 MONTECITO DRIVE	3/27/2025	13:45	598	2	299.2	1.80	1.86	0.00	3%	0.03	Y
1095 MONTECITO DR	3/27/2025	13:30	823	2	411.4	1.81	1.99	0.00	9%	0.04	Y
2399 MARYHELEN ST	3/27/2025	14:20	524	2	261.8	0.14	1.52	0.00	91%	0.02	Y
641 JORDAN CT	3/27/2025	14:05	900	3	300	2.20	2.15	0.00	-2%	0.04	Y
1709 SHERBORN ST	3/27/2025	14:40	524	2	261.8	1.38	1.52	0.00	9%	0.03	Y
191 N MCKINLEY ST	3/27/2025	15:45	4,189	10	418.88	0.10	2.36	0.00	96%	0.03	Y
3099 MANCHESTER Cir	3/27/2025	15:20	299	1	299.2	1.38	1.40	0.00	1%	0.05	Y
3099 HAMPSHIRE Cir	3/27/2025	15:25	598	2	299.2	1.56	1.62	0.00	4%	0.04	Y
431 SCARBOROUGH Cir	3/27/2025	15:35	449	2	224.4	1.57	1.59	0.00	1%	0.03	Y
2802 GREEN RIVER RD #101	4/11/2025	12:11	3,067	20	153.34	0.08	2.07	0.00	96%	0.03	Y
2140 W ONTARIO AV	1/5/2025	12:12	1,646	15	109.77	1.03	2.02	0.00	49%	0.04	Y
880 Robles Pl	1/5/2025	11:38	2,768	15	184.50	1.83	1.97	0.00	7%	0.04	Y
889 Live Oak Pl	4/11/2025	12:59	3,815	14	272.49	1.58	1.65	0.00	4%	0.03	Y

Table 8.24 – Annual Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
987 MONTAGUE Cir	4/10/2025	13:58	5,161	14	368.66	1.61	1.72	0.00	6%	0.01	Y
1890 AZTEC LN	4/18/2025	14:30	673	3	224.4	1.90	2.04	0.00	7%	0.04	Y
1225 DON LUIS Cir	4/20/2025	16:15	3,516	20	175.78	0.73	2.19	0.00	67%	0.03	Y
1998 ATHERTON Cir	4/4/2025	12:23	2,169	12	180.77	1.44	2.40	0.01	40%	0.03	Y
792 SAMANTHA Cir	4/4/2025	12:00	898	5	179.52	1.76	1.96	0.01	10%	0.03	Y
19108 Lyle Av	4/18/2025	13:45	75	1	74.8	1.80	1.84	0.00	2%	0.05	Y
3080 DARTMOUTH ST	4/17/2025	11:40	3,665	17	215.6	0.86	1.93	0.00	55%	0.02	Y
609 BALBOA DR	4/4/2025	11:31	1,870	9	207.78	1.75	1.94	0.01	10%	0.02	Y
1716 COPLEN Cir	2/26/2025	10:00	6,657	25	266	1.56	1.82	0.00	14%	0.03	Y
2390 INDEPENDENCE Cir	4/16/2025	12:00	1,720	10	172	1.30	1.80	0.00	28%	0.04	Y
2924 CAPE DR	3/3/2025	16:30	6,134	30	204	1.22	1.65	0.00	26%	0.02	Y
1451 TUDOR Cir	3/3/2025	17:20	6,882	30	229	1.25	1.59	0.00	21%	0.03	Y
2970 GLENWOOD Cir	3/4/2025	11:55	4,937	20	247	1.50	1.73	0.00	13%	0.03	Y
1471 MEADOWCREST Cir	3/4/2025	14:15	7,779	35	222	0.93	1.62	0.00	43%	0.04	Y
Funston Way	3/4/2025	15:05	4,264	20	213	1.45	1.69	0.00	14%	0.04	Y
1443 Burnette Cir	4/14/2025	16:30	3,516	20	176	1.24	1.91	0.00	35%	0.02	Y
1341 STEEPLE CHASE Cir	3/26/2025	17:15	1,421	11	129	1.25	1.85	0.00	32%	0.04	Y
1144 SINSONTE Cir	4/14/2025	17:05	4,189	20	209	0.58	1.78	0.00	67%	0.04	Y
2930 RIMROCK Cir	4/12/2025	14:30	3,590	16	224	1.12	1.71	0.00	35%	0.02	Y
2884 PLUMWOOD Cir	3/4/2025	15:55	7,480	31	241	0.25	2.38	0.00	89%	0.01	Y
2860 OLIVEWOOD Cir	3/4/2025	15:20	4,039	24	168	0.29	1.94	0.00	85%	0.03	Y
291 SABINA PEAK Cir	3/26/2025	12:00	1,945	15	130	1.74	1.97	0.00	12%	0.04	Y
2391 FARGO Cir	3/4/2025	14:30	3,665	15	244	1.43	1.67	0.00	14%	0.01	Y
2880 CALIFORNIA AV	2/26/2025	15:30	1,795	12	150	0.05	1.88	0.00	97%	0.03	Y
3650 NELSON ST	1/7/2025	0:00	4,862	16	304	1.42	2.04	0.00	30%	0.04	Y

Table 8.24 – Annual Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
3979 CAMELBACK Cir	2/26/2025	10:35	7,929	35	227	0.92	1.56	0.00	41%	0.03	Y
4164 FOREST HIGHLANDS Cir	3/4/2025	13:50	3,142	19	165	0.70	1.59	0.00	56%	0.05	Y
3013 BONNYVIEW Cir	3/2/2025	16:05	6,508	30	216.92	1.25	1.70	0.00	26%	0.03	Y
1450 TRUDY WY	3/2/2025	17:00	5,909	30	196.97	0.42	1.56	0.00	73%	0.03	Y
3795 TRINITY CI	3/2/2025	17:45	3,216	15	214.44	1.48	1.64	0.00	7%	0.02	Y
3765 SAWTOOTH Cir	3/23/2025	16:20	6,582	25	263.30	0.76	1.85	0.00	59%	0.04	Y
3780 Wallowa Cir	3/2/2025	17:30	3,216	12	268.03	0.87	1.45	0.00	40%	0.02	Y
3820 PEREGRIN Cir	3/25/2025	17:15	1,720	7	245.77	1.75	1.93	0.00	9%	0.03	Y
1443 CHERRYWOOD Cir	3/26/2025	10:10	3,665	20	183.26	0.02	1.90	0.00	99%	0.05	Y
3505 SUNMEADOW Cir	3/26/2025	10:45	2,543	10	254.32	1.90	1.96	0.00	3%	0.02	Y
4165 CHANTICLEER Cir	3/26/2025	11:10	6,657	25	266.29	0.85	1.87	0.00	55%	0.07	Y
4293 SOTOGRANDE Cir	3/26/2025	11:45	3,890	15	259.31	1.83	1.93	0.00	5%	0.05	Y
135 CUSTER Cir	1/17/2025	4:52	4,488	15	299.2	0.51	1.85	0.00	72%	0.03	Y
4000 S MAIN ST	2/14/2025	12:20	5,685	25	227	1.35	1.70	0.00	21%	0.04	Y
405 CLEVELAND WY	1/18/2025	11:22	2,543	10	254.32	0.25	1.89	0.00	87%	0.02	Y
4150 ROBBY Cir	1/22/2025	15:56	1,496	7	213.71	0.32	1.86	0.00	83%	0.04	Y
3780 HURON Cir	4/15/2025	11:25	3,216	15	214.43	1.91	2.05	0.00	7%	0.06	Y
1032 STOWELL RANCH Cir	1/23/2025	11:32	3,366	10	336.6	0.29	1.91	0.00	85%	0.04	Y
1155 SANDRA Cir	1/23/2025	11:56	3,740	12	311.67	0.27	1.86	0.00	85%	0.03	Y
4280 PRAIRIE Cir	2/26/2025	14:00	8,303	40	207.57	1.16	1.58	0.00	27%	0.05	Y
3966 ASHWOOD Cir	4/15/2025	12:10	7,630	40	190.74	0.26	1.90	0.00	86%	0.03	Y
1377 VERSANTE Cir	1/28/2025	16:30	972	6	162.07	1.59	1.70	0.00	6%	0.03	Y
4380 MAIDSTONE Cir	1/22/2025	13:22	1,945	10	194.48	0.26	1.85	0.00	86%	0.03	Y

Table 8.24 – Annual Low Chlorine

Location	Date	Time	Total Gallons	Time (Mins)	GPM	Cl2 Residual (Before)	Cl2 Residual (After)	Disch. Cl_2	% Difference	FCL2	Disch. NTU Below 100 (Y/N)
4390 ROSERIDGE CT	1/22/2025	12:41	2,394	10	239.36	0.82	1.89	0.00	57%	0.04	Y
4539 BIRDIE Cir	3/29/2025	12:50	3,516	18	195	1.28	1.70	0.00	25%	0.03	Y
4555 EDGEWATER Cir	3/29/2025	13:15	3,142	12	261.8	0.88	1.76	0.00	50%	0.03	Y
11759 CHADWICK RD	5/19/2025	14:38	1,945	10	194.48	1.01	1.18	0.00	14%	0.03	Y
4710 GREEN RIVER	5/13/2025	11:53	3,890	15	259.31	0.91	1.10	0.00	17%	0.02	Y
2985 HIDDEN HILLS Cir	5/10/2025	9:10	1,047	6	174.53	0.38	1.56	0.00	76%	0.02	Y
1070 AQUINO Cir	5/11/2025	14:37	823	11	74.8	1.15	1.39	0.00	17%	0.01	Y
2891 WOLFSON Cir	5/21/2025	11:16	4,862	12	405.17	1.75	1.87	0.00	6%	0.04	Y

Key to Abbreviations

The abbreviations used in this section are referenced from the 2025 Consumer Confidence Report.

1,2,3-TCP	1,2,3-Trichloropropane
AI	Agressiveness Index
CCR	Consumer Confidence Report
CFU/mL	Colony-Forming Units per Milliliter
DBP	Disinfection Byproducts
DBPR	Disinfectants and Disinfection Byproducts Rule
DDW	Division of Drinking Water (State Resources Control Board)
DLR	Detection Limits for purposes of Reporting
EPA	U.S. Environmental Protection Agency
LRAA	Locational Running Annual Average
MBAS	Methylene Blue Active Substances
MCLG	Maximum Contaminant Level Goal Mentioned
MGD	Million Gallons per Day
MWD	Metropolitan Water District of Southern California
N	Nitrogen
NA	Not Applicable
ND	Not Detected
NL	Notification Level
NTU	Nephelometric Turbidity Units
pCi/L	PicoCuries per liter
PFAS	Per- and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonic Acid
ppt	Parts per trillion
RL	Response Level
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TOC	Total Organic Carbon

UCMR	Unregulated Contaminant Monitoring Rule
WMWD	Western Municipal Water District
µg/L	Micrograms per liter or parts per billion (ppb)
mg/L	Milligrams per liter or parts per million (ppm)
ng/L	Nanograms per liter or parts per trillion (ng/L)
RAA	Running Annual Average TOC Total Organic Carbon
µS/cm	microSiemen per centimeter; or micromho per centimeter (µmho/cm)

EXTENDED ABBREVIATIONS

The abbreviations used in this section are referenced from the 2025 Consumer Confidence Report.

Maximum Contaminant Level (MCL): The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste and appearance of drinking water.

Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL): The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG): The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Notification Level (NL) and Response Level (RL): Advisory levels established by the California State Water Resources Control Board, Division of Drinking Water (DDW) for contaminants that do not have enforceable Maximum Contaminant Levels (MCLs). A Notification Level (NL) represents a concentration at which a contaminant does not pose a significant health risk but warrants communication to governing agencies and the public when detected. A Response Level (RL) identifies the concentration at which water systems are recommended to take corrective action, such as removing the source from service, providing treatment, or notifying consumers.

Public Health Goal (PHG): The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Primary Drinking Water Standard (PDWS): MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Regulatory Action Level (AL): The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Treatment Technique (TT): A required process intended to reduce the level of a contaminant in drinking water.

SECTION 9 - MASTER PLAN IMPROVEMENTS

9.1. Recommended Improvements

This section recommends improvements based on this Master Plan and identified through technical analysis. Future inclusion of Recommended Improvements in the City's Capital Improvements Plan (CIP) is determined through the City's prioritization and funding process.

Recommended Improvements are based on a risk assessment that evaluated the likelihood of a facility failure and the potential consequences of a failure. The primary factors considered were the age of the facility, and the results of the existing and future system analysis described in **Section 6** and **Section 7**. Recommended Improvements also considered observations made during the condition assessment of the water treatment facilities; the evaluation of the City's wells and booster pump stations based on SCE efficiency tests; outcomes of the remaining service life analysis.

9.1.1. Recommended Improvements

The Recommended Improvements included in this section are the result of this Master Plan effort and were identified independently of the City's CIP. Where this master plan identifies improvements that are also included in the City's Capital Improvement Plan Fiscal Year (FY) 2026-FY2035 at the time of the adoption of this Master Plan, those projects are denoted with (Existing CIP).

This section presents all costs in 2026 dollars. The planning period for Recommended Improvements is 2026-2040. This section identifies water system improvements based on the following criteria:

- Remaining service life analysis of water system infrastructure as summarized in **Section 2.**
- Water system deficiencies identified in **Sections 2, 6, and 7**.

9.1.2. Capital Improvement Plan

The City's CIP serves as a long-term planning tool that enables the City to strategically prioritize and fund infrastructure projects aligned with the City's Strategic Plan, specifically Goal 3: Sound Infrastructure. As part of the City's CIP, the City scores and prioritizes capital improvement projects using the following prioritization criteria: risk to health and safety, regulatory/mandated requirement, condition and longevity of asset, improves service delivery, funding availability/grant funded, project readiness, contributes to financial well-being of City, improves quality of life, fulfills a strategic plan goal, sustainability and resource conservation, coordination of multiple improvements, and master plan implementation. Current capital improvement projects are included in the City's Adopted Capital Improvement Plan FY 2026- FY2035. The CIP informs the City's Adopted Annual Budget for the current FY, and the Adopted Annual Budget can also include projects based on necessity which were not previously identified in the CIP.

9.2. Project Priorities

The Recommended Improvements prioritize projects based on the outcome of a risk-based analysis. Each facility was evaluated using a risk-based analysis that considered the likelihood of failure based on the deficiencies found, and the consequence of failure of that specific facility. Facilities that were determined to have both a high probability of failure, and a high consequence of failure, were assigned a higher priority. It is important to note that a failure can include a physical break or rupture of the asset, or a failure to meet the required level of service because the asset is undersized. Project priority reflects relative system risk and operational need, not project cost or scale.

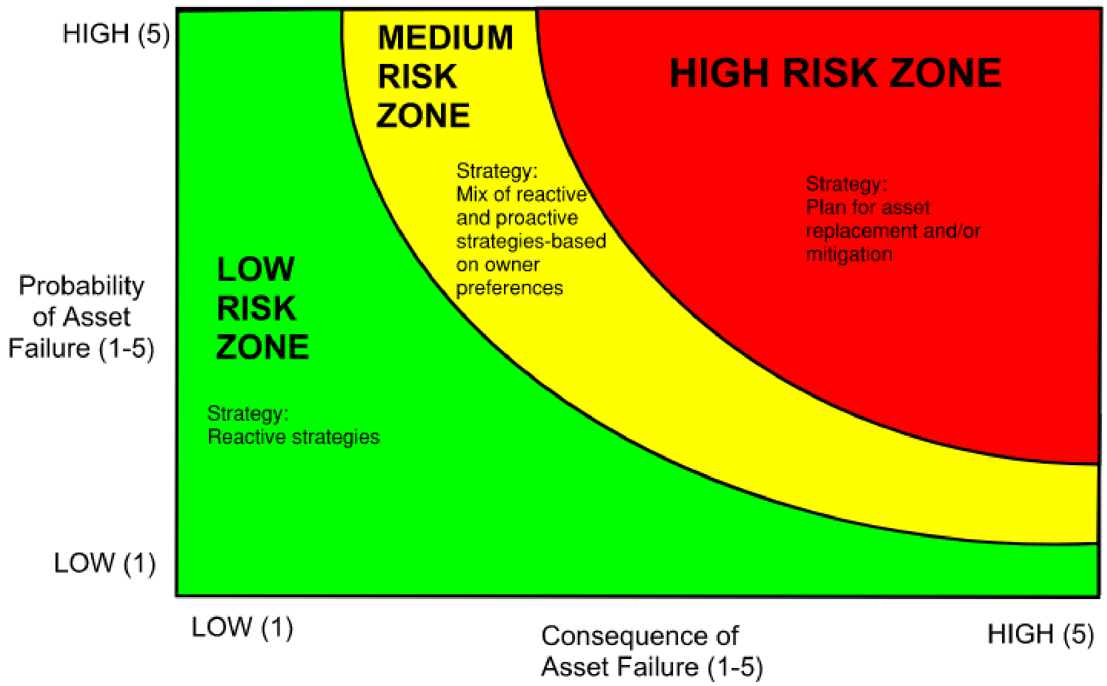
To catalog the assets owned by the City, the existing facility data in **Section 2**, was used to assemble the asset list for the treatment facilities, wells, booster pumps, tanks, pressure-reducing stations, and other related facilities. Asset registers were created for each asset in the list. These registers contain data that was used to evaluate the likelihood of failure and the cost of failure for each asset. This asset list and the corresponding asset registers were used to perform the risk-analysis and ultimately determine a need for the improvement and to assign a priority in the CIP.

The risk-based analysis used to determine the priority of each Recommended Improvement.

9.3. Risk-Based Analysis Methodology

The risk-based analysis used was based on the intersection between the consequence of failure (CoF) and likelihood of failure (LoF). The CoF is used to evaluate the consequences, or impacts, which could affect the City, the water service users, or the public health and safety if a failure of that facility were to occur. The LoF is used to evaluate the probability of a particular asset failing based on known information. Both the LoF and CoF are assigned a value between 1 (low) to 5 (high). A low LoF score indicates that the facility is not likely to fail, while a high LoF indicates the facility is likely to fail or has already failed. A low CoF score indicates that relatively little to no interruption of service or public safety threat would occur if the facility were to fail. Based on the intersection of the LoF and CoF, facilities fall within a *low-risk*, *medium-risk*, or *high-risk* zone. The zones are shown graphically in **Figure 9.1**.

Figure 9.1 – Likelihood and Consequence of Failure Score Zones



The most critical assets have both a high LoF and a high CoF, shown in the red area in the figure above**.** These represent facilities that have a high probability of failing (or have already failed) and have the most risk to the City, water users, or the public, and are therefore considered critical assets that need immediate attention. These facilities are identified by a high risk-score and are assigned the highest priority in the CIP. The next group of risk-based assets falls into the medium-risk zone. A medium-risk asset could be recommended for partial replacement and/or refurbishment in the next planning period. They are assigned a lower priority in the CIP. And finally, recommendations for low-risk assets may include continuation of current operation for the remaining service life and will be assigned the lowest priority when included in the CIP.

The scores assigned for CoF and LoF are subjective, and the basis of the scoring varies based on the facility type. The facility deficiencies may include hydraulic deficiencies, age, material reliability, and other factors that may vary for each individual facility. Each facility is discussed in detail below. Please refer to Appendix G for an in-depth review of the condition assessment.

Each of the following subsections apply the same risk-based methodology to each major asset class within the City's potable water system. The risk-based analysis described above establishes a consistent, transparent framework for prioritizing capital improvements across all major asset classes. These results were used to define the CIP project categories and candidate projects described in **Section 9.4**.

9.3.1. Storage Tank Risk Analysis

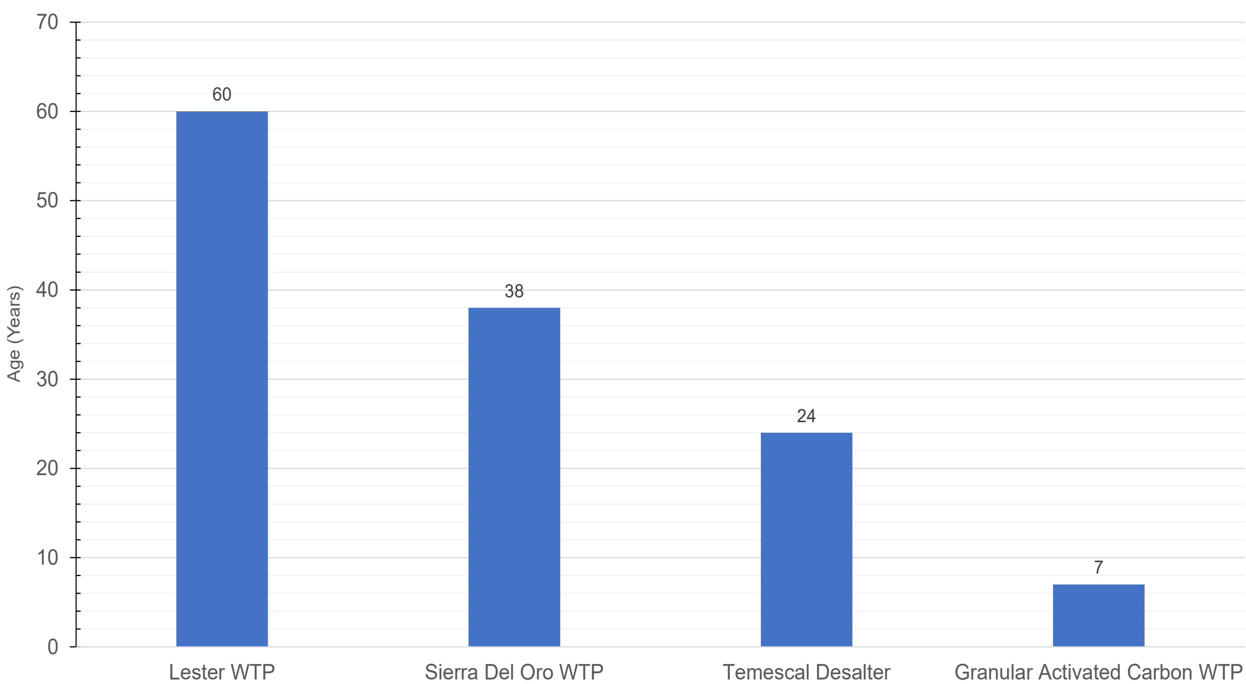
The risk analysis of the storage tanks was determined solely on the age of the facilities. These facilities should be inspected every three to five years to determine if the facility is in need of rehabilitation work or replacement. The risk analysis for the storage tanks is based on typical service life analysis.

The typical service life for a steel tank is 50 years. However, a steel tank could last longer if inspected, maintained, and periodically recoated, and if no external forces damage the tank. Concrete tanks have an expected service life of 100 years if properly inspected and maintained, and no external forces damage the tank. Unless an inspection finds damage, none of the City's concrete tanks will be considered a high risk of failure.

9.3.2. Water Treatment Plant Risk Analysis

Risk analysis for the City's Water Treatment Plants (WTPs) was based on visual inspection during a site visit on October 14, 2021 as documented in Appendix F. The treatment plants were assigned a medium priority, as none of the recommended upgrades/replacements are critical to WTP operation. While the assigned risk priority is based on observed site conditions from the 2021 inspection, **Figure 9.2** is provided for reference to present the approximate age of the City's WTPs.

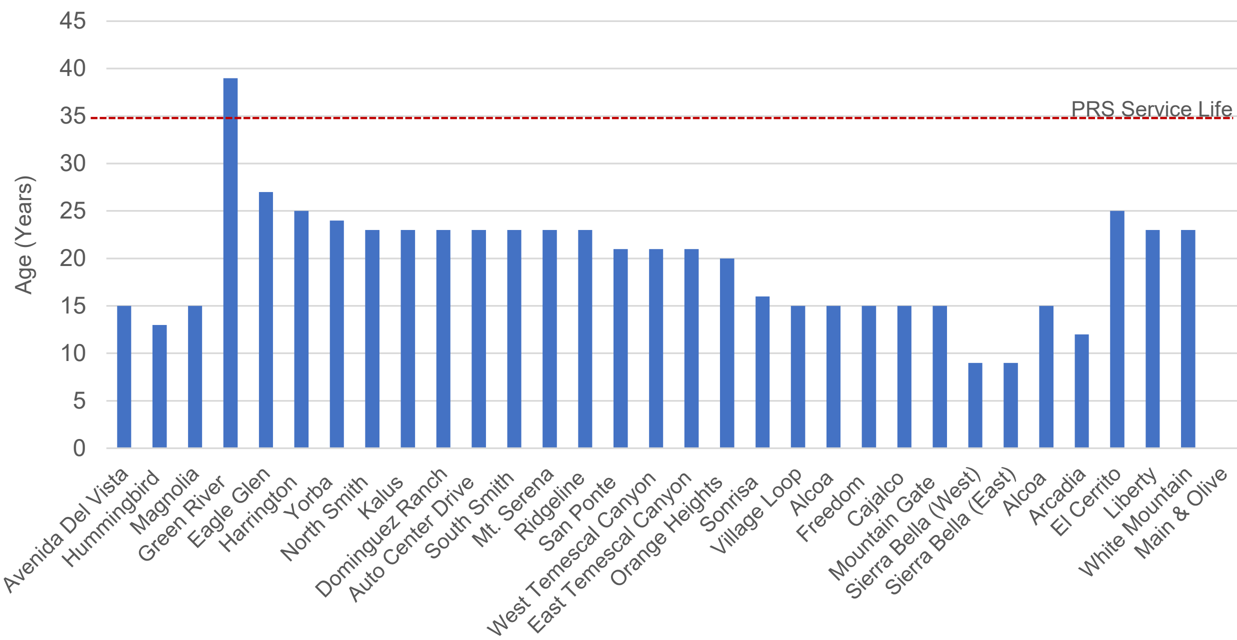
Figure 9.2 – Age of Water Treatment Plants in 2026



9.3.3. Pressure Reducing Station Risk Analysis

The risk analysis of the pressure reducing stations (PRS) was also determined solely on the age of the facilities. Typically, a pressure-reducing station will have a typical service life of 35 years. **Figure 9.3** shows the age of the City's PRS in 2026. Most of the City's PRS have 10 to 20 years remaining in their expected service life. One (1) PRS has unknown installation data. Therefore, it was assumed this station will be assigned a higher risk.

Figure 9.3 – Age of Pressure Reducing Stations in 2026

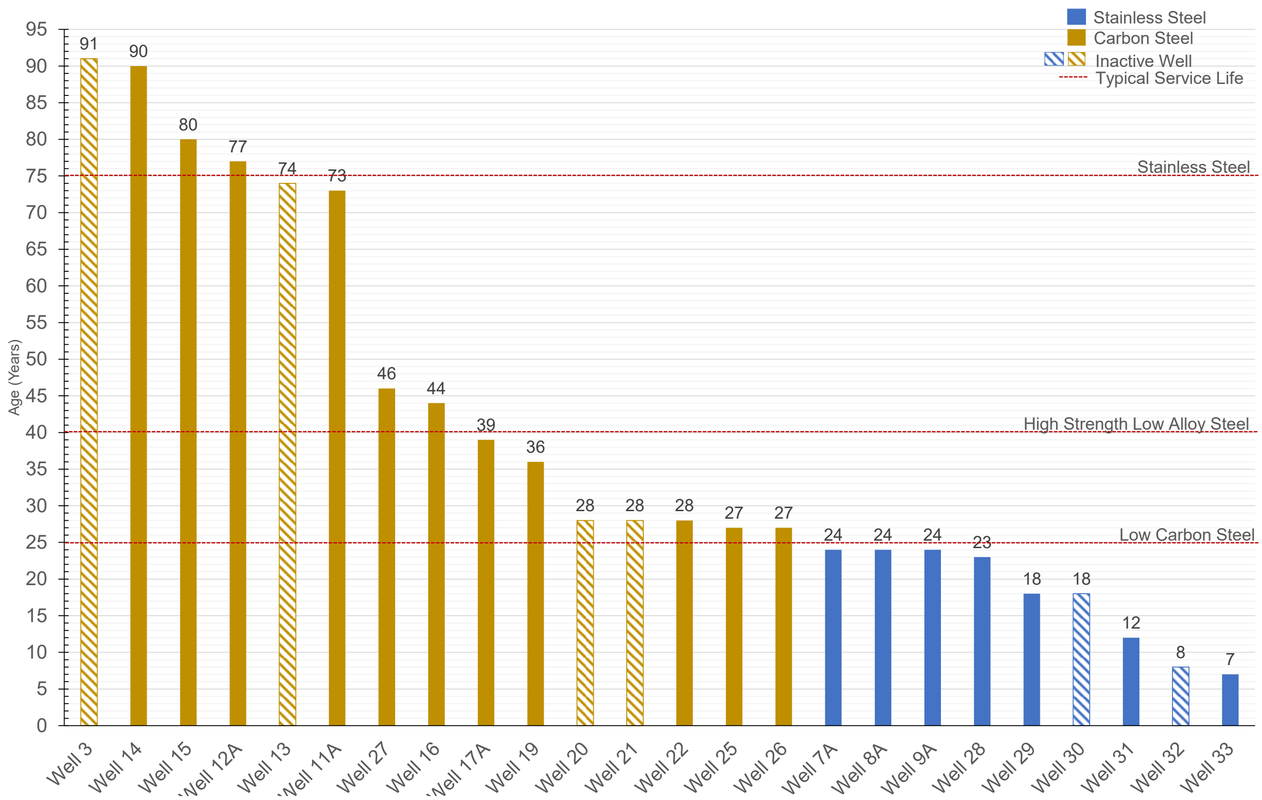


9.3.4. Groundwater Production Well Risk Analysis

The facility age and the current mechanical pumping efficiency were used to assign the LoF score to groundwater production wells. Facilities have an anticipated typical service life and are more likely to fail as they reach and exceed that anticipated typical service life. The efficiency of the City's well pumps was selected because it can generally predict the likelihood of mechanical and/or electrical equipment failures. Low efficiencies are indicative of aged and worn equipment that is more likely to fail. The pumping efficiency was determined by reviewing the SoCal Edison (SCE) efficiency tests. Pumps operating between 50% and 60% efficiency are an acceptable efficiency range but indicate that mechanical and electrical equipment may degrade and should be considered for replacement or rehabilitation. Any pumps operating below 50% efficiency require replacement of the mechanical and electrical equipment.

In addition to the electrical and mechanical equipment, the groundwater wells also consist of subsurface components of a borehole and the below grade casing. The type of casing material used typically determines the typical service life of the below grade improvements. The City used carbon steel casings until the late 1990s, and after the late 1990's used stainless steel casings. Low-carbon steel wells are expected to last 25 years, while stainless steel wells have a typical service life of 75 years. **Figure 9.4** displays a comparison of well-material and age.

Figure 9.4 – Age and Material of Wells in 2026



To calculate the LoF, a weighted average of efficiency and age was used, with efficiency accounting for 80% and age accounting for 20% of the score. Age was given a lower weighted value since the efficiency shows the active performance of the wells. However, when the City's carbon steel wells are scheduled for rehabilitation, a thorough inspection of the City's boring holes will be required to determine if the well requires redrilling or relocation. The total well production capacity was used to determine The CoF, since wells with greater capacity will affect the City's overall production capacity. The scoring used for the groundwater wells is shown in **Table 9.1.**

Table 9.1– Likelihood and Consequence of Failure Scoring for Wells

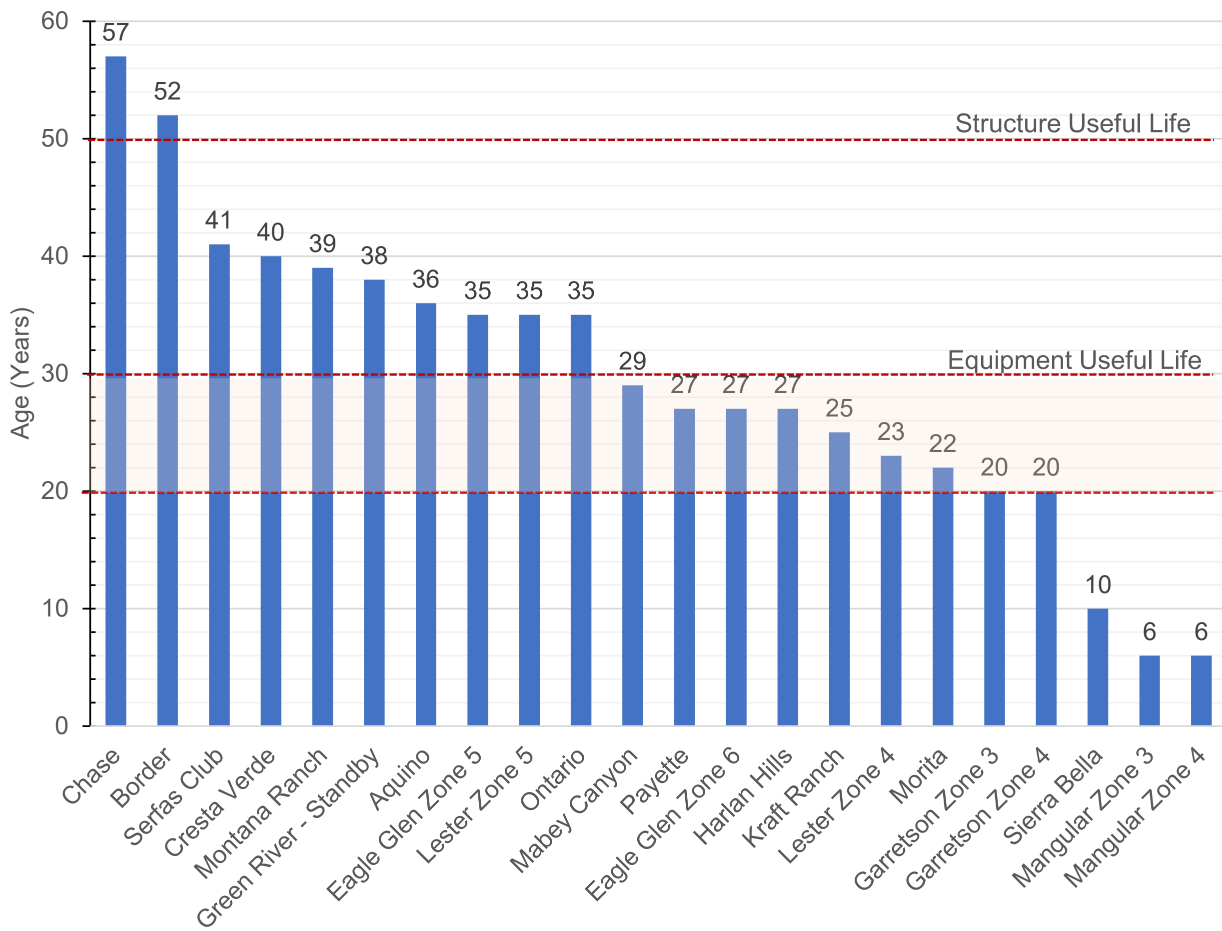
Item		1 (Low)	2 (Low-Medium)	3 (Medium)	4 (Medium-High)	5 (High)
LoF	Efficiency Range	Greater than 70%	60%-70%	50%-60%	40%-50%	Less than 40%
	Remaining Service Life Range	Greater than 30 years remaining	20-30 years remaining	10-20 years remaining	0-10 years remaining	Exceeds Service Life
CoF		Less than 250 gpm	250 gpm to 500 gpm	500 gpm to 1000 gpm	1000 gpm to 2000 gpm	Greater than 2000 gpm

9.3.5. Pump Station Risk Analysis

Similar to groundwater wells, the facility age and the current mechanical pumping efficiency were used to assign the LoF score to booster pump station facilities. To calculate the LoF, a weighted average of efficiency and age was used, with efficiency accounting for 80% and age accounting for 20% of the score.

Figure 9.5 shows the average age of each pump station and the expected service life.

Figure 9.5 – Age and Material of Pump Stations in 2026



For the LoF analysis performed for the booster pump stations, it was assumed that if there were mechanical and electrical equipment replacement performed at a given station, all booster pumps within the facility were replaced with new equipment. For this reason, the LoF analysis did not analyze individual pumps or other individual equipment for failures. The average efficiency of all the booster pumps within a pump station was used as a basis.

The capacity of the pumps was used to assign a CoF for each facility. For this risk analysis, the capacity was determined using the sum total of the pumping horsepower. The CoF was assumed to be greater for a larger total horsepower. Therefore, a facility with higher pumping horsepower was assigned a higher CoF score. The scoring used for the booster pump stations is shown in **Table 9.2.**

Table 9.2 – Likelihood and Consequence of Failure Scoring for Pumps

Item		1 (Low)	2 (Low-Medium)	3 (Medium)	4 (Medium-High)	5 (High)
LoF	Efficiency Range	Greater than 70%	60%-70%	50%-60%	40%-50%	Less than 40%
	Remaining Service Life Range	greater than 30 years remaining	20-30 years remaining	10-20 years remaining	0-10 years remaining	Exceeds Service Life
CoF		Less than 50 HP	50 HP to 75 HP	75 HP to 100 HP	100 HP to 200 HP	Greater than 200 HP

9.3.6. Pipeline Risk Analysis

The risk-analysis approach for pipelines utilized several factors for determining risk scores. The LoF score was based on the remaining service life of the pipe and also considered any hydraulic deficiencies that were predicted by the system model presented in **Section 6 and 7**.

The remaining service life was estimated based on pipe age and material type, considering the expected life of the specific material. The typical service life for pipelines can vary from 40 to 100 years, depending on the material. Approximately one third of the City's pipelines are constructed from asbestos concrete pipe (ACP) material. Asbestos concrete pipe was widely utilized in the mid-20th century and is no longer favored due to health effects from damaged asbestos pipes (associated with cutting, repair, and removal of pipe material.) Selection of specific replacement pipe materials will be determined during detailed project design.

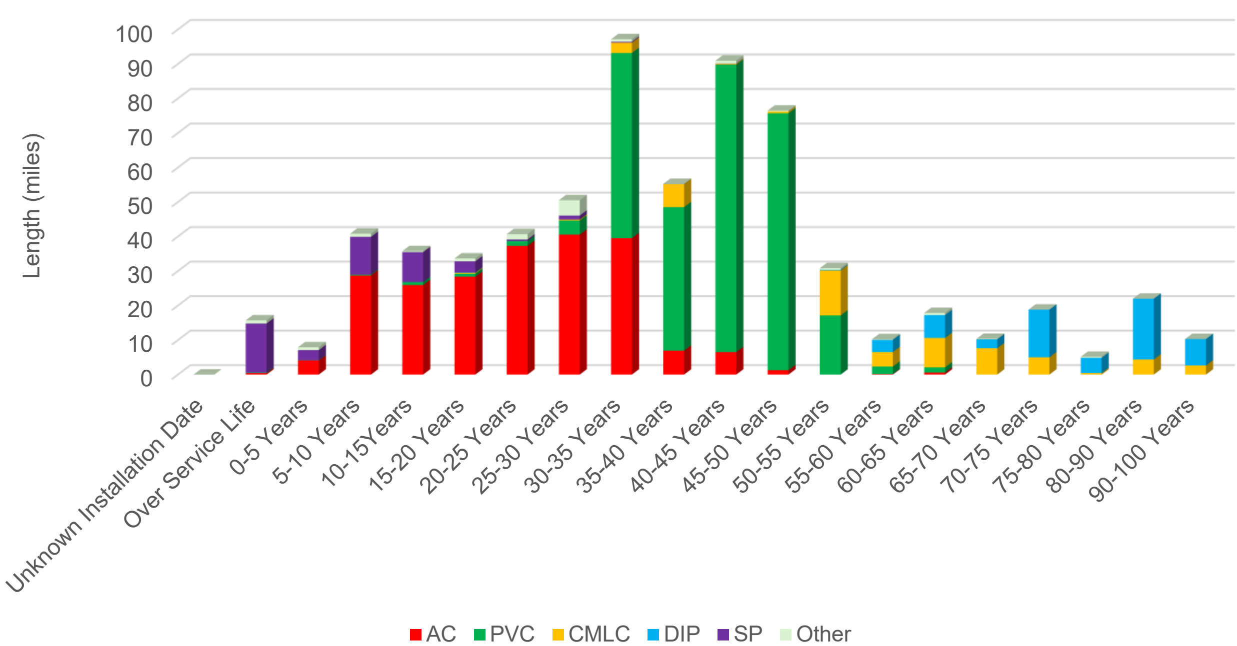
For pipelines, the remaining service life analysis considers the age and material of the pipeline to estimate the typical service life for specific pipe material. For pipelines, the end of the service life is the age when pipe material could be expected to weaken, crack, or rupture. Pipes can be utilized beyond their expected service life if they are assessed to remain intact with no leaks. It is recommended that once a pipeline reaches the end of its service life, pipeline condition be evaluated through CCTV inspection, pressure testing, and leak detection measures as identified by the City. If significant damage or degradation is found, pipeline replacement is recommended to maintain the integrity of the distribution system. The typical service life for each pipeline material within the City's distribution system is shown in **Table 9.3.**

Table 9.3 –Pipeline Typical Service Life based on 2021 GIS Data

Abv.	Material	Service Life	Length (miles)
AC	Asbestos Cement Pipe	70	219.94
CAS	Cast Iron Pipe	50	0.01
CEM	Cement Pipe	75	1.60
CIPP	Relined Pipes	100	10.43
CMLC	Cement Mortar Lined and Coated Steel Pipe	100	56.82
CML-TW	Cement Mortar Lined and Tape Wrapped Steel Pipe	75	0.73
COP	Copper Pipe	50	0.13
DIP	Ductile Iron Pipe	100	57.75
GP	Galvanized Pipe	50	0.03
PEP	Polyethylene Pipe	75	0.17
PVC	Polyvinyl Chloride Pipe	70	279.16
RCP	Reinforced Concrete Pipe	100	0.00
SP	Steel Pipe	50	40.98
		TOTAL	667.75

Figure 9.6 shows the quantity of pipeline in miles of pipeline and the remaining service life in 5-year increments. The figure also indicates the type of pipe material. As of 2026, approximately 16 miles of water pipelines have exceeded their service life, and approximately 118 miles are projected to reach the end of their service life within the next 20 years. These pipelines beyond typical service life are further discussed in **Section 9.6.1.**

Figure 9.6 – Remaining Pipe Service Life



In addition to age, the hydraulic capacity of the pipelines was also considered. If minor hydraulic issues (e.g. insufficient capacity, etc.) were identified, the pipeline was assigned a minimum score of 2. If critical hydraulic issues were identified, the pipeline was assigned a score of 5. Although a hydraulic issue does not necessarily predict a break failure, it does indicate the pipeline can jeopardize the level of service required for the City's water users.

The CoF score is based on several factors, the most predominant was the pipe classification (distribution/transmission). Transmission lines were given a higher score because a broken transmission line would have a greater effect on the City's distribution system. Another factor considered for the CoF was the expected cost of a failure. Since cost of failure is directly related to the length of the pipe, the pipe length was used as a surrogate for pipeline cost. Finally, the material of the pipe was considered, more specifically if the pipe was an AC pipeline.

Since both the LoF and CoF are based on several factors, the summation of the factors was considered to determine the LoF and CoF score. Unlike the well, and booster pumps, this causes the maximum score for each factor to rise to 13 and 10 respectively. These factors were multiplied to create a risk-based score that determined an order of priority.

Table 9.4 – Likelihood of Failure Scoring of Pipelines

Item		1	2	3	4	5
LoF	Age (Remaining Years)	Over 50	20-50	10-20	0-5	Over service life
	Model	N/A	Minor issues	N/A	N/A	Critical Issues
	Diameter (in)	N/A	N/A	Less Than 8-in	N/A	N/A
CoF	Pipeline Type	Distribution	N/A	Transmission	N/A	N/A
	Length (Miles)	Less than 0.1	0.1 to 0.25	0.25 to 0.50	0.5 to 1.0	Over 1.0
	Material	N/A	ACP	N/A	N/A	N/A

9.4. Basis of Planning Level Cost Opinions

The opinion of probable costs (cost opinion) for each project serves to establish an order of magnitude cost for each Recommended Improvement. The cost opinion utilizes estimated construction opinion and assigns percentage of the estimated construction opinion to estimate other factors. **Table 9.5** shows the cost opinion elements of the water system improvements. In subsequent cost opinion tables for specific Recommended Improvements, values are rounded to the nearest $1,000 increment.

Table 9.5 – Summary of Elements Used to Estimate Recommended Improvement Costs

	Pipelines	WTPs	Tanks	Wells	Booster Pump Stations	Pressure Reducing Stations
Estimated Construction Opinion						
Planning	5%	5%	5%	5%	5%	5%
Design	10%	10%	10%	10%	10%	10%
Construction Management, Inspection, and Materials Testing	15%	15%	15%	15%	15%	15%
Contingency	25%	25%	25%	25%	25%	25%
City Administrative and Legal Costs	5%	5%	5%	5%	5%	5%

- **Planning and Design.** Planning will account for 5% of the estimated construction opinion, and design will account for 10% of the estimated construction opinion.
- **Construction Management, Inspection, and Materials Testing.** Construction management, inspection, and materials testing will account for 15% of the estimated construction opinion.
- **Construction Contingency.** Many of the Recommended Improvements will be the replacement or rehabilitation of existing equipment which tends to be more complex than new construction on previously undeveloped areas, thus contingency will account for 25% of the estimated construction opinion.
- **City Administrative and Legal Costs.** Legal and administrative costs will account for 5% the estimated construction opinion.
- **Property Acquisition.** Generally, the identified improvement projects occur at existing water system infrastructure and are located within City right-of-way (ROW); therefore, generally no property acquisition is expected. If an identified project is planned outside of the City’s ROW, property acquisition costs must be identified on a project-by-project basis.

9.5. Construction Opinion Assumptions

All cost opinions and construction cost opinions are shown in 2026 dollar values, and costs should be escalated to reflect inflation to the CIP budget year when the Recommended Improvement is adopted into the CIP.

9.5.1. Pipeline Cost Opinion

Pipeline installation costs opinions were generated using recent contract award values for water distribution main replacement costs within Riverside County. The costs are based on parallel replacement of a water mains, and including appurtenances, maintenance of services, traffic control, and other typical requirements for the construction of a complete water main replacement project. Extensive repaving is not included; with the assumption the replacements will be coordinated by the City with the pavement replacement program. Economies of Scale are present in pipeline construction projects, and projects with less than 1,000 linear feet will have escalating unit costs.

Table 9.6 – Basis for Pipeline Construction Cost Opinion

Item	Unit	2026 Cost
8-inch pipeline	Per Linear Foot	$390
12-inch pipeline	Per Linear Foot	$420
16 to 24-inch pipeline	Per Linear Foot	$480
>24-inch pipeline	Per Linear Foot	$520
12-inch PRV	Per valve	$70,000
Connection to New Meter	Per Meter	$3,500
Connection to Existing Meter	Per Meter	$5,000

9.5.2. Facilities Cost Opinion

An order of magnitude construction cost opinion for water facilities, water system infrastructure other than pipelines, is considered to be a Class 5 Construction Cost Opinion as defined by the Association for the Advancement of Cost Engineering (AACE International) Recommended Practice No. 18R-97. The construction cost opinion makes use of quantity estimates; industry cost estimating tables; vendor, supplier, or manufacturer quotations; actual construction costs of past projects; and recent contract bid award data in the development of the cost opinion.

Table 9.7 – Basis for Facilities and Infrastructure Construction Cost Opinion

Water Infrastructure	Conditions	2026 Cost Opinion
Well	Newly drilled well, 300 ft deep Equipment for new well	$3.0 million $1.0 million
Tank	New 2.5 MG pre-stressed concrete tank Recoating welded steel tank	$11.5 million $600,000/per MG
Booster Pump Station	Construction of new booster pump station Rehabilitation of existing booster pump station	~$4 million $75k - $2.0 million
Pressure Reducing Stations	Pressure reducing station rehabilitation	$120,000
Flow Control Valves	New flow control station	$1.0-$1.5 million

Table 9.8 defines the various cost opinion classes defined by AACE International.

Table 9.8 - Summary of Construction Cost Classes

COST OPINION	Primary Characteristic	Secondary Characteristic			
	Level of Project Definition Expressed as % of Complete Definition	End Usage	Methodology	Expected Accuracy Range	Preparation Effort
	Expressed as % of Complete Definition	Typical Purpose of Cost Opinion	Typical Estimating Method	Typical Variation in Low and High ranges (a)	Typical Degree of effort relative To Least Cost Index of 1(b)
Class 5	0% to 2%	Concept Screening	Capacity Factored. Parametric Models. Judgment or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Model	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/ Tender	Detailed Unit Cost with Forced Detailed Take- Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100

(a) The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

(b) If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the Project and the quality of estimating data and tools.

9.6. W1: Water Distribution System Improvements

Category W1 includes Recommended Improvements identified for the water pipelines.

Basis for Improvements. The City has approximately 675 miles of pipelines, over 45,000 meters, and numerous blowoff valves, air relief valves, and backflow prevention valves. Water distribution system infrastructure naturally deteriorates over time due to age, material fatigue, corrosion, and operational stress. As components age, the risk of leaks, failures, and service disruptions increases, which can compromise system reliability and water quality.

- Pipelines need to be replaced when the pipeline does not meet the level of service required by City standards outlined in **Section 5**, specifically undersized pipelines, or when pipelines reach the end of their service life. Associated valves should be replaced when pipelines are replaced.
- Maintaining functional water meters promotes reliable and accurate water usage data.

The W1 Recommended Improvements are:

- Systematic Water Distribution System Replacement Considering Identified Deficiencies
- Water Meter Replacements (AMI Meter Replacements **(Existing CIP)** and Systematic Meter Replacement Program)
- SCADA Improvements

9.6.1. W1-1: Systematic Water Pipeline Replacement Considering Identified Deficiencies

Location: Various locations
Cost Opinion (2026): See **Table 9.10**
Priority: Low to Medium

Overview: Since pipeline infrastructure continues to age and deteriorate over time, systematic pipeline replacement must be a continuous and ongoing process to maintain system reliability and to meet current and future water demands. The ongoing process requires prioritization, planning, and construction. In addition to systematic replacement, the water system also contains known hydraulic deficiencies and known pipe diameter deficiencies (specifically pipelines less than 8-inches in diameter).

To implement systematic water pipeline replacement, the City could consider replacing a percentage of pipeline each year. There are various factors that the City can consider when determining how to prioritize its pipeline replacement. Some factors include:

- Known hydraulic deficiencies (identified in **Sections 6 and 7**, **Table 9.9**, and Appendix K).
- Size-deficient pipes (areas of concern documented in **Section 2.7.7** and Appendix L).
- Typical service life of pipeline (considering pipe material and age of pipeline and documented in Appendix L).
- Scheduled projects in the vicinity including street paving or pavement maintenance and other utility projects.
- Break history, regardless of material and age.

Generally, prioritizing pipeline replacement involves evaluating multiple factors- individually and in combination- to determine the most effective sequence of projects. For instance, older asbestos cement pipeline, which have shown an increasing number of breaks, may be elevated in priority. Additionally, when a street overlaying an aging asbestos cement pipeline is scheduled for pavement rehabilitation, the timing of that pavement project may guide the scheduling of the corresponding pipeline replacement to minimize repeated disturbance and traffic interruptions and to minimize the risk of vibrations resulting from construction equipment.

W1-1 summarizes the following information to assist the City with its pipeline prioritization.

- **Hydraulically Deficient Pipes- Sections 6 and 7** summarize hydraulic deficiencies identified by the hydraulic model based on high velocities, low pressures, inadequate fire flows, and high velocities during fire flows. **Table 9.9** groups all hydraulic deficiencies identified by the hydraulic model into Recommended Improvement projects by pressure zone, and Appendix K includes cut sheets of projects identified in **Table 9.9.**
- **Size-Deficient Pipes-** Appendix L includes figures and tables identifying size-deficient pipes (pipelines less than 8-inches in diameter that do not meet the City's minimum distribution main size criteria discussed in **Section 5.2.6.4**). These pipelines were identified based on system design standards in the City Department of Water and Power (DWP) Design Policy (Nov 2012), Section B.6, independent of hydraulic modeling results. The identified pipelines include dead-end mains

less than 8-inches that serve hydrants and are therefore expected to meet the minimum 8-inch main size criteria.

- The size-deficient pipes included in Appendix L are recommended for upsizing to 8-inches.
- The City's DWP Design Policy (Nov 2012), Section B.6 requires 12-inch diameter minimum pipeline size under specific scenarios associated with commercial, industrial, and multifamily projects and where fire flows are greater than 1,500 gpm, but the Design Policy also allows for approval of exceptions to the minimum pipeline size for looped conditions which do not exceed maximum velocity (under fire flow and max day flow scenarios). Because replacing all size-deficient pipelines represents a substantial capital investment that is unlikely to be completed system-wide during the planning period—and because the interconnected distribution system generally meets City criteria aside from the hydraulically-deficient pipes identified in **Table 9.9** and Appendix K — final pipe sizing should be confirmed during project development. Actual system conditions, development patterns, land use, and fire-flow needs at the time of project planning may differ from conditions identified in this Master Plan, and pipe sizing should reflect those project-specific requirements.

- **Pipelines Beyond Typical Service Life-** Appendix L includes figures and tables identifying pipelines beyond typical service life (pipelines that have exceeded their typical service life or will exceed their typical service life by the end of the planning period, 2040). **Table 9.3** summarizes typical services life based on the pipeline material and age of the pipeline and can help the City understand remaining service life.

Extensive tables detailing size-deficient pipes and pipelines beyond their typical service life are included in Appendix L, and the Estimated Construction Opinion and 2026 Cost Opinion are summarized by pressure zone in **Table 9.10**.

Reference-Only (Not Recommended for Improvement): Dead-End Pipelines (Non-deficient)

Dead-end pipelines less than 8-inches in diameter are not always characterized as size-deficient. Specifically, Appendix M summarizes pipelines less than 8 -inches in diameter that extend past the last fire hydrant on a main and primarily serve residential connections. These dead-end mains function as service extensions and are not recommended for upsizing improvements. These dead-end pipelines (non-deficient) and are provided for reference only; they are not included in **Table 9.10** or as Recommended Improvements.

Table 9.9 –Hydraulically Deficient Pipes

Zone	Project No.	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Deficiency	Priority	Pavement Rehab Zone	Estimated Construction Opinion	Comments
725	725-1	(10") 12"	Green River Road at Dominguez Ranch	290	Fire Velocity > 12 fps	Existing System	Low	9	$609,000	Industrial fire flow of 3,500 gpm required. Max Flow available existing is 2,925 gpm.
905	905-1	(12") 16"	Smith Ave between Sherman Ave and Border Ave connection to existing 24" main	622	Velocity > 5 fps *(Ultimate 5.5 - 6.9 fps)*	Future System	Low	5	$448,000	Transmission main, marginally above criteria at ultimate buildout
	905-2	(12") 14"	Radio Rd south of Quarry St	233	Velocity > 5 fps *(Ultimate 5.1 fps)*	Future System	Low	7	$147,000	Transmission main, marginally above criteria at ultimate buildout
	905-3	(12") 14"	6th Ave between Radio Rd and Compton Ave	1,052	Velocity > 5 fps *(Ultimate 6.1 fps)*	Future System	Low	7	$443,000	Transmission main, marginally above criteria at ultimate buildout
	905-4	(12") 16"	Small segment in Railroad St east of Alcoa Cir	21	Velocity > 5 fps *(Ultimate 5.8 fps)*	Future System	Low	4	$51,000	Small reduced diameter section of pipe
					Fire Velocity > 12 fps	Existing System				
		(10") 16"	Alcoa Cir north of Railroad up to Alcoa PRS	1,025	Velocity > 5 fps *(Ultimate 12.0 fps)*	Future System	Low		$431,000	Major feed to Alcoa PRS, but flow could be offset by other stations to limit velocity.
					Fire Velocity > 12 fps	Existing System				
(Sub zone) 780	780-1	(10") 16"	Alcoa Cir north of PRS to Rincon St	1,094	Velocity > 5 fps *(Ultimate 12.0 fps)*	Future System	Low	4	$526,000	Major feed from Alcoa PRS, but flow could be offset by other stations to limit velocity.
		(10") 12"	Segment in Rincon St west of Alcoa Cir	14	Velocity > 5 fps *(Ultimate 6.9 fps)*	Future System	Low		$30,000	Small reduced diameter section of pipe
1060	1060-1	(14") 16"	Border Ave between Ontario Ave and Carolwood Dr	994	Velocity > 5 fps *(Ultimate 5.6 fps)*	Existing System	Low	5	$478,000	Transmission main, marginally above criteria at ultimate buildout
	1060-2	(8") 10"	Kroonen Dr between Newton Ln and Peeler St	380	Velocity > 5 fps *(Ultimate 5.3 fps)*	Future System	Low		$223,000	Distribution main, marginally above criteria at ultimate buildout

Table 9.9 –Hydraulically Deficient Pipes

Zone	Project No.	(Existing Diameter) Proposed Diameter	Location	Length (LF)	Hydraulic Deficiency	Deficiency	Priority	Pavement Rehab Zone	Estimated Construction Opinion	Comments
1220	1220-1	(12") 16"	I-15 crossing between Bedford Canyon Road and Tuscany St	1,644	Velocity > 5 fps *(Ultimate 6.1 - 8.6 fps)*	Future System	Low	10	$2,368,000	This is a major freeway crossing
	1220-2	(6") 12" [1]	400' South of Magnolia Ave and S Main Street	380	Fire Velocity > 12 fps	Existing System	Med	10	$160,000	Industrial fire flow of 3,500 gpm required. Max Flow available existing is 2,300 gpm.
	1220-3	(6") 8"	Grandview St between Consul Ave and Diplomat Ave	380	Fire Velocity > 12 fps	Existing System	Med	2	$149,000	Single family residential fire flow 1,500 gpm required. Max Flow available existing is 1,050 gpm.
1380	1380-1	(16") 20"	Upper Dr from Orange Crest St to Peregrin Dr	938	Velocity > 5 fps *(Ultimate 6.8 fps)*	Future System	Med	6	$451,000	Transmission main, marginally above criteria at ultimate buildout

[1] Based on the existing system hydraulic model, Project 1220-2 proposed diameter would be 8" to achieve fire flow criteria of <12 fps velocity. However, City Department of Water and Power (DWP) Design Policy (Nov. 2012) B.6 requires 12" diameter for industrial projects and where fire flows are greater than 1,500 gpm.

Table 9.10 – Systematic Water Pipeline Replacements 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Zone 725 (Zone 1)							
Project 725-1	$609,000	$30,450	$60,900	$91,350	$152,250	$30,450	**$974,000**
Size Deficient (4.0 to Under 8-in Diameter)	$1,345,000	$67,250	$134,500	$201,750	$336,250	$67,250	**$2,152,000**
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	$2,132,000	$106,600	$213,200	$319,800	$533,000	$106,600	**$3,411,000**
Zone 905 (Zone 2)							
Project 905-1	$448,000	$22,400	$44,800	$67,200	$112,000	$22,400	**$717,000**
Project 905-2	$147,000	$7,350	$14,700	$22,050	$36,750	$7,350	**$235,000**
Project 905-3	$443,000	$22,150	$44,300	$66,450	$110,750	$22,150	**$709,000**
Project 905-4	$482,000	$24,100	$48,200	$72,300	$120,500	$24,100	**$771,000**
Size Deficient (4.0 to Under 8-in Diameter)	$65,118,000	$3,255,900	$6,511,800	$9,767,700	$16,279,500	$3,255,900	**$104,189,000**
Size Deficient (Under 4-in Diameter)	$8,059,400	$402,970	$805,940	$1,208,910	$2,014,850	$402,970	**$12,895,000**
Pipelines Beyond Typical Service Life	$58,008,000	$2,900,400	$5,800,800	$8,701,200	$14,502,000	$2,900,400	**$92,813,000**
Zone 905: Subzone 780							
Project 780-1	$556,000	$27,800	$55,600	$83,400	$139,000	$27,800	**$890,000**
Subzone 780- Size Deficient (4.0 to Under 8-in Diameter)	$8,992,000	$449,600	$899,200	$1,348,800	$2,248,000	$449,600	**$14,387,000**
Pipelines Beyond Typical Service Life	$3,901,000	$195,050	$390,100	$585,150	$975,250	$195,050	**$6,242,000**
Zone 1020							
Size Deficient (4.0 to Under 8-in Diameter)	$1,613,000	$80,650	$161,300	$241,950	$403,250	$80,650	**$2,581,000**
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	$12,541,000	$627,050	$1,254,100	$1,881,150	$3,135,250	$627,050	**$20,066,000**
Zone 1060 (Zone 3)							
Project 1060-1	$478,000	$23,900	$47,800	$71,700	$119,500	$23,900	**$765,000**
Project 1060-2	$223,000	$11,150	$22,300	$33,450	$55,750	$11,150	**$357,000**
Size Deficient (4.0 to Under 8-in Diameter)	$63,812,000	$3,190,600	$6,381,200	$9,571,800	$15,953,000	$3,190,600	**$102,099,000**
Size Deficient (Under 4-in Diameter)	$650,000	$32,500	$65,000	$97,500	$162,500	$32,500	**$1,040,000**
Pipelines Beyond Typical Service Life	$26,352,000	$1,317,600	$2,635,200	$3,952,800	$6,588,000	$1,317,600	**$42,163,000**

Table 9.10 – Systematic Water Pipeline Replacements 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Zone 1060: Subzone 920							
Subzone 920- Size Deficient (4.0 to Under 8-in Diameter)	$119,000	$5,950	$11,900	$17,850	$29,750	$5,950	**$190,000**
Pipelines Beyond Typical Service Life	$1,233,000	$61,650	$123,300	$184,950	$308,250	$61,650	**$1,973,000**
Zone 1136							
Size Deficient (4.0 to Under 8-in Diameter)	$1,206,000	$60,300	$120,600	$180,900	$301,500	$60,300	**$1,930,000**
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	None						
Zone 1220 (Zone 4)							
Project 1220-1	$2,368,000	$118,400	$236,800	$355,200	$592,000	$118,400	**$3,789,000**
Project 1220-2	$149,000	$7,450	$14,900	$22,350	$37,250	$7,450	**$238,000**
Project 1220-3	$160,000	$8,000	$16,000	$24,000	$40,000	$8,000	**$256,000**
Size Deficient (4.0 to Under 8-in Diameter)	$33,677,000	$1,683,850	$3,367,700	$5,051,550	$8,419,250	$1,683,850	**$53,883,000**
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	$15,735,000	$786,750	$1,573,500	$2,360,250	$3,933,750	$786,750	**$25,176,000**
Zone 1220: Subzone 1045							
Subzone 1045- Size Deficient (4.0 to Under 8-in Diameter)	$276,000	$13,800	$27,600	$41,400	$69,000	$13,800	**$442,000**
Subzone 1045- Size Deficient (Under 4-in Diameter)	None						
Zone 1320							
Size Deficient (4.0 to Under 8-in Diameter)	None						
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	None						
Zone 1380 (Zone 5)							
Project 1380-1	$451,000	$22,550	$45,100	$67,650	$112,750	$22,550	**$722,000**
Size Deficient (4.0 to Under 8-in Diameter)	None						
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	None						

Table 9.10 – Systematic Water Pipeline Replacements 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Zone 1640 (Zone 6)							
Size Deficient (4.0 to Under 8-in Diameter)	None						
Size Deficient (Under 4-in Diameter)	None						
Pipelines Beyond Typical Service Life	None						

9.6.2. W1-2: Water Meter Replacements

Water Meter Replacement within the Master Plan planning period (2026 to 2040) includes both the City's ongoing Advanced Metering Infrastructure (AMI) Project and Systematic Meter Replacement. Both the AMI and Annual Systematic Meter Replacement are discussed in W1-2.

Location: Throughout City

AMI Project (Existing CIP)	**Total Project Cost:** $22,500,000 (City funded: $20,500,000|Grant funded: $2,000,000) **Schedule:** March 19, 2025 to March 31, 2027
Systematic Meter Replacement	**Total Project Cost:** See **Table 9.13**

Priority: Medium

Overview: The AMI Project is currently underway to retrofit or replace meters throughout the City between March 2025 and March 2027. A total of 47,573 meters will be upgraded, of which 25,112 will be replaced and 22,461 will be retrofitted. In the AMI Project, older meter bodies are fully replaced, while meter bodies less than eight years old are retrofitted with AMI communication modules. The AMI project is expected to be completed by March 2027 and represents a one-time, accelerated system upgrade. **Table 9.11** summarizes the AMI Project based on June 2025 data provided by the City.

Table 9.11 – AMI Project Summary

Meter Size	Number of Meters	
	Replacement	Retrofit
5/8"	4,656	2,237
3/4"	14,222	14,794
1"	4,305	3,557
1-1/2"	735	754
2"	1,089	1,027
3"	34	52
4"	17	26
6"	18	12
8"	36	-
10"	-	2
Total	**25,112**	**22,461**
	47,573	

While AMI Project modernizes meter communications, it does not eliminate the need for systematic meter replacement. Following completion of AMI Project, the City plans to resume a long-term systematic meter replacement program, initially prioritizing retrofitted meter bodies once they exceed 10 years of age. Given the anticipated 10-to-15-year service life of water meters, replacing a portion of the system annually is necessary to maintain system reliability.

Table 9.12 shows the sizes and number of meters retrofitted during the AMI Project. Assuming all meters retrofitted during the AMI Project will be replaced prior to the end of the planning period (2040), 22,461 meters would need to be replaced. The estimated cost per meter is based on 2026 dollars and does not include cost escalation for installing in future years. These estimated meter costs should not be compared against the City's current service fee schedule for new service connections.

Table 9.12 – Water Meter Count and Estimated Cost to Replace

Meter Size	Number of Meters	Estimated Cost Per Meter (2026)
5/8"	2,237	$660
3/4"	14,794	$720
1"	3,557	$830
1-1/2"	754	$1,960
2"	1,027	$2,300
3"	52	$830
4"	26	$830
6"	12	$830
8"	-	$830
10"	2	$950
Total	**22,461**	

Table 9.13 shows AMI Project and Systematic Meter Replacement 2026 Cost Opinion. Rounded total for systematic meter replacement assumes all 22,461 meters are replaced during the planning period but presents 2026 dollar value.

Table 9.13 – Systematic Meter Replacement 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
AMI Project **(Existing CIP)**							**$22,500,000**
Meter Replacement	$19,000,000	$950,000	$1,900,000	$2,850,000	$4,750,000	$950,000	**$30,400,000**

9.6.3. W1-3: SCADA Improvements

Location: Throughout City
Cost Opinion (2026): Not Applicable

Overview: SCADA systems are expected to need upgrades and improvements every 15-20 years. The City's current SCADA system has recently been upgraded and is not expected to need improvements until 2038 or later.

Operational Considerations:
The City provided the SCADA operations upgrades included in **Table 9.14;** however, the estimated construction opinion is not included in the Recommended Improvements cost opinion summary since these are operational and maintenance improvements and not Recommended Improvements.

Table 9.14 – City Provided SCADA Operations Improvements

Improvement	Estimated Construction Opinion
1. ADV WST	$82,500
2. Aquino BS	$93,500
3. Cresta Verde BS	$93,500
4. Temescal Desalter Treatment Plant	$550,000
5. EG Zone 6 BS	$93,500
6. EG WST	$82,500
7. Garretson Blend Station	$121,000
8. Gilbert Potable WST	$82,500
9. Glen Ivy WST	NA- Inactive
10. Green River Comms	$82,500
11. Harlan Hill BS	$93,500
12. Hayden WST	$82,500
13. Home Gardens WST	$82,500
14. Kraft Ranch BS	$93,500
15. Lester Zone 4 BS	$93,500
16. Lester Zone 5 BS	$93,500
17. Mabey Canyon BS	$93,500
18. Main St WST	$82,500
19. Montana Ranch BS	$93,500
20. Mountain Gate FCS	$82,500
21. Serfas Club BS	$82,500
22. Yuma WST	$82,500
23. Well 3 – Glen Ivy	$110,000
24. Well 8	$110,000
25. Well 13	NA- Inactive
26. Well 14	$110,000
27. Well 15 $110,000.00	$110,000
28. Well 20 – Glen Ivy	$110,000
29. Well 21 – Glen Ivy	$110,000
30. Well 27 – Out of service	NA- Inactive

9.7. W2 Water Treatment Plant Improvements

Category W2 includes Recommended Improvements identified for the water treatment plants (WTPs).

Basis for Improvements. A site visit of each WTP was conducted in October 2021 and documented in Appendix F. The Recommended Improvements in category W2 come from the October 2021 site visit and subsequent conditions assessment.

The W2 Recommended Improvements are:

- Temescal Desalter WTP Improvements
  - Replacement of Programmable Logic Control (PLC) and Control Logic
- Lester WTP Improvements
  - Blending Facility Relocation of Chlorine Injection
  - Surge Basin Upgrades
- Sierra Del Oro WTP Improvements
  - Sedimentation Basin Shade Cover **(Existing CIP)**
- Glen Ivy Well Treatment Improvements
  - Process Improvements

9.7.1. W2-1: Temescal Desalter Water Treatment Plant Improvements

Location: 745 Corporation Yard Way

Cost Opinion (2026): Not Applicable

Priority: Medium

Overview: No Recommended Improvements are identified for the Temescal Desalter.

Maintenance (not included):

- As documented in W1-3: SCADA Improvements, a PLC Replacement for the Temescal Desalter WTP is planned maintenance (**Table 9.14** – Line 4).
- Reverse Osmosis (RO) membranes are recommended for replacement approximately every five years. Because the City considers RO Membrane Replacements as maintenance costs, they are not listed in the City's CIP.

9.7.2. W2-2: Lester Water Treatment Plant Improvements

Location: 2970 Rimpau Ave
Cost Opinion (2026): $5,520,000
Priority: Medium
Overview:

- Surge Basin Upgrades: The existing surge basin is insufficient, and a larger surge basin is needed. This would also include replacing the existing effluent pumps with new VFD-driven vertical turbines or submersible pumps.

Table 9.15 –Lester WTP Improvements 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Surge Basin Upgrades	$3,450,000	$172,500	$345,000	$517,500	$862,500	$172,500	**$5,520,000**

Maintenance (not included in Table 9.15):

- W1-3: SCADA Improvements documents SCADA improvements applicable to the Lester.

9.7.3. W2-3: Sierra Del Oro Water Treatment Plant Improvements (Existing CIP)

Location: 2940 Wilderness Circle

Cost Opinion (2026): $1,840,000

Priority: Medium

Overview: The preliminary field analysis to the Sierra Del Oro WTP revealed a few improvements necessary to maintain the treatment plant's reliability. These include the following:

- Sedimentation Basin Shade Cover: The sedimentation basin needs a shade cover to prevent UV degradation of chlorine residual within the basin.

Table 9.16 –Sierra Del Oro WTP Improvements 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Sedimentation Basin Shade Cover **(Existing CIP)**	$1,150,000	$57,500	$115,000	$172,500	$287,500	$57,500	**$1,840,000**

9.7.4. W2-4: Glen Ivy Well Treatment Improvements

Location: 3745 Temescal Canyon Road

Cost Opinion (2026): $6,373,000

Priority: Medium

Overview: Due to water quality issues, the Glen Ivy wells in Pressure Zone 1136 that serve the Glen Ivy tank and the future Glen Ivy Well Treatment are offline. Design of the Glen Ivy Well Treatment Improvements, including cartridge filters, disinfection by CT, and subsequent chloramination, has been completed. This project will result in the installation of the disinfection equipment and construction of related improvements. When construction of the Glen Ivy Well Treatment improvements is complete, the Glen Ivy wells can be brought back online.

The Glen Ivy Well Treatment Improvements have been designed. The City provided the estimated construction opinion.

Table 9.17 –Glen Ivy Well Treatment Improvements 2026 Cost Opinion

Improvement	Planning	Design	Construction Management	Contingency (10%)	Legal/ Administration	Engineer's Estimate (2026)
Disinfection System Improvements	Complete	Complete	Unspecified	$637,300	Unspecified	**$6,373,000**

9.8. W3 Storage Tank Improvements

Category W3 includes Recommended Improvements identified for the storage tanks.

Basis for Improvements. The City has both welded steel and concrete storage tanks. As discussed in **Section 2.7.4**, welded steel tanks have a typical service life of 50 years, and concrete tanks have a typical service life of 100 years. There are plans to construct new tanks to serve areas scheduled for development.

- Based on installation year of each concrete tank, no concrete tanks are expected to exceed their anticipated service life by 2040.
- Based on the installation year of each welded steel tank, 4 of the 5 welded steel tanks are expected to exceed their anticipated service life by 2040. However, regular recoating can extend the service life of these tanks. Therefore, the Recommended Improvement is the recoating of welded steel tanks at 20-year intervals.

Routine inspection, cleaning, and recoating can prolong the service life of tanks and should be prioritized as part of a maintenance budget. The welded steel tanks require complete recoating every 20 years to prevent corrosion, protect water quality, and prolong tank service life. Every 5 years, the welded steel tanks should be dewatered, inspected, and repair any minor coating defects. The City could schedule rehabilitation, assuming one tank per year.

Concrete tanks typically do not require the same level of maintenance as is required for the welded steel tanks; however, periodic inspection and scheduling necessary repairs can prolong the service life of concrete tanks.

The W3 Recommended Improvements are:

- Welded Steel Storage Tank Recoating
- Pressure Zone 1380 Improvements

9.8.1. W3-1: Welded Steel Storage Tank Recoating

Location: Hayden Tank, Avenida Del Vista Tank, Green River Tank, Eagle Glen Tank

Cost Opinion (2026): $7,410,000

Priority: High

Overview: Four (4) welded steel tanks are scheduled to reach the end of their anticipated service life before 2040; however, recoating every 20-years is likely to extend the service life of a welded steel tank. Recoating is recommended for four of the five welded steel tanks, which are listed in **Table 9.18**.

Table 9.18 –Storage Tank Recoating 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Hayden	$1,104,000	$55,200	$110,400	$165,600	$276,000	$55,200	**$1,770,000**
Avenida Del Vista	$1,104,000	$55,200	$110,400	$165,600	$276,000	$55,200	**$1,770,000**
Green River	$1,035,000	$51,750	$103,500	$155,250	$258,750	$51,750	**$1,660,000**
Eagle Glen	$1,380,000	$69,000	$138,000	$207,000	$345,000	$69,000	**$2,210,000**
Total	**$4,623,000**	**$231,150**	**$462,300**	**$693,450**	**$1,155,750**	**$231,150**	**$7,410,000**

Table 9.19 – Welded Steel Storage Tank Potential End of Service Life

Tank Name	Volume (MG)	Installation Year	Potential End of Service Life Year
Hayden	1.6	1970	2020
Glen Ivy (Taken out of service and scheduled for demolition)	0.5	1977	2027
Avenida Del Vista	1.6	1977	2027
Green River	1.5	1984	2034

Maintenance (not included in Table 9.18):

Recoating does not account for necessary tank repairs identified during maintenance inspections. It is recommended that the City plan for routine inspection of all storage tanks and determine if additional upgrades are required to meet current seismic design and AWWA standards and CalOSHA requirements.

9.8.2. W3-2: Pressure Zone 1380 Improvements

Location: South of Foothill Parkway

Cost Opinion (2026): $31,240,000

Priority: Medium

Overview: The Pressure Zone 1380 Improvement will require the construction of a potable water tank, booster pump station, and associated pipelines to service the new developments in Pressure Zone 1380 located south of the Foothill Parkway. The improvements will include a 2.5 MG capacity pre-stressed tank, distribution pipelines and the booster pump station. W3-2 is expected to be phased with design and construction occurring over multiple years. Although this project is identified as a Recommended Improvement, it is anticipated that this will be provided in full or in part by the future developer and may not be included as part of the City's Capital Improvement Plan.

Table 9.20 – Pressure Zone 1380 New BPS and Pipeline 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
New Storage Tank (Zone 1380)	$11,500,000	$575,000	$1,150,000	$1,725,000	$2,875,000	$575,000	**$18,400,000**
New BPS (Zone 1380)	$4,025,000	$201,250	$402,500	$603,750	$1,006,250	$201,250	**$6,440,000**
Distribution Pipeline	$4,000,000	$200,000	$400,000	$600,000	$1,000,000	$200,000	**$6,400,000**
Total	**$19,525,000**	**$976,250**	**$1,952,500**	**$2,928,750**	**$4,881,250**	**$976,250**	**$31,240,000**

9.9. W4 Well Improvements

Category W4 includes Recommended Improvements identified for the City's wells.

Basis for Improvements. As discussed in **Section 2.7.2**, the age and material of a well casing is predictive of the typical service life, and pump efficiency testing efficiency is a predictive indicator of the likelihood of mechanical and/or electrical equipment failures at production wells.

- The typical service life of carbon steel wells (installed prior to 1990) is 25 years, and the typical service life of stainless steel well casings is 75 years (installed after 1991).
- Pumps wear as they age, and the wear results in decreasing efficiency. Pumps operating between 50% and 60% efficiency are an acceptable efficiency range but indicate that mechanical and electrical equipment may degrade and should be considered for replacement or rehabilitation. The typical service life of well pump equipment is 20 years.
- When water quality samples from a well show pollutant concentrations above Maximum Contaminant Levels (MCLs), improvements may be required to restore water quality and maintain compliance with state and federal drinking water regulations.

Evaluating well casing age and material, pump efficiency, and water quality compliance is essential for identifying improvements that preserve reliable production capacity and ensure the City can continue meeting water system demands.

The W4 Recommended Improvements are:

- Groundwater Well Equipment

9.9.1. W4-1: Systematic Groundwater Well Equipment Pumping Equipment Rehabilitation

Location: Throughout City

Cost Opinion (2026): $22,700,000

Priority: Medium

Overview: Given the 20-year typical service life of pumping equipment, it is recommended that all groundwater wells within the system be considered for rehabilitation prior to 2040. (Due to recent rehabilitation of wells 14, 29, and 31, these wells may not need rehabilitation prior to 2040). When many category components, in this case PRSs, are considered for cyclic improvements, the improvements are categorized as "systematic".

Table 9.21 – Well Rehabilitation 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Well No. 29	Recently rehabilitated						
Well No. 21	$1,251,000	$62,550	$125,100	$187,650	$312,750	$62,550	**$2,000,000**
Well No. 25	$863,000	$43,150	$86,300	$129,450	$215,750	$43,150	**$1,380,000**
Well No. 22	$1,639,000	$81,950	$163,900	$245,850	$409,750	$81,950	**$2,620,000**
Well No. 19	$604,000	$30,200	$60,400	$90,600	$151,000	$30,200	**$970,000**
Well No. 3	$690,000	$34,500	$69,000	$103,500	$172,500	$34,500	**$1,100,000**
Well No. 13	$389,000	$19,450	$38,900	$58,350	$97,250	$19,450	**$620,000**
Well No. 33	$863,000	$43,150	$86,300	$129,450	$215,750	$43,150	**$1,380,000**
Well No. 31	Recently rehabilitated						
Well No. 17A	$776,000	$38,800	$77,600	$116,400	$194,000	$38,800	**$1,240,000**
Well No. 7A	$604,000	$30,200	$60,400	$90,600	$151,000	$30,200	**$970,000**
Well No. 9A	$949,000	$47,450	$94,900	$142,350	$237,250	$47,450	**$1,520,000**
Well No. 8A	$1,208,000	$60,400	$120,800	$181,200	$302,000	$60,400	**$1,930,000**
Well No. 28	$1,466,000	$73,300	$146,600	$219,900	$366,500	$73,300	**$2,350,000**
Well No. 26	$259,000	$12,950	$25,900	$38,850	$64,750	$12,950	**$410,000**
Well No. 20	$302,000	$15,100	$30,200	$45,300	$75,500	$15,100	**$480,000**
Well No. 11A	$518,000	$25,900	$51,800	$77,700	$129,500	$25,900	**$830,000**
Well No. 12A	$518,000	$25,900	$51,800	$77,700	$129,500	$25,900	**$830,000**
Well No. 27	$431,000	$21,550	$43,100	$64,650	$107,750	$21,550	**$690,000**
Well No. 14	In construction for rehabilitation in 2026						
Well No. 15	$863,000	$43,150	$86,300	$129,450	$215,750	$43,150	**$1,380,000**
Total	**$14,193,000**	**$709,650**	**$1,419,300**	**$2,128,950**	**$3,548,250**	**$709,650**	**$22,700,000**

Prioritization of groundwater well replacements could be selected based on pump efficiency or the potential end of service life year. **Table 9.22** provides data that can help with prioritization. The efficiency is based on the SCE tests provided by the City. The Glen Ivy Wells discussed in W2-4 are not included in W4-1. Well 15 is scheduled for relocation. Wells 29 and 31 have recently been rehabilitated.

Table 9.22 – Groundwater Well Pumping Equipment Rehabilitation Prioritization

Booster Pump Sation Name	Average Efficiency	Year Installed or Rehabilitated	Potential End of Service Life Pumping Equipment (Year)
Well No. 21	48.7	1998	2018
Well No. 33	51.7	2016	2036
Well No. 8A	51.7	2011	2031
Well No. 26	53.2	1999	2019
Well No. 9A	53.9	2002	2022
Well No. 28	55.8	2011	2031
Well No. 22	56.5	1998	2018
Well No. 20	58.9	1998	2018
Well No. 19	59.5	1990	2010
Well No. 12A	62.5	2007	2027
Well No. 13	63.3	1952	1972
Well No. 27	65.2	2007	2000
Well No. 25	66.6	2011	2031
Well No. 11A	67.7	1953	1973
Well No. 3	68.6	1935	1955
Well No. 17A	69.6	2010	2030
Well No. 7A	71.8	2020	2040
Well No. 15	72.0	2005	2025

Maintenance (not included in Table 9.21): Inspection of Wells 3, 11A, 12A, 17A, 19, 20, 21, 22, 25, 26, 27, and 29 prior to rehabilitation may inform the condition of the wells to determine if any casings are inadequate. If casings are inadequate due to age, the wells may need to be evaluated for re-drilling.

9.9.2. W4-2 New Well 34

Location: TBD

Cost Opinion (2026): $5,310,000

Priority: Low

Overview: Well 34 is expected to be drilled and equipped. Note that the planning, design, and construction management costs represent smaller percentages than typical projects.

Table 9.23 – New Well 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (2%)	Design (0%)	Construction Management (5%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Well 34 Drilling and Equipping	$3,875,000	$77,500	-	$193,750	$968,750	$193,750	**$5,310,000**

9.10. W5 Booster Pump Station (BPS) Improvements

Category W5 includes Recommended Improvements identified for the booster pump stations (BPS).

Basis for Improvements. As discussed in **Section 2.7.5**, the age of the pump is predictive of the typical service life, and pump efficiency testing efficiency is a predictive indicator of the likelihood of mechanical and/or electrical equipment failures at production wells.

- Pumps wear as they age, which results in decreasing efficiency. Pumps operating between 50% and 60% efficiency are an acceptable efficiency range but indicate that mechanical and electrical equipment may degrade and should be considered for replacement or rehabilitation. Typical service life of well pump equipment is 20 years.

Evaluating pump efficiency and pump age is essential for identifying improvements that preserve the City's capacity to meet distribution system pressures.

The W5 Recommended Improvements are:

- Systematic Booster Pump Station Rehabilitation

9.10.1. W5-1: Systematic Booster Pump Station (BPS) Rehabilitation

Location: Throughout City

Cost Opinion (2026): $47,240,000

Priority: Medium

Overview: Given the 20-year typical service life of pumping equipment, it is recommended that all BPSs within the system be considered for rehabilitation prior to 2040. Rehabilitation cost opinions for each BPS depend on the type of mechanical improvements anticipated, the number and size of pumps, and civil and coating improvements.

Table 9.24 – Systematic Booster Pump Station Equipment Rehabilitation 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Green River	$625,000	$31,250	$62,500	$93,750	$156,250	$31,250	**$1,000,000**
Cresta Verde	$1,201,000	$60,050	$120,100	$180,150	$300,250	$60,050	**$1,920,000**
Garretson Zone 3	$6,003,000	$300,150	$600,300	$900,450	$1,500,750	$300,150	**$9,600,000**
Serfas Club	$1,501,000	$75,050	$150,100	$225,150	$375,250	$75,050	**$2,400,000**
Mangular	Rehabilitation in 2021						
Garretson Zone 4	$2,251,000	$112,550	$225,100	$337,650	$562,750	$112,550	**$3,600,000**
Morita	$1,001,000	$50,050	$100,100	$150,150	$250,250	$50,050	**$1,600,000**
Aquino	$75,000	$3,750	$7,500	$11,250	$18,750	$3,750	**$120,000**
Border	$1,026,000	$51,300	$102,600	$153,900	$256,500	$51,300	**$1,640,000**
Chase	$1,526,000	$76,300	$152,600	$228,900	$381,500	$76,300	**$2,440,000**
Lester Zone 4	$2,001,000	$100,050	$200,100	$300,150	$500,250	$100,050	**$3,200,000**
Montana Ranch	$750,000	$37,500	$75,000	$112,500	$187,500	$37,500	**$1,200,000**
Kraft Ranch	$1,126,000	$56,300	$112,600	$168,900	$281,500	$56,300	**$1,800,000**
Lester Zone 5	$4,002,000	$200,100	$400,200	$600,300	$1,000,500	$200,100	**$6,400,000**
Eagle Glen Zone 5	$600,000	$30,000	$60,000	$90,000	$150,000	$30,000	**$960,000**
Harlan Hills	$475,000	$23,750	$47,500	$71,250	$118,750	$23,750	**$760,000**
Mabey Canyon	$750,000	$37,500	$75,000	$112,500	$187,500	$37,500	**$1,200,000**
Eagle Glen Zone 6 2	$1,126,000	$56,300	$112,600	$168,900	$281,500	$56,300	**$1,800,000**
Payette	$1,501,000	$75,050	$150,100	$225,150	$375,250	$75,050	**$2,400,000**
Sierra Bella	$2,001,000	$100,050	$200,100	$300,150	$500,250	$100,050	**$3,200,000**
Total	**$29,541,000**	**$1,477,050**	**$2,954,100**	**$4,431,150**	**$7,385,250**	**$1,477,050**	**$47,240,000**

Prioritization of BPS replacements could be selected based on pump efficiency or the potential end of service life year. **Table 9.25** provides data that can assist with prioritization.

Table 9.25 – Systematic Booster Station Equipment Rehabilitation Prioritization

Booster Pump Sation Name	Average Efficiency	Year Installed or Rehabilitated	Potential End of Service Life Pumping Equipment (Year)
Eagle Glen Zone 5	47.40%	2018	2038
Aquino	48.30%	1990	2010
Montana Ranch	61.60%	2013	2033
Chase	62.80%	2014	2034
Cresta Verde	62.80%	2016	2036
Harlan Hills	63.80%	2000	2020
Eagle Glen Zone 6	64.40%	2012	2032
Lester Zone 5	65.10%	1995	2015
Border	65.50%	2024	2044
Lester Zone 4	66.00%	2004	2024
Green River	66.50%	1989	2009
Garretson Zone 4	67.60%	2009	2029
Serfas Club	68.90%	2022	2042
Payette	69.00%	2021	2041
Garretson Zone 3	70.00%	2009	2029
Morita	72.30%	2015	2035
Kraft Ranch	72.40%	2003	2023
Mabey Canyon	74.40%	2016	2036
Sierra Bella	Unspecified	2017	2037

9.11. W6 Pressure Reducing Station (PRS) Improvements

Category W6 includes Recommended Improvements identified for the pressure reducing stations (PRSs).

Basis for Improvements. PRSs reduce pressure from higher zones to lower zones within the City's distribution system. There are no known PRS deficiencies within the existing system. As discussed in **Section 2.7.6**, the age of the PRS is predictive of the typical service life. Typical service life for most PRSs is 35 years.

9.11.1. W6-1: Systematic Pressure Reducing Stations (PRS) Rehabilitation

Location: Throughout City

Cost Opinion (2026): $3,264,000

Priority: Low

Overview: Given the 35-year typical service life of PRSs, it is recommended that 17 of the PRSs within the system be considered for rehabilitation prior to 2040. When many category components, in this case PRSs, are considered for cyclic improvements, the improvements are categorized as "systematic". PRS service life can be extended based on proactive maintenance. Thirteen (13) PRSs will not reach their 35-year typical service life by 2040.

One (1) PRSs that has an unknown installation date will be assumed to have reached the end of its service life.

Table 9.26 – Systematic PRS Rehabilitation 2026 Cost Opinion

Improvement	Estimated Construction Opinion	Planning (5%)	Design (10%)	Construction Management (15%)	Contingency (25%)	Legal/ Administration (5%)	Rounded Total (2026)
Green River	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Eagle Glen	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Harrington	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
El Cerrito	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Yorba	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
North Smith	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Kalus	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Dominguez Ranch	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Auto Center Drive	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
South Smith	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Mt. Serenata	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Ridgeline	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Liberty	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
White Mountain	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
San Ponte	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
West Temescal Canyon	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
East Temescal Canyon	$120,000	$6,000	$12,000	$18,000	$30,000	$6,000	**$192,000**
Total	**$2,040,000**	**$102,000**	**$204,000**	**$306,000**	**$510,000**	**$102,000**	**$3,264,000**

Prioritization of PRS rehabilitation could be selected based on potential end of service life year. **Table 9.27** provides data that can help with prioritization. Since many PRS were installed between 2002 and 2005, consideration could be given to phasing prior to end of service life to reduce the number of PRS rehabilitated in one year or numerous PRSs could be grouped as one improvement and replaced as part of a single capital improvement project.

Table 9.27 – Systematic Pressure Reducing Station Rehabilitation Prioritization

Pressure Reducing Station Name	Year Installed	Potential End of Service Life (Year)
Main & Olive	Unknown	-
Green River	1987	2022
Eagle Glen	1999	2034
Harrington	2001	2036
El Cerrito	2001	2036
Yorba	2002	2037
North Smith	2003	2038
Kalus	2003	2038
Dominguez Ranch	2003	2038
Auto Center Drive	2003	2038
South Smith	2003	2038
Mt. Serenata	2003	2038
Ridgeline	2003	2038
Liberty	2003	2038
White Mountain	2003	2038
San Ponte	2005	2040
West Temescal Canyon	2005	2040
East Temescal Canyon	2005	2040
PRS with Service Lives that are Expected to Extend beyond 2040:		
Orange Heights	2006	2041
Sonrisa	2010	2045
ADV	2011	2046
Magnolia	2011	2046
Yuma Village Loop	2011	2046
Alcoa	2011	2046
Freedom	2011	2046
Cajalco	2011	2046
Mountain Gate	2011	2046
Hummingbird	2013	2048
Arcadia	2014	2049
Sierra Bella (West)	2016	2051
Sierra Bella (East)	2016	2051

9.12. Recommended Improvements Cost Opinion Summary

Table 9.28 lists all Recommended Improvements detailed in previous sections in 2026-dollar values. Improvements with "Not Applicable" 2026 Cost Opinions reference maintenance projects described in **Section 9**.

Table 9.28 – Recommended Improvements Cost Opinion Summary

Improvement No.	Improvement Description	2026 Cost Opinion
W1: Water Distribution System Improvements		
W1-1	Systematic Water Distribution System Replacement Considering Deficiencies	**See Table 9.10**
W1-2	Systematic Meter Replacement	**See Table 9.13**
W1-3	SCADA Improvements	**Not Applicable**
W2: Treatment Plant Improvements		
W2-1	Temescal Desalter WTP Improvements	**Not Applicable**
W2-2	Lester WTP Improvements	**$5,520,000**
W2-3	Sierra Del Oro WTP Improvements (Existing CIP)	**$1,840,000**
W2-4	Glen Ivy Well Treatment Improvements	**$6,373,000**
	W2 Subtotal	**$13,733,000**
W3: Storage Tank Improvements		
W3-1	Welded Steel Storage Tank Recoating	**$7,410,000**
W3-2	Pressure Zone 1380 Improvements	**$31,240,000**
	W3 Subtotal	**$38,650,000**
W4: Well Improvements		
W4-1	Systematic Groundwater Well Pumping Equipment Rehabilitation	**$22,700,000**
W4-2	New Well 34	**$5,310,000**
	W4 Subtotal	**$28,010,000**
W5: Booster Pump Station Improvements		
W5-1	Systematic Booster Pump Station Rehabilitation	**$47,240,000**
	W5 Subtotal	**$47,240,000**
W6: Pressure Reducing Station Improvements		
W6-1	Systematic PRS Station Rehabilitation	**$3,264,000**
	W6 Subtotal	**$3,264,000**