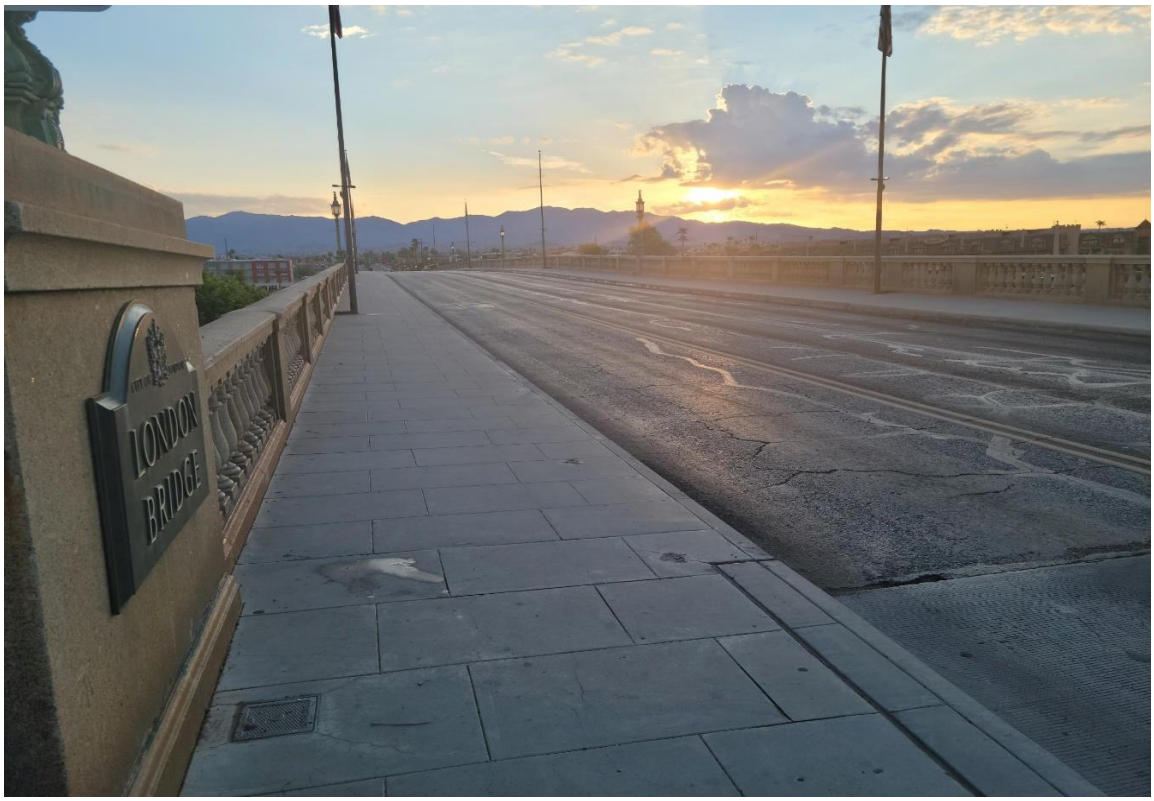
Lake Havasu City
2025 Water Master Plan

Lake Havasu City, Arizona



DRAFT

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Executive Summary

Lake Havasu City (City) operates a water distribution system consisting of 7 major pressure zones, 1 water treatment plant, 14 booster pump stations (BPSs), 26 reservoirs, 11 system pressure-reducing valve (PRV) stations, 10 conventional wells, 1 horizontal collector well (HCW), and nearly 500 miles of pipe, ranging in diameter from 4 to 48 inches. In 2024, the City provided water to approximately 59,500 people.

Utility master plans such as the 2025 Water Master Plan (WMP) are typically prepared every 5 to 10 years depending on a community's growth rate and land use, changes in water supply and demand, aging infrastructure, and regulatory and financial requirements. The last City WMP was prepared in 2019. The City also completed a comprehensive Updated Wastewater Master Plan in 2024.

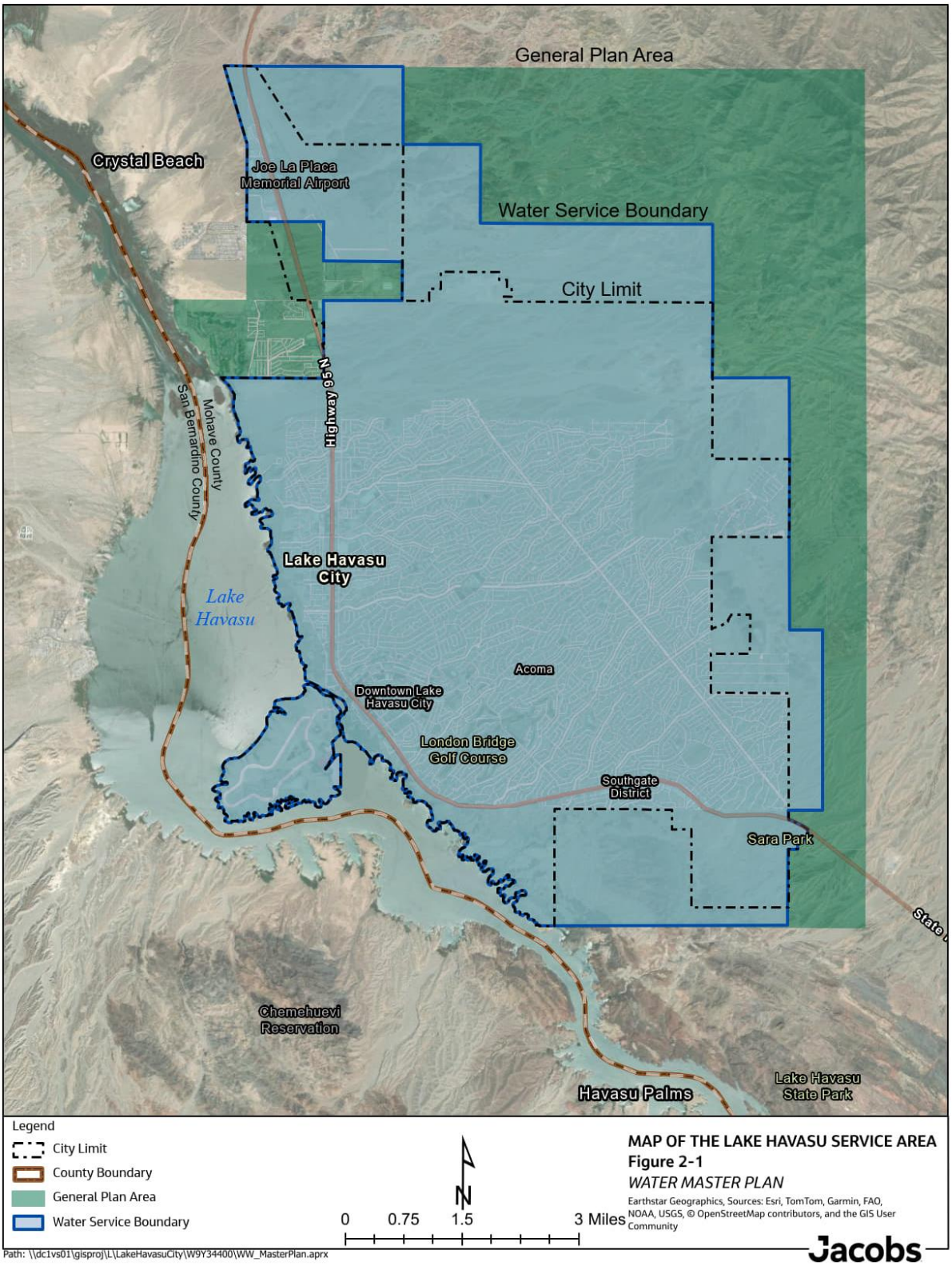
The 2025 WMP focuses on the following key topics:

- Water Demand Update and 2040 Forecast
- Water Supply Portfolio
- Water Distribution System Analysis
- Water Quality and Treatment
- Rehabilitation and Replacement Projects
- Capital Improvement Program Update

Water Service Area

The City is in Mohave County and encompasses approximately 46 square miles. The City was incorporated in 1978 and provides water service to an area defined in Title 7 of the City's Code. Figure ES-1 shows the water service area. A small area northwest of the City is served by a private water utility (EPCOR).

Figure ES-1. Map of the Lake Havasu City Service Area

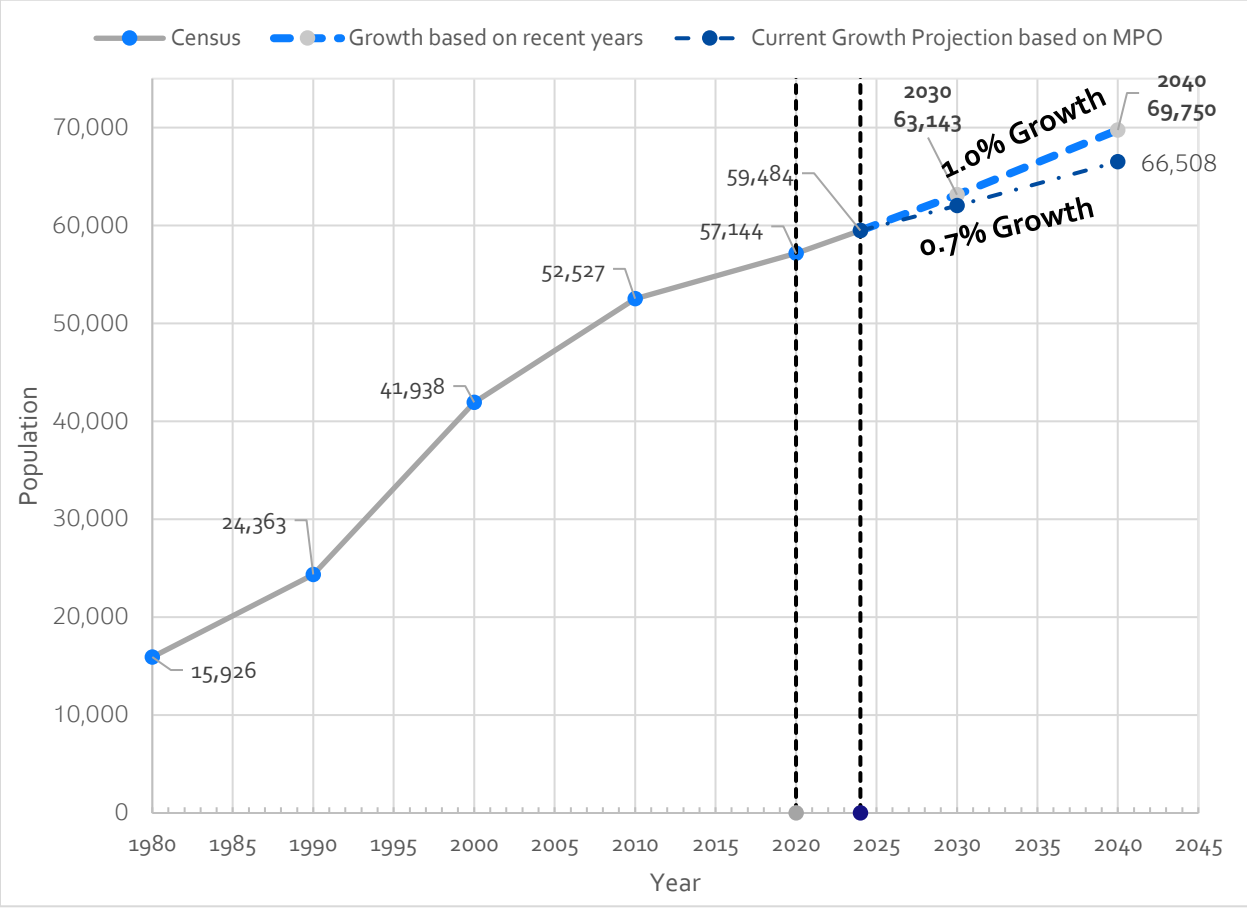


Population Forecasts

According to the U.S. Census Bureau, the City's population increased from 52,547 in 2010 to 57,144 in 2020. The Arizona Office of Economic Opportunity reported a population estimate of 59,484 for 2024.

From 2020 to 2024, the City experienced a growth rate of 1 percent. Multiple factors may have affected this growth, such as general economic conditions, an increase in remote working, and pandemic-related regulations. Figure ES-2 shows population-based projected growth through 2040 used in the WMP, including the 0.7 percent and 1 percent growth rates.

Figure ES-2. Lake Havasu City Population Forecast



Existing Water Supply

The principal water source for the City is contracted, fourth priority[1] Colorado River water entitlements that total 28,581.7 acre-feet per year. This amount comes from contracts with the Bureau of Reclamation for 19,180 acre-feet per year, and with the Mohave County Water Authority for 9,389 acre-feet per year. Additionally, 2,139 acre-feet of fourth priority Colorado River water was secured in 2009 by the City.

The City uses 10 conventional wells and the HCW for its water supply. The conventional production wells are in two wellfields.

Existing and Forecast Water Demands

Figure ES-3 shows actual and adjusted water use for 2023 and 2024. The actual water use is based on the date the customer's meter is read within the month; the adjusted water use is proportionally distributed in the months between meter read dates. The City's monthly average potable production is also shown. Figure ES-3 also shows a typical seasonal pattern for the years 2023 and 2024, with the highest water consumption and production levels occurring in the summer months. The average annual water demand was approximately 12 million gallons per day (mgd) in 2024. Residential customers account for approximately 80 percent of the City's water usage. The maximum month and maximum day demands (MDD) were approximately 1.3 and 1.5 times the average demand, respectively.

The population projections through 2040 were used, along with a low and high per capita water use range of 175 to 216 gallons per capita per day, to develop the average water demand projections. These demands were multiplied by 1.5 to estimate the MDD, which is the required water supply capacity needed in the future. As shown on Figure ES-4, using the assumed 0.7 percent growth seen between 2024 and 2040, the MDD is expected to increase to 18.8 mgd in 2030 and 20 mgd in 2040. If growth continues at 1%, by 2040, the MDD will be approximately 21.4 mgd. Figure ES-4 also shows when the City will reach 80% water treatment plant (WTP) capacity, which is the industry standard when planning the next incremental expansion should be undertaken, which would be more than 10 years in the future.

[1] There is a specific priority system for Arizona's use of Colorado River water, numbered first through sixth, with the first priority rights being the most senior and most protected. For example, first priority rights are established in a Supreme Court Decree (Arizona v. California 373 U.S. 546 [1963]), known as Present Perfected Rights. These first priority rights were in use before the 1922 Colorado River Compact was signed. Fourth priority rights are held by water users with contracts, Secretarial Reservations, or other rights established by the United States after September 30, 1968. Entitlement of priority has a direct relationship to resource availability during periods of shortages within the Colorado River basin.

Figure ES-3. 2023 and 2024 Monthly Potable Summary

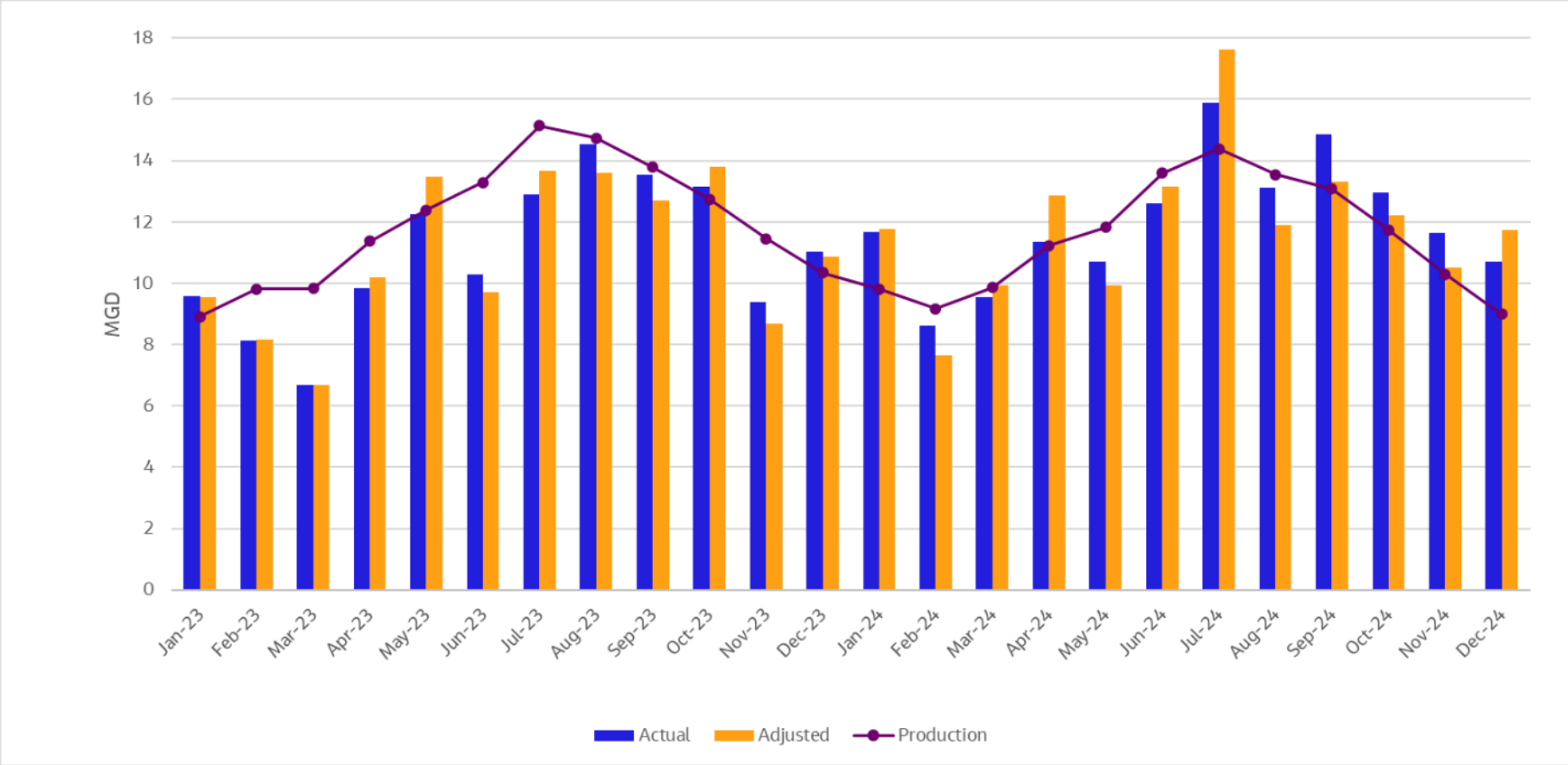
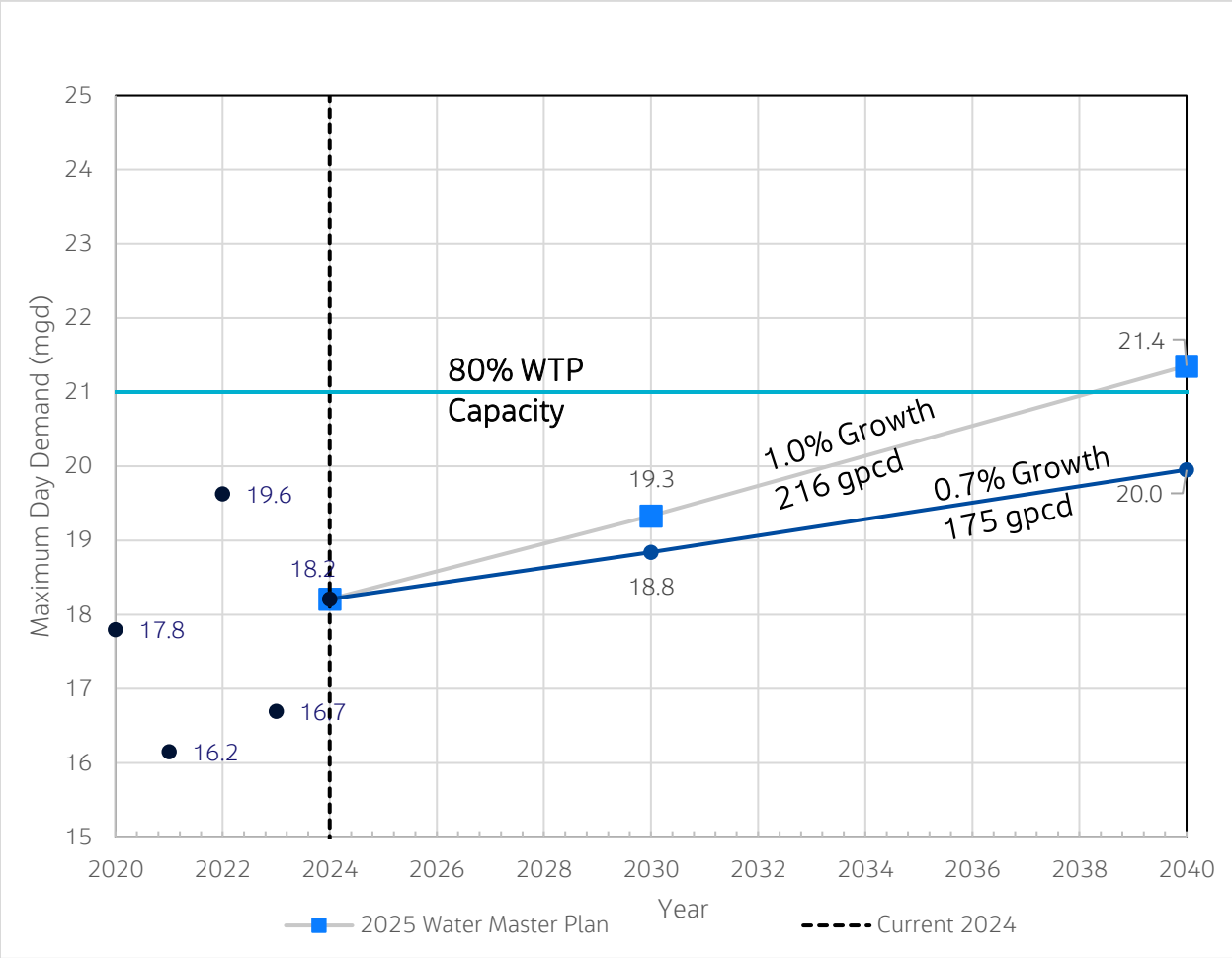


Figure ES-4. Water Demand Projections



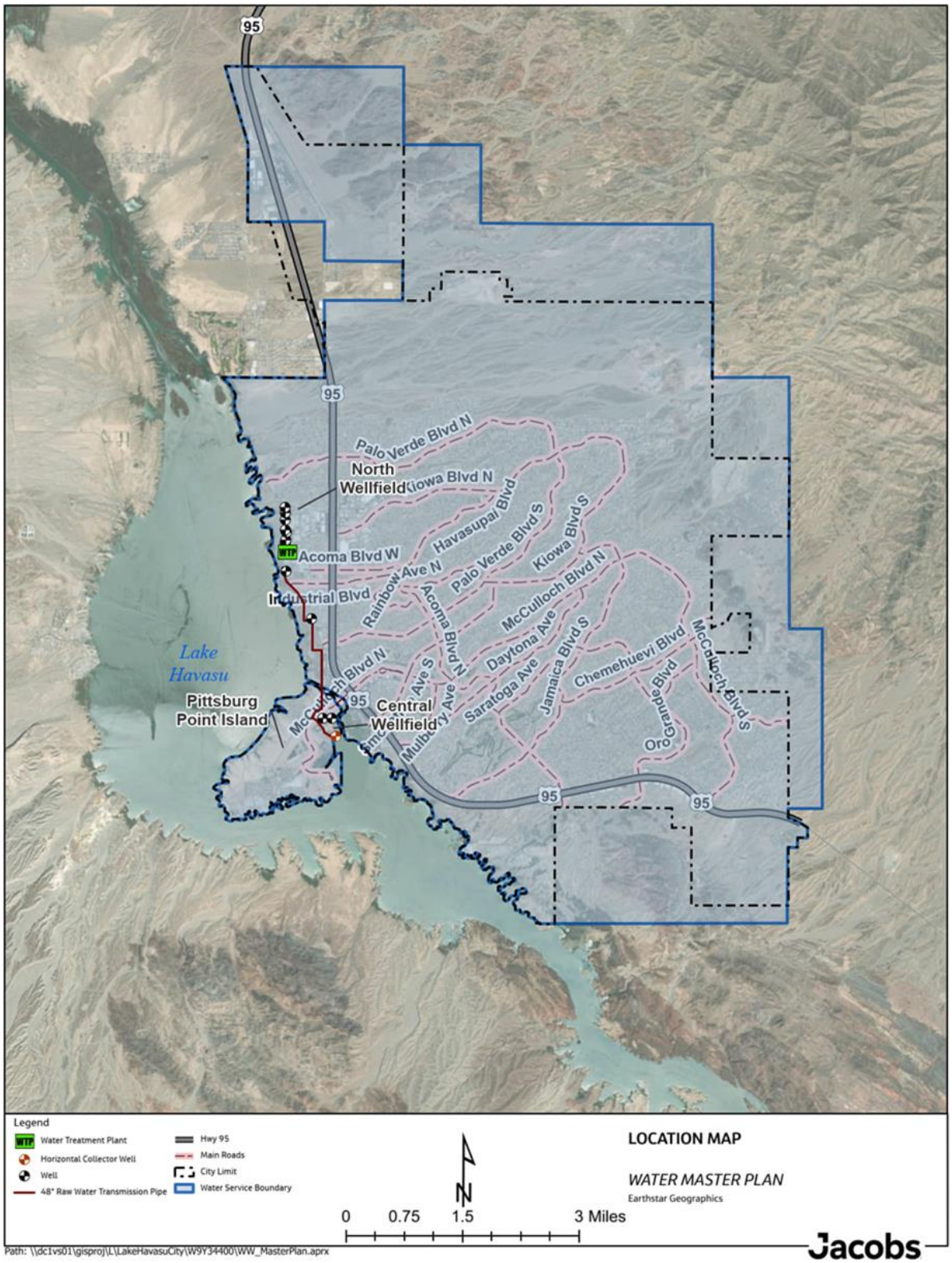
Water Supply Portfolio

The City uses up to 10 conventional wells and the HCW for its water supply, as follows:

- Eight conventional wells are in the northern part of the City, just north of the existing WTP. Collectively, these wells constitute the North Wellfield, with a total capacity of approximately 10 mgd.
- Two conventional wells and the HCW are located on Pittsburg Point Island (Island) near the west-central part of the City. These wells constitute the Central Wellfield, with a capacity range between 10 and 23 mgd.

Figure ES-5 shows the location of the HCW, conventional water wells, and WTP.

Figure ES-5. Location Map



The existing and 2040 water MDDs are summarized in Table ES-1. The MDDs must be supplied by the City's water supply sources. The City has flexibility in the future to develop additional well capacity to meet this demand. Assuming the HCW rehabilitation project is completed, the City will need to conduct a test boring program to determine the preferred locations for new wells. In some cases, a new well may be replacing an existing well that has reached the end of its useful life.

Table ES-1. Water Demand Analysis

DemandScenario	Estimated MDD	
	mgd	gpm
Existing	18.4	12,800
2040	21.4[a]	14,900

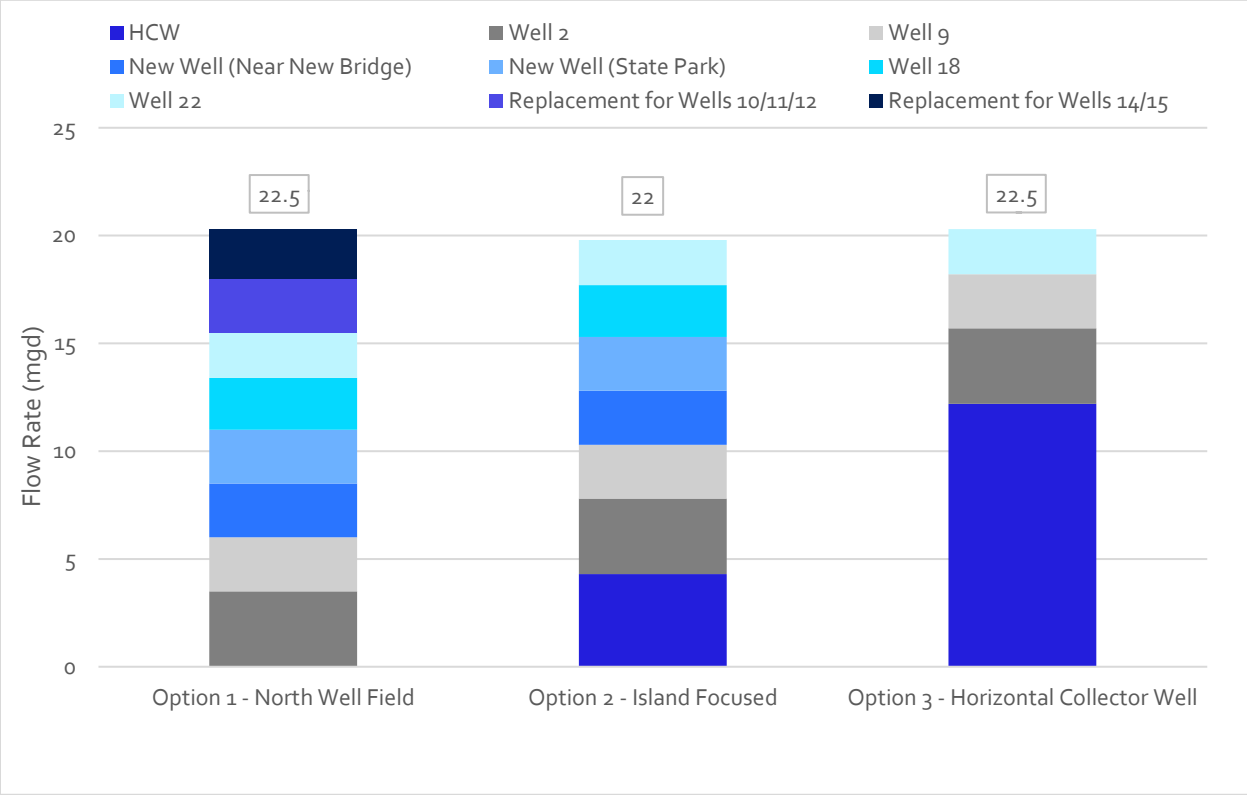
[a] Assumes 1% growth

gpm = gallon(s) per minute

Figure ES-6 presents three water supply options that would meet the projected 2040 demand. These options illustrate the City's flexibility in operating varying water supplies to meet demand and provide optimum water quality. The three options are the following:

- Option 1. North Wellfield focused supply development
- Option 2. Island well development known for larger capacity wells
- Option 3: HCW operating at its new de-rated capacity from rehabilitation project

Figure ES-6. Water Supply Analysis, Future Supply Options



Water Treatment Plant

The City's WTP was constructed in 2004 and designed with a rated capacity of 26 mgd. Currently, the WTP operates within a range of 8 to 16 mgd to meet City demands. The average water production in 2024 was approximately 12 mgd and an MDD supply of around 18 mgd. The WTP is currently supplied by the North Wellfield and the Island wells. Historically, the HCW, with a capacity of approximately 25 mgd, located south of the WTP, supplied more than 90 percent of groundwater from the local aquifer.

The WTP is designed to meet current drinking water standards, which include removal of manganese (secondary maximum contaminant level [MCL] = 0.050 milligram per liter [mg/L]) and arsenic (primary MCL = 0.010 mg/L). The treatment process original design includes aeration, ferric chloride addition, biological sand filtration, ultraviolet disinfection, and chlorine gas addition.

Several major mechanical components at the plant have reached the end of their useful life and will require repair or rehabilitation. In addition, structural assessments are recommended to determine the extent of concrete repair needed as part of the overall rehabilitation effort. Specific improvements necessary to support plant rehabilitation are included in the Capital Improvement Plan (CIP).

Existing Water System Analysis

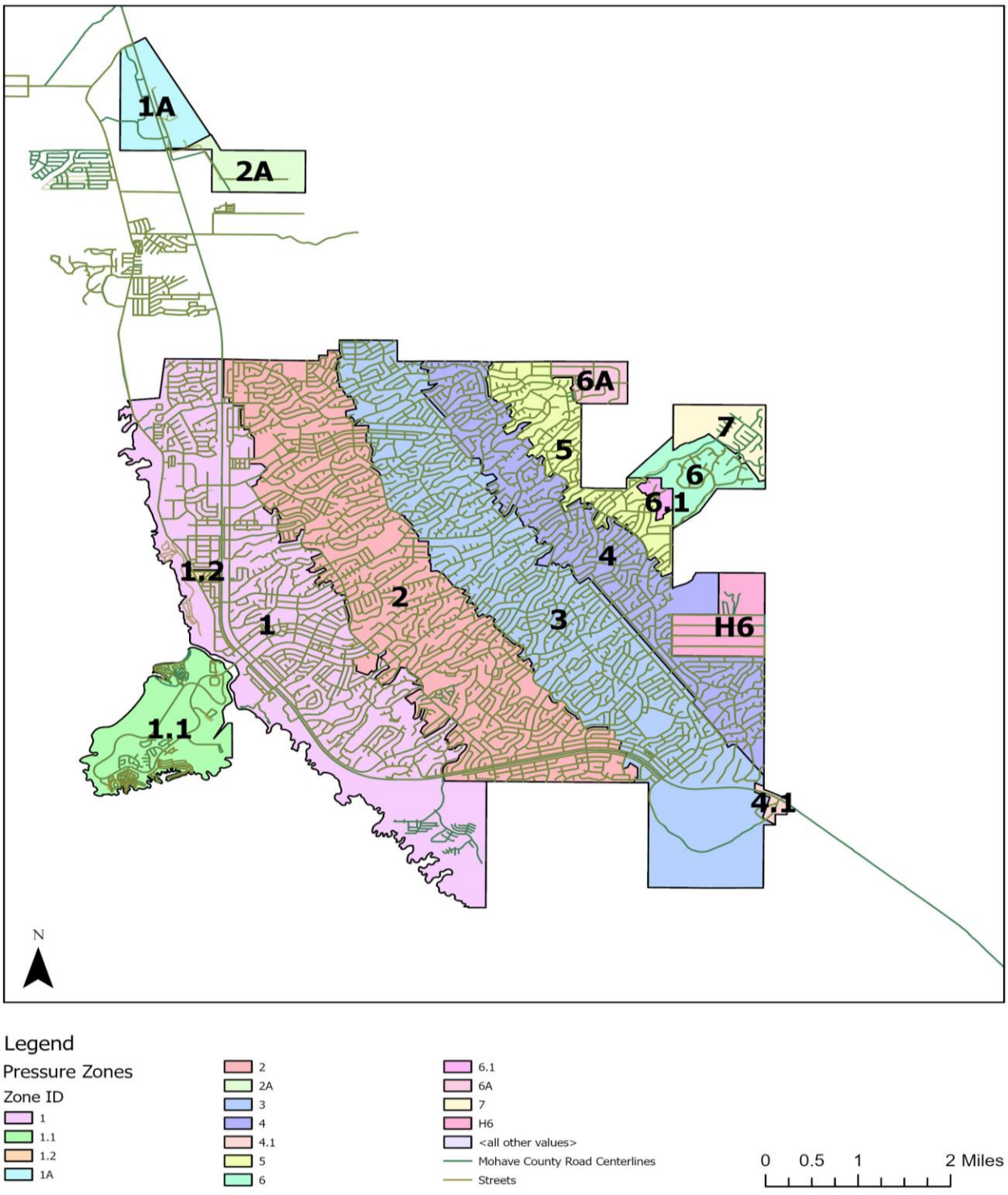
The existing water system consists of more than 538 miles of water distribution and transmission pipelines that serve the City. A large percentage of the water system was constructed between the 1960s and 1980s as the City's population expanded. Most older distribution pipeline is constructed of asbestos cement, and transmission mains are typically constructed of prestressed concrete cylinder pipe or ductile iron pipe.

The potable drinking water supply originates at the City's WTP and is pumped through the High Service BPS to the north and south via 30-inch- and 36-inch-diameter transmission pipelines, respectively. The City's water service area topography varies in elevation by 1,200 feet, ranging from as low as nearly 450 feet along the shorefront of Lake Havasu to as high as 1,800 feet in the eastern foothill areas. In 2024, the City operated 14 water BPSs and 27 distribution system reservoirs, not including the WTP clearwell storage. Figure ES-7 illustrates the 14 pressure zones that serve the City.

A capacity analysis was performed of the existing water system based on the City's design and planning criteria. The analysis included use of a hydraulic computer model that simulated the 2040 distribution system, storage tanks, pump stations, and City-wide demands. A summary of key findings follows:

- The existing storage system generally meets current design criteria for operational, fire flow, and emergency needs for most zones. Two pressure zones would benefit from a small increase in emergency storage for the near term.
- The existing pump station capacity for all pressure zones meets current design criteria. This surplus capacity provides the City with flexibility to move the water supply around the system. No near-term pump capacity improvements are recommended.
- Under simulated peak hour demands, pipe velocities are well within established criteria, with most pipeline velocities being less than 2 feet per second and most transmission mains under 5 feet per second, indicating low pressure losses.
- The City would benefit from several reliability improvements, notably redundant pipelines to areas where many homes are served by a single pipeline.

Figure ES-7. Lake Havasu City Pressure Zones



2040 Water System Analysis

The City continues to experience residential and commercial growth in several core areas and infill areas because of many available vacant parcels. Approximately 20 percent of the City's forecasted growth is infill development. The City's existing water distribution system can serve these parcels and developments with little need for additional infrastructure.

The General Plan identifies core areas of major development. These areas include the Island, Havasu Riveria to the south, and Foothills Estates to the east. For these planned development areas, the City should continue to require developers to design and construct the onsite systems and necessary offsite facilities in accordance with the City's water design criteria.

A capacity analysis was performed of the 2040 water system using an expanded hydraulic computer model with 2040 City-wide demands. A summary of key findings follows:

- It is estimated that by 2040, four City pressure zones will have a storage deficit if no other tanks are constructed because of the increased demand. The City's current 5-year CIP includes several high-priority tank replacement projects.
- Based on the assumptions and water demand forecast, the City shows no pumping capacity deficiencies through 2040. This further illustrates the flexibility of the water system, with multiple pump stations serving individual zones.
- The 2040 water system analysis recommends transmission main capacity improvements from Tank 1A up to Tank 5A, including a new pump station at Site 1A.
- The City would benefit from several pressure zone interconnections with PRV stations that would stabilize pressures along zone boundaries during peak demands and promote water circulation and quality at the edges of the zone systems.
- Over the long term, the City should initiate early planning for a second WTP to provide redundancy as the City continues to grow.

Distribution System Risk Analyses

The primary goal of the pipeline risk analysis was to create a uniform and more defensible approach for making repair and replacement decisions. The risk analysis process can also be used to accomplish the following:

- Prioritize assets.
- Provide insights on where to collect and verify data.
- Guide decision-making when there is either a lack of requisite asset information or when there is sufficient information.
- Inform condition assessment field crews on prioritized areas for fieldwork.
- Identify capital projects for both short- and long-term CIPs.

Jacobs developed Consequence of Failure and Likelihood of Failure scoring matrices with input from the City, and risk is estimated as the product of Consequence of Failure and Likelihood of Failure. The matrices were entered into a geographic information system-based commercially available software to calculate pipeline risk. Table ES-2 summarizes the pipeline risks.

Table ES-2. City-wide Pipeline Risk Summary

Risk	Length (miles)	% of Total Length
Negligible	30.5	6.0
Low	27.0	5.3
Medium	393.0	77.0
High	44.9	8.8
Extreme	15.1	2.9

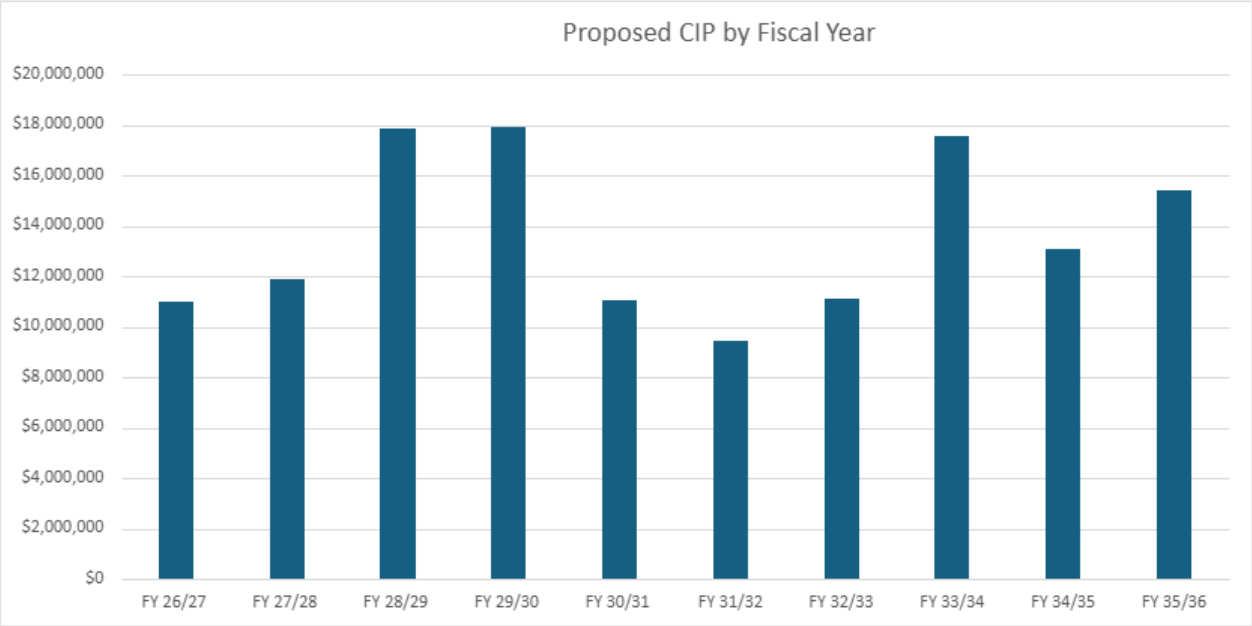
Capital Improvement Plan

A comprehensive 10-year CIP (2026 to 2036) is developed by fiscal year, with the first 5 years incorporating the City's current CIP, plus new projects from this 2025 WMP. Longer-term projects to meet future water system requirements and 2040 demand conditions were assumed in 2036 to 2041.

The CIP associated with this 2025 WMP builds upon the water supply reliability focus from the 2019 WMP and further recommends investments in upgrading facility components of the City's 20-year-old WTP, to continue to provide a high level of water service to its customers. The CIP includes the water tank rehabilitation and replacement program, and presents plans to increase storage commensurate with continued growth. The City would benefit from a few interconnections (via PRV stations) between higher- and lower-pressure zones to increase reliability and system flexibility. Lastly, an annual investment in pipeline rehabilitation or replacement has been included in the CIP to address high-risk pipelines.

The 10-year CIP will require an annual expenditure between $10 and $18 million per year. It reflects the continued major investment in water infrastructure as the system ages. The increase in expenditures is also attributed to a major upgrade and replacement program at the WTP. Figure ES-8 summarizes the annual estimate CIP over the next 10 years.

Figure ES-8. Proposed 10-year CIP by Fiscal Year



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Acronyms and Abbreviations

Acronym	Definition
ADD	Average Day Demand
ADEQ	Arizona Department of Environmental Quality
AWWA	American Water Works Association
BPS	Booster Pump Station
City	Lake Havasu City
CIP	Capital Improvement Plan
COF	Consequence of Failure
County	Mohave County
DCP	Drought Contingency Plan
fps	feet per second
GIS	Geographic Information System
gpm	gallon(s) per minute
gpm/ft	gallon(s) per minute per foot
HCW	Horizontal Collector Well
HGL	Hydraulic Grade Line
HWL	High Water Level
LHH WQARF	Lake Havasu Avenue and Holly Avenue Water Quality Assurance Revolving Fund site
LOF	Likelihood of Failure
n/a	not applicable
MCL	Maximum Contaminant Level

Acronym	Definition
MCWA	Mohave County Water Authority
MDD	Maximum Day Demand
MG	million gallons
mgd	million gallons per day
mg/L	milligram(s) per liter
PCCP	Prestressed Concrete Cylinder Pipe
PRV	Pressure-reducing Valve
psi	pound(s) per square inch
SCADA	Supervisory Control and Data Acquisition
SR	State Route
UV	Ultraviolet
WMP	Water Master Plan
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

1. Overview

Lake Havasu City (City) is located on the Colorado River and is situated by Lake Havasu in Mohave County (County), which is in the west-central area of the state of Arizona. Lake Havasu City was designed as a master planned community in 1963 by Mr. Robert McCulloch, with an emphasis on recreation and residential development. As such, the City experiences a tremendous influx of seasonal and weekend visitors throughout the year, resulting in a large transient population that can affect the water and wastewater systems.

1.1 INTRODUCTION AND PURPOSE

Beginning in March 2020 with the onset of the COVID-19 pandemic, the City experienced changes in population and a slight increase in per capita water use during the 3-year pandemic. Today, the City is seeing a dramatic increase in housing starts and home prices, in part from an influx of residents from California and other states. The ability for homeowners to leverage short-term rental properties throughout the City has increased the percentage of year-round occupancies and thus increased water use per capita.

The City operates a water distribution system consisting of 7 major pressure zones, 14 booster pump stations (BPSs), 26 reservoirs, 11 system pressure-reducing valve (PRV) stations, 10 conventional wells, 1 horizontal collector well (HCW), and nearly 500 miles of pipe, ranging in diameter from 4 to 48 inches. In 2024, the City provided water to approximately 59,500 people.

This Water Master Plan (WMP) is one of many documents that will be used to plan for future infrastructure needs to ensure a reliable water supply and service to customers throughout the year. Utility master plans such as this WMP are typically prepared every 5 to 10 years depending on a community's growth rate and land use, changes in water supply and demand, aging infrastructure, and regulatory and financial requirements.

Water master planning documents were prepared in the 1990s that laid the foundation for a new major water supply source and water treatment plant (WTP). In 2007, the City completed a comprehensive WMP that addressed water supply and distribution system needs to meet projected demands out to 2050 (Carollo 2007).

In 2019, the WMP was updated (2019 WMP) (Jacobs 2019). The 2019 WMP is the most recent planning document and incorporated revised population forecasts based on the 2016 *Lake Havasu City 2016 General Plan* (2016 General Plan) (Clarion 2016). An important focus of the 2019 WMP was to address water supply capacity, reliability, and vulnerability, given the age and condition of the City's existing North Wellfield.

This 2025 WMP focuses on the following key issues:

- **Water Demand Update and 2040 Forecast.** Based on recent growth trends and water use patterns, update the 2040 forecasts, including the estimated 2040 maximum day demand (MDD).
- **Water Supply Portfolio.** Address the recent water supply operational changes with the HCW and the North Wellfield and evaluate future supply options to meet 2040 demands.
- **Water Distribution System Analysis.** Update the City's hydraulic model, perform pump station and reservoir capacity analysis, and evaluate system reliability projects to improve overall system operations.
- **Quality and Treatment.** Evaluate water quality concerns from the well sources and potential impacts on the WTP and issues in the distribution system. Address possible per- and polyfluoroalkyl substance impacts and future WTP needs, and identify opportunities for future direct potable reuse.
- **Rehabilitation and Replacement Projects.** Using industry standards, identify an annual pipeline replacement program based on risk and the City's desire to minimize private easements and difficult-to-access pipelines.
- **Financial and Capital Improvement Program Update**. Prepare a prioritized list of capital projects in 5-year increments through 2040.

1.2 SCOPE

The 2025 WMP scope of work focuses on water supply resources and reliability and water distribution system upgrades to meet existing water demands. An evaluation of future water treatment requirements in terms of capacity, rehabilitation, and reliability is also included in this WMP.

The 2025 WMP scope of work includes the following:

- Review system design criteria.
- Develop water demand projections.
- Evaluate water supply sources and capacities.
- Assess storage and pumping.
- Update hydraulic water model.
- Develop pipeline replacement program.
- Present detailed 5-year capital improvement plan (CIP) and identify future CIPs through 2040.

In summary, the 2025 WMP will serve as the basis for an updated, prioritized CIP and system-wide recommendations for the City over the next 15 years.

1.3 RECENT MASTER PLANS

In addition to water planning work conducted in the 1990s, the City prepared a comprehensive *Water Master Plan Update* in 2007 (Carollo). Wastewater planning efforts included the major septic-to-sewer program proposed in the late 1990s and the Wastewater System Expansion Program Oversight Finalization (Carollo 2014), which presented an updated and calibrated sewer collection model for the City.

1.3.1 2019 WATER MASTER PLAN

In 2019, the WMP was updated again. The 2019 WMP (Jacobs 2020) focused on water supply resources and reliability, and water distribution system upgrades to meet existing and projected water demands. In addition, the 2019 WMP addressed system redundancy, risk, and consequences of failure for its major water supply, an HCW, and the long-term ability of the North Wellfield to sustain the City's future water supply needs.

The 2019 WMP evaluated pump station and reservoir capacity needs for each pressure zone based on existing and projected increases in water use. An evaluation was performed of the City's WTP, and several optimization projections were recommended. The City's hydraulic model was updated and continues to be used to address new development proposals and fire sprinkler flow design pressures in the community. The 2019 WMP also provided a 5- and 10-year CIP and supported the City's recent water rate case and revenue plan.

1.3.2 2024 UPDATED WASTEWATER MASTER PLAN

The *2022 Wastewater Master Plan, Lake Havasu City, Arizona* was updated in 2024 (Updated Wastewater Master Plan) (Jacobs 2024). The updated plan outlines a comprehensive strategy to modernize and optimize the City's wastewater infrastructure. It includes updating wastewater flow projections through 2040 and refining the hydraulic model of the sewer system to improve regional conveyance and pumping operations. The plan also evaluates the condition and performance of existing treatment facilities, explores opportunities for reclaimed water and reuse, assesses effluent (i.e., treated wastewater) discharge, and establishes a CIP to guide future investments and implementation efforts. The Updated Wastewater Master Plan also supports the City's sewer rate case and revenue plan.

On August 4, 2025, the Mohave County Board of Supervisors approved Resolution No. 2025-146, a resolution setting forth a recommendation to the Arizona Department of Environmental Quality (ADEQ) for an amendment to the *Mohave County 208 Water Quality Management Plan* (Stantec and Himes 2003). The amendment to the 208 Water Quality Management Plan will include the Updated Wastewater Master Plan (Jacobs 2024).

2. Basis of Planning

This section describes the basis of planning for the 2025 WMP, including the water service area, land use and major development information, population data, and water system planning and design criteria.

2.1 WATER SERVICE AREA DESCRIPTION

The 2016 General Plan (Clarion 2016) documents the City's water service area, which defines the geographic boundary for the future water demand forecast. As shown on Figure 2-1, developable land within the water service area is primarily within the City municipal boundary, and the remaining area is within Mohave County. The City's water service area is referenced in Title 7 and can only be amended by amendment to the City's water delivery contract with BOR. The 2016 General Plan area boundary extends well beyond the water service area and City boundary. The population forecast through 2040 and associated projected water demand is assumed within the water service boundary for the 2025 WMP.

In early 2025, the City began work on the Lake Havasu City General Plan: Shaping our Future, which will set forth a new plan for development going forward into the next decade. The plan is expected to be approved by the City Council and then ratified by the voters. The City should review significant development changes, findings, and recommendations of the General Plan Update; then, based on changes presented in the General Plan Update, it may be warranted in 5 years to review and conduct a minor update to this 2025 WMP.

2.1.1 CITY BOUNDARY

The City is in Mohave County and encompasses approximately 46 square miles. The City was incorporated in 1978 and provides several utility services to its residents, including water supply and distribution; wastewater collection, treatment, and disposal; and reclaimed water service.

2.1.2 EPCOR WATER SERVICE AREA

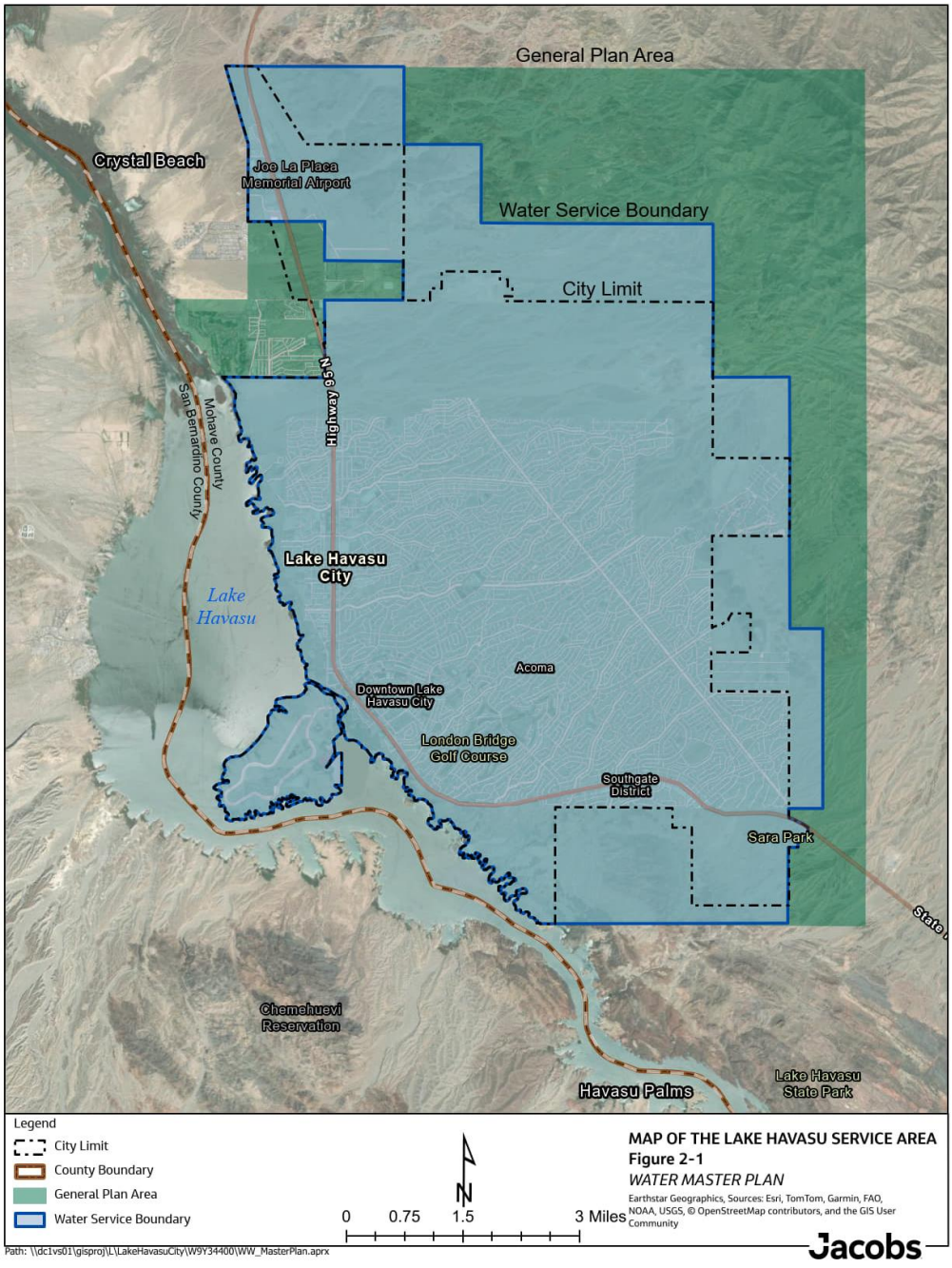
A small portion of the City is served by a private water utility (EPCOR). EPCOR provides water service to approximately 2,300 service connections in the northwestern area of the state, primarily in an unincorporated area of the County to the north of Lake Havasu City. EPCOR also provides water to a small group of customers within the City limits (EPCOR 2024). EPCOR operates a water system west of State Route (SR) 95 and south of Chenoworth Road. The service area includes primarily residential units and the Iron Wolf Golf Club.

Facilities include supply wells, wellhead treatment, and a distribution network. There are no interconnections with the City public water system. The City does provide some wastewater collection by contract within the EPCOR water service area.

2.2 LAND USE

Existing management plans for the City establish land use categories within its water service area. The land use is divided into the following categories: rural residential, low density, medium density, high density, resort, business/government, commercial, school, irrigation, and industrial. The major land uses within the City are residential, commercial/industrial, recreation/resort, and undeveloped lands.

Figure 2-1. Map of the Lake Havasu City Service Area



The City consists of the following character areas:

- Originally platted residential neighborhoods
- Tourism-based areas along much of the Lake Havasu shoreline and on Pittsburg Point Island (the Island)
- Urban core, which consists of downtown Lake Havasu City and other commercial and employment areas that serve both tourists and local residents

Residential areas are located throughout the City, and the commercial and industrial areas are concentrated in narrow strips that parallel the following main traffic routes: SR 95, Lake Havasu Avenue, North Kiowa Boulevard, and McCulloch Boulevard. The recreation and resort areas include the Lake Havasu shoreline, the Island, and golf course facilities in the southwestern portion of the City. Most of the undeveloped area is in the northern and eastern parts of the City. The northern portion is separated by an unincorporated area served by EPCOR. The northern area lends itself to future growth based on its terrain, while the eastern area is characterized by steeper topography that may constrain its maximum development potential.

The federal- and state-owned lands bordering the City also provide development constraints. Large portions of the Island and the City are publicly owned. Although the City has conducted initial planning for certain areas, and these plans are reflected in the future land use plan for the City, these areas will remain undeveloped until the State auctions off the larger parcels.

2.2.1 GENERAL PLAN

The 2016 General Plan (Clarion 2016) is a long-range plan for guiding the future growth of the community. The Arizona Revised Statutes require that each city adopt a comprehensive, long-range general plan to guide the community's physical development. The following are purposes of the general plan:

- Express the community's vision.
- Identify the community's goals and development priorities.
- Serve as a policy guide for local decision-making.
- Fulfill legal requirements created by state law.

The 2016 General Plan is a statement of policy and an expression of the community's vision for the future. The plan is a tool for helping to guide and shape the planning area's physical development. The City's population, which is now well over 50,000, has triggered a specific set of requirements under the Revised Statutes and Growing Smarter Act. The 2016 General Plan meets the requirements of the Growing Smarter Act and the general plan requirements outlined in Arizona Revised Statutes Section 9-461.05.

The 2016 General Plan included several new areas that have grown significantly since the 2019 WMP was issued. New areas include two large residential master planned communities: Foothills Estates to the east and Havasu Riviera along the southern Lake Havasu shoreline. In the past several years, the Island area has developed, with residential consisting of single-family units with varying densities per acre. Each of these areas is expected to continue to grow over the next 5 to 10 years.

The General Plan Update will follow guidelines similar to those presented in the 2016 General Plan. This plan will be a long-term vision for the community's future, guiding decisions on growth, development, infrastructure, and quality of life.

2.2.2 POPULATION PROJECTIONS

Population estimates were updated based on the recent forecasts performed as part of the 2019 WMP (Jacobs 2019) and recently completed census data (U.S. Census Bureau 2020). The sources used in the development of the population projections are as follows:

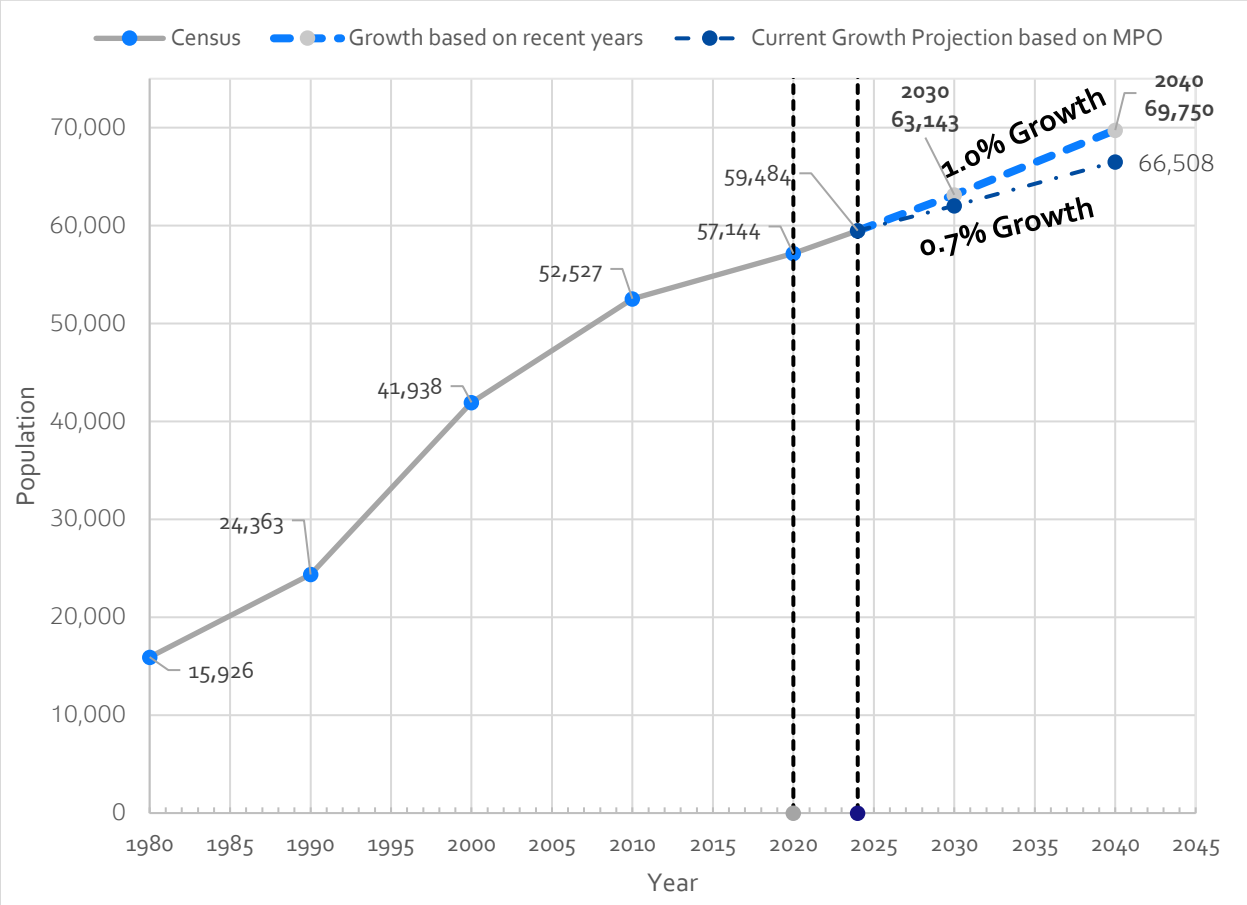
- Arizona Office of Economic Opportunity
- U.S. Census Bureau
- 2016 General Plan (Clarion 2016)

According to the U.S. Census Bureau, the City's population increased from 41,938 in 2000 to 52,547 in 2010 and 57,144 in 2020 (U.S. Census Bureau 2020). The Updated Wastewater Master Plan (Jacobs 2024) includes the Census Bureau's reported population of 59,257 for year 2023 (U.S. Census Bureau 2023). The Arizona Office of Economic Opportunity reported a population estimate of 59,484 for 2024 (AZOEO 2024). As part of the recent wastewater plans, the more recent population projections reported in the Lake Havasu Metropolitan Planning Organization *2045 Regional Transportation Plan* (Lake Havasu MPO 2022) were reviewed with the City Planning and Zoning Division. The population growth was estimated to be 0.7 percent from 2014 through 2040; this percentage was used to forecast the low range of future water demands.

From 2020 to 2024, the City experienced a growth rate of 1 percent. Multiple factors may have affected this growth, such as general economic conditions, an increase in remote working, and pandemic-related regulations. Figure 2-2 shows population-based projected growth through 2040, including the 0.7 percent and 1 percent growth rates.

Assuming an average 0.7 percent growth rate for the next 15 years through 2040, another 7,000 people would be added. If the current 1 percent growth rate were to continue through 2040, another 10,000 people would be added. In summary, population projections for Lake Havasu City indicate a slow but steady increase of residents over the next 25 years. For consistency with the Updated Wastewater Master Plan (Jacobs 2024), and given that several large-scale developments will be building out, a 0.7 percent growth rate was assumed for CIP timelines.

Figure 2-2. Lake Havasu City Population Forecast



2.3 WATER RESOURCES OVERVIEW

This overview of water resources includes information on water supply, groundwater, and water reuse.

2.3.1 WATER SUPPLY

The principal water source for Lake Havasu City is contracted, fourth priority[2] Colorado River water entitlements that total 28,581.7 acre-feet per year. This amount comes from contracts with the Bureau of Reclamation for 19,180 acre-feet per year, and with the Mohave County Water Authority (MCWA) for 9,389 acre-feet per year. Additionally, 2,139 acre-feet of fourth priority Colorado River water was secured in 2009 by the City through another MCWA subcontract, as indicated in the *Water Conservation Plan, Lake Havasu City* (LHC 2020). Furthermore, a 12.7-acre-foot fourth priority allocation was

[2] There is a specific priority system for Arizona's use of Colorado River water, numbered first through sixth, with the first priority rights being the most senior and most protected. For example, first priority rights are established in a Supreme Court Decree (Arizona v. California 373 U.S. 546 [1963]), known as Present Perfected Rights. These first priority rights were in use before the 1922 Colorado River Compact was signed. Fourth priority rights are held by water users with contracts, Secretarial Reservations, or other rights established by the United States after September 30, 1968. Entitlement of priority has a direct relationship to resource availability during periods of shortages within the Colorado River basin.

transferred to the City in 2012 from a developer planning to construct a small marina on Lake Havasu. This 12.7-acre-foot fourth priority water is exclusively reserved to compensate for lake surface evaporation caused by the enlargement of the Lake's surface area.

Because the Colorado River Basin is experiencing its worst drought in recorded history, the *Lower Basin Drought Contingency Plan Agreement* (DCP) (Bureau of Reclamation 2019) was adopted in 2019 by the seven Colorado River basin states (U.S. Department of the Interior 2019). The DCP was designed to protect the Colorado River system through voluntary reductions and increased conservation. If Lake Mead experiences continued water level elevation declines, the DCP has established pre-determined "trigger" elevations that would reduce water deliveries to Arizona.

In March 2024, the Bureau of Reclamation released the *Supplement to the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead Record of Decision* (Bureau of Reclamation 2024). The Record of Decision indicates an aim to conserve 3 million acre-feet of water through 2026 beyond reductions agreed to in the original *Record of Decision, Colorado River Interim Guidelines for Lower Basin Shortages and the Coordinated Operations for Lake Powell and Lake Mead* (Bureau of Reclamation 2007) also referred to as the 2007 Interim Guidelines, and the DCP.

Both the 2007 Interim Guidelines and the DCP are set to expire in 2026; therefore, a re-consultation process will take place between the Colorado River Basin states, U.S. government, Tribal Nations, and Mexico. The states are actively negotiating, and the U.S. Secretary of the Interior will develop new guidelines for long-term management of the Colorado River before the end of 2026. Currently, the impacts on Colorado River supplies are unknown; however, City staff are actively engaged in the re-consultation process as members of the MCWA.

2.3.2 GROUNDWATER

Lake Havasu City uses 10 conventional wells and the HCW for its water supply. The conventional production wells are located in two wellfields: one on the northwestern side of the City (eight wells) and one on the Island (two wells). Chapter 4 includes a detailed capacity evaluation and assessment of the City's well supply.

All wells use the Colorado River aquifer, which is hydrologically connected to the Colorado River and Lake Havasu. The City is aware of three private water wells for landscape irrigation that provide untreated water to a golf course, to a cemetery lawn, and to City Hall. Raw lake water is seasonally pumped through a surface water intake (called the South Intake) to supplement effluent demands; the raw lake water is stored at the City's Mulberry Wastewater Treatment Plant (WWTP). The mix of effluent and lake water is then pumped to the 36-hole Lake Havasu Golf Club and used for irrigation. The South Intake has typically provided between 1 and 1.5 million gallons per day (mgd) of raw source water during the summer months for golf course irrigation.

2.3.3 WATER REUSE

The City's practice of reusing treated wastewater (effluent) for landscape and turf irrigation has reduced the demand on the City's Colorado River water supply, resulting in the City lowering its annual allocation requests. Approximately 2,020 acre-feet of effluent was sold in 2014 to irrigation customers,

about one-half of the City's total annual generated effluent. Effluent will play a larger water management role in the future as the City moves to convert public potable water irrigation systems to effluent.

Approximately 50 percent of the treated effluent from the City's three WWTPs (Island, Mulberry, and North Regional) is reused, and the remaining balance is either recharged in percolation or discharged to vadose zone wells. Virtually 100 percent of the treated effluent from the Mulberry WWTP is reused for golf course irrigation. The North Regional WWTP reuse is sent to the Iron Wolf Golf Club, and some of this effluent is injected into the subsurface through vadose zone wells for storage; any excess effluent is conveyed to the Island WWTP percolation ponds. Historically, the combined annual volume of effluent is between 1,600 and 2,000 acre-feet.

The City has had recent challenges during the winter months to fully dispose of all the recycled water because of the loss of vadose zone well capacity, Iron Wolf Golf Club's reducing demand, and cooler winter days. As result, the City has embarked on new projects to increase vadose zone well capacity in the north and develop an option to reverse flow through the South Intake, sending recycled water to Lake Havasu.

2.4 DESIGN CRITERIA

This section summarizes the recommended water system design criteria for the 2025 WMP. Table 2-1 provides supply, distribution, and reliability criteria for this WMP that are consistent with American Water Works Association (AWWA) supply guidelines. Sections 2.4.1 through 2.4.8 provide a discussion on the major criteria.

Table 2-1. Potable Water Design Criteria

Description	Criteria
Water Supply ▪ HCW/Island Wells ▪ North Wellfield	MDD + % nonrevenue water
Water Supply Reliability ▪ HCW ▪ North Wellfield	Provide redundancy in the event of loss of the HCW supply. Develop a backup water supply from additional wells in the range from: ▪ Maximum: 100% maximum month supply ▪ Minimum: 100% average day supply
WTP Supply/Production	MDD + % nonrevenue water
Peaking Factors	
Minimum Day/Average Day Ratio	0.7
Maximum Day/Average Day Ratio	1.5
Maximum Month/Average Day Ratio	1.2 to 1.3
Peak Hour/Average Day Ratio	2.5
Storage Criteria	Sum of the following:

Table 2-1. Potable Water Design Criteria

Description	Criteria
Operational	20% of MDD
Fire	Based on largest fire zone (see Fire Demand Criteria below)
Emergency	100% of ADD
Transmission/Distribution Pipeline Criteria	
Maximum Velocity – MDD	
Pipe < 36 inches	5 fps
Pipe ≥ 36 inches	6 fps
Maximum Velocity – Peak Hour Demand	7 fps
Maximum Velocity – Fire Flow	15 fps
Maximum Head Loss – Peak Hour Demand	10 feet/1,000 feet
Distribution System Reliability	No more than approximately 50 homes on a dead-end main or three fire hydrants
Pressures Criteria	
Minimum Residual Pressure – Fire Flow	20 psi
Minimum Residual Pressure – Peak Hour Demand	40 psi (Note: desirable that during peak demands, the water system experiences no more than a 25-psi pressure drop from static.)
Minimum Static Pressure	50 psi
Minimum Desired Static Pressure (New Development)	≥ 60 psi
Booster Pump Station Criteria	
Without Storage	Capacity equal to larger of peak hour or MDD plus fire flow
With Adequate Storage	Capacity equal to MDD
Firm Capacity	Capacity with single pump (or largest pump) out of service
Pressure Zone Supply Reliability	Pressure zones with three or more BPSs supplying ADD with one station out of service
Booster Station	Minimum of three equally sized pumps; backup generator to supply sufficient power for firm capacity
Fire Demand Criteria	Based on International Fire Code (Fire flow credit is allotted for sprinklered buildings. A minimum fire flow of 1,500 gpm is required if sprinkler systems are not installed.)

ADD = average day demand
gpm = gallon(s) per minute
fps = feet per second
psi = pound(s) per square inch

2.4.1 WATER SUPPLY

Table 2-1 shows that water supply facilities, including wells and the WTP, must be sized to meet the MDD for the year. A nonrevenue or water loss allowance is also included as part of the design criteria.

2.4.2 PIPELINES

Water system piping serves three purposes:

- To transfer water from the source of production to storage
- To distribute water from the source or storage to the consumer
- To provide a conduit to supply firefighting water

Transmission and distribution mains are sized for the greater of the following two demand conditions:

- MDD plus fire flow
- Peak hour demand

Pipeline sizing criteria are established to minimize system head loss, optimize pumping energy requirements, reduce scouring of pipeline interior protective coatings, and minimize wear on in-line valves. This is especially important for large cement mortar-lined and coated steel or ductile iron transmission mains. Pipeline velocities are limited to 7 fps for all operating conditions, except MDD plus fire flow, in which case velocities may not exceed 15 fps. Typically, transmission mains are sized under peak hour conditions, while distribution mains are sized for MDD plus fire flow. Looping is desired, where applicable, to maintain water quality and reliability, especially to avoid long dead-ended water mains. In special circumstances, piping facilities may operate outside maximum ranges if minimum residual pressures are met and conditional approval is obtained from the City.

2.4.3 PEAKING FACTORS

The demand peaking factors shown in Table 2-1 are based on an analysis of current and historical City peak flows. The current criteria for minimum day, maximum day, and maximum month peaking factors of 0.7, 1.5, and 1.3, respectively, were validated based on a review of 2023 and 2024 water production and water use data. The peak hour factor of 2.5 has been used in past City WMPs and is consistent with industry standards for the size of the water service area.

2.4.4 FIRE FLOW

Fire flow analysis is conducted to ensure that adequate protection is provided during fire emergencies. In addition to supplying adequate flows, a minimum residual pressure of 20 psi is required to maintain the integrity of the distribution system. Therefore, the City's water infrastructure will be evaluated to determine whether a minimum pressure of 20 psi will be maintained in an MDD plus fire flow condition.

The Fire Marshal confirmed that the City had adopted the International Fire Code for determining the fire flow requirements for new development. The Code also allows for a reduction in fire flow based

on fire sprinklers being installed. Additional local fire codes may be applied, as determined by the Fire Marshal.

Fire flow storage would be calculated based on the largest fire flow and duration required in a pressure zone based on AWWA M42 criteria (AWWA 2017). In most cases for the City, the largest fire flow will be commercial or industrial type uses based on large building square footages. Fire flow storage can typically be shared between reservoirs in the same pressure zone. For closed zones, fire flow storage is located in the nearest reservoir supplying the BPSs.

2.4.5 BOOSTER PUMP STATIONS

Table 2-1 includes industry standard sizing criteria for BPS facilities, which is to provide a firm MDD capacity based on available storage within a pressure zone with a single pump out of service. Peak hour and fire flow demands in excess of the MDD are typically met from water stored in the reservoirs in that zone. Standby pumping units with capacity equal to the largest unit in a BPS and emergency backup power are required for each station. Closed BPSs must be able to deliver the larger of the peak hour or MDD plus fire flow demand with the required standby capacity, including backup power.

2.4.6 PRESSURES

The following pressure criteria are recommended to assess the adequacy of the water transmission or distribution system under the two demand conditions:

- Peak Hour Demand: Minimum pressures should be greater than 40 psi. Service pressures higher than 80 psi require that each individual house have pressure regulation on each service line according to the City Building Code (LHC 2025b). Criteria are established to account for distribution system and backflow prevention facility head loss in order to achieve a minimum service pressure of 40 psi.
- MDD plus Fire Flow Condition: A minimum of 20 psi at the point of maximum fire draft.

Minimum residual pressure criteria for fire flow and peak hour demand are as follows:

- Fire flow ≥ 20 psi
- Peak hour demand ≥ 40 psi

Minimum static pressure and desired static pressure criteria are as follows:

- Static pressure ≥ 50 psi
- Desired static pressure for new development projects ≥ 60 psi

There should not be large pressure swings in the distribution system. A target maximum pressure swing of no more than a 25-psi drop from static during peak hour.

2.4.7 STORAGE FACILITIES

This section presents the recommended 2025 storage criteria for the distribution system. Based on a review of AWWA Manual M42 (AWWA 2017), storage should be sized based on three storage components:

- Fire flow
- Operation
- Emergency

Fire Flow Storage

It is recommended that fire flow storage be provided for the largest fire flow and duration in each pressure zone. Fire flow storage is assumed to be shared among multiple tanks in a pressure zone. If additional fire storage is required in the pressure zone, especially in the far reaches, the master plan also recommends several PRV stations between zones to access higher zone storage during emergencies.

Operational Storage

No change is recommended in operational storage based on a review of operational parameters and reservoir level pump settings.

Emergency Storage

Emergency storage is needed in the distribution system for the following reasons:

- Localized outage in the zone distribution system being served
- Lower-pressure zone BPS outage
- Other tanks in the pressure zone out of service
- Forebay storage for a BPS

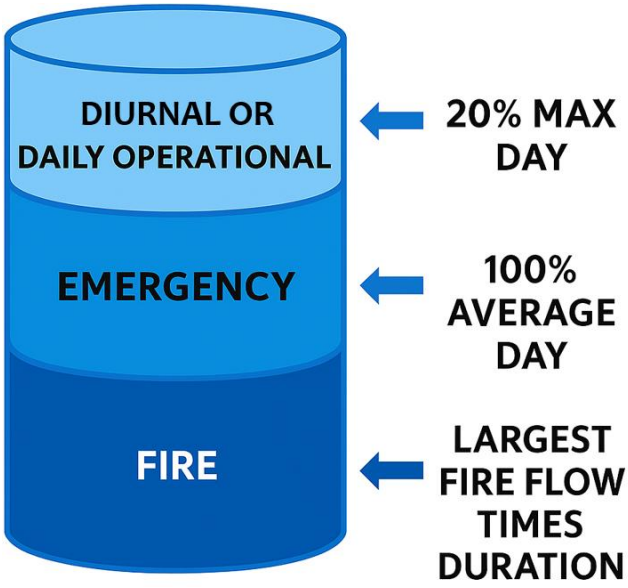
Emergency storage is unique to every system and pressure zone. Various industry standards range as follows:

- 100 percent MDD
- 100 percent ADD
- 50 percent ADD

Based on a review of the 2019 WMP and the City's input, it is recommended that at least 1 ADD of water be maintained in storage.

The recommended 2025 storage criteria are shown on Figure 2-3. Figure 2-3 includes percentages for operational, emergency, and fire storage components based on the 2019 WMP storage criteria.

Figure 2-3. 2019 Water Master Plan Storage Criteria



The City takes into consideration whether splitting the required storage volume into two tanks would be beneficial for a particular site. Such a decision is made on a site-by-site basis and based on the service zone characteristics. In this manner, the City can take one tank out of service at a time for maintenance activities or operate only one tank during low demand to more closely manage system water quality.

2.4.8 PRESSURE-REDUCING VALVE STATIONS

The City owns and operates 11 PRV stations in the distribution system, as shown in Table 2-2. Design criteria typically include a main valve (sized for downstream zone fire flow) and smaller bypass valve (sized for average or peak demands). Recently, the City equipped new water BPSs with a PRV to allow flow to be bypassed from the higher zone to the lower zone. Use of PRVs should be evaluated on a case-by-case basis for each new BPS project.

Table 2-2. PRV Station Summary

Lake Havasu City ID	Name	Zone	Valve Diameter (inches)		Setting (psi)		Elevation (feet)
			Primary	Secondary	Primary	Secondary	
1	North Havasu East	Zone 2A to Zone 1A	2	8	128	75	730
2	North Havasu West	Zone 2A to Zone 1A	4	10	128	78	730
3	C-Booster	Zone 1 to Zone 1.1	6	10	148	82	460
4	Well 2	Zone 1 to Zone 1.1	4	10	140	90	480
5	McCulloch	Zone 1 to Zone 1.1	4	-	140	90	480

Table 2-2. PRV Station Summary

Lake Havasu City ID	Name	Zone	Valve Diameter (inches)		Setting (psi)		Elevation (feet)
			Primary	Secondary	Primary	Secondary	
6	Vagabond	Zone 4 to Zone 3	6	-	156	90	1,040
7	Cherrytree	Zone 6 to Zone 6.1	2	8	150	57	1,435
8	Sea Angler	Zone 1 to Zone 1.2	2	6	135	75	480
9	Sea Lancer	Zone 1 to Zone 1.3	2	6	135	75	480
10	SARA Park[a]	Zone 3	6	-	82	82	1,032
11	BS-4	Zone 6 to Zone 6.1[b]	4	4	165	135	1,380

[a] This valve is a safeguard against over pressurizing Zone 3 if the Vagabond PRV station were to fail in the open position. If failure were to occur, the potential pressure at the bottom of Zone 3 could reach 312 psi without the secondary valve in place.

[b] Fed from the Zone 6 BPS discharge pipe (Zone 6) to Zone 6.1

Note:

- = not applicable

3. Water Demand Development

This section presents Lake Havasu City's current water supply production and existing average annual demand. The baseline data are then used to show a future demand forecast based on potential growth scenarios.

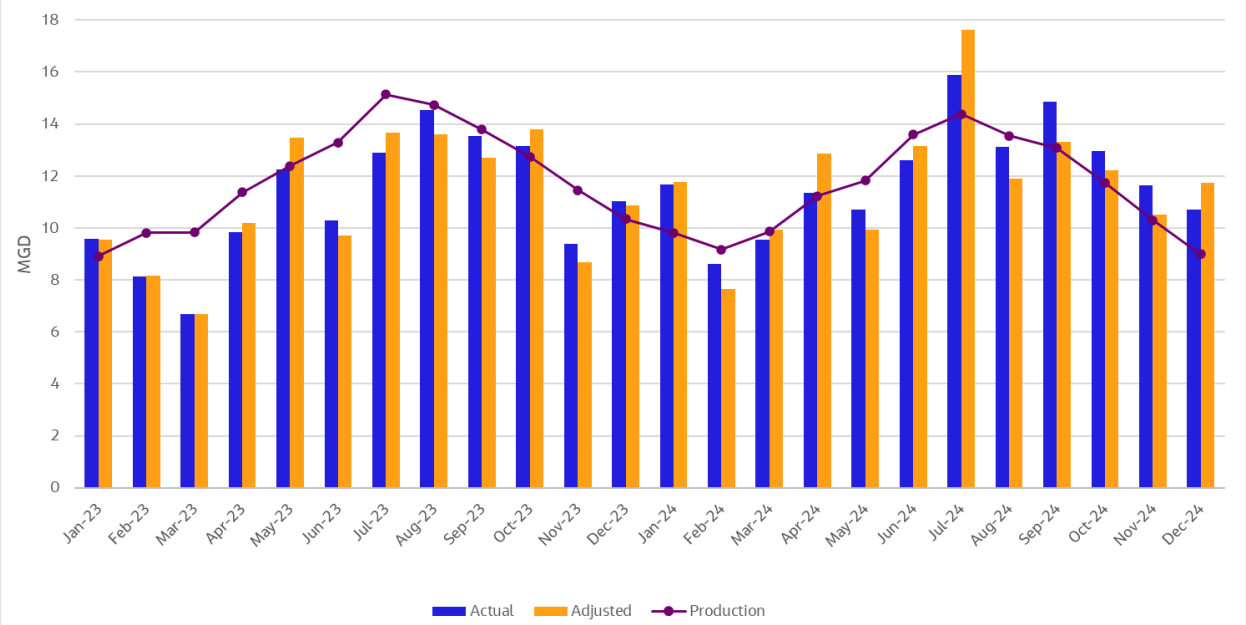
To plan for future needs, the City's water supply and demand balance are carefully monitored to confirm that this growth is accommodated with additional infrastructure and reliable supplies but without compromising water quality. Sections 3.1 and 3.2 discuss various aspects of water management, including existing demands, future demand projections, and associated best practices for water conservation and efficiency.

3.1 EXISTING BASELINE DEMAND

Jacobs analyzed the monthly customer consumption data from the billing system from December 2022 to January 2025 and compared the data with the average water production each month. The billing data included instances of negative water usage, which required adjustments. These anomalies were primarily attributed to billing corrections or the application of customer credits. Meter read dates vary among accounts each month and do not necessarily align with the date ranges in the monthly production data summaries. To more accurately compare monthly consumption with monthly production, the consumption data need to be adjusted to match production data time frames. To achieve this consistency, the average daily use was calculated in the monthly read period, and the averages by calendar month were aggregated.

Figure 3-1 shows actual and adjusted water use for 2023 and 2024. The actual use equates to consumption during the read month as documented in the City's billing system, and the adjusted use is the estimated consumption associated with each calendar month. The City's monthly average potable production is also shown. Throughout the analysis period, the adjusted consumption aligns with monthly production values. Figure 3-1 also shows a typical seasonal pattern for the years 2023 and 2024, with the highest water consumption and production levels occurring in the summer months.

Figure 3-1. 2023 and 2024 Monthly Potable Summary



Figures 3-2 and 3-3 illustrate the City's customer account types and respective monthly water consumption for 2023 and 2024. The blue bars represent residential customers, purple bars represent commercial customers, red bars represent industrial customers, yellow bars represent municipal usage, and green bars represent hydrant usage. Residential customers account for approximately 80 percent of the City's water usage. Figure 3-2 shows actual usage, and Figure 3-3 shows adjusted usage.

Figure 3-2. 2023 and 2024 Customer Account Type Monthly Summary (actual)

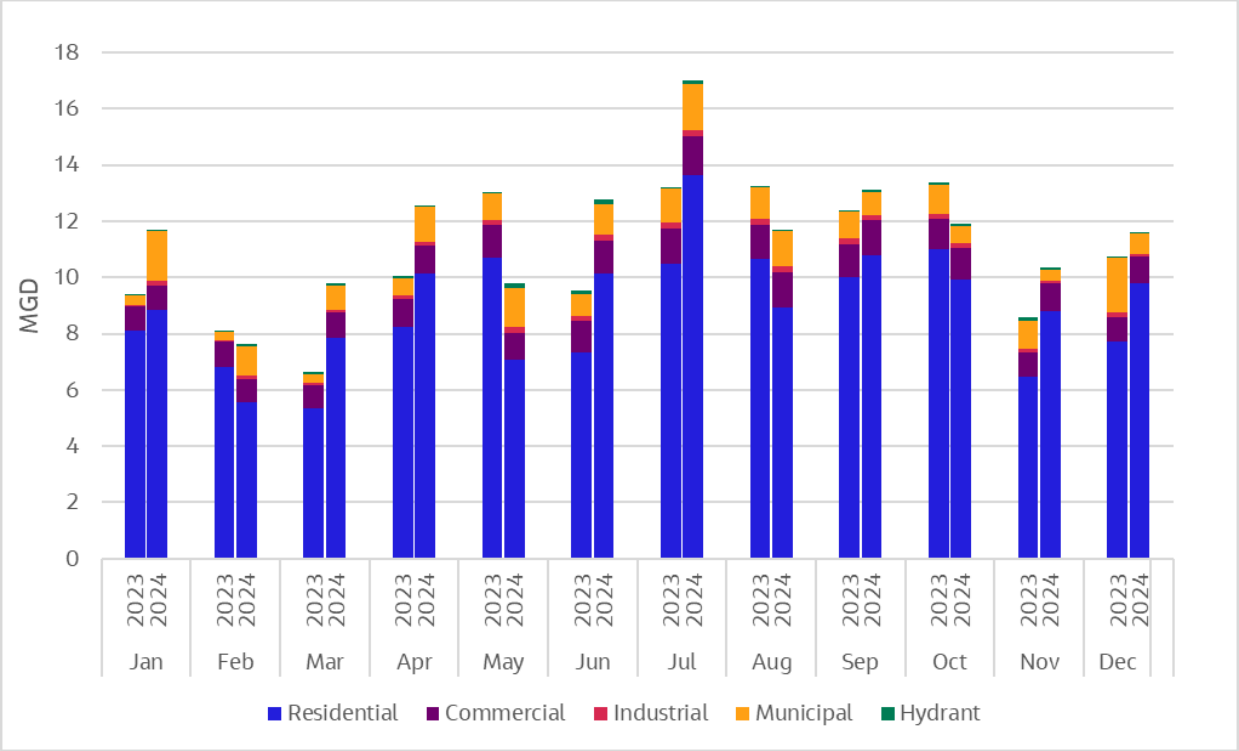


Figure 3-3. 2023 and 2024 Customer Account Type Monthly Summary (adjusted)

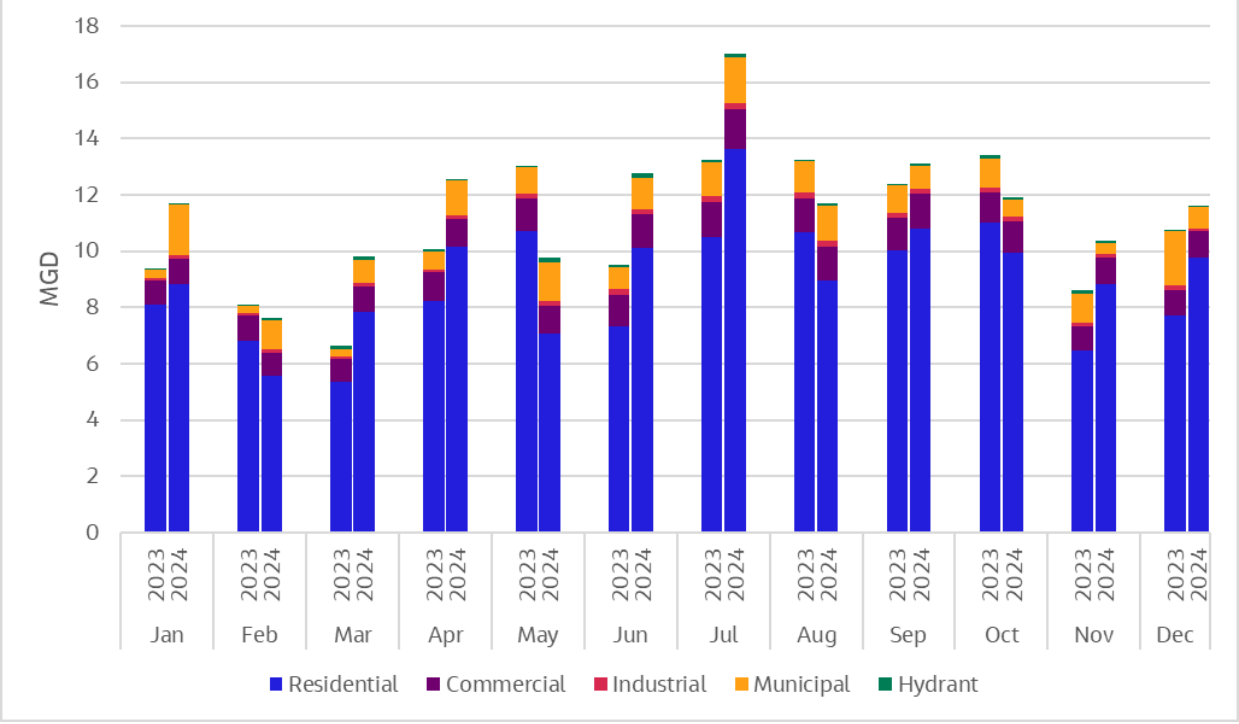
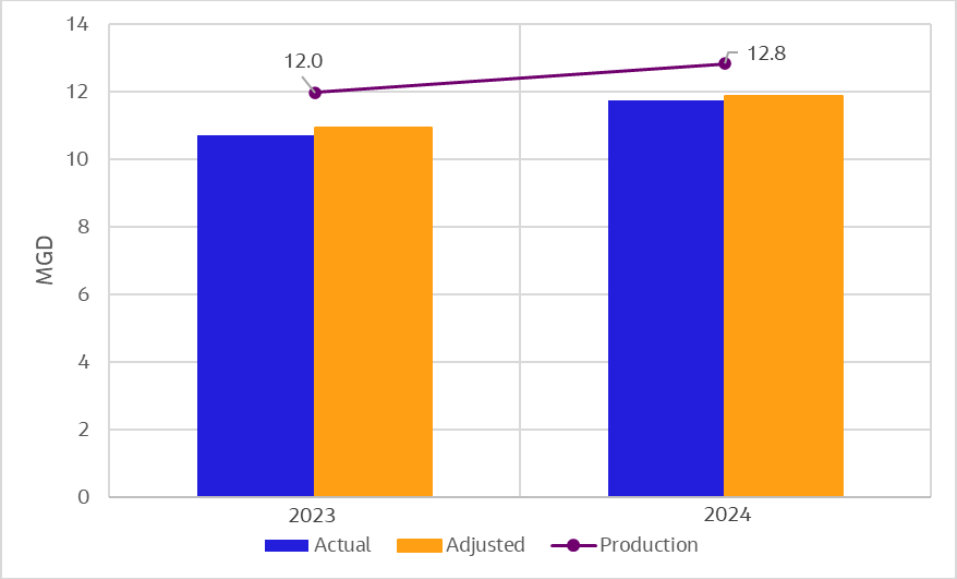


Figure 3-4 shows the increase in annual consumption and production from 2023 to 2024. The City's water production was 12 mgd in 2023 and increased by 6.67 percent to 12.8 mgd the following year. This increase may be a result of the new meters installed by the City. The new meters are more accurate, resulting in an apparent increase in water usage.

Figure 3-4. Annual Potable Consumption versus Production



Potable production is correlated to temperature. Figure 3-5 shows a moving 7-day average of both potable production and daily maximum temperature for 2023 to 2024. Maximum daily temperature and production tend to be more closely correlated during the summer months.

Figure 3-5. 2023 and 2024 Temperature and Potable Production

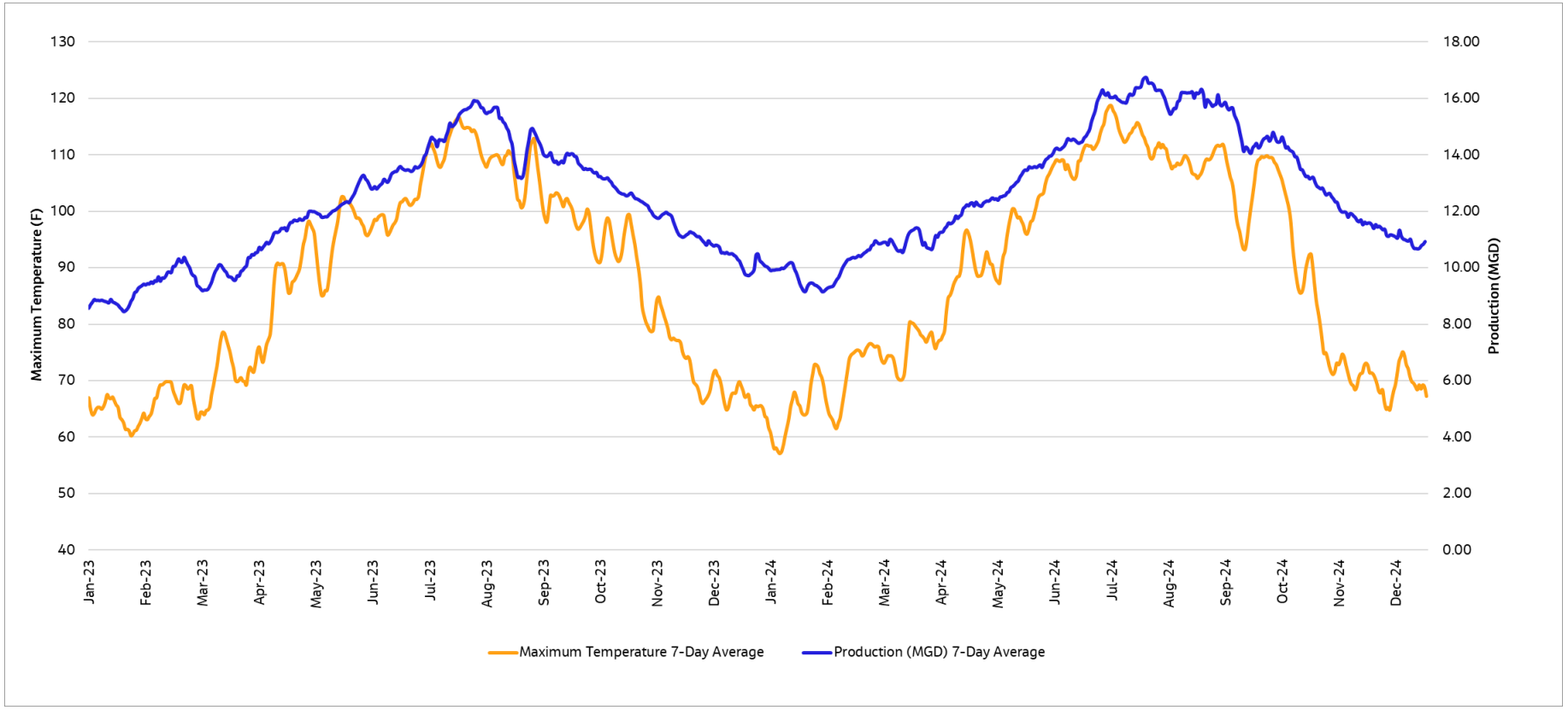
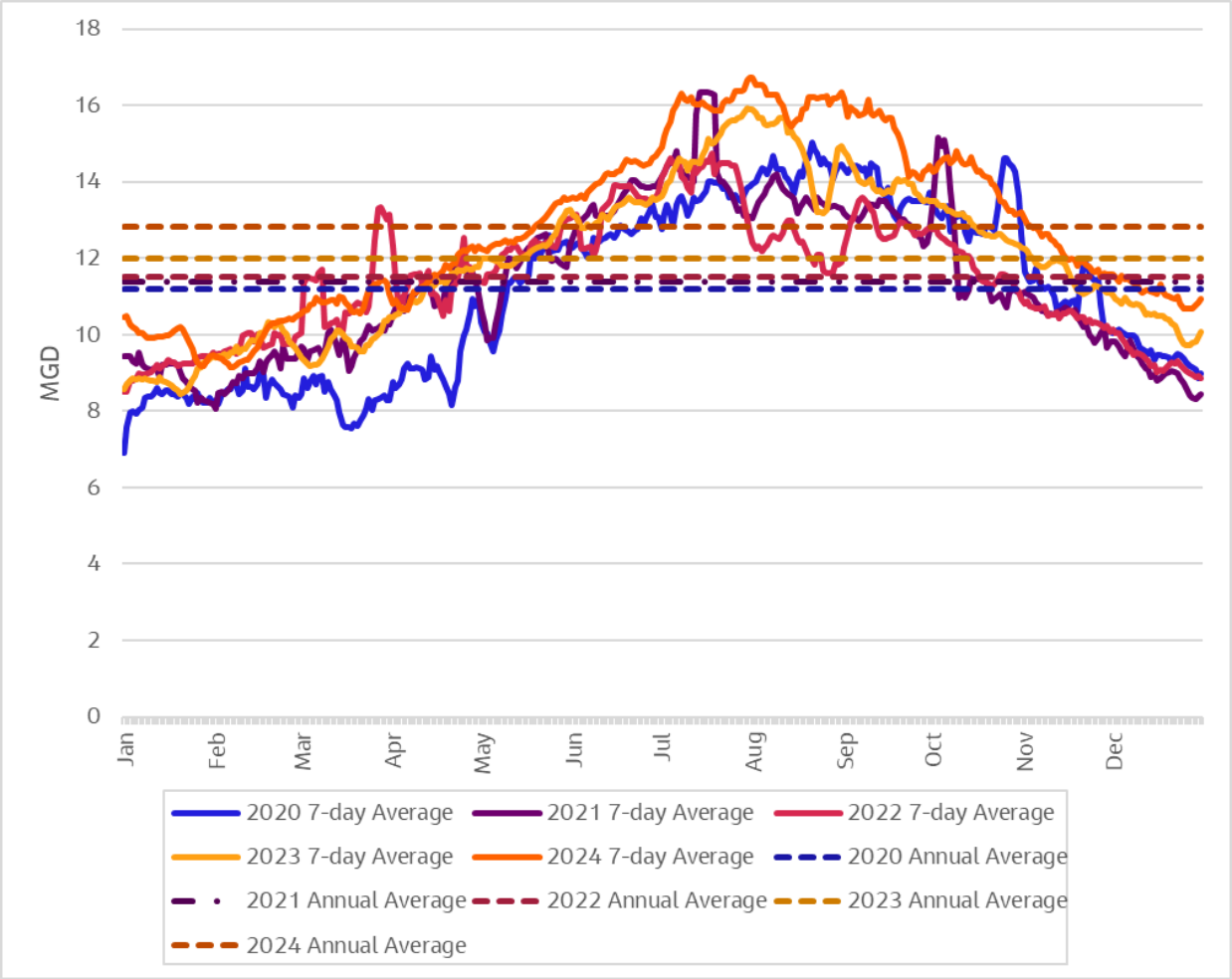


Figure 3-6 shows the annual variation in water production by the City. Production increases in the summer to meet higher demands and decreases in the winter. The annual average production has increased from 11.2 mgd in 2020 to 12.8 mgd in 2024.

Figure 3-6. 7-day Average and Annual Average Water Production



3.1.1 EXISTING DEMAND BY PRESSURE ZONE

The City's water distribution system consists of 14 pressure zones to serve the varying topography. Figure 3-7 illustrates the major pressure zones within the City that are served by a BPS and in most cases storage tanks. Pressure zones 1, 2, 3, and 4 are the largest zones servicing the highly developed central and western parts of the City.

Figure 3-7. Lake Havasu City Pressure Zones

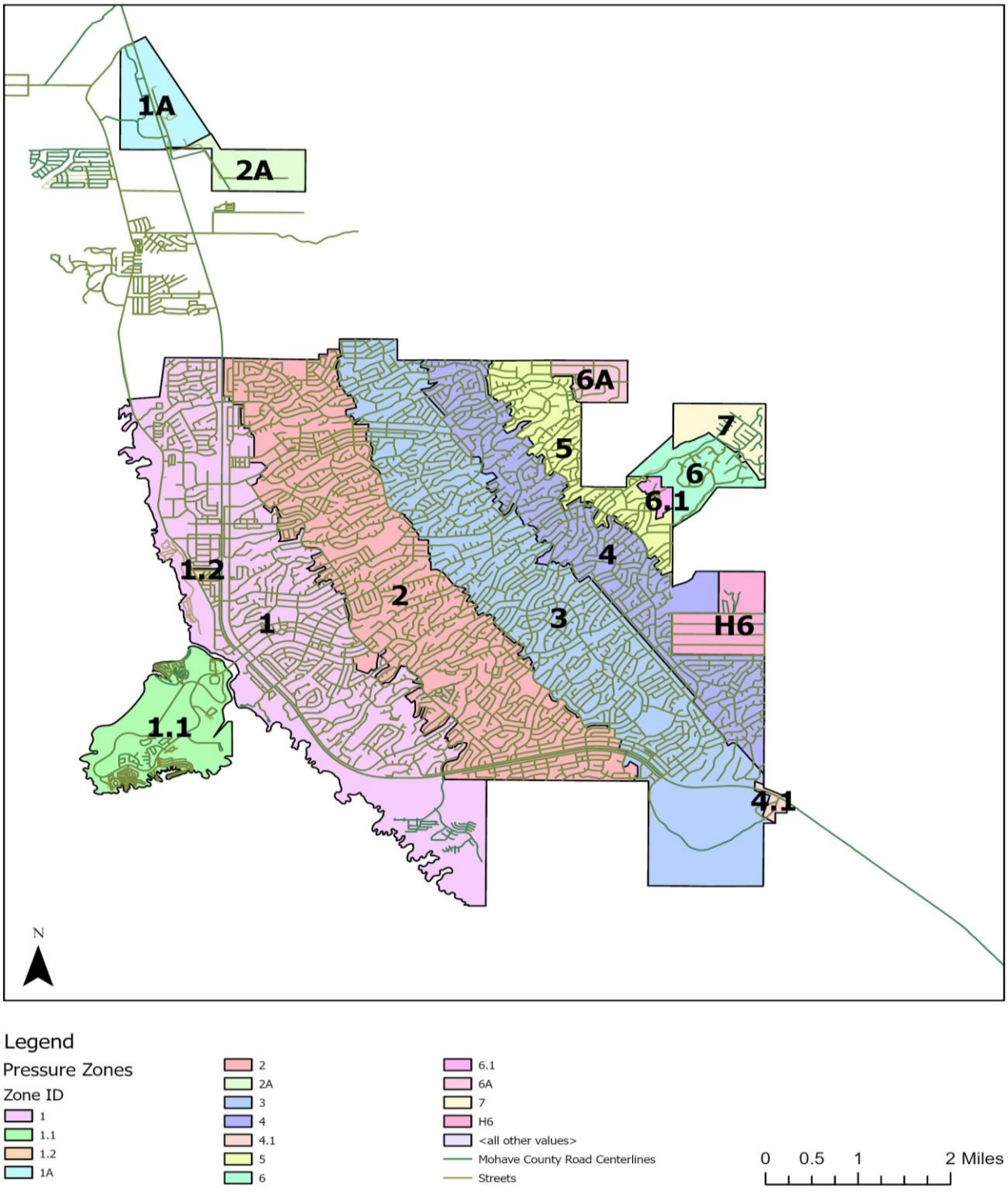


Table 3-1 presents the adjusted and actual water consumption levels by pressure zone for 2023 and 2024. The Lake Havasu City billing data were exported from the geographic information system (GIS) and summarized using a pivot table to show annual water consumption by pressure zone. Data entries missing location data or falling outside defined pressure zones were excluded from this analysis. Nineteen records, mostly irrigation and Lake Havasu City accounts, could not be assigned to a pressure zone because of missing location information. As shown in Table 3-1, the total adjusted water consumption in 2023 was 10.93 mgd, increasing to 11.88 mgd in 2024. In contrast, the total for actual water consumption in 2023 was 10.96 mgd, increasing to 11.97 mgd in 2024.

Table 3-1. Adjusted and Actual Water Consumption by Pressure Zone in 2023 and 2024

Pressure Zone	Adjusted 2023 (mgd)	Actual 2023 (mgd)	Adjusted 2024 (mgd)	Actual 2024 (mgd)
1	3.30	3.23	3.66	3.68
1.1	0.36	0.37	0.41	0.41
1.2	0.02	0.02	0.02	0.02
1A	0.06	0.06	0.08	0.08
2	2.88	2.89	3.06	3.06
2A	0.02	0.02	0.01	0.01
3	2.19	2.25	2.44	2.49
4	1.13	1.14	1.19	1.18
5	0.52	0.52	0.55	0.55
6	0.10	0.10	0.11	0.11
6.1	0.02	0.02	0.02	0.02
6A	0.09	0.09	0.09	0.09
7	0.05	0.05	0.06	0.06
H6	0.07	0.07	0.07	0.07
Total	**10.93**	**10.96**	**11.88**	**11.97**

3.1.2 PEAKING FACTORS

A peaking factor is a multiplier used to convert ADD into MDD or peak hour demand. These factors are essential in hydraulic models to simulate conditions of maximum stress on the system (such as seasonal peak or seasonal peak plus fire flow) or to validate diurnal patterns in extended period simulations. Jacobs calculated average day to maximum day and month peaking factors using the City's production data. Table 2-1 includes the recommended WMP peaking factors.

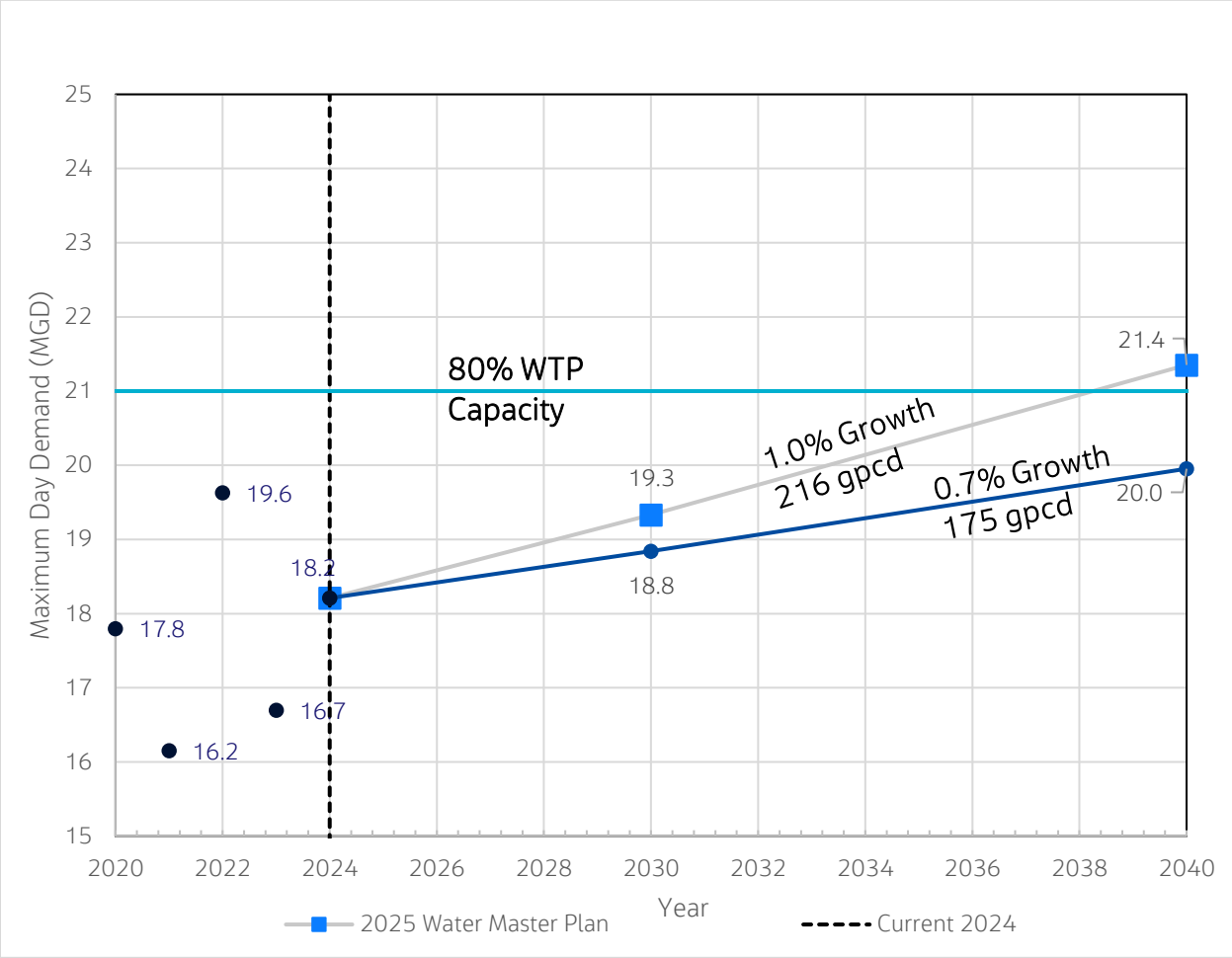
3.1.3 NONREVENUE WATER

Nonrevenue water in Lake Havasu City includes water produced but not billed to customers, such as losses from leaks in the City's network, unauthorized consumption, and meter discrepancies. Water used for other municipal purposes not tracked by meters, such as for flushing mains and firefighting, is also considered nonrevenue water. The City monitors its water distribution network to identify major losses and discrepancies between supply and meter data. These efforts aid in minimizing nonrevenue water and maximizing water system efficiency.

3.2 WATER DEMAND PROJECTIONS

Based on population projections from Section 2.2.2, Jacobs used the calculated per capita water use of 216 gallons per capita per day to develop the water demand projections for 2030 and 2040, assuming the current 2024 maximum day production data and the current 2024 population. As shown on Figure 3-8, and using the assumed 7 percent growth seen between 2024 and 2040 (Figure 2-2), the water MDD was expected to increase to 19 mgd in 2025 and 20.4 mgd in 2040, both of which are below the 80 percent WTP capacity. However, if growth continues at 1 percent, as it did from 2020 through 2024, by 2040, the MDD will be above the 80 percent WTP capacity benchmark. Because the data are derived from production data, the water unaccounted for in the distribution system is included. The potable water demand forecast conservatively does not consider any new increases in recycled water demand from the conversion of potable irrigation meters. The City could potentially convert 0.3 to 0.5 mgd of potable water irrigation to recycled water in the future. However, cost-benefit issues may affect the ability to realize this demand.

Figure 3-8. Water Demand Projections



Assumes a range between 175 and 216 gallons per capita per day

4. Water Supply

Sections 4.1 through 4.6 review the infrastructure and components that make up the City's water supply.

4.1 COLORADO RIVER ALLOCATION

The water source for the City is derived from entitlements to the Colorado River and the hydraulically connected Colorado River aquifer. The City's groundwater facilities have historically consisted of conventional vertical groundwater wells near the Colorado River. The wells draw Colorado River water through the subsurface sediments and into the wells.

4.2 EXISTING SYSTEM – EVALUATION

The City uses up to 10 conventional wells and the HCW for its water supply, as follows:

- Eight conventional wells are located in the northern part of the City, just north of the existing WTP. Collectively, these wells comprise the North Wellfield.
- Two conventional wells and the HCW are located on the Island near the west-central part of the City. These wells comprise the Central Wellfield.

Figure 4-1 shows the location of the HCW, conventional water wells, and WTP.

The City's well collection system piping consists of a 48-inch pipeline that conveys raw water north from the Central Wellfield (including the HCW) to the WTP. A single transmission main conveys water from the North Wellfield south to the WTP. The 48-inch pipeline runs beneath the channel that separates the Island from the mainland and was installed using a directional boring technique. This pipeline is reported to be deep beneath the channel, such that required repairs to the deep portions of the pipeline would likely be infeasible (Morris 2017). This fact highlights a vulnerable point in the City's water supply system because an interruption in service of the 48-inch pipeline would cut off a portion of the City's raw water supply until repairs of the 48-inch pipeline could be made or a replacement installed. The City is addressing this vulnerability by installing a parallel pipeline through a bridge across the channel.

Jacobs obtained information regarding the City's existing and abandoned conventional wells from the City's existing well records, supplemented with information from the Arizona Department of Water Resources Well Registry. The City wells identified for this work are listed in Table 4-1.

Figure 4-1. Location Map

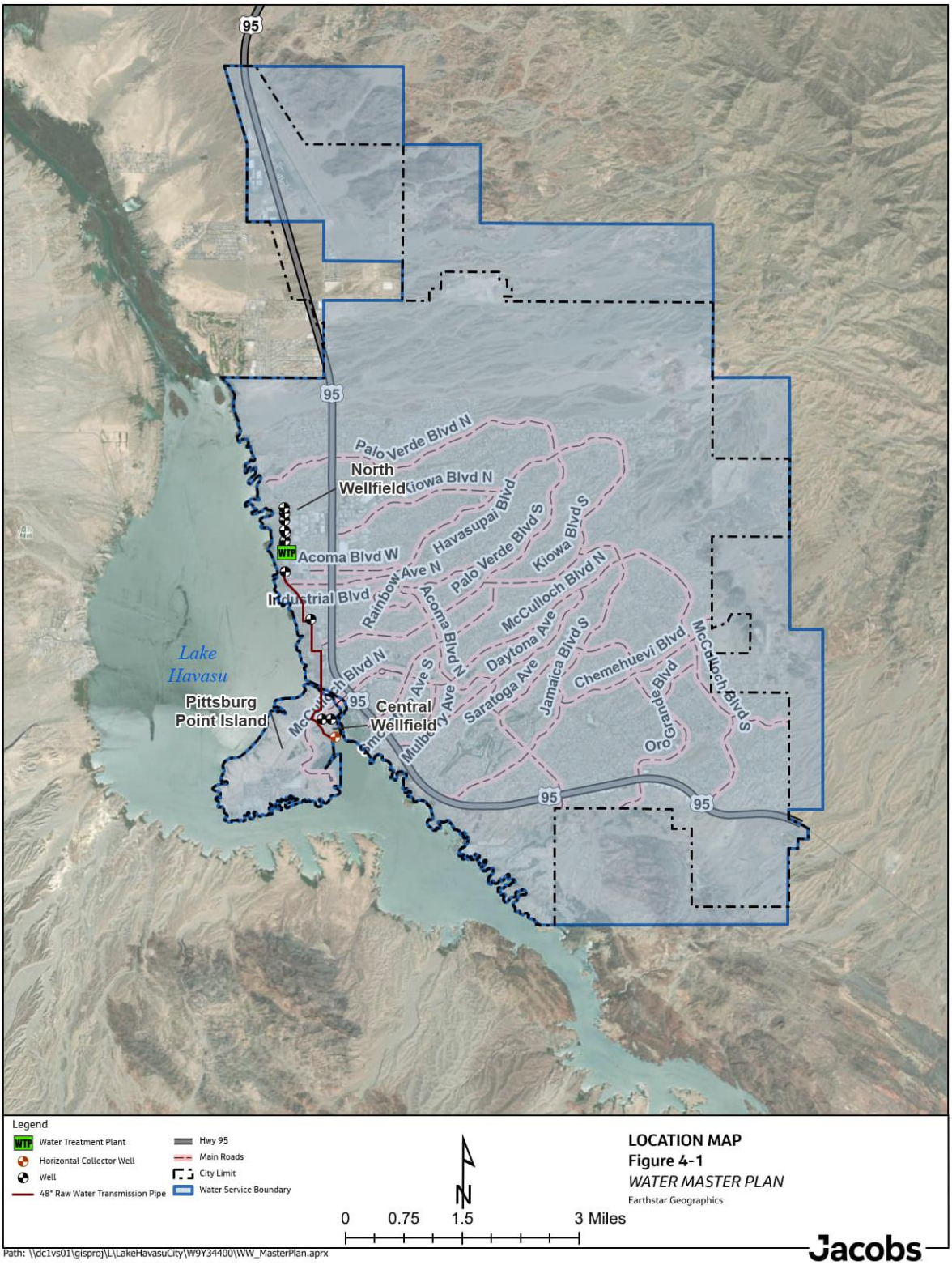


Table 4-1. Wells Reviewed in Lake Havasu City for 2026 Water Master Plan

Date Constructed		Age (years)	Depth[a] (feet)	Diameter (inches)	Design Capacity (gpm)	Initial Specific Capacity (gpm/ft)
North Wellfield Existing						
Well 22	6/9/2021	4	600	21	1,800	12
Well 23	6/9/2021	4	600	21	1,800	12
Well 18	3/7/1986	39	450	30/20	1,700	10
Well 15	3/7/1977	48	550	16	1,300	unknown
Well 14	8/20/1975	49	509	20/16	1,100	13
Well 10	1/31/1975	50	550	20/16	1,000	11
Well 12	11/15/1974	51	405	12/10	700	8
Well 11	9/20/1974	51	440	12/10	700	11
North Wellfield Abandoned						
Well 3	1/12/1987	n/a	160	20	500	6
Well 8	6/27/1965	n/a	155	12	475	6
Well 13	4/4/1975	n/a	511	20/16	1,100	11
Central Wellfield Existing						
Well 2	4/12/1979	46	163	20	2,200	115
Well 9	4/21/1990	35	175	18	2,900	139
HCW	4/16/2000	25	97	192	17,400	484

[a] From ground surface to inside bottom of finished well

Notes:

gpm/ft = gallon(s) per minute per foot

n/a = not applicable

Equation 1. Specific Capacity

$$SC = \frac{Q}{\Delta s}$$

Variables

SC = Specific capacity (gpm/ft)
Q = Pumping rate (gpm)
Δs = Drawdown, change in well water level due to pumping (feet)

The wells listed in Table 4-1 with known locations are shown on Figures 4-2 and 4-3.

Figure 4-2. North Wellfield

Figure 4-3. Central Wellfield

4.3 CENTRAL WELLFIELD - HORIZONTAL COLLECTOR WELL

The HCW consists of a central concrete caisson with 14 stainless-steel lateral screens projected horizontally near the base of the caisson. The collector caisson has an inside diameter of 16 feet and 2.5-foot-thick caisson walls. The internal depth of the caisson is 98 feet from the top of the caisson to the caisson floor.

4.3.1 HCW CONSTRUCTION

Eleven lower lateral screens were installed at 3 feet above the floor of the caisson, and 3 upper lateral screens were installed at 5.5 feet above the floor of the caisson. Each lateral is equipped with 30 to 210 feet of 12-inch-diameter wire-wound stainless-steel well screen. The total lateral length installed is 1,900 feet. The laterals were installed through stainless-steel port assemblies, which were grouted into the wall of the caisson. The laterals were each equipped with non-rising stem resilient seat gate valves. The gate valve operators are submerged in the caisson; valve stem risers were not installed to enable valve operation inside the HCW building.

The geologic logs for the HCW and the test hole constructed for it indicate that hydrogeological conditions are similar to those in the area of existing wells 2 and 9—that is, sand, gravel, and cobbles in at least the upper 100 feet of the sediments.

The HCW was tested following its construction in March 2000. A variable-rate pumping test was conducted at pumping rates of 6.3 mgd, 12.5 mgd, 18.7 mgd, and 25 mgd. After the variable-rate pumping test was complete, a constant-rate pumping test was conducted. For the constant-rate test, the HCW was pumped at a constant rate of 25 mgd for a period of 30 days.

The 2019 WMP describes assessment activities in the Rotary Park Beach area and near Lake Havasu State Park for a second HCW. However, data from a test boring drilled just north of the channel at Lake Havasu State Park indicated that development of an HCW might be possible at this location (Ranney 1996).

4.3.2 HCW OBSERVATIONS

Specific Capacity. In the 2019 WMP, the specific capacity of the HCW at the time of construction was compared to the specific capacity calculated using operational data. The analysis indicated that the specific capacity in the HCW has decreased over time, which is not uncommon. Based on this analysis, the capacity of the HCW has decreased from 25 mgd in 2000 to about 17.5 mgd in 2019, a reduction of approximately 30 percent (Jacobs 2019).

Inspection. In 2018, inspection of the HCW was performed by Building Crafts, Inc. The inspection included diving into the HCW, inspecting the laterals, and measuring the flow contribution from each lateral. The results of the inspection indicated that operation of the HCW for prolonged periods of time at or near the initial design pumping rate (25 mgd) may exceed the capacity of the laterals, thereby reducing the long-term useful life of the HCW (Building Crafts, Inc. 2019).

Additional Inspection. In February 2019, the City reported higher than usual turbidity production from the HCW. Reportedly, the turbidity was observed about 1 week following the start of a restroom renovation, which occurred over two of the HCW laterals. Divers were sent into the HCW for an inspection on April 5, 2019, and found that the two laterals closest to the restroom were full of sand, with a pile of sand accumulated on the HCW floor. The laterals were valved off, which was expected to further reduce the HCW capacity.

Current Status. Currently, the City operates the HCW by periodic pumping at an average rate of 8,500 gpm (12.2 mgd). The City is in the process of installing two new pumps with planned ratings of 3,000 gpm (4.3 mgd) and 6,000 gpm (8.6 mgd) to provide more flexibility in the production rate. When the work is complete, the 3 pumps can be operated independently or in various combinations to provide flow rates ranging from 4.3 to 25.1 mgd. The latter capacity would require all three pumps to operate.

4.4 CENTRAL WELLFIELD - CONVENTIONAL WELLS

Details of the construction and capacity of the Central Wellfield wells were reviewed to develop an assessment of potential future use of the wellfield. The well details that were used in this assessment are listed in Table 4-2.

Table 4-2. Central Wellfield Existing Wells

Existing			Casing			Perforations	Well
No.	Age in Years	Material	Diameter (inches)	Interval (feet)	Wall (inches)	Interval (feet)	Cut (inches)
2	46	Mild Steel	20	0 to 163	Unknown	Unknown	Unknown
9	35	Mild Steel Stainless Steel	Unknown 18	0 to 60 0 to 175	Unknown Unknown	None 90 to 165	None 0.04 Louvered

4.4.1 CENTRAL WELLFIELD CONSTRUCTION

Existing Well 2 is constructed of mild steel casing and is believed to have a perforated screen interval. Well 9 is constructed of mild steel and stainless-steel casing with a stainless-steel louvered screen. Very little construction information was found for Well 2. More information was obtained from the Arizona Department of Water Resources Well Registry for Well 9. The upper 60 feet of casing is listed as mild steel, followed by stainless-steel casing and screen to the depth of 175 feet. The geologic logs for both wells indicate that they are completed in sands and gravels. The current specific capacity values for Wells 2 and 9 are 115 gpm/ft and 139 gpm/ft, respectively.

4.4.2 CENTRAL WELLFIELD OBSERVATIONS

The existing conventional wells in the Central Wellfield are between 35 and 46 years old. As discussed in the North Wellfield section, the useful life of well casings in Arizona typically ranges from 40 to 50 years (Roscoe Moss n.d.), and considering mild carbon steel casing, the economic life may be only 25 years.

Based on these guidelines, Well 2 may be at or near the end of its useful economic life. Maintenance, including sonic jetting, brushing, and replacing the pump shaft, was performed on Well 9 in 2023 and 2024. The well casing appeared to be in good condition.

4.5 NORTH WELLFIELD

Details of the construction and capacity of the North Wellfield wells were reviewed to assess potential future use of the wellfield. The well details that were used in this assessment are listed in Tables 4-3 and 4-4.

Table 4-3. North Wellfield Existing Wells

Existing		Casing				Perforations	
Well No.	Age (years)	Material	Diameter (inches)	Interval (feet)	Wall (inches)	Interval (feet)	Cut (inches)
22	4	Stainless Steel	21	0 to 600	0.375	150 to 590	0.045 Louvred
23	4	Stainless Steel	21	0 to 600	0.375	150 to 590	0.045 Louvred
18	39	Mild Steel Mild Steel Mild Steel	30 20 16	0 to 20 0 to 150 150 to 450	Unknown 0.250 0.250	None None 150 to 450	None None 0.25 x 2.75
15	48	Mild Steel	16	0 to 550	Unknown	Unknown	Unknown
14	49	Mild Steel Mild Steel	20 16	0 to 84 77 to 509	0.250 0.250	None 89 to 497	None 0.25 x 1.5
10	50	Mild Steel Mild Steel Mild Steel	24 20 16	0 to 20 0 to 150 140 to 550	0.312 0.134 0.250	None 65 to 130 150 to 550	None 0.25 x 2.5 0.25 x 1.5
12	51	Mild Steel	12 10	0 to 148	0.25 0.25	60 to 132 132 to 405	0.25 x 1.5 0.1875 x 3
11	51	Mild Steel	12 10	0 to 150 140 to 440	0.25 0.25	60 to 136 239 to 440	0.25 x 1.5 0.1875 x 3

Table 4-4. North Wellfield Wells Abandoned or Inactive

Taken Out of Use		Casing				Perforations	
Well No.	Age (years)	Material	Diameter (inches)	Interval (feet)	Wall (inches)	Interval (feet)	Cut (inches)
8	n/a	Mild Steel	12	0 to 110	0.25	20 to 110	0.25
3	n/a	Mild Steel	20	0 to 160	0.312	60 to 160	0.125 x 2.375
13	n/a	Mild Steel Mild Steel	20 16	0 to 157 139 to 511	0.250 0.250	None 145 to 505	None 0.25 x 1.5

4.5.1 NORTH WELLFIELD CONSTRUCTION

The older North Wellfield wells are between 39 and 51 years old and are constructed of mild steel casings with a wall thickness that ranges between 0.134 inch and 0.312 inch. The casings are perforated with hole openings ranging from 0.1875 inch to 0.25 inch. The older wells are mostly a telescoped construction with a larger upper casing first setting and then a smaller casing set through the upper casing to the lower depths. This type of well construction likely indicates two separate layers of aquifer sediments.

4.5.2 NORTH WELLFIELD OBSERVATIONS

The useful life of mild steel well casings is affected by many environmental factors, such as the different soils and waters in contact with the casings, and the relationship between the physical, chemical, and biological components of the well environments. It has been stated by the well casing manufacturer, Roscoe Moss Company, that in general, the useful life of water wells in Arizona typically ranges from 40 to 50 years (Roscoe Moss n.d.). An economic analysis done in that Case Study used the economic life of carbon (mild) steel water well casing as 25 years. Based on this information, many of older wells in the North Wellfield appear to be at or near the end of their economic life.

The older wells with telescoped construction (larger upper casing first setting and then a smaller casing set through the upper casing to the lower depths) indicate two separate layers of aquifer sediments. The geologic logs reviewed for these wells indicate that the sediments are approximately 150 feet of sand, gravel, and boulders overlying approximately 400 feet of similar but finer, more clayey materials. The geological log observations match the well casings' telescoped design. Specific capacities for the existing wells in the Central Wellfield are seen to be considerably higher than the wells in the North Wellfield (Table 4-1).

In contrast, the newer wells (Wells 22 and 23) were installed in 2021 and are constructed of stainless steel with smaller screen slot sizes (0.045 inch), which are more appropriate for the alluvial aquifer. These wells are anticipated to last longer than the old wells and produce less sediment.

Maintenance was performed on Wells 10 and 14 in 2023 and 2024. Maintenance included brushing the casing; cleaning out sediment; refurbishing the pumps and discharge heads; replacing impaired downhole piping and pump motors; installing airline water gauges, check valves, isolation gate valves, and flow meters; and upgrading the supervisory control and data acquisition equipment.

4.6 SOUTH WELLFIELD

The City historically operated five wells in the South Wellfield near Rotary Community Park; however, these wells were abandoned in 2013 (Wilson 2013). Four of these wells were used for potable water supply and one, Well 21, was used for irrigation purposes. All infrastructure in the South Wellfield has been abandoned.

Two borings were tested for water quality before the WTP weas constructed. The wells had high concentrations of nitrate, nitrate, or both. The South Wellfield wells also contained higher

concentrations of manganese than other City wells (Morris 2025). The South Wellfield was located more than 2.5 miles from the WTP; that distance would add considerable cost to any water supply options in that area. For these reasons, the South Wellfield area should be lower on the priority list of water supply options for the City.

4.7 WATER QUALITY

Two primary factors related to water quality should be considered when evaluating future water supply development:

- The first factor is the higher amount of organic matter in groundwater from the Central Wellfield compared to that of the North Wellfield. City operations staff have observed the organic matter when pumping from Central Wellfield wells. The higher amount of organic matter increases the treatment costs by up to an estimated $250,000 per year (Gane 2025), which should be factored into siting of future wells and balancing water supply from the wellfields.
- The second factor is an environmental cleanup site east of the North Wellfield. Jacobs evaluated conditions related to the Lake Havasu Avenue and Holly Avenue Water Quality Assurance Revolving Fund site (LHH WQARF site). No impacts were identified that would prohibit the use of groundwater from the North Wellfield (Jacobs 2020), which is located about 2,000 feet hydraulically downgradient of the LHH WQARF site groundwater plume, although increased pumping from the North Wellfield could accelerate the transport of groundwater contaminants toward the North Wellfield. Periodic review of LHH WQARF site documents and communication with the ADEQ can help monitor conditions related to the LHH WQARF site and convey the City's expectations on protection of the North Wellfield wells.

4.8 CAPACITY EVALUATION

Under normal water demands, the City must be able to supply the MDD condition with all supply facilities in service and the redundant water supplies ready in standby mode. Peak hourly demands that exceed the MDDs are typically met by operational storage, while the water sources supply the MDD.

The City's current, fully operational raw water supply components consist of one HCW, two vertical wells in the Central Wellfield, and eight vertical wells in the North Wellfield. Recent operational data (Riddle, pers. comm. 2025) indicate that Wells 9, 11, 12, 15, and 18 are not operating at or near their design capacities. The HCW has apparently lost capacity over its time in service (based on the analysis in Section 4.3.1). The design capacity and current observed production capacity of these water supply facilities are presented in Table 4-5.

Table 4-5. Current Water Supply Capacities

Raw Water Supply Component	Design Capacity (mgd)	Current Observed Production (mgd)
HCW	25.0	4.3 to 17.5[a]
Well 2	3.2	3.5
Well 9	4.2	2.5
Well 10	1.4	1.5
Well 11	1.0	0.4
Well 12	1.0	0.5
Well 14	1.6	1.4
Well 15	1.9	1.7
Well 18	2.4	1.1
Well 22	2.6	2.1
Well 23	2.6	2.2
Total	32.4	19.7 to 32.9

[a] The range given reflects various pumping capacities for one or two pumps up to the current rated capacity of the collector well.

Many wells in the North Wellfield are in poor condition with short remaining life expectancies. Several wells are operating below their design capacities. The North Wellfield wells were reviewed and the wells were ranked based on factors such as the age and general known condition of the well casing, pump, motor, and electrical panels, and the general cost of well repairs compared to the capacity of the well. This ranking is presented in Table 4-6.

Table 4-6. Existing North Wellfield Well Condition Rankings

Well	Readiness Ranking	Capacity (gpm)	Comments
Well 22	1 (tie)	1,800	New well commissioned in 2023
Well 23	1 (tie)	1,800	New well commissioned in 2023
Well 18	3	1,700	Newest casing, highest capacity
Well 15	4	1,300	Second newest casing, second highest capacity, auxiliary engine; hole in casing
Well 14	5	1,100	New pump and motor in 2023
Well 10	6	1,000	16-inch casing; new pump and motor in 2023
Well 11	7	700	12-inch casing limits pump size; hole in casing
Well 12	8	700	10-inch casing limits pump size; heavy scale in bottom two-thirds of screen

A test boring program was conducted in 2020 in which five borings were drilled between the Island and the North Wellfield (Jacobs 2020). Boring locations are shown on Figure 4-4.

Figure 4-4. Test Boring Locations

Figure 1. Well and Test Boring Locations
Lake Havasu City North Well Field Backup Water Supply
Lake Havasu City, Arizona

The aquifer transmissivity and potential capacity of a hypothetical well at each location was estimated from the lithological log and sieve sample analysis. The methodology is capable of only an approximate determination of aquifer properties. However, this approach provides valuable guidance for determining which test locations would be more suitable for production wells because of higher transmissivities and thicker saturated thicknesses. Estimated borehole yields are summarized in Table 4-7.

Table 4-7. Calculated Borehole Site Vertical Well Yields

Site	Borehole Yield (gpm/mgd)
WTP	1,880 / 2.7
State Park	1,790 / 2.6
Public Works	1,390 / 2.0
645 London Bridge Road	1,090 / 1.6
Well Site 3	296 / 0.4

All locations, except the site of former Well 3, have comparable or higher yields than existing North Wellfield wells. The State Park location was also evaluated as a potential site for an HCW; the site has an estimated yield of about 7,000 to 10,000 gpm or 10 to 15 mgd. Based on these results, Well 22 was installed at the Public Works location, and Well 23 was installed at the WTP test boring location.

The North Wellfield and the vicinity of the State Park should be considered for future vertical well locations. The area north of the North Wellfield has not been explored but may provide satisfactory well yields.

4.9 FUTURE WATER SUPPLY ANALYSIS AND OPTIMIZATION

The existing and 2040 water MDDs are summarized in Table 4-8. When all facilities are in operation, the City's water system can supply both demand scenarios.

Table 4-8. Water Demand Analysis

Demand Scenario	Estimated MDD	
	mgd	gpm
Existing	18.4	12,800
2040	21.4[a]	14,900

[a] Assumes 1% growth

Table 4-9 and Figure 4-5 present the following three options for meeting the projected 2040 demand:

- Option 1. North Wellfield
- Option 2. Island-focused
- Option 3. HCW

Under the existing operating scenario, the North Wellfield wells are pumped into a common 12-inch to 18-inch-diameter pipeline for conveyance to the WTP. This may have the result of increasing the discharge pressure at each well and therefore decreasing the flow from each well. This issue could be mitigated by replacing the existing pipeline with a larger one properly sized for increased production if the North Wellfield remains a primary component of the City's water supply. It also has been observed that pumping multiple wells in the North Wellfield reduces production from each well due to interfering cones of depression. Aquifer testing within the North Wellfield could provide data to quantify this effect.

Table 4-9. Water Supply Analysis

Well	Flow Rate from Each Well (mgd)		
	Option 1 North Wellfield	Option 2 Island-focused	Option 3 Horizontal Collector Well
Central Wellfield			
HCW	0 (Backup)	4.3	12.2
Well 2	3.5	3.5	3.5
Well 9	2.5	2.5	2.5
New Well (Near New Bridge)	2.5	2.5	0
New Well (State Park)	2.5	2.5	0
North Wellfield			
Well 18[a]	2.4	2.4	0 (Backup)
Well 22	2.1	2.1	2.1
Well 23	2.2	2.2	2.2
Replacement for Wells 10, 11, and12	2.5	0	0
Replacement for Wells 14 and 15	2.3	0 (Backup)	0
TOTAL:	22.5	22.0	22.5

[a] It is assumed that a larger pump is installed in Well 18.

Notes:

It is assumed that Wells 10, 11, 12, 14, and 15 are no longer viable because of age but could be replaced by two larger-diameter wells with assumed capacities based on nearby wells.

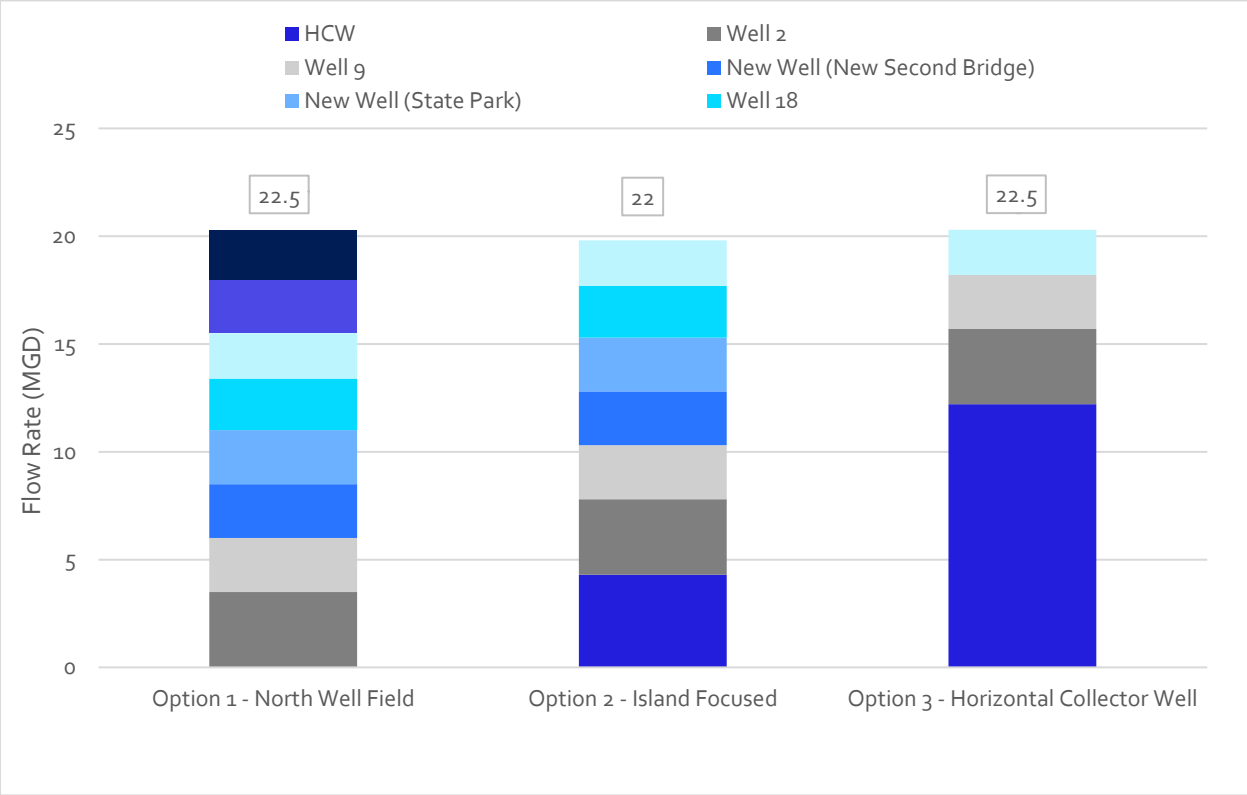
Installing a larger pipeline in the North Wellfield to reduce pressure and increase flow rates from the wells may be needed to reach the capacities listed.

Two of the options rely on the installation of two to four new vertical wells, with initial placement either as replacements for older wells in the North Wellfield or near the channel between the City and the Island. Option 3 would rely on existing wells.

The HCW provides a wide range of flexibility in pumping rates. Its low-end capacity of 4.3 mgd would be suitable for routine operation or as a backup to other wells. Its high-end capacity of 16.5 mgd could

supply more than 70 percent of the MDD, and the flexibility provided by its three pumps would provide a wide range of flow rates adaptable to changing daily or seasonal demand.

Figure 4-5. Water Supply Analysis, Future Supply Options



4.10 RAW WATER TRANSMISSION MAIN ANALYSIS

Two pipelines convey raw water from the wellfields to the WTP. A 48-inch-diameter pipeline conveys water from the Central Wellfield, and an 18-inch-diameter pipeline conveys water from the North Wellfield. A second, smaller-diameter pipeline is planned for construction across a new bridge being built to the Island. Once connected to the raw water pipeline, this second pipeline will reduce the dependency on the 48-inch pipeline that runs under the channel.

A previous recommendation (Jacobs 2020) was to replace the aging North Wellfield pipeline, which is partially constructed of asbestos-cement pipe and partially situated on private properties and adjacent to buildings, making repairs difficult. Replacing this pipeline with a larger-diameter pipeline would accommodate the increased water production from the North Wellfield that has been observed since well installation and maintenance was conducted between 2021 and 2024. Such a pipeline could be installed within the right-of-way of London Bridge Road or along the existing pipeline alignment.

New wells installed outside of existing wellfields would require installation of new raw water piping. Locations that have been considered for new wells include near the new bridge to the Island, Lake Havasu State Park, the right-of-way of London Bridge Road, or north of the North Wellfield.

4.11 OTHER WELLS (CITY/PRIVATE)

Several City and private wells scattered throughout the City are used primarily for irrigation purposes. For example, London Bridge Golf Course is irrigated entirely with private wells. Several public areas are irrigated with City wells. On an annual basis, the City reports the well supplies as part of their Colorado River allocation.

4.12 RECLAIMED WATER SUPPLY SUMMARY

As described in the Updated Wastewater Master Plan (Jacobs 2024), the City's reclaimed water system is a closed system where all effluent must either be directly reused by customers or recharged. Over the last several years, just under half of the City's reclaimed water has been reused by customers for irrigation, primarily by golf courses and parks. The remainder is recharged through vadose zone wells or percolation ponds. This reclaimed water could be used to offset raw water produced from wells through one or more of the following processes:

- Increase recovery of water recharged through the vadose zone wells at the North Regional WWTP
- Direct potable reuse of reclaimed water at the WTP
- Increase the use of reclaimed water at parks to reduce the amount of potable water used for irrigation

4.13 WATER SUPPLY RELIABILITY AND CONSEQUENCES

Redundancy has reduced the cases of a raw water supply component failure since the 2019 WMP through installation of two new wells in the North Wellfield, and by pump and motor maintenance on two other wells in the North Wellfield. In addition, there is the planned installation of a second raw water pipeline across the channel. However, potential resilience issues remain related to continued degradation or failure of the older wells and pipeline in the North Wellfield.

The City should plan to develop a reliable backup supply that is between an average day (1.0 x average) and a maximum month supply (1.2 x average) or more. During the winter months, an average day supply may meet nearly 100 percent of the demand, whereas during the summer months, an average day supply may only meet 70 percent of the demand, thus requiring a level of mandatory water conservation.

This 2025 WMP recommends a continued investment in new or replacement wells to increase water supply and reliability as a high-priority project. These water supply projects and timelines are discussed in Chapter 8. Table 4-10 lists water supply events and consequences.

Table 4-10. Water Supply Events and Consequences

Event	Frequency	Duration	Existing Response Asset	Consequence
North Wellfield Supply Pipeline Failure	Once every 50 years	1 to 3 months	City operates Island Wells 2 and 9 and HCW.	Minor. Would not be able to meet future MDD without installation of 1 to 2 new vertical wells.
HCW Failure (lateral screen collapse or pump failure)	Once every 30 years	6 to 9 months	City operates Island Wells 2 and 9 and all North Wellfield wells. Improvements to North or Central Wellfield would increase capacity and improve redundancy and reliability.	Minor. The City is able to provide for current demand without the HCW but would not be able to meet the future demand without installation of new wells.
Central Wellfield Supply Pipeline Failure (under Lake)	Once every 50 years	9 to 12 months	Water restrictions would be required. North Wellfield would only provide approximately 50% of the future MDD. A parallel transmission main would be needed to provide redundancy.	Significant. Loss of all Central Wellfield water supplies until pipeline could be repaired.

4.14 WATER SUPPLY SUMMARY AND FINDINGS

The findings of this investigation are summarized as follows:

- Lake Havasu City historically operated three wellfields: the North, Central, and South Wellfields. Currently, the Central Wellfield and North Wellfield supply water to the City. The South Wellfield has been abandoned with all infrastructure removed.
- The City can operate one large HCW in the Central Wellfield. The HCW was constructed in 2000 and 2001, put in service in the year 2004, and has an installed capacity of 25 mgd. The HCW is currently undergoing major rehabilitation.
- The City operates two vertical wells in the Central Wellfield and eight vertical wells in the North Wellfield. Current capacities range from 1 to 4.2 mgd.
- The aquifers in all three wellfields appear suitable for future use. The North Wellfield area would be expected to support wells with about 2-mgd (1,400-gpm) capacities. The Central Wellfield area is more productive and currently supports 2 wells, each with more than 3-mgd (2,100-gpm) capacities.
- A single 48-inch transmission pipeline conveys water from the Central Wellfield to the WTP. A second segment of pipeline is being constructed over the channel, eliminating a potential reliability issue related to the difficulty of repairing the existing 48-inch line below the channel.

- All but three of the City's existing conventional wells are more than 39 years old and constructed of mild steel casing and perforated screens. Mild steel cased wells would only be expected to have an economic life of about 25 years. Well 9 in the Central Wellfield is 35 years old, and much of the casing and screen is stainless steel and would be expected to have a much longer service life than carbon steel.
- Flow and water level data from the HCW over the past decade indicate that the HCW is likely losing capacity. The HCW also produces sand when pumped at high flow rates.
- The City's water supply system as it exists today has better redundant capacity than it did in 2018; nevertheless, an interruption in service of the 48-inch collection pipeline from the Central Wellfield could result in a limited supply of water to customers, especially as aging wells in the North Wellfield continue to deteriorate. A leak in the 18-inch pipeline in the North Wellfield could be difficult to repair and could also limit water supply. Issues with the North Wellfield wells or pipeline or higher population growth would increase reliance on the HCW.
- The City explored five locations north of the Island and found geologic conditions suitable for installation of conventional wells in four locations and installation of an HCW in one location. Vertical wells were installed at two of the locations in 2021.

4.15 WATER SUPPLY RECOMMENDATIONS

The recommendations include both the development of additional redundant well water supply capacities and the servicing of the HCW. The recommendations are as follows:

- Clean and rehabilitate the HCW because of the condition of the HCW central caisson, the isolation valves on each HCW lateral, and the lateral screens.
- Develop a rehabilitation and maintenance program for the HCW.
- Conduct an engineered pumping test on the HCW following cleaning and rehabilitation to evaluate the final hydraulic capacity. Compare the test results with the originally reported capacity and assess any degree of capacity loss and the current sustainable capacity.
- Conduct an engineered aquifer test of North Wellfield wells to assess the extent of interference when multiple wells are pumped simultaneously and the effects of the current small-diameter pipeline on discharge pressure and flow rate when multiple wells are pumped.
- Continue planning and design for new wells on the North or Central Wellfields. The long-term goal would be to develop up to 7,000 gpm (10 mgd) of well capacity in the North and Central Wellfields to provide primary or backup water supply depending on the pumping option selected.
- Consider a test boring program north of the North Wellfield to evaluate potential water supply development in that area.
- Connect the planned secondary pipeline from the Island to the 48-inch-diameter raw water main to increase the reliability of the Central Wellfield pipeline. Also develop a plan for replacing the 18-inch raw water line in the North Wellfield.
- Develop potential pipeline alignments for the North and Central Wellfield new well sites.
- Develop new well specifications to be used for soliciting bids for the construction of new wells following site selection and acquisition.

5. Water Treatment Plant Evaluation

Sections 5.1 through 5.3 present the evaluation of the WTP. Multiple discussions were held with plant staff throughout 2025 to confirm current operating conditions and to inform key recommendations included in this chapter. The information in this section updates findings from the 2018 site visit and provides an overview of current operations, treatment performance, and potential improvements needed to maintain reliable production. Updated cost estimates for these improvements are included in the Water CIP (Appendix A).

Several major mechanical components at the plant have reached the end of their useful life and will require repair or rehabilitation. In addition, structural assessments are recommended to determine the extent of concrete repair needed as part of the overall rehabilitation effort. Sections 5-1 and 5-2 describe the specific improvements necessary to support plant rehabilitation.

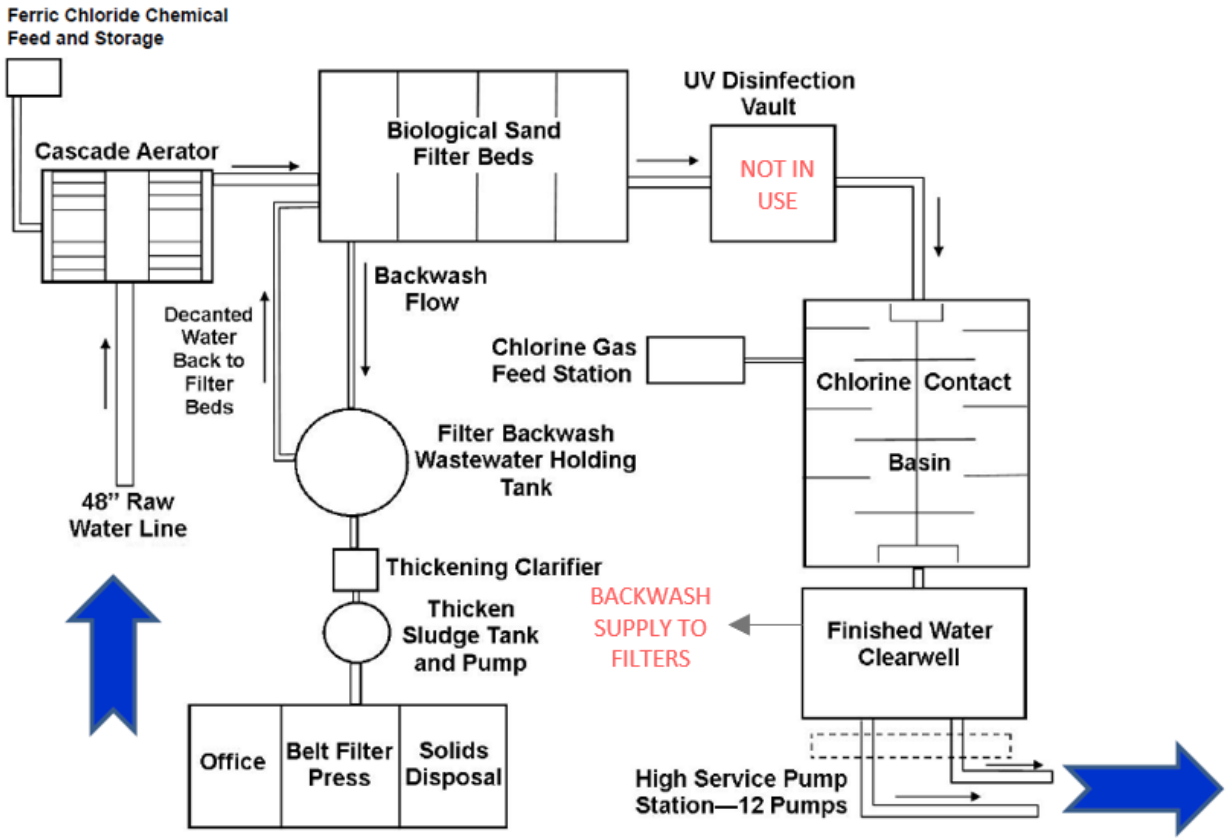
5.1 OVERVIEW OF WATER TREATMENT PLANT PROCESS AND CURRENT OPERATIONS

The City's WTP was constructed in 2004 and designed with a rated capacity of 26 mgd. Currently, the WTP operates within a range of 8 to 16 mgd to meet City demands. The average water production in 2024 was 11.5 mgd to satisfy the City's potable water needs and peak summer demand of 18 mgd. The WTP is currently supplied by the North Wellfield and the Island wells. Historically, the HCW, with a capacity of approximately 25 mgd, located south of the WTP, supplied more than 90 percent of groundwater from the local aquifer. As discussed in Chapter 4, the collector well is undergoing major rehabilitation and will be operated at lower flows in the future.

The WTP is designed to meet current drinking water standards, which include removal of manganese (secondary maximum contaminant level [MCL] = 0.050 milligram per liter [mg/L]) and arsenic (primary MCL = 0.010 mg/L). The treatment process original design includes aeration, ferric chloride addition, biological sand filtration, ultraviolet (UV) disinfection, and chlorine gas addition. Filter backwash from the biological sand filters is collected in wastewater holding tanks before being treated by a thickener clarifier and belt filter press (BFP). The decant from the wastewater holding tanks is recycled within the WTP and the solids generated are hauled offsite for landfill disposal. A process flow schematic of the City's WTP is presented on Figure 5-1.

Discussions with City staff indicate that the WTP is in compliance with all state and federal drinking water regulations and meets the City's water quality targets. A review of the City's 2025 Consumer Confidence Report (i.e., *Lake Havasu City 2024 Annual Drinking Water Quality Report*) shows that the WTP produces finished water with manganese levels to a "virtual non-detect" level and arsenic levels between non-detect and 0.005 mg/L (Lake Havasu City 2025a), which is below the federal MCL.

Figure 5-1. Lake Havasu City Water Treatment Plant Process Flow Schematic



5.2 WATER TREATMENT PLANT SYSTEMS

Jacobs completed a virtual walkthrough of the entire plant to discuss each step of the treatment process. Although the City operating staff has a good maintenance program plan in place, and the WTP site is clean and well maintained, several equipment pieces are reaching the end of their useful life given the age of the plant. These pieces of equipment may be eligible for rehabilitation although many will likely require full replacement. Sections 5.2.1 through 5.2.16 present the condition of each major plant component based on Jacobs' virtual walk through and discussion.

5.2.1 RAW WATER TRANSMISSION LINE

Groundwater from the HCW is supplied to the WTP by a single 48-inch pipeline, with portions of the pipeline directly under the Lake. The main underneath the Lake was constructed with encased prestressed concrete cylinder pipe (PCCP), and the remaining water main was constructed as a PCCP pipeline. Natural water bodies are subject to ongoing erosion and changes in lakebed topography, which can lead to unsupported pipeline spans, deflection, and increased stress. Over time, these conditions may cause structural fatigue, joint separation, or rupture. As recommended in the 2019 WMP, the City has moved forward with new supply wells in the North Wellfield (Chapter 4). In addition, the City is

planning to construct a second, 24-inch redundant raw water transmission line, as part of the City's "Second Bridge" Project, to enhance reliability of the City's water supply.

5.2.2 RAW WATER FLOW METER

Within the WTP limits, the 48-inch raw water pipeline is equipped with a propeller flow meter housed in vault. The original flow meter was an insertion meter but required frequent calibration (every 3 to 4 days) and was replaced with a propeller meter. The current propeller meter is not registering all flow. The lower limit to accurately register in a 48-inch pipe is 4,000 gpm, while expected flow in winter months is 3,000 to 4,000 gpm. The issue of too low flow-through is further evidenced by flow data collected from new mag meters installed in the North Wellfield. Operators have reported incidents of 900- to 1,100-gpm discrepancy between the total flow coming from the North Wellfield and the expected flow at the raw water flow meter.

The propeller flow meter is recommended to be replaced with an alternate flow measuring technology. A preliminary design conducted as part of the equipment replacement should include the following:

1) Review manufacturer offerings for an insertion style meter. Install a 36-inch or 24-inch mag meter in the existing vault with appropriate reduction/expansion fittings to increase velocity through the meter and improve accuracy.
2) Consult manufacturers regarding newer product offerings for mag meters that have additional sensors and improved algorithms for calculating flow. Accuracy and velocity ranges on newer model mag meters have improved, and a direct replacement may be possible. Also consider models that have flush ports or improved cleaning access, improved materials that reduce interference, automated cleaning via electrical pulses, and heartbeat technology that can detect and alert operators to performance degradation. Make sure that new products include a performance guarantee from the supplier or manufacturer to safeguard the investment against potential non-performance.
3) Install a flow meter on the existing 18-inch bypass line for use during low-flow seasons. The 48-inch meter can remain in service for high-flow periods.
4) For all options, assess head loss impacts to ensure no adverse effects on upstream or downstream systems.

The meter replacement project will also support resolution of observed water discrepancies between the City's WTP supply records and water meter sales data.

5.2.3 CASCADE AERATOR

The raw water pipeline conveys water to a cascade aerator that facilitates oxygen transfer from the atmosphere into the raw water. The target dissolved oxygen level maintained in the water through this process is 8 mg/L. The oxidized environment created by the aerator is needed to facilitate microbial growth in the downstream biological filters. The target pH after aeration of 7 to 8 is maintained, and no pH adjustment (via caustic) is required. To mitigate plant and algae growth on the steps of the aerator, the City installed mesh shade structures over each aerator train.

Operators have observed deterioration of the concrete on the structure, including spalling and concrete splitting at one anchor point. Plant operators have started the process to have the structure inspected and rehabilitated.

Dust from the nearby concrete plant covers the exposed pipes within the aeration facility, and dust is likely blown into the water. It is recommended that the City consider a more permanent structure around the aerator that would still provide gas transfer at the top but would prevent dust from entering the water.

5.2.4 BIOLOGICAL FILTERS

The biological filtration process (MANGAZUR), a proprietary treatment system, consists of four gravity filters that use Infilco Degremont's Biolite media to support microbial growth required to remove manganese and enable high-rate filtration. Ferric chloride is dosed in-line upstream of the filters at approximately 4 mg/L to coagulate arsenic. The filters were designed to operate at a loading rate of 3.75 gpm per square foot at the rated capacity of 26 mgd. Generally, the filters continue to operate well. Manganese is removed to non-detect levels, and suspended solids are removed in sufficient quantity to support downstream filter performance that achieves filter effluent below 0.03 nephelometric turbidity unit. Operators noted when the North Wellfield, including the two new water supply wells, is operating, ferric dosing rates can be slowed and still achieve treatment goals and provide significant cost savings in annual chemical usage. Other filtration plants operate at higher loading rates (5 to 6 gpm per square foot), and the City should investigate operating the filters at higher loading rates if the WTP is expanded.

The filter valves and actuators have reached the end of their useful life and require replacement. Aside from the effluent valves, operators will need to shut down the entire plant to replace valves and actuators. These shutdowns must typically be limited to less than 6 hours to maintain water demand and service levels.

The filters were originally installed with retractable screens to provide shade and dust protection; however, these were removed because of challenges associated with maintenance. The City operating staff expressed interest in adding an enclosure or building around the filters to serve this same function. This addition should be considered as part of scheduled 20-year maintenance.

5.2.5 BACKWASH SYSTEM

The backwash system, which consists of the backwash pumps and blowers, is used to backwash the filters with non-chlorinated water. The backwash regime includes the following four steps: (1) air scour only, (2) combined air scour and backflushing, (3) backflushing only, and (4) filter to waste. Since startup, there have been no significant operating issues associated with the backwash system.

The backwash system, including backwash pumps, has reached the end of its useful life and is recommended for replacement as part of the overall facility rehabilitation.

5.2.6 ULTRAVIOLET DISINFECTION

UV disinfection is not in use. When the State reconfirmed that the groundwater supply was not under the influence of surface water, the UV facility was removed from service in 2024. Water continues to flow through the deactivated unit between the biological filters and the chlorine contact basin. The City received a cost estimate of approximately $700,000 to remove the disinfection equipment, but removal of the disinfection equipment is not a capital priority and would be an inefficient use of funds. The system remains deactivated and abandoned in place. The priority for removing the UV disinfection equipment is low compared to plant rehabilitation. During the plant rehabilitation project, approaches to remove the UV equipment and replace with spools of pipe should be investigated. Additionally, the City should investigate which materials and components of the UV disinfection system pose long-term risk, if any, to water quality and consider removing those components to avoid further deterioration.

5.2.7 CHLORINE CONTACT BASIN/STORAGE

After the biological filters, the water flows through the chlorine contact basin, which is dosed with chlorine to provide disinfection and maintain a residual in the finished water. The chlorine contact basin has a total volume of 2.5 million gallons (MG) and is divided into two equal basins, each of which is baffled to prevent short circuiting. Currently, the two basins operate in parallel and also serve as a clearwell for the finished water pump station. In the past, the basins were isolated by a blind flange, which was subsequently removed so both basins would operate in parallel, and there is currently no way to isolate the basins. It is recommended that an evaluation be performed to determine the best way to isolate the basins. This evaluation should be conducted and included as part of the plant rehabilitation.

Plant operators expressed concerns about not being able to directly assess basin structural concrete. It is recommended that the City hire a diver-equipped inspection company to assess the concrete condition and recommend mitigation and rehabilitation measures as part of the plant rehabilitation project. Concrete rehabilitation should be provided as part of the plant rehabilitation project as needed.

5.2.8 CHLORINE DISINFECTION SYSTEM

As of November 2025, a $2.7 million project to decommission the existing chlorine gas system and transition to liquid sodium hypochlorite disinfection is underway. This important capital improvement project should enhance operational safety, simplify chemical handling, and improve supply chain resilience because there are more sodium hypochlorite producers regionally and nationally. Sodium hypochlorite is easier to store and dose than chlorine gas, and its use reduces regulatory burdens and risks associated with pressurized chlorine gas systems. Sodium hypochlorite also improves public safety. Chlorine gas leaks or explosions can pose serious hazards to downstream neighborhoods, while sodium hypochlorite presents significantly lower risk in the event of an accidental release. Rehabilitation of the upgraded sodium hypochlorite disinfection system is not anticipated.

5.2.9 FINISHED WATER PUMP STATION

The existing finished water pump station includes 12 vertical turbine high service pumps, which were sized and constructed 20 years ago for maximum production capacity of the WTP. Half the pumps supply the northernmost areas of the City while the other half supply the southern and central areas of the City. The pumps supply multiple reservoirs and establish the first pressure zone in the City's water distribution system (Chapter 7 provides more information). Each pump has a rated capacity of 3,500 gpm, and all are equipped with soft starters. Together, the pumps provide nearly twice the duty capacity of the original plant (26 mgd) and more than four times the current average flow.

Given the water meter discrepancies operators have noted, further assessment is needed on how best to measure flow on the high service pumps. Operators suggested installing mag meters on each high service pump. It is recommended that flow discrepancies be evaluated in more detail and that a specific project scope be developed if additional flow metering is needed.

As part of the facility rehabilitation project, the City could evaluate the pumping needs of this facility, including the number of pumps that need to be in service and the size of the pumps. Reducing the number of pumps will reduce maintenance requirements. An evaluation of pump sizing using years of flow and pressure data from the distribution system will identify the optimal facility operating efficiency.. The City replaced the existing ball valves on the discharge piping with globe style check valves based on high repair/maintenance costs and recent input by the vendor indicating that the installed ball valve product line is expected to be discontinued.

5.2.10 CHEMICAL FEED SYSTEM

Information on the chemical storage and feed system is provided in Table 5-1.

Table 5-1. Chemical Storage and Feed System

Chemical	Purpose	Current Status
Caustic	pH adjustment prior to biological filters	Inactive
Ferric Chloride	Coagulation of arsenic prior to biological filters	Active
Potassium Permanganate	Manganese oxidation during startup	Inactive and never required/used
Phosphoric Acid	Nutrient source for biological filters	Inactive and never required/used
Chlorine Gas (current) Sodium Hypochlorite (in progress)	Disinfection	Active
Polyphosphate	Sequestering	Inactive and never required/used
Polymer – Backwash Waste Storage	Enhance settling of backwash waste solids	Active
Polymer – Plate Settler	Enhance clarification of backwash waste solids	Active
Polymer – BFP	Dewatering aid to increase cake dryness	Active

5.2.11 WASTEWATER HOLDING TANKS, SOLIDS PUMP STATION, AND DECANT PUMP STATION

The wastewater holding tanks provide storage and equalization for process wastewater from the biological filters (filter backwash and filter to waste), thickening clarifier decant, and BFP filtrate. Each of the two wastewater holding tanks are dosed with polymer to promote the settling of solids, which are directed to the thickener clarifier, while the decant is recycled back to the head of the WTP and blended with the raw water. Typical maintenance activities for the wastewater holding tanks include regular rinsing performed through access hatches located on the dome covers that enclose each tank.

Given the operator involvement associated with this activity, it is recommended that the City investigate the feasibility of installing a cleaning system (e.g., tank washing nozzles) to reduce the labor required on a routine basis. In addition, the City may consider segregating the cleaner process waste flows (e.g., filter to waste) from other flows (e.g., backwash waste, plate settler decant, BFP filtrate) to reduce the frequency of cleaning required for one of the wastewater holding tanks.

The solids pumps, which convey solids from the wastewater holding tanks to the thickener clarifier, have reached the end of their useful life and should be rehabilitated or replaced as part of the facility rehabilitation project. The decant pumps that convey the wastewater holding tank overflow back to the head of the WTP are also due for rehabilitation or replacement.

5.2.12 THICKENER CLARIFIER

The solids in the wastewater holding tanks are treated by a single-duty thickener clarifier that is dosed with polymer. The thickened solids are collected in a small holding tank and pump station that delivers the solids to the BFP system. Plant operations staff indicated that the clarifier accumulated solids in the corners, which need to be removed manually. The City may consider replacing the rectangular clarifier with a circular clarifier which would eliminate solids accumulation in the corners.

5.2.13 BELT FILTER PRESS

The City operates a single-duty BFP to dewater the thickened solids generated by the thickener clarifier. The BFP is housed in a building and is installed to drop dewatered solids into a conveyor belt to transfer solids to a trailer parked in a truck bay adjacent to the BFP room. The dry solids are disposed of at the municipal landfill, and the filtrate from the BFP is returned to the wastewater holding tanks. The dewatering process is operated on a batch basis (approximately once a week under current flow conditions).

Both the BFP and conveyor systems have generally performed well; however, operators noted that the system is original, wearables need to be replaced frequently, and the equipment is maintenance intensive. The equipment is recommended for replacement as part of the facility rehabilitation project. As part of the project, the City should evaluate alternate dewatering technologies, which may reduce maintenance efforts and employ the use of fewer wearable parts that need regular replacement. The City has a good understanding of the amount of solids that are generated and has the data to assess alternate dewatering technologies. The current units are generally oversized for the amount of solids generated, and alternate equipment, such a screw press, may free up space for additional onsite storage.

5.2.14 BACKUP POWER SUPPLY

Discussions with the City operations staff indicate that the WTP has not experienced extended power outages and that the backup power supply is adequate. There are six standby generators that power various systems at the plant. These generators are nearing the end of their useful life. It is recommended that the City evaluate the condition of the generators and plan for replacement.

5.2.15 SCADA AND PROGRAMMING

Over the past 5 years, the City has retained Jacobs under separate contracts to support and upgrade supervisory control and data acquisition (SCADA) components, such as programmable logic controllers on the wastewater and water systems. In 2022, Jacobs completed a SCADA Master Plan for both the water and wastewater systems (Jacobs 2022). The focus of the water SCADA was primarily programmable logic controllers and computer programming. At the WTP, the City upgraded its Wonderware software and is now running Windows 11. In 2026, Jacobs will complete a water filter SCADA upgrade at the WTP to bring SCADA components up to current industry standards.

5.2.16 MISCELLANEOUS OBSERVATIONS

The following observations were noted during discussions with City staff:

- It is recommended that the City assess the age and condition of their SCADA equipment and plan for upgrades as part of the rehabilitation projects, consistent with recommendations from the SCADA Master Plan (Jacobs 2022).
- It is recommended that the City complete the AWWA Cybersecurity Assessment Tool and follow *Guidance on Improving Cybersecurity at Drinking Water and Wastewater Systems* (EPA 2024) in parallel with SCADA and other operational technology upgrades.
- Operating staff indicated having limited space in the existing operations building for storage or for conducting meetings. The City should consider evaluating a building plan expansion to provide additional space for these functions.

5.3 SECOND WATER TREATMENT PLANT CONSIDERATIONS

As the City continues to grow, further enhancing the water supply reliability could be achieved through the planning, design, and construction of a second WTP.

The City's Island raw water supplies rely on a single raw water transmission main that crosses underneath the Lake, making it vulnerable to service risks. Moreover, a major pipeline failure within the WTP, or on the treated water discharge side, also may affect operations of the WTP. To that end, the City has requested a preliminary evaluation of potential new WTP sites. A phased second WTP project that can be planned and constructed over the next 10 to 20 years could provide the City with a robust water supply for its growing population.

The following three candidate sites were identified and reviewed with the City that could be evaluated in future engineering feasibility and siting studies:

- South WTP - Body Beach area:
  - **Option:** Northeastern corner near the State Lands area.
  - **Benefits:** Geographic separation and potential for a different raw water source (Island wells and South Intake), improving redundancy in the event of source water contamination.
  - **Considerations:** Likely requires a surface WTP, transmission system upgrades to supply larger southern area, and independent staffing. May face opposition due to proximity to recreational beach areas.
- North WTP on federal lands:
  - **Options:** Federal parcels west of London Bridge Road.
  - **Benefits:** Leverages existing and future North Wellfield supplies and good raw water quality for lower treatment costs. Supports future population growth in the north, and is in proximity to existing WTP for shared resources.
  - **Considerations:** Transmission mains would need extension. Use of federal lands may involve environmental constraints and face potential opposition due to wildlife refuge. Adjacent sites offer land use compatibility but less redundancy.
- North WTP adjacent to existing WTP:
  - **Options:** Parcels east of London Bridge Road may be more reasonable to acquire.
  - **Benefits:** Leverages existing and future North Wellfield supplies and supports future population growth in the north. Proximity to existing WTP allows for shared resources and some facilities.
  - **Considerations:** Transmission mains would connect into older existing, less reliable distribution system. Proximity to existing WTP allows for shared resources. Land use is compatible adjacent to the existing plant.

Section 8 includes study costs to further investigate siting options, secure future property, and conduct necessary environmental reviews. Because of the high capital cost of a second WTP, the project has been programmed into the 2035 to 2040 timeline and assumes an initial Phase 1 size of 7.5 mgd, with a future expansion to 15 mgd.

The siting study will include the compilation and documentation of critical information that will support preparation of the Design Report required for ADEQ review as part of the Approval to Construct and Approval of Construction process. Time will be allocated at each step for meetings with ADEQ to ensure compliance with ADEQ siting standards and Safe Drinking Water Act requirements. The recommended scope of work for the siting study for a second WTP includes the following activities:

- **Collect Data.** Gather existing system data, service area maps, population projections, water demand forecasts, and regulatory requirements. Deliverable: submit compiled data package (GIS layers, reports, demand projections) for review and approval by the client.

- **Define Siting Criteria.** Establish criteria for site selection, including ADEQ siting standards, Safe Drinking Water Act compliance, and local planning considerations. Deliverable: Siting criteria document with weighted scoring matrix.
- **Finalize Potential Sites.** Use GIS and preliminary screening to finalize candidate sites within the service area. Deliverable: Map of candidate sites with summary table of key attributes.
- **Screening and Shortlisting.** Apply siting criteria and regulatory constraints to develop a shortlist of top-ranked locations. Deliverable: Screening analysis report with scoring results and shortlist of three to five sites.
- **Detailed Site Evaluation.** Conduct detailed evaluation of shortlisted sites (geotechnical, environmental, permitting, constructability, access, utility availability). Deliverable: Site evaluation report for each shortlisted site.
- **Hydraulic and System Integration Analysis.** Assess how each site integrates with existing and future distribution system (pumping requirements, redundancy, and pressure zones). Deliverable: Hydraulic analysis summary and integration concept for each site.
- **Cost and Schedule Estimates.** Develop planning-level cost estimates and implementation schedules for each shortlisted site. Deliverable: Cost and schedule comparison table.
- **Public Outreach and Community Context Review.** Conduct outreach to inform and engage the public and stakeholders regarding potential sites. Review shortlisted sites in the context of nearby City facilities, including parks and open space, historic and cultural sites, and established residential areas, schools, and viewscapes. Document public feedback regarding site evaluation. Deliverable: Public outreach summary (meeting notes and feedback log) and publicly posted site evaluation reflecting community input. If requested by the City, Jacobs will host a public-facing website to facilitate this process.
- **Stakeholder and Regulatory Review.** Document ADEQ's and local agencies' feedback on shortlisted sites and regulatory pathways. Deliverable: Meeting summary and documented feedback.
- **Final Siting Recommendation Report.** Summarize findings, regulatory pathways, and next steps for Approval to Construct/Approval of Construction. Include maps, scoring, evaluations, and preferred site recommendation. Deliverable: Final siting recommendation report.

5.4 SUMMARY OF RECOMMENDATIONS

Based on the site visit, the major mechanical components of the City's WTP have generally reached the end of their useful life and are due for replacement or rehabilitation. The City has several ongoing maintenance activities in progress and could benefit from upgrading the major components at the facility. Additionally, some mechanical items would benefit from further evaluation to identify their replacement with alternate technologies. Additionally, a structural assessment or evaluation of the existing basins is recommended to determine the extent of structural rehabilitation. These ongoing activities and recommended improvements are summarized in Table 5-2.

Table 5-2. Summary of Ongoing Activities and Recommended Improvements

Category	Description
Ongoing or Planned Maintenance	▪ HCW rehabilitation ongoing. ▪ Dive inspections of chlorine contact basin every 3 years.
Facility Rehabilitation Project Components	▪ Assess best approach for accurate flow metering on raw water line and replace flow meter. ▪ Install new flow meter on existing 18-inch raw water bypass line. ▪ Replace aging valves and actuators on filters, except effluent valves. ▪ Replace backwash pumps. ▪ Assess finished water pump design criteria and capacity and replace pumps. ▪ Provide flow meters on individual pumps. ▪ Replace solids and decant pumps. ▪ Evaluate dewatering technologies and replace BFP with newer technology, such as a more compact screw press and house in a building. Use freed-up space for more general storage. ▪ Rehabilitate structural basins as determined from a structural assessment.
Further Evaluation	▪ Conduct a detailed siting study and develop cost options for a phased second WTP.

6. Hydraulic Model Update and Verification

The existing hydraulic model of the City's potable water distribution system (previously updated in the 2019 WMP and currently maintained by Jacobs for the City under an as-needed contract) was updated to support the 2025 WMP. The model is a fully detailed representation of the existing system and includes pipes, BPSs, reservoirs, PRV stations, and control valves. An updated water demand allocation was performed using 2024 customer billing data to represent a new existing baseline condition, while future demands were estimated based on the 2016 General Plan, known planned core development areas, and forecasted continued infill development. Updated diurnal water use patterns were included based on a review of 2024 SCADA data during peak summer and low winter demand conditions. The hydraulic model was validated for both steady-state and extended period simulation scenarios. The steady-state condition was limited to a peak hour demand simulation because City-wide hydrant flow and field pressure testing were not part of the scope.

6.1 MODEL REVIEW AND UPDATES

Section 6.1.1 addresses GIS data and Section 6.1.2 addresses demand allocation.

6.1.1 GIS DATA

The modeled facilities were verified against the City's geographic information system (GIS) database and represent the complete hydraulic network of the potable water system, including all transmission and distribution mains, junction nodes, storage tanks, BPSs, valves, and supply sources. The model stores these facilities with their respective hydraulic and spatial attributes, as summarized in the following subsections.

Pipelines

Pipeline data included diameters, lengths, materials (where available), installation years, assigned service pressure zones, and roughness coefficients. The roughness coefficient, represented by the Hazen–Williams "C" factor, is used to estimate frictional headloss within each pipe segment. Initial "C" factors were assigned based on pipe material, diameter, and age and were subsequently refined during calibration to reflect actual system performance.

Junction Nodes

Node data included ground elevations, assigned pressure zones, and allocated demand with an associated diurnal pattern. As part of the updated hydraulic model development, node attributes were reviewed and revised to reflect current system conditions. Ground elevations were verified and updated using the most recent available topographic and GIS data, and pressure zone assignments were reviewed to ensure consistency with existing system boundaries, operational controls, and hydraulic grade lines (HGLs).

A new water demand allocation was performed based on customer usage from the 2024 water meter database and service connection information. Metered demands were spatially distributed to model nodes using parcel and service area mapping, with demands aggregated where appropriate to represent model junctions. Updated diurnal demand patterns were applied to reflect current system usage characteristics. These updates ensure that node demands and hydraulic behavior in the model accurately represent existing operating conditions and provide a reliable basis for evaluating projected system performance.

Pump Stations

Pump station data included site elevations, number of pumps, individual pump curves, and corresponding service pressure zone assignments. Pump operational settings were established based on 2024 SCADA control settings and system performance analysis, and settings were refined during the calibration process to accurately represent observed operating conditions.

Storage Tanks

Tank data included site elevations, tank diameters, high water levels (HWLs), and assigned pressure zones. In addition, pump control settings were added for tanks that directly affect pressure zone operations. These storage elements provided hydraulic stability and operational flexibility across the system and were modeled to accurately represent their interaction with the distribution network. The City also relies on the storage tanks to provide forebay storage and suction pressure for pump stations, in addition to their function for operational, fire flow, and emergency storage.

6.1.2 DEMAND ALLOCATION

The City provided customer water meter billing data for calendar years 2023 and 2024. Based on this dataset, the baseline potable water ADD used for model development was established at 12.8 mgd (8,900 gpm). Demands were spatially allocated within the model using the InfoWater Pro Demand Allocator tool, which assigned each metered demand to the nearest model junction within the corresponding pressure zone. This process resulted in the allocation of approximately 35,000 individual service meters to existing model nodes, ensuring accurate geographic representation of customer usage patterns.

Future demands were assigned by pressure zone using the 2016 General Plan, developer planning studies, and projected growth estimates (infill). The total forecasted infill demand was proportionally distributed among nodes within each pressure zone unless specific developments were identified with defined locations. For the 2040 planning horizon, an additional 2.2 mgd (1,500 gpm) was applied to the existing baseline demand, resulting in a total modeled average demand of 15 mgd for 2040 simulations.

Table 6-1 presents the 2040 water demand allocation by core development area. Infill development will make up about 20 percent of the growth and include both residential and commercial uses. It was assumed that the Island area waterfront development proposal moves forward and is built by 2040. Residential and resort uses make up the remaining undeveloped areas of the Island. Residential (70 percent) and commercial (30 percent) development was assumed to the north, at similar percentages as existing development in Lake Havasu City. Continued residential development was assumed in and around Foothills Estates, in Havasu Riviera, and in a few large vacant areas to the south.

Table 6-1. 2040 Water Demand Assumptions and Allocations

Core Development Area	Pressure Zone	Assumed Land Development Use [a]	Average Annual Demand (gpd)	Notes
Infill Development (20%) (proportioned by zone size)	1 through 5	Low- and High-density Residential plus Commercial and Employment	400,000	Proportioned based on size of zone. Assumed approximately 1,500 residential units.
Island (State Lands) Waterfront Resort[b] New Single-family/ Multifamily Residential Resort Uses	1.1	250 units +Resort Low- and High-density Residential and Resort Developments	170,000 230,000	Waterfront Resort submitted water study demands. Assumed undeveloped acres for residential and resort uses.
North Havasu Development				
Residential West of SR 95	1/1A/2A	Low- and High-density Residential	400,000	Assumed residential development west and east of SR 95.
Residential East of SR 95 Commercial (shopping mall and airport area)		Commercial and Employment		Airport and shopping mall area commercial development expansion.
Southwest Havasu				
Havasu Riviera[b]	2/3	Low-density Residential	350,000	Havasu Riveria assumes more than 750 residential units according to development plans.
SARA Park[b]			50,000	Assumes a SARA Park expansion by 2040.
Foothills Estate/Area North				
Foothills Trinity[b] Future North of Trinity East of Foothills	6/7	130 Low- and High-density Residential and Neighborhood Commercial	400,000	Assumes current Trinity plan. Assumes 200 +/- acres of residential development.
Southeast Havasu				
Campbell[b]	4	Low-density Residential	200,000	Assumes 100 +/- acres of residential development
Bluewater[b] Future Zone 5	5			
Total	-	5,500	2,200,000[c]	

[a] Assumed approximately 70% residential and 30% nonresidential use in future increase.

[b] Based on previous developer water studies prepared for the City.

[c] Future 2040 demand increase is approximately 2.2 mgd based on population estimates and per capita use.

6.2 MODEL CALIBRATION AND VALIDATION

The hydraulic model was validated under both steady-state and extended period simulation conditions. The steady-state calibration represents a single snapshot of the existing system and provides a high-level, macro calibration where global adjustments are applied to approximate static operating conditions. This level of calibration included a review of 2024 SCADA data during peak summer demand days, and pump and tank operations during peak hours. No hydrant flow or pressure tests were performed as part of the master plan scope of services.

It is recommended that the City consider a structured hydrant flow test program in 2026, which would allow for further refinement of the hydraulic model and would support the Fire Department in its hydrant flow/pressure reporting to the Insurance Service Organization regarding the City's water system fire flow availability.

6.2.1 STEADY-STATE CALIBRATION

During steady-state calibration, modeled flow, pressure, and tank levels were compared against SCADA data. Model control setpoints and initial tank levels were adjusted to align pump operation within design parameters and improve consistency with observed system performance.

Exact replication of SCADA data across the distribution system is not feasible because of inherent system variability; therefore, the objective of the steady-state calibration was to minimize the difference between modeled and observed data and achieve the best overall fit. Acceptable error thresholds were established to ensure that the model remained a reliable representation of actual system conditions. Steady-state discharge flow and pressures from each pump station were compared to corresponding SCADA data during summer of 2024 MDD. With the exception of a few Zone 1 pump stations, modeled results closely matched the observed SCADA values, indicating accurate simulation of pump station performance. Pressures from each pump station were compared to corresponding SCADA data.

6.2.2 EXTENDED PERIOD SIMULATION CALIBRATION

In addition to the steady-state calibration, the hydraulic model was calibrated under extended period simulation conditions to verify that the model accurately represents system performance over time. The extended period simulation calibration assessed the operation of transmission mains, pumps, and storage tanks under typical system operating conditions.

The steady-state calibration, discussed in Section 6.2.1, established a reliable baseline of system characteristics, including pipe geometry, spatial demand allocation, and roughness coefficients. Building on that foundation, the extended period simulation calibration incorporated diurnal variations in demand and operational data to simulate dynamic interactions between pumping and storage throughout a representative 24-hour period.

As with steady-state calibration, exact replication of observed data at all monitoring points is not feasible because of normal operational variability and field measurement limitations. The objective of

the extended period simulation calibration was to minimize the differences between modeled results and the 2024 SCADA results to achieve a best overall fit for key performance indicators.

For a system of this size and complexity, the following accuracy criteria were applied for extended period calibration:

1) Simulation duration of at least 24 hours
2) Pump discharge pressures within ±5 percent of SCADA-recorded design points
3) Tank water levels within ±5 feet of SCADA observations for at least 80 percent of the simulation period

Typical calibration results and comparison plots for the extended period simulation are included on Figures 6-1 through 6-5.

Based on the calibration results, Jacobs believes the City's hydraulic model achieves the desired level of accuracy necessary to support water system evaluations and future planning scenarios. The validated model provides a representation of existing system performance and general operating characteristics under both steady-state and extended period simulation conditions.

The City would benefit in the future from a hydrant flow testing program to further validate the steady-state model performance. This program would also benefit the City Fire Department in its annual reporting requirements. The hydrant flow tests would need to balance the public's concern and perception of wasteful water practices with the City's benefit for water operations. Often these programs uncover closed and partially closed valves and unknown pressure zone interconnections that affect water system pressures and supply.

Figure 6-1. Tank 2A Calibration Graph

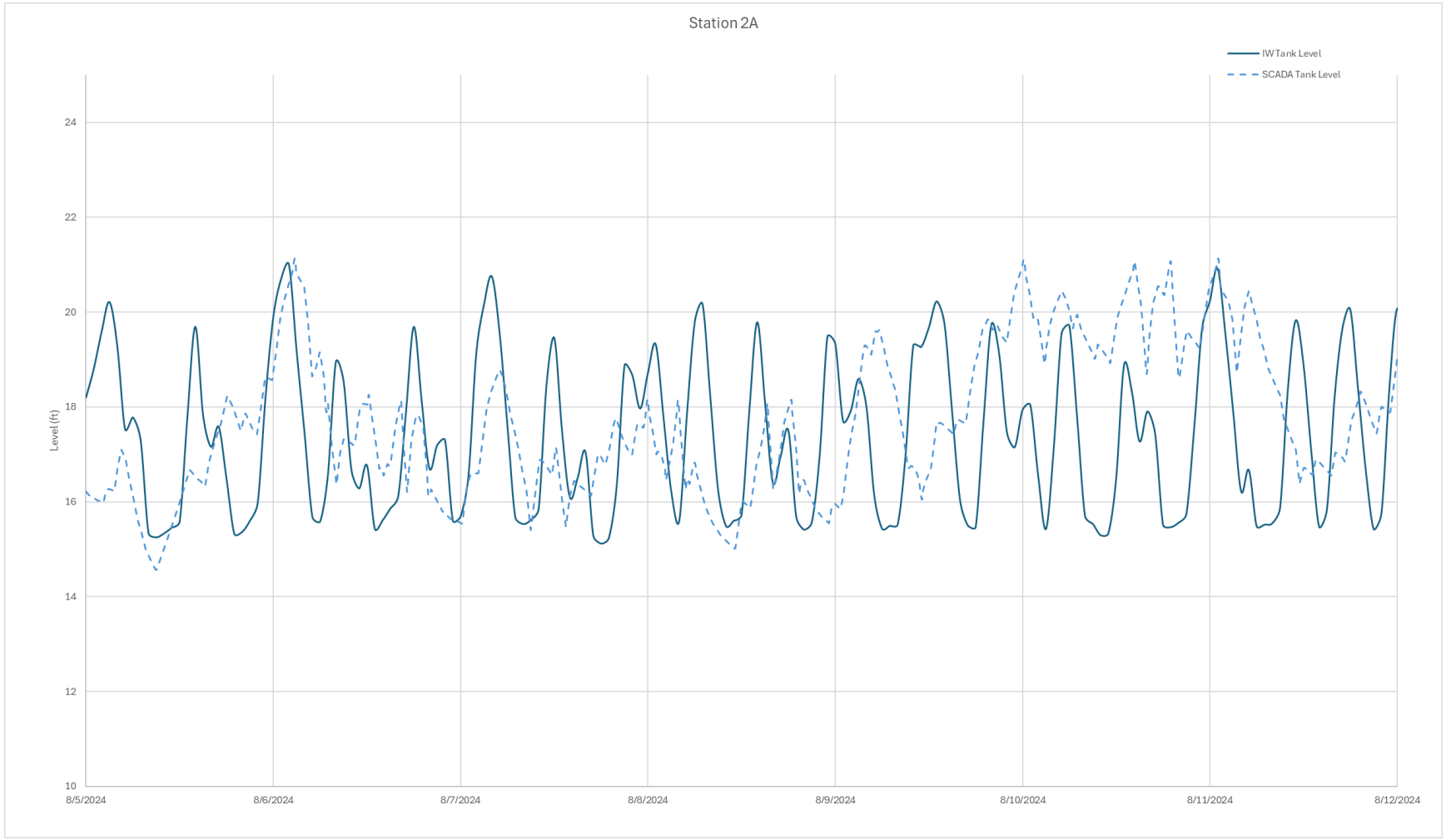


Figure 6-2. Tank 3A Calibration Graph

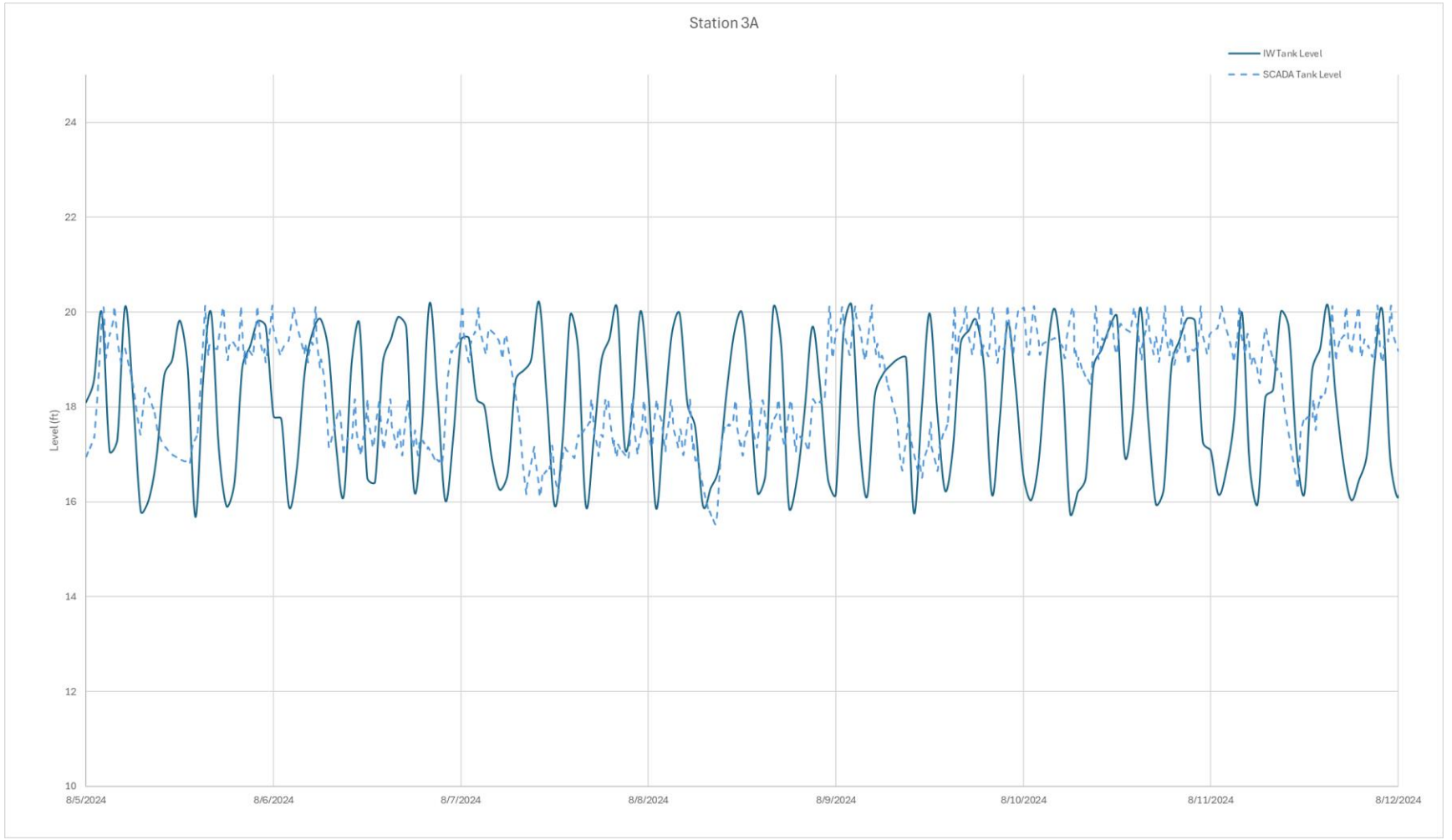


Figure 6-3. Tank 4A Calibration Graph

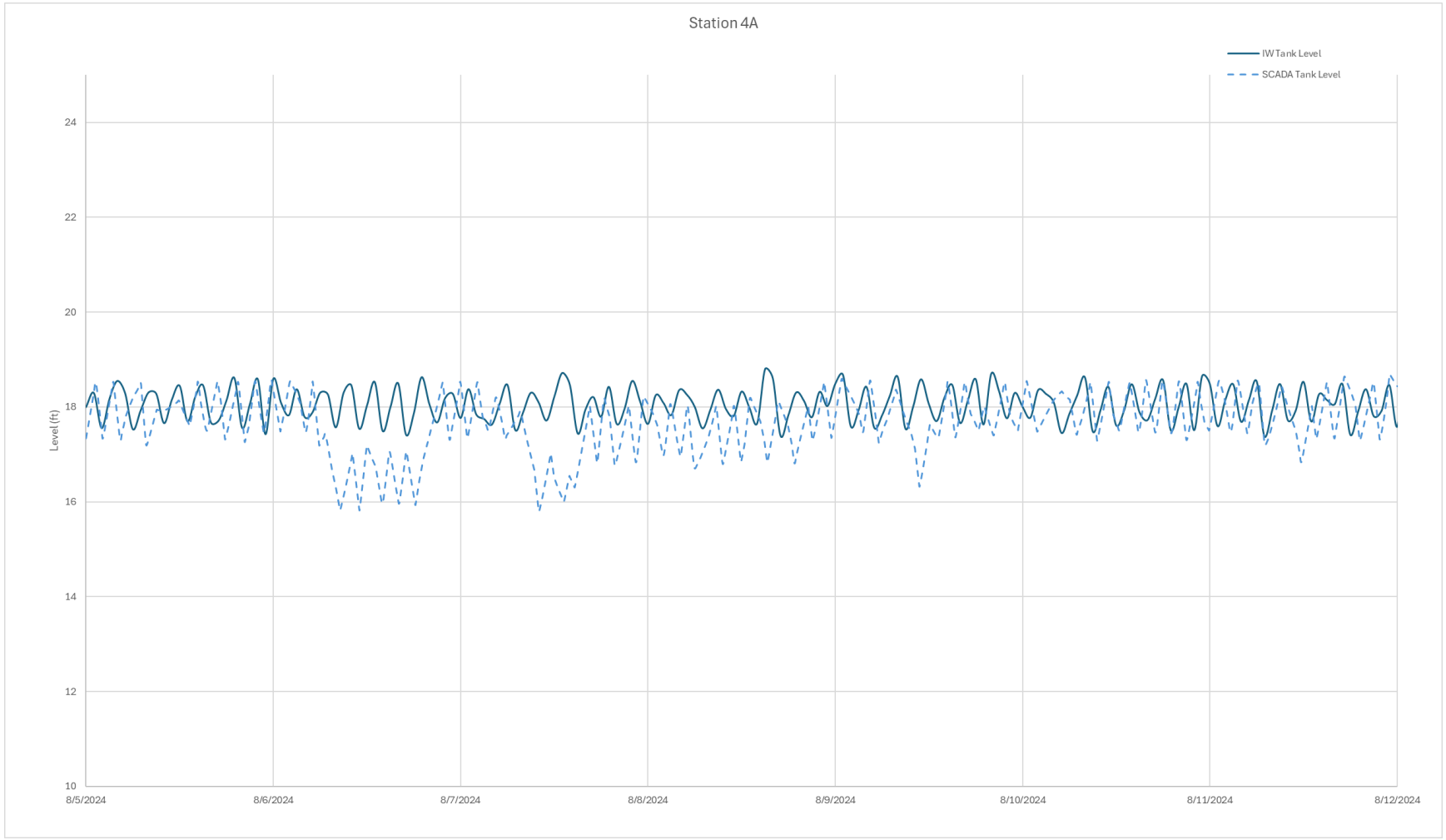


Figure 6-4. Tank 5A Calibration Graph

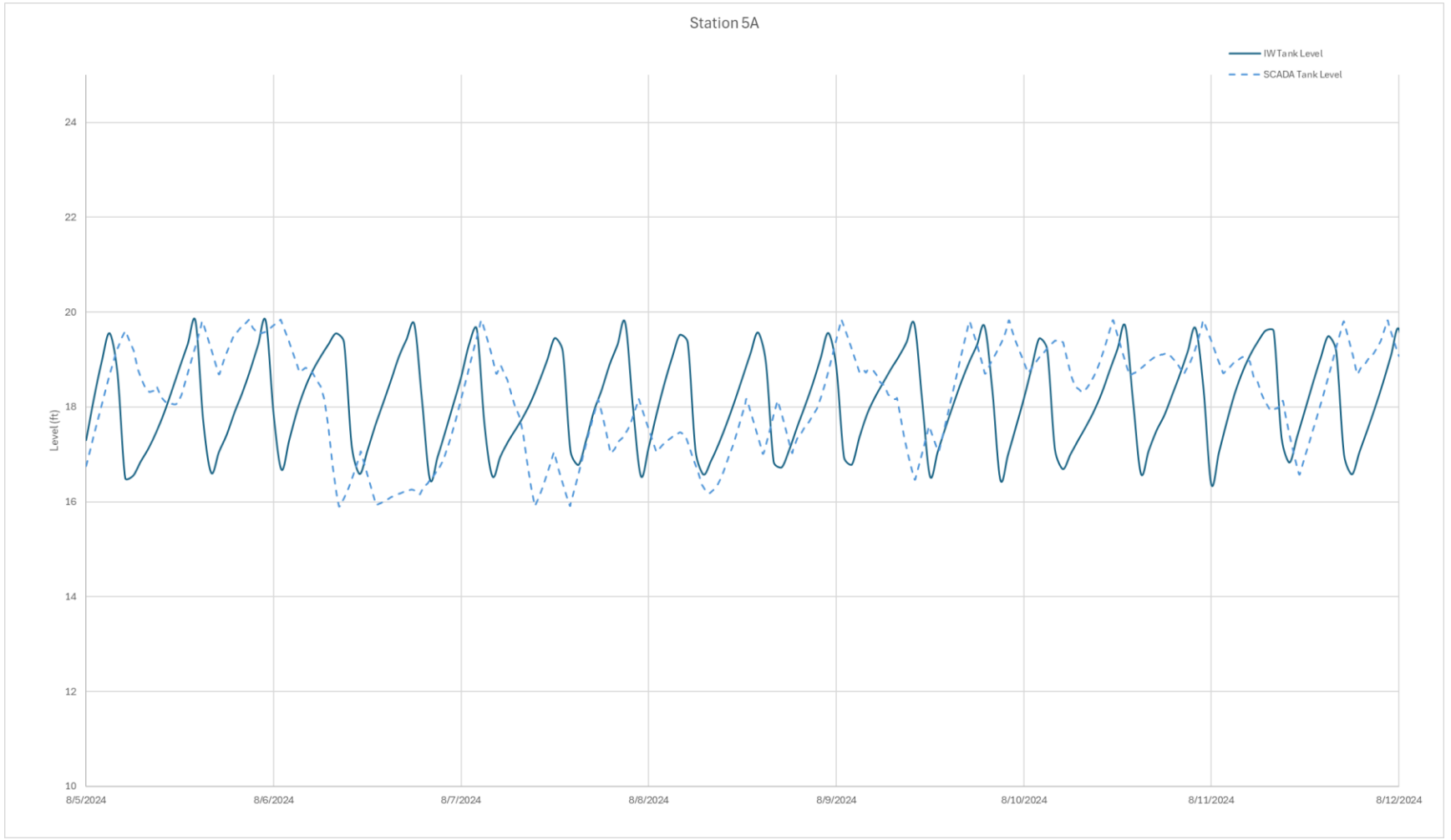
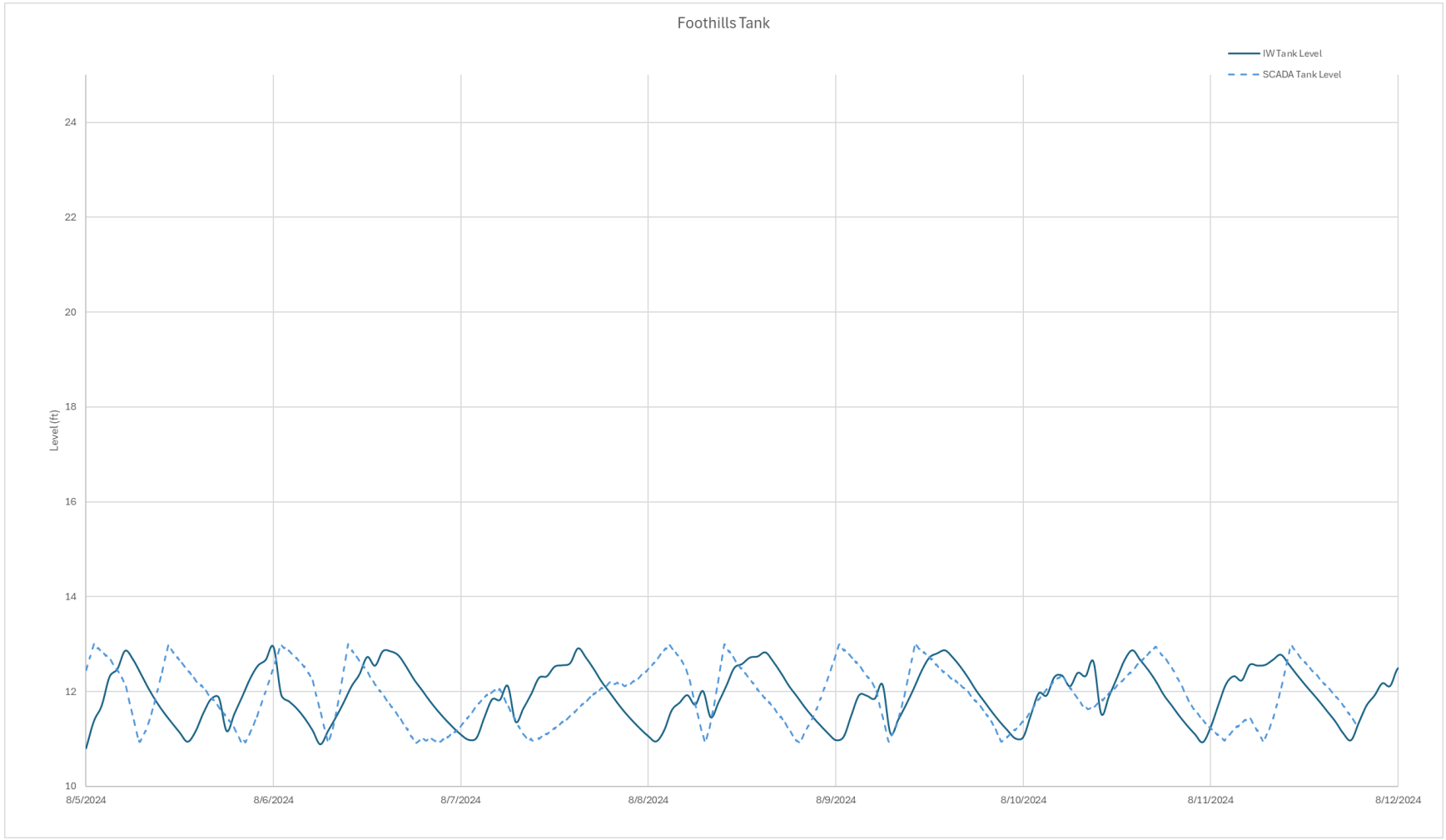


Figure 6-5. Foothills Tank Calibration Graph



7. Water System Evaluation

This chapter presents an overview of the existing water system and its current operations, including a summary of each pressure zone. Existing BPSs are evaluated based on criteria from Section 2.4.5 and storage facilities based on criteria from Section 2.4.7. Criteria for both BPSs and storage facilities are summarized in Table 2-1. The capacity of the existing water distribution system is analyzed based on the updated hydraulic model (Chapter 6) and workshops with City Water Operation staff. The capacity analysis includes the identification of system deficiencies and recommended new projects. Future water system improvements include projects needed to mitigate existing deficiencies and projects to support future growth. Projects that are solely attributed to new growth are noted and would be expected to be funded and constructed by new development, and timing would be commensurate with the new developments. Cost of the recommended capital facilities and major operation and maintenance projects is presented in Section 8.

7.1 EXISTING WATER SYSTEM

The existing water system consists of more than 538 miles of water distribution and transmission pipelines to serve the City. Approximately 470 miles or about 90 percent of the pipelines were constructed before 1990 as the City's population expanded. Most older distribution pipeline was constructed of asbestos cement, and transmission mains were typically PCCP or ductile iron pipeline. Today, most of the new water distribution system is constructed of polyvinyl chloride (PVC) (C-900) pipe and has been a reliable and good product. Unfortunately, there was a time when smaller-diameter pipelines were constructed of an inferior PVC product (Schedule 40), and these pipelines have become a high priority for the City's replacement program.

The potable drinking water supply originates at the City's WTP and is pumped through the High Service BPS to the north and south via 30-inch- and 36-inch-diameter transmission pipelines, respectively. For a short distance, east of the WTP, the transmission mains are collocated in the same street, and a past pipeline break resulted in a shutdown of the WTP supply. This critical point of failure will be addressed with a future redundancy project.

The City's water service area topography varies by 1,200 feet in elevation, ranging from as low as nearly 450 feet along the shorefront of Lake Havasu to as high as 1,800 feet in the eastern foothill areas. To manage service pressures, the City has constructed a water system consisting of narrow bands of pressure zones, established by a series of BPSs and reservoirs and interconnecting transmission mains. In 2024, the City operated 14 water BPSs and 27 distribution system reservoirs, not including the WTP clear well storage.

An illustration of the City's entire water system in profile is provided in Appendix B. The illustration includes HWLs, which establish the pressure zone hydraulic elevations, static pressures, and the service elevations between zones. The City has targeted about a 200-foot service range between pressure zones, allowing pressures to typically range from 50 to 120 psi. Each pressure zone is unique given the varying topography and development. In some cases, high pressures exceeding 150 psi may be necessary to optimally provide water service. Section 7.2 describes each of the pressure zones.

7.2 PRESSURE ZONES

The City's water system is separated into 14 pressure zones, which generally run parallel to one another from west to east and have been sequentially labeled, with Zone 1 originating from the WTP. Several of the existing pressure zones are planned to be extended north and south within the City limits to support future growth. The pressure zones serving the higher elevations consists of smaller residential development areas because of topography constraints. Accordingly, the pressure zone service areas decrease in size from the western and central area, which is more densely populated, to the eastern foothills, which is low-density residential development.

Water is supplied from BPSs within each pressure zone to distribution reservoirs via dedicated transmission mains. Water from these reservoirs is gravity-fed to customers in the zone, with distribution lines directly connected to the transmission mains for service. Several closed zones within the distribution system are served by BPSs. The existing pressure zone boundaries are illustrated on Figure 3-8. Major features and operations of the pressure zones are described in Sections 7.2.1 through 7.2.9.

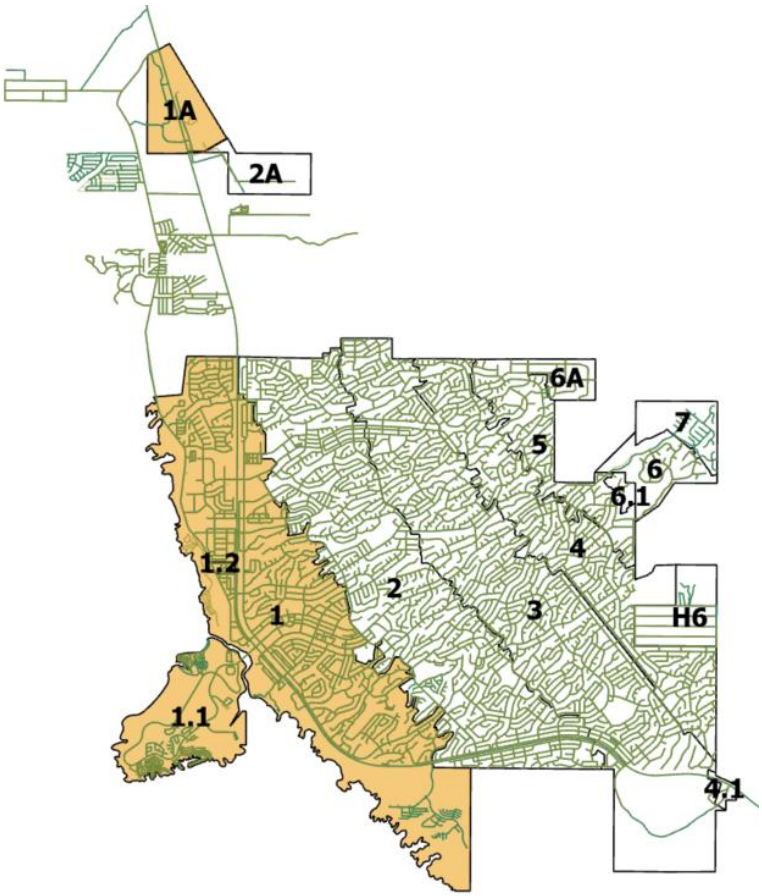
7.2.1 ZONE 1

Zone 1 (Figure 7-1) is the initial pressure zone established by the High Service BPS at the WTP and supplies all other pressure zones in the water distribution system. The City generally operates a northern- and southern-supplied Zone 1 system by splitting the High Service BPS into a northern and southern delivery with dedicated transmission mains and pumps, respectively. Zone 1 originates at the shoreline of Lake Havasu and extends eastward to approximately Acoma Boulevard. The zone extends to the far northern and southern City limits and includes the SR 95 corridor for service.

Zone 1 establishes an HGL of 794 feet, based on the Zone 1 reservoirs' HWLs and serves elevations ranging from approximately 430 feet to 670 feet. Zone 1 is the most highly populated with residential and employment and includes the central downtown area and lakefront development. The existing average annual demand for Zone 1 service area is 4.17 mgd. During MDDs, Zone 1 supplies the entire City-wide MDD of approximately 17.6 mgd (12,260 gpm) to the higher zones.

Zone 1 consists of seven distribution reservoirs and the High Service BPS at the WTP. One set of pumps supplies the north, and the other set of pumps supplies the south. Zone 1 is characterized by a northern and southern transmission main from the WTP and a network of looped water mains ranging in size from 4 inches to 36 inches in diameter. The available Zone 1 storage has been recently reduced to 5.25 MG because one of the tanks at 1C was removed from service. The City operates two tanks at each of the following sites: 1B, 1, and 1C. The City operates only one tank at Site 1A and North Havasu. All tank sites in Zone 1 include BPSs to serve Zone 2, although Site 1A includes only a single natural gas-fired pump that is manually operated because of a limited electrical power source. Increased pumping and storage capacity at Site 1A would require major electrical upgrades and transmission improvements.

Figure 7-1. Zone 1 (and Reduced Zone 1)



The High Service BPS was designed and constructed in the early 2000s to serve a future WTP capacity of 50 mgd. Because the WTP was initially constructed at 50 percent capacity (25 mgd), the City maintains full High Service BPS redundancy (equivalent to one pump station serving north or south) should the WTP be out of service. Twelve pumps were installed, each at 5 mgd, to serve the northern and southern systems. In 2024, the City used about 35 percent of the station's capacity to meet MDDs and operated between 3 and 4 pumps to meet demand. The City may require an additional pump to meet the WTP backwash filter operations, although this has been partially mitigated by the improved clearwell storage operations.

As presented in Section 7.2, the estimated 2040 capacity for the High Service BPS is approximately 21 mgd. This estimated capacity would require the City to operate a minimum of five pumps plus standby pumps to serve the north and south, respectively, during MDDs.

The City rehabilitates one 5-mgd pump per year, including control valves, because of the age of the pumps. As pumps are rehabilitated, the City could explore the following options to further optimize pumping operations:

- If a pump requires full replacement, consider the benefit of a lower capacity pump (2 to 2.5 mgd) to operate with larger 5-mgd pumps to potentially improve efficiencies and operational flexibility.
- As part of the second WTP siting study, review how the High Service BPS will operate in conjunction with a second WTP and potential pump capacity changes.

The City's hydraulic control from the WTP is established at two Zone 1 tanks. The northern pumps are operated and controlled by Tank 1B, and the southern pumps are controlled by Tank 1C. Based on daily City-wide water consumption, the City increases pumping capacity to Zone 1 based on the water levels in these respective tanks. A robust transmission system of 24-inch through 36-inch transmission mains conveys water to the higher-pressure zones, tanks, and BPSs.

Zone 1 also includes a small pressure-reduced area (Zone 1.1), consisting of three PRV stations supplying the Island area distribution system via one 12-inch and one 16-inch line. Pressures are reduced about 50 psi from Zone 1 to Zone 1.1 (694 feet HGL); otherwise, pressures would exceed 150 psi. This area continues to experience increased development activity consisting of residential and resort type projects.

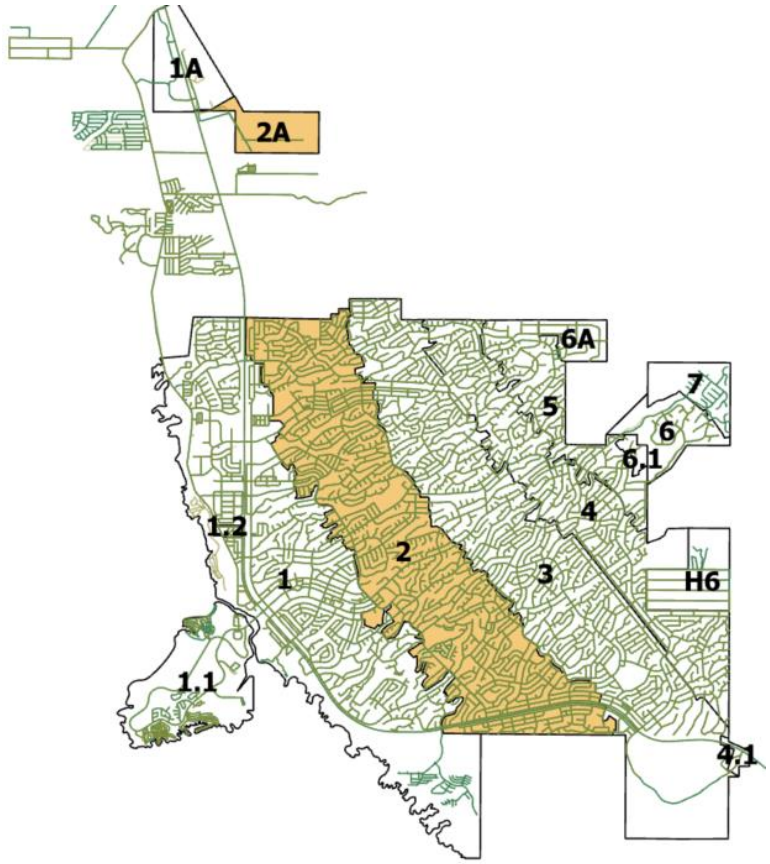
The City recently experienced an isolated area of pipe breaks and leaks because of excessive high pressure south of the WTP, along London Bridge Road. To mitigate the high pressure, the City installed two PRV stations consisting of one 2-inch and one 6-inch hydraulic control valve each.

Zone 1 also is the sole supply to the North Havasu Tank (HWL = 757 feet), approximately 5 miles north of the WTP, which serves the airport and shopping mall areas. A single 30-inch reduced to 20-inch transmission main conveys the required water supply and refills the tank for the North Havasu system.

7.2.2 ZONE 2

Zone 2 (Figure 7-2) generally parallels Zone 1, with a zone band width of approximately 1.2 miles, as the topography steepens eastward. Zone 2 is served by 6 tanks with a total storage capacity of 5.3 MG. Two tanks are located at each of the following sites: 2A, 2, and 2C. The primary BPSs at Sites 1B, 1, and 1C establish a hydraulically balanced pressure zone of pumped supply and storage operations within Zone 2, thereby minimizing large pressure swings during peak hour demands. BPS 1A is a single standby pump supply for Zone 2. The Zone 2 service area is the start of the transition from commercial to residential development within the City's pressure zones, although Zone 2 includes a number of commercial areas.

Figure 7-2. Zone 2



Zone 2 establishes an HGL of 1,020 feet, based on the Zone 2 reservoirs' HWLs. Zone 2 serves elevations ranging from 670 to 900 feet. The existing average annual demand for Zone 2 is 3.1 mgd, similar in volume to the demand in Zone 1. During MDDs, Zone 2 also must supply Zone 3 through Zone 6 MDDs of approximately 11.4 mgd (7,910 gpm). Section 7.3.1 includes an evaluation of available BPS and storage capacity within Zone 2.

The Zone 2 transmission mains radiating from each of the 3 main BPSs range in size from 20 inches to 27 inches in diameter and provide both supply capacity within Zone 2 and to the upper pressure zones. Most of the residential areas within Zone 2 are supplied by smaller-diameter distribution mains ranging in size from 4 to 8 inches. BPS 2A has limited transmission capability to its smaller sized pipelines (8 to 12 inches).

The northern reaches of Zone 2 can also be supplied by the North Havasu BPS (discussed in Section 7.2.3). The North Havasu BPS must be periodically used to manage water quality in the North Havasu 2-MG tank. The City will operate smaller pumps at the North Havasu BPS to meet daily commercial demands in the shopping mall and airport areas, and excess supply can be relieved by heading south back to Zone 2 for nearly 2 miles via an 8-inch pipeline. The City estimates as much as 1,000 gpm can be supplied from the North Havasu BPS back into Zone 2. The North Havasu Zone is further discussed in subsection 7.2.3.

7.2.3 ZONE 2A (NORTH HAVASU 1035 ZONE) AND ZONE 1A (900 ZONE)

North Havasu Tank (HWL = 757 feet) and North Havasu BPS were constructed to provide water service to the shopping mall area, which required a large fire flow (5,000 gpm for 5 hours). The tank is solely filled by Zone 1 through the 20-inch transmission main. The North Havasu BPS operates as a closed system and delivers pressures at an HGL of 1,035 feet, slightly higher than Zone 2 pressures (1,020 feet) and establishes Zone 2A. Historically, the shopping mall area was operated at high water services pressures (more than 150 psi). Several years ago, the City created a reduced pressure zone to mitigate the problem of high pressure in the shopping mall area and established a new Zone 1A system that operates at 900 feet HGL. The City constructed two PRV stations near the airport area to provide a looped system. These PRV stations have solved the problems associated with the high-pressure service failures in buildings and fire sprinkler systems, but these stations result in lower fire flow system pressures than originally designed.

Operational challenges include maintaining the standby fire flow pumps for this commercial area, which are rarely needed, and a large reservoir that does not turn over with current domestic demands; hence, there is a need to recirculate water south back to Zone 2. The North Havasu Reservoir has not been taken out of service because of its critical function as fire flow storage, and the City does not have a second tank at the site to facilitate such a shut down. In 2024, the City conducted a tank siting study and determined that a 0.5-MG tank could serve the area in a shutdown, and fire flows could be supplemented by the high service pump station at the WTP working in conjunction with the 0.5-MG tank.

In the future, the North Havasu storage site will serve as a main water supply to the east as the northern portion of the City develops. The North Havasu pump station could supply a Zone 3 storage tank in the future.

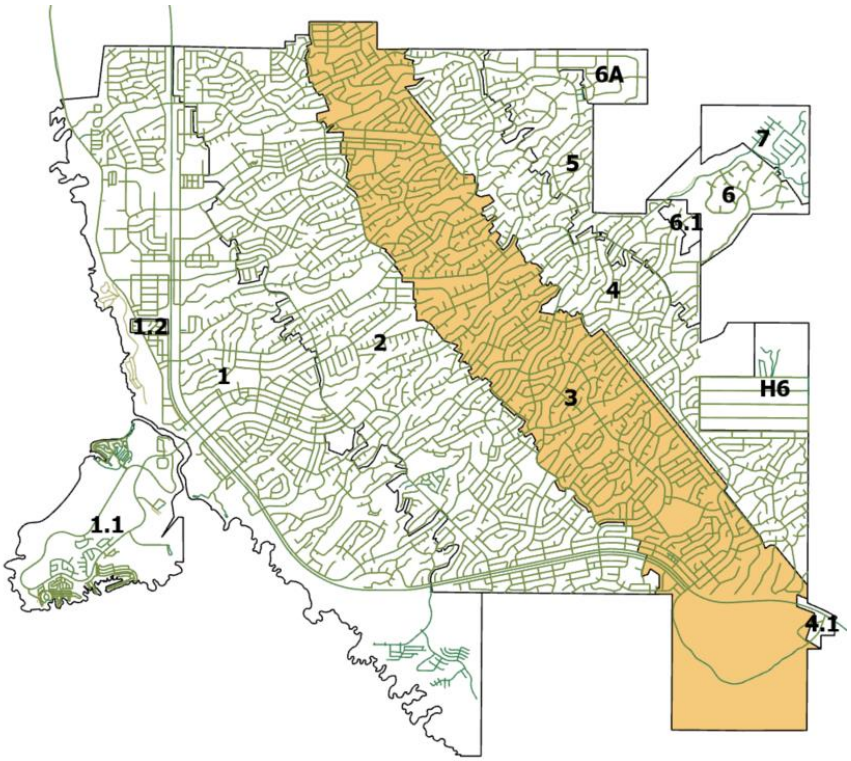
7.2.4 ZONE 3

Zone 3 (Figure 7-3) is a narrow pressure zone band, approximately 1 mile wide, a backbone water system that extends up steeper topography to the east while maintaining the desirable service pressure ranges. The Zone 3 system includes three tank sites and three BPSs. Transmission mains, ranging in diameter from 12 inches (in the northern portion of the zone) to 24 inches, deliver water to the reservoirs. There is limited transmission from north to south in the zone.

The zone is characterized by looped 8-inch distribution lines that feed a network of smaller pipes. Zone 3 is served by a total of six tanks, with two tanks at each site (3A, 3, and 3C). The total available storage is 4 MG. BPSs 2A, 2, and 2C provide the pumping capacity that is similar to the pumping capacity of Zone 2.

Zone 3 establishes an HGL of 1,227 feet based on the Zone 3 reservoirs' HWLs and serves elevations ranging from 870 feet to 1,100 feet. The Zone 3 service area is predominantly residential with local neighborhoods, commercial areas, and schools. The existing average annual demand for Zone 3 is 2.44 mgd, about two-thirds the size of Zone 2' average annual demand. During MDDs, Zone 3 will be required to supply Zone 4 through Zone 6 MDDs, totaling approximately 6.80 mgd (4,720 gpm). Section 7.3.2 includes an evaluation of available BPS capacity within Zone 3.

Figure 7-3. Zone 3



Reservoir Site 3C serves the far southeastern portion of Lake Havasu City. In addition, the reservoir site serves as forebay storage for Mohave County's Horizon Six water system, to which the City supplies water. The Horizon Six water system includes a Mohave County BPS and distribution system serving 240 connections.

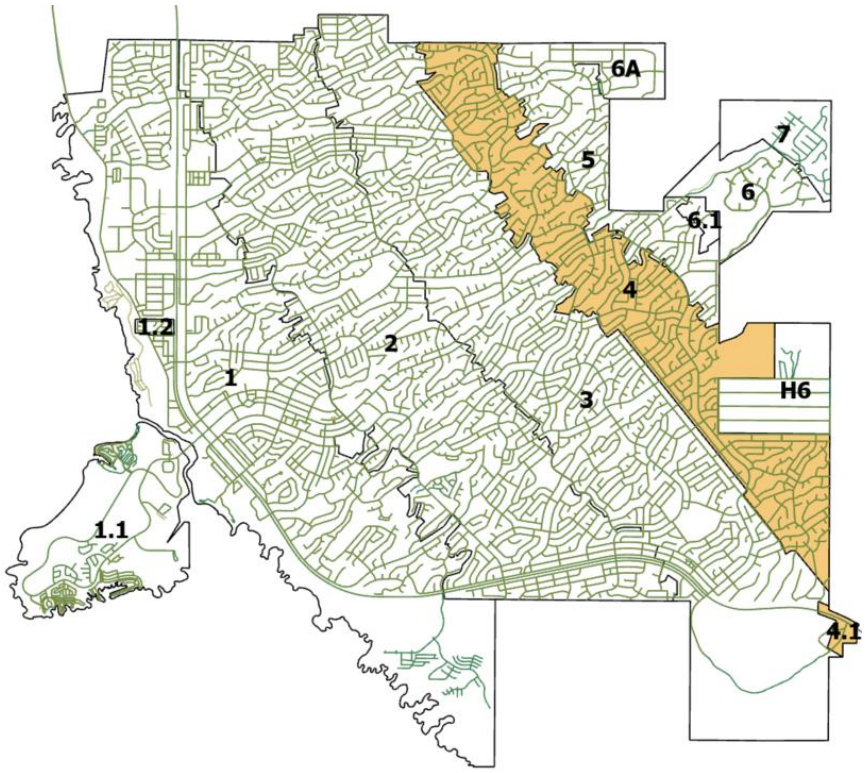
The City has recently expanded the Zone 3 water system to serve the new SARA Park water system to the south and created a looped system by connecting the portion of SARA Park east of SR 95 to the Vagabond PRV station at the edge of Zone 4. SARA Park is fed by parallel sources: from Zone 3 by gravity and Zone 4 via the Vagabond PRV station. The City needs to upgrade the pipeline across SR 95, which is an undersized 4-inch main.

7.2.5 ZONE 4

Zone 4 (Figure 7-4) serves the southeastern corner of the City up to north of North Kiowa Boulevard. The western boundary of the zone follows the Western Area Power Administration power transmission line easement from south to north. The Zone 4 system includes a backbone system of four tanks and two BPSs. Site 4A includes a 1-MG and 0.25-MG tank. Site 4 has two 1-MG tanks for a total zone capacity of 3.3 MG.

Zone 4 establishes an HGL of 1,404 feet, based on the Zone 4 reservoirs' HWLs and serves elevations ranging from 1,045 to 1,276 feet. The Zone 4 service area is mostly residential. The existing average annual demand for Zone 4 is approximately 1.19 mgd.

Figure 7-4. Zone 4



The two BPSs that feed Zone 4 are located at Sites 3 and 3A. A new BPS has been constructed by Mohave County at Site 3C, dedicated to serving the Horizon Six water system (discussed in Section 7.2.6). Section 7.3.2 includes an evaluation of available BPS capacity within Zone 4.

7.2.6 HORIZON SIX 1500 ZONE

Although owned and operated by the County, the Horizon Six water system is supplied from the City's water system at Mohave County's BPS at Site 3C. The Horizon Six water system consists primarily of 6-inch water mains between Little Finger Road and Window Rock Road, just east of Lakeside Drive and west of Red Rock Road. Figure 7-5 shows the Horizon Six zone.

The County has multiple PRV stations to reduce pressure in the Horizon Six system. The County has future plans to upgrade the domestic BPS to add fire flow pumps because currently, the water system has limited fire flow capacity. The existing average annual demand for the Horizon Six water system is approximately 0.07 mgd.

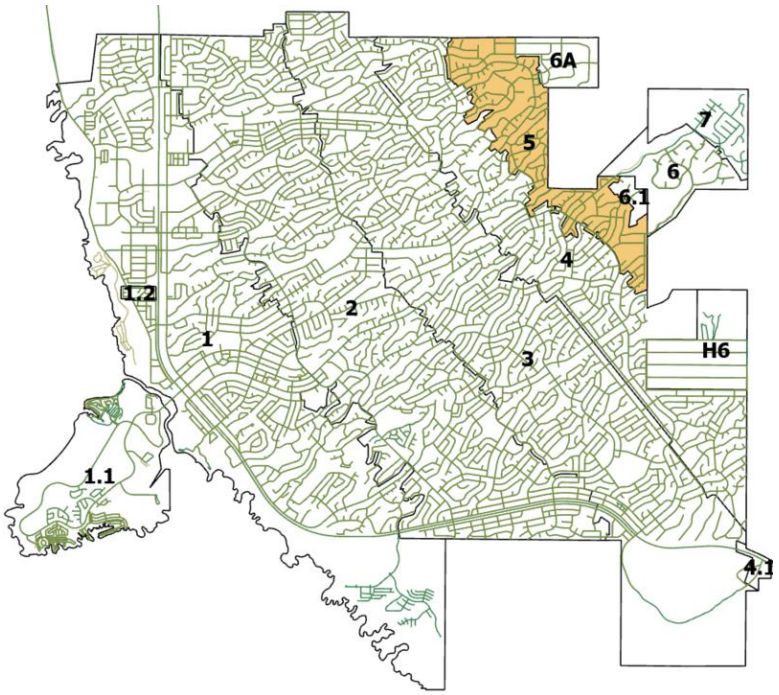
Figure 7-5. Zone Horizon Six

7.2.7 ZONE 5

Zone 5 (Figure 7-6) is established in the far northeastern corner of the City where two reservoirs are collocated at Site 5A (0.5 MG and 0.75 MG, respectively), totaling an available storage capacity of 1.3 MG. The northern portion of Zone 5 is served solely by BPS 4A. Three pumps are located at BPS 4A, for a total pump capacity of 1,150 gpm.

Zone 5 establishes an HGL of 1,579 feet, based on the Zone 5 reservoir's HWL and serves elevations ranging from 1,220 to 1,450 feet. The Zone 5 service area includes some of the higher residential areas of the City. Zone 5 extends nearly 3 miles to the southeast from Tank 5A, making it one of the longer zones not supported by a second reservoir; therefore, Zone 5 can be subject to higher-pressure swings. In lieu of a second reservoir to the south, the City formerly operated the Cherry Tree PRV station, which was interconnected with the higher-pressure foothills (Zone 6) water system, to provide additional Zone 5 supply during peak hour demands. However, with the recent pressure Zone 6 conversion around Site 4, the PRV station and piping were reconfigured to serve a new small Zone 6.1. Future improvements are recommended to improve strengthening the southerly portion of Zone 5, including a new Cherry Tree PRV station. The existing average annual demand for the entire Zone 5 is approximately 0.55 mgd (380 gpm) and peak hour flows of nearly 1,000 gpm that must be supplied from north to south.

Figure 7-6. Zone 5

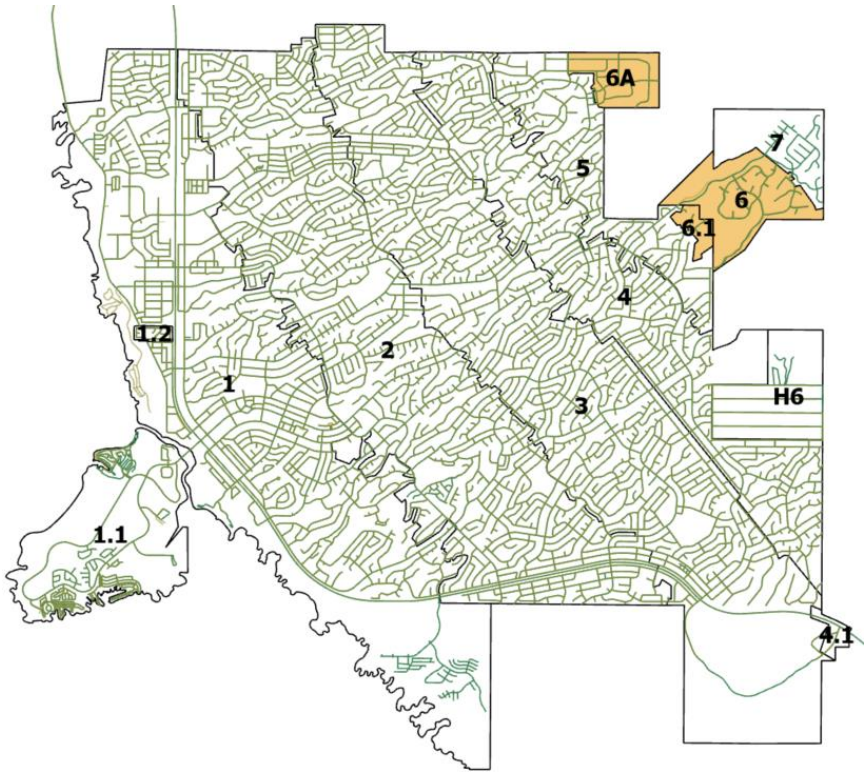


7.2.8 ZONE 6A AND ZONE 6

Zone 6A consists of a small, closed zone serving the higher elevations around Tank 5A, and Zone 6 includes the water system constructed as part of the Foothills Estates development (Figure 7-7). These two Zone 6 water systems are not connected; however, they could be connected in the future, should Foothills Estates be required to construct a second access road to the north. The closed Zone 6A water system is supplied by BPS 5A (Hydro) and operated at an HGL of 1,760 feet.

The City has secured a site for a future Tank 6A to convert the closed system to an open system and simplify operations, should development activities increase. In the future, when Tank 6A is constructed, Zone 6A will also establish an HGL of 1,760 feet and will serve elevations ranging from 1,440 feet to 1,640 feet.

Figure 7-7. Zones 6A and 6



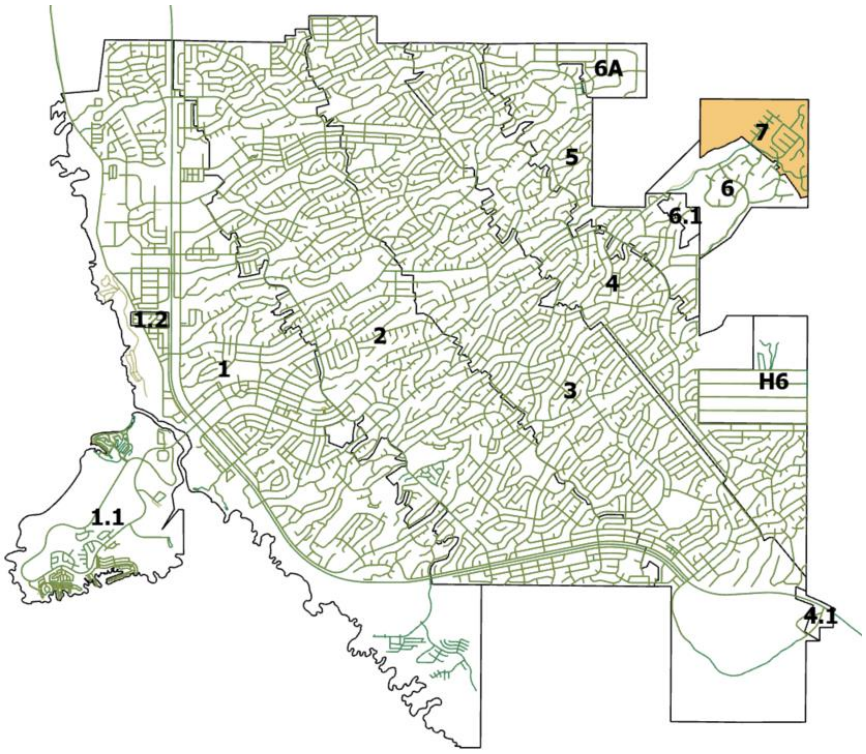
7.2.9 FOOTHILLS ESTATES ZONE 6 AND ZONE 7 (1760 AND 1975 ZONES)

The new Foothills Estates Zone 6 establishes an HGL of 1,760 feet, based on the two 0.34-MG tanks, and serves elevations ranging from 1,440 to 1,640 feet. The tanks were originally planned to be 24 feet high; however, in final design, they were reduced to a height of 16 feet, thereby lowering the Zone 6 static pressures.

All water supply to the foothills Zone 6 is from BPS 4, and a dedicated single 12-inch transmission main to the tanks runs both cross-country and through the development. BPS 4 includes 5 pumps with a capacity of 230 gpm each, resulting in an available zone pump firm capacity of 920 gpm.

The higher elevations above Zone 6 within Foothills Estates are served by a pumped closed system because of constraints posed by a higher elevation reservoir within the development. The closed zone operates as a Zone 7 system and could be expanded to the north and east in the future. The new closed Zone 7 (Figure 7-8) operates near an HGL of 1,975 feet and serves elevations ranging from 1,635 to 1,790 feet. The BPS includes three domestic pumps and three fire pumps and is adjacent to the two Foothills Estates tanks.

Figure 7-8. Zone 7



7.3 REVIEW OF PUMP STATION AND RESERVOIR DESIGN CRITERIA

This section summarizes the BPS and reservoir design criteria presented in Chapter 2 and applications to the existing water system. Section 7.3.1 includes a detailed capacity analysis of existing storage and pumping by pressure zone.

7.3.1 STORAGE CRITERIA

Water supply facilities are designed to operate at a steady rate over an extended period, so storage reservoirs are being planned to accommodate fluctuating demands. The factors included in sizing reservoirs are diurnal demand fluctuations, fire flows, and emergency reserve storage. In some areas of the City's water system, it may be prudent to have the following additional storage volume to provide more operational flexibility:

- Forebay storage where a large BPS operates at a tank site and would benefit from additional storage for pump operations
- Emergency storage at the higher-pressure zone elevations, which provide the City with an ability to move water by gravity
- Clearwell storage located at the WTP to provide more flexibility in WTP operations and high service pumping operations

The City's water storage sizing is summarized in Table 7-1 and based on the following criteria:

- Operational Storage – 20 percent of MDD
- Fire Storage – Based on the largest fire zone and International Fire Code (Fire flow credit is allotted for sprinklered buildings. A minimum fire flow of 1,500 gpm is required if sprinkler systems are not installed.)
- Emergency Storage – 100 percent of ADD

A challenge associated with increased storage is achieving adequate turnover to minimize water quality degradation. In summary, as new reservoirs are designed and brought online, the storage factors listed above and the storage criteria listed in Table 2-1 should be taken into consideration.

The City has also undertaken a City-wide program to rehabilitate the steel tanks in the water system. Depending on the condition of the tanks, the facilities may be out of service for up to 1 year during construction. With the large number of tanks in the City system, it is the City's desire to plan for two tanks at a single reservoir site so that one tank can be taken out of service for an extended period of time.

Storage analysis is done on a zone-by-zone basis and typically considers full capacity of the tank. Because of overflow elevations and pump level controls, typically less than 100 percent of a tank is available for water storage. Therefore, the effective storage for a typical tank may only be about 80 to 85 percent of the total tank volume. Storage tank capacity evaluations for an individual pressure zone should take these factors into consideration.

Table 7-1. Lake Havasu City Existing Storage Analysis

Pressure Zone	Existing Zone ADD[g]		Max Day PF	MDD (ADD x PF)		Number of Tanks	Capacity by Tank (MG)	Operational (0.20 x MDD) (MG)	Fire (MG)	Emergency (1.0 x ADD) (MG)	Total Required Storage (MG)	Available (MG)	Surplus/ Deficit (MG)
	(gpm)	(mgd)		(gpm)	(mgd)								
1	2,896	4.17	1.5	4,344	6.26	5[e]	1	1.251	1.20[a]	4.17	6.62	5.25	-1.37
						1	0.25						
2	2,132	3.07	1.5	3,198	4.61	4	1	0.921	1.20[a]	3.07	5.191	5.75	0.559
						1	1.5						
						1	0.25						
3	1,694	2.44	1.5	2,542	3.66	3	1	0.732	1.20[a]	2.44	4.372	4	-0.372
						1	0.5						
						2	0.25						
4	826	1.19	1.5	1240	1.785	3	1	0.357	0.54[b]	1.19	2.087	3.25	1.163
						1	0.25						
5	382	0.55	1.5	573	0.825	1	0.75	0.165	0.18[c]	0.55	0.895	1.25	0.355
						1	0.5						
6a	63	0.09	1.5	94	0.135	-	-	0.027	0.18[c]	0.09	--	0.0[d]	--
6	90	0.13	1.5	135	0.195	2.00	0.33	0.057	0.18[c]	0.19	0.427	0.67	0.24
7	42	0.06	1.5	63	0.09	-	-	0.018	--	0.06	--	0.0[e]	--

Table 7-1. Lake Havasu City Existing Storage Analysis

Pressure Zone	Existing Zone ADD[g]		Max Day PF	MDD (ADD x PF)		Number of Tanks	Capacity by Tank (MG)	Operational (0.20 x MDD) (MG)	Fire (MG)	Emergency (1.0 x ADD) (MG)	Total Required Storage (MG)	Available (MG)	Surplus/ Deficit (MG)
	(gpm)	(mgd)		(gpm)	(mgd)								
H6	49	0.07	1.5	73	0.105	-	-	0.021	--	0.07	--	0.0[f]	--
						-	-						

[a] Assumed 5,000 gpm fire flow x 4 hours = 1.20 MG.

[b] Assumed 3,000 gpm fire flow x 3 hours = 0.54 MG.

[c] Assumed 1,500 gpm fire flow x 2 hours = 0.18 MG.

[d] Zone 6A is a closed pressure zone with no existing storage.

[e] Zone 7 is a closed pressure zone with no existing storage.

[f] Horizon 6 Zone is served by the County. Storage is included in Zone 4.

[g] ADD is based on 2024 adjusted billing data.

[h] Tank 1C (1 MG) is out of service. CIP has replacement within next 5 years.

7.3.2 PUMP STATION CRITERIA

The City's BPSs boost the water pressure so that service may be provided to users at higher elevations. Increased water pressure is accomplished by a series of BPSs that move water from Zone 1 to Zone 7. BPSs may supply water to an open system or to a closed system. An open system is a service area with its own storage reservoir. A closed system is a service area without a storage reservoir. BPSs supplying a closed system must regulate pressures using multiple pumps, variable speed drives, or hydropneumatics tanks.

The City's water BPS sizing is summarized in Table 7-2 and based on the following criteria:

- BPSs serving a reservoir system should be designed for MDDs.
- When pumping to a closed system, the capacity should equal the larger of either peak hour demand or MDD plus fire flow demand.
- BPSs should be sized to meet demands with the largest pump out of service (firm capacity).
- When multiple BPSs (minimum of three) supply a zone, average annual water demands should be supplied with the largest BPS out of service.

The City pumping system is flexible and robust with the ability to have major stations out of service and still meet average demand.

Table 7-2. Lake Havasu City Existing Pumping Capacity Analysis

Primary Zone Served	Available Zone Pump Capacity (gpm)	Pump Station	Number of Pumps	System	Rated Capacity Design		Firm Capacity		All Zones Served	Zone ADD (gpm)	Zone ADD (mgd)	Max Day Demand[a]	Surplus/ Deficit (calculated)
					gpm	mgd	gpm	mgd					
1	35,000	North Bank WTP High Service Pump Station	6	North	3,500	5.0	17,500	25.2	1 1.1 1.2 1A 2 2A 3 4 5 6 6.1 6A 7 H6	8,174	11.8	12,260	22,740
		South Bank WTP High Service Pump Station	6	South	3,500	5.0	17,500	25.2					
2	19,100	Station 1A	1	North	1,000	1.4	1,000	1.4	2 3 4 5 6 6.1 6A 7 H6	5,271	7.6	7,906[2]	11,194
		Station 1B	4	North	3,300	4.8	9,900	14.3					
		Station 1	4	Central	1,400	2.0	4,200	6.0					
		Station 1C	2	South	2,750	4.0	4,000	5.8					
			1		1,250	1.8							
2A	7,170	North Havasu Pump Station	1	North	170	0.2	7,170	10.3	1A 2A	62	0.1	5,094	2,076
			2		1,500	2.2							
			3		2,000	2.9							
3	7,785	Station 2A	2	North	1,435	2.1	2,485	3.6	3 4 5 6 6.1 6A 7 H6	3,146	4.5	4,719	3,066
			1		1,050	1.5							
		Station 2	3	Central	1,400	2.0	2,800	2.1					
		Station 2C	2	South	1,750	2.5	2,450	3.5					
			1		700	1.0							

Table 7-2. Lake Havasu City Existing Pumping Capacity Analysis

Primary Zone Served	Available Zone Pump Capacity (gpm)	Pump Station	Number of Pumps	System	Rated Capacity Design		Firm Capacity		All Zones Served	Zone ADD (gpm)	Zone ADD (mgd)	Max Day Demand[a]	Surplus/ Deficit (calculated)
					gpm	mgd	gpm	mgd					
4	5,600	Station 3A	3	North	1,300	1.9	2,600	3.7	4 5 6 6.1 6A 7	1,403	2.0	2,104	3,496
		Station 3	4	Central	1,000	1.4	3,000	4.3					
5	1,150	Station 4A	2	North	650	0.9	1,150	1.7	5 6 6.1 6A 7	576	0.8	865	285
			1		500	0.7							
Horizon Six[e]	300	Station 3C	4	South	100	0.1	300	0.4	H6	49	0.1	78[f]	--
6 (Foothills Estates)	920	Station 4 (Foothills Estates)[c]	5	Central	230	0.3	920	1.3	6 6.1 7	194	194	0.3	628
6.1	--	Served by PRVs from Zone 6		Central	--	--	--	--	6.1	14	0.02	21	--
6a	1,320	Station 5A[d]	4	North	440	0.6	1,320	0.6	6A	62	0.1	1,094[d]	226
7	2465	Station 6 (Foothills)[g]	2	South	240	0.3	2465	3.55	7	42	0.1	1,562[g]	903
			1		485	0.7							
			2		1500	2.2							

[a] MDD in mgd = 1.5 x ADD.

[b] North Havasu BPS assumed sized for MDD + 5,000 gpm fire flow.

[c] Pump Station 4 (Foothills Estates) is an interim closed zone; future open system when Zone 6 tanks are built.

[d] Pump Station 5A is assumed sized for MDD + 1,000 gpm fire flow.

[e] Served by Mohave County. Pump station was replaced with four 100-gpm pumps. No fire pumps included.

[f] Peaking factor based on 1.6 x average.

[g] North Havasu BPS assumed sized for MDD + 1,500 gpm fire flow.

7.4 EXISTING STORAGE AND PUMPING CAPACITY ANALYSIS

This section presents a capacity evaluation of the City's storage tanks and BPSs according to the recommended design criteria in Table 2-1 and discussions in Section 7.1.

7.4.1 EXISTING WATER STORAGE ANALYSIS

Table 7-1 presents an analysis of the storage capacity in the existing water system based on the design criteria and consideration of effective storage in each reservoir. Referring to calculations in Table 7-1, most of the major zones have surplus capacity. Zone 1 and Zone 3 may benefit from additional storage in the near term. The City's current CIP includes a Zone 3 tank replacement that increases storage by 0.25 MG. Zone 1 storage deficiencies can be mitigated by crediting a portion of the WTP clearwell storage for the zone given that the high service pump station supplies water directly from this storage. A discussion of future tank projects is included in Section 7-6.

The City's existing storage system meets current design criteria for operational, fire flow, and emergency needs for most zones. In addition, the City has continued to require two tanks at each site, resulting in greater operational flexibility. The City has continued its multi-year program to rehabilitate and replace older tanks based on an inspection report. Where siting allows, the City may choose to replace a smaller tank with a larger tank.

7.4.2 EXISTING PUMP STATION ANALYSIS

Table 7-2 includes a zone-by-zone capacity analysis for each pump station. Each pressure zone is evaluated for pumping needs within the zone and then compared to the available pumping capacity, which is determined by counting the pump stations serving the zone. In contrast to pressure zone storage analysis, which only looks at the zone demand, the pumping analysis must consider supplying each higher-pressure zone. For example, Zone 3 must be able to supply the Zone 3 demands, as well as Zone 4 through Zone 7 demands; therefore, the high service pump station at the WTP must supply 100 percent of the City's water demands.

The City's existing pump station capacity for all pressure zones meets current design criteria. For the lower zones, namely Zone 1 through 3, the existing pump station has substantial surplus pumping capacity. This capacity provides the City with flexibility to move the water supply around the system. Zone 1 has the largest surplus of pumping capacity, nearly 27,000 gpm, because all pumps at the High Service BPS were installed with the construction at the future WTP capacity. The City could reduce the number of pumps in operation and save on operation and maintenance costs. On the other hand, the High Service BPS is the backbone supply facility for the entire water system, and operational flexibility and reliability is critical to maintain.

An example of full pump station redundancy on a zone basis is shown in Table 7-2. Zones 1 through 3 in Table 7-2 have surplus capacities greater than the capacity of a single pump station, which means the City can lose one pump station during MDDs and still have sufficient pump station capacity to serve zone demands.

7.5 EXISTING DISTRIBUTION SYSTEM CAPACITY ANALYSIS

The existing 2024 water system model, described in Chapter 6, was used to evaluate the water system under maximum day and peak hour conditions. A steady-state peak hour simulation with a peaking factor of 2.5 was modeled, and pressure losses and pipe velocities were reviewed over the entire water system. An extended period simulation during MDDs was performed to review pump station and tank operations and any areas of large pressure swings.

For the peak hour conditions, tank levels were assumed based on current SCADA settings and BPSs operating one of two pumps, depending on the zone demand condition. Figure 7-9 illustrates peak hour demand pipeline velocities, and Figure 7-10 illustrates residual pressures at model nodes.

In summary, the City's water distribution system has no major system deficiencies when all water facilities are in service, when evaluated against the Table 2-1 system design criteria. The City operates a robust and well-looped system, with sufficient storage tank sites and pump stations to provide multiple water supplies to each pressure zone. As a result, the core area of the City sees few pressure swings, and only the far ends of a pressure zone (near a zone boundary) may see marginal pressures at times. This isolated area would benefit from higher-pressure water during short peak hour events, supplied via PRV stations. These would also provide a means to promote water quality and circulation during low demand periods.

A summary of the existing system analysis follows:

- Under peak hour demands, pipe velocities (Figure 7-9) are well within established criteria, with most pipeline velocities being less than 2 fps and most transmission mains under 5 fps, indicating low-pressure losses.
- Figure 7-9 illustrates pressures at junction nodes from the hydraulic model under peak hour simulations. Pressure ranges are color coded throughout the system. As shown on Figure 7-9, most of the water system meets the 40-psi minimum pressures. Typical of many water systems, the few exceptions are areas with higher elevations in the zone and therefore lower initial static pressures. This typically occurs along the pressure zone boundary where the transition from a higher pressure to a lower pressure occurs, or near reservoir sites.
- A strong indicator of the strength of the water system is the pressure drop relative to static during peak hour conditions. It is desirable to not exceed a 20- to 25-psi drop. Based on the peak hour simulations, most of the City's water system pressure swings are generally 5 to 15 psi in the outer edges of the zones. Zone 4 and parts of Zone 5 exhibit the higher-pressure swings under peak hour but are well within criteria with all facilities in service.

Figure 7-9. Peak Hour Pipe Velocity

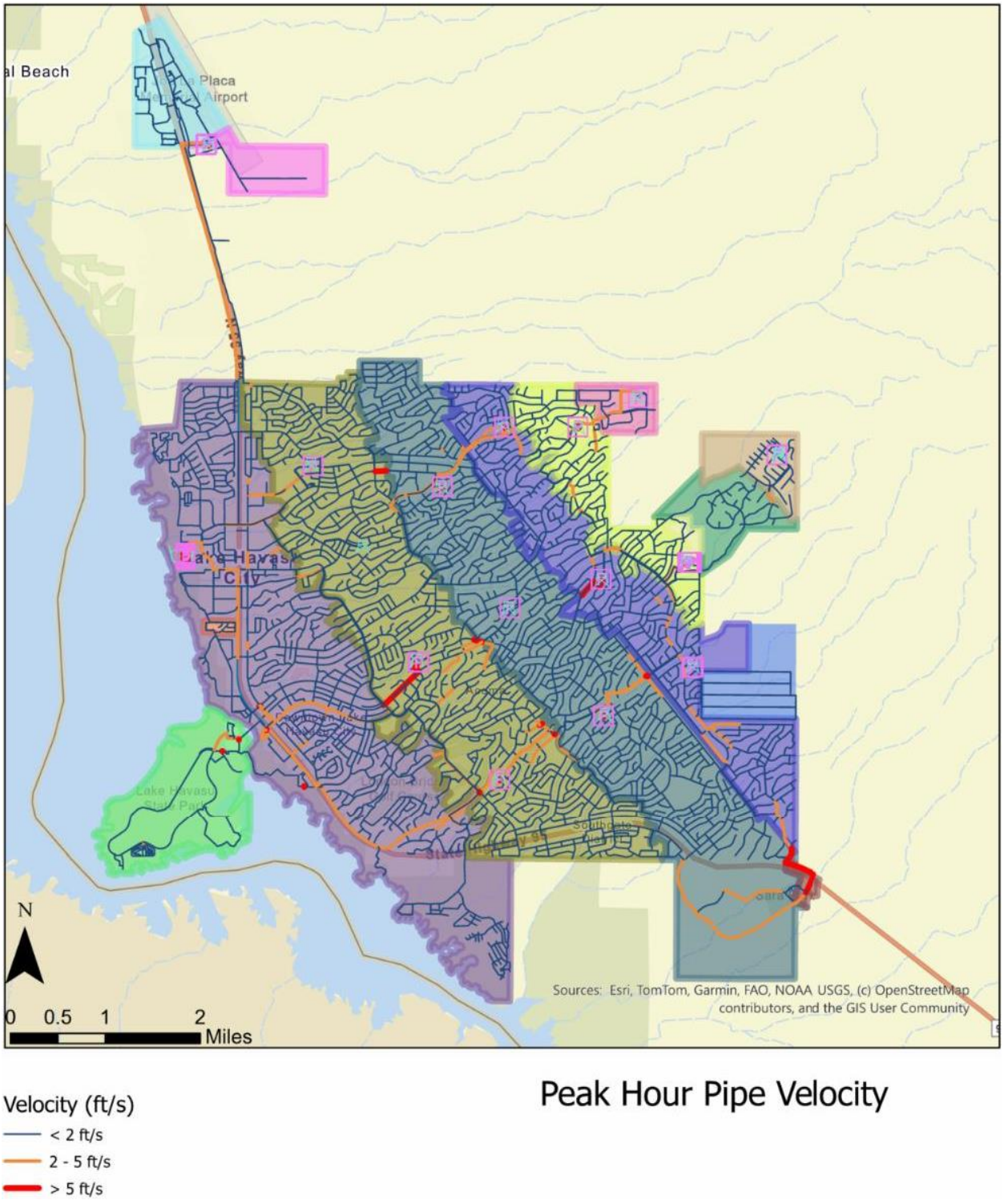
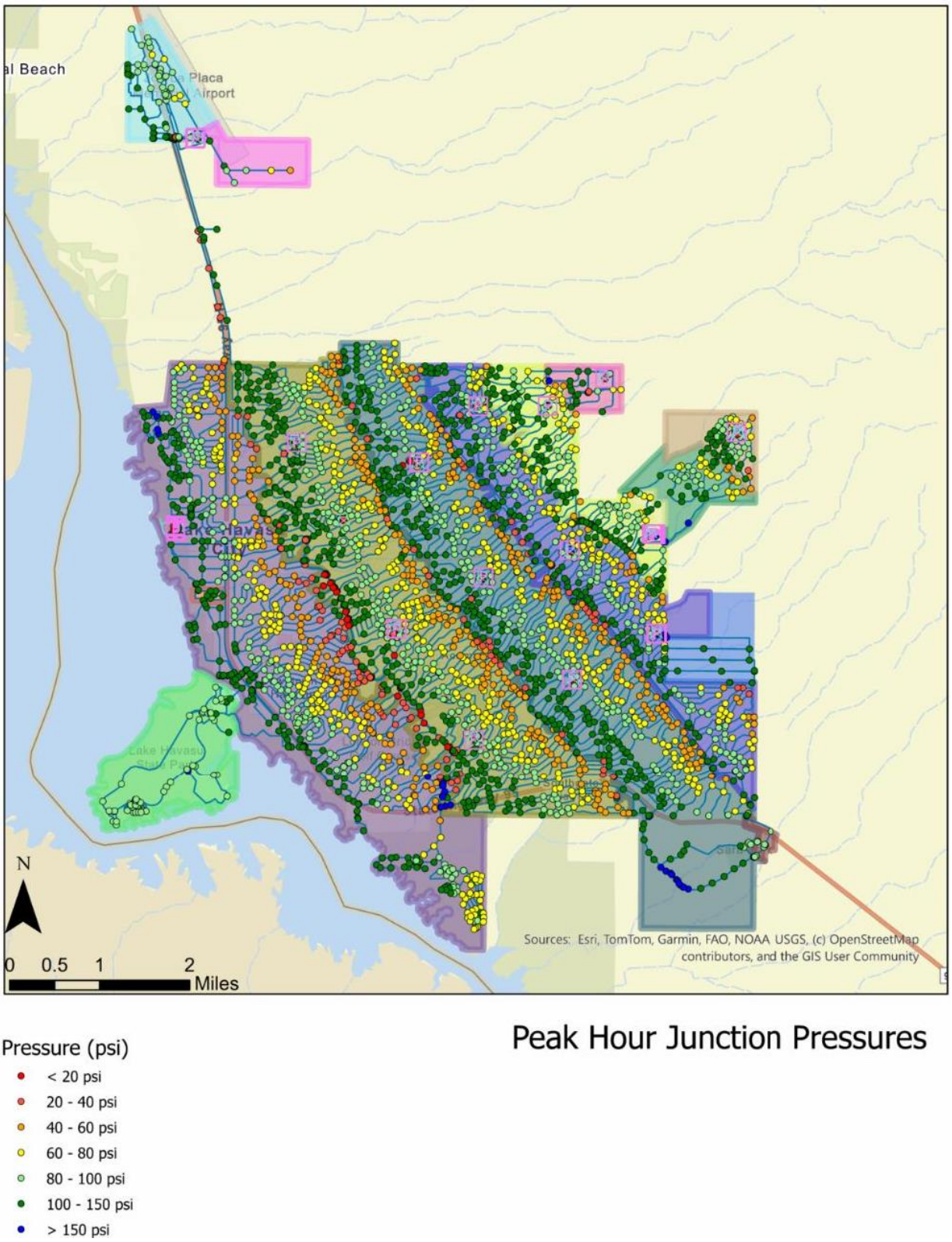


Figure 7-10. Peak Hour Junction Pressures



- It is recommended that the City consider several new PRV stations between zones to provide added reliability, potentially access available water storage, and assist in managing water quality. Typically, these PRV stations should include a main and bypass valve. The smaller bypass valve would be field-adjusted to provide minimum flows to promote water circulation. The main valve would be set to help only during a high demand downstream, such as a fire flow. This would also ensure the PRV station is not supplying large flows on a regular basis, which would increase system pumping costs. Chapter 8 includes the recommended CIP PRV station projects.
- The following areas would benefit from additional pipeline looping to increase water system reliability and avoid outages affecting large numbers of customers:
  - Havasu Riveria. This southwestern area is served by a single 12-inch pipeline from SR 95. Because of topography and land use constraints, a second feed was never constructed as planned. The City should consider a parallel redundant feed to improve reliability over the next 5 to 10 years as the area builds out.
  - Foothills Estates. The entire water system is supplied by a single 12-inch transmission main to the two storage tanks. Should the City lose the pipeline, the only source of water would be the storage in the tanks. It is recommended that a redundant pipeline run northwest through existing streets. Portions of the upper reaches may be constructed by developers who plan to extend the water system northward.
- Distribution system storage is recommended at Zone 1 and Zone 3 under existing conditions. Although not a high priority, the City should develop plans to increase storage in the lower zones. This could include constructing new storage in Zone 2 because Zone 2 has better siting options than Zone 1.
- Some areas of the City do not meet MDD plus 1,500 gpm fire flow because these areas were designed for lower fire flows at the time of construction (in many cases, about 500 to 1,000 gpm). The City has recognized this deficiency and continues to take steps to replace the smaller diameters, especially 4-inch dead-end lines with 8-inch lines, and is adding new fire hydrants. The City has also replaced the old "wharf hydrants," which had limited capacity.

Chapter 8 includes the recommended existing water system projects, which also include several small BPS upgrades, tank upgrades, and reliability projects. As discussed in Section 7.3, the City's major focus will be on the following:

- Rehabilitation or replacement of BPSs and reservoir facilities
- A shift to increasing asset management on the distribution system pipelines
- Establishment of a prioritized program over the next years to replace aging pipelines

The City has taken major steps with its annual rehabilitation program, which includes replacing a large portion of the small-diameter pipelines that have had a frequent break history.

7.6 2040 SYSTEM ANALYSIS

The City continues to experience residential and commercial growth in several core areas and many infill areas because of many available vacant parcels. Approximately 20 percent of the City's forecasted growth is infill development. The City's existing water distribution system can serve these parcels and developments with little need for additional infrastructure.

The existing 2016 General Plan and the 2026 General Plan Update will identify the core areas of major development. These areas primarily include the Island, Havasu Riveria to the south, and Foothills Estates to the east. For this planned development area, the City should continue to require developers to prepare MWPs for their projects to ensure conformance to this WMP and determine whether additional infrastructure (pump stations, tanks, and offsite pipelines) is needed by the developer to serve the project.

The City's core area of development over the next 5 to 10 years and demand allocation are presented in Chapter 6 and in Table 6-1. Developers required to construct major facilities such as BPSs and reservoirs should work closely with the City to ensure adequate sizing for future growth. Developers should also provide sufficient detail in construction drawings for the City's review and ensure that the facilities meet City standards for acceptance.

The timing of development in the far northern area of the City is unknown because most of the area is part of State Lands and subject to a State auction. It is assumed that most of this area will develop after the 2040 planning horizon. This WMP assumes limited growth in the area and around the commercial areas near the airport. Water usage is currently minimal in the far north, so there is sufficient hydraulic capacity to support increased growth. Once growth occurs northward and eastward up the foothills, developers will be required to extend the City's water system from Zone 2A. As the City's water system expands from Zone 2A, new water storage and BPS upsizing will be required to serve higher-pressure zones. It is envisioned that these higher zones may be interconnected with existing pressure zones to the south and provide added reliability to the North Havasu water system, which is supplied by a single Zone 1 transmission main.

7.6.1 FUTURE WATER SYSTEM AND PRESSURE ZONES

Expansion of the City's water system and establishment of new and reliable water systems will be driven primarily by new growth in the following core development areas:

- **Foothills Estates**: Since the 2019 WMP, a new Zone 7 water system was constructed to serve the higher development areas in Foothills Estates, which are not serviceable by the Zone 6 tanks. A new closed booster pump system serves these higher elevations. It is anticipated that this core development area will be expanded northward toward Zone 6A and will be served by an extension of Zone 6. Areas farther east could be served by Zone 7.
- **Island Development**: Over the past decade, the State has auction lands on the Island area accessed by the London Bridge, and increased higher-density residential development has occurred around the Island. Recently, the City received a development for a new resort on the abandoned Nautical Golf Course areas. Known as the Waterfront Resort, this project will expand the Island pressure

zone with a new parallel 12-inch transmission supply line along McCullough Boulevard. The City plans to add a third water supply on the northern end as part of the Second Bridge water improvements, which will include a new pipeline and PRV station.

- **Havasu Riviera**: This master planned single-family development along the southwestern lakefront will continue to develop over the next decade, in accordance with the 2016 General Plan. Because of the size of the development, it is critical that the City construct a second water supply source. The most efficient option is a new 12-inch feed connected to a new PRV station off Zone 2, near SR 95, extending into the core development area. Other options to evaluate include a Zone 1 connection directly north, approximately 3,000 feet, to the 27-inch transmission main near SR 95 and Jamaica Boulevard.
- **Bluewater and Campbell Areas**: These two undeveloped areas in the far southerly part of Zone 4, just east of Tank 3C sites and north of Window Rock Road, have been considered for residential development over the past few years. A few development proposals and conceptual water systems have been evaluated and reviewed with the City. To date, the projects are still under planning and should they move forward would require an updated water study. Because of the several mile distance from these two undeveloped areas and existing Zone 4 tanks, and the need to pump to a future Zone 5, a new Tank 4C may need to be evaluated. Because of the topography, a new isolated Zone 5 would be constructed as a small, closed pump system.

Section 7.6.2 highlights the major water distribution facilities needed to serve the City by 2040 based on an increase in average water demand of nearly 2.2 mgd and an MDD increase of 3.3 mgd (2,000 gpm). Capacity requirements for the water supply wells and WTP are presented in Chapters 4 and 5.

7.6.2 2040 STORAGE CAPACITY ANALYSIS

2040 water demands were estimated for each pressure zone based on the population and demand forecasts presented in Chapters 3 and 6. Table 7-3 includes the 2040 required water storage capacity by pressure zone. As the City's core areas continue to develop and as development expands to the north and east, additional storage will be needed to meet the City's storage criteria for operational, fire flow, and emergency needs.

It is estimated that by 2040, four City pressure zones will be deficit in storage if no other tanks are constructed, with Zone 1 having the largest deficit (Table 7-3). The City's current 5-year CIP includes several high-priority tank replacement projects, which will add a cumulative total of 1 MG of storage, as follows:

- Zone 2 (+0.25 MG)
- Zone 3 (+0.25 MG)
- Second North Havasu Tank to Zone 2A (+0.5 MG)

It is recommended that storage be added at Site 1A (0.5 MG) because the pumping system and transmission will be upgraded to support future growth. Because there are few sites in Zone 1, increased storage in Zone 2 could mitigate part of the Zone 1 deficit. To that end, a new 1.5-MG tank is recommended at Site 2C in the south, which will allow Zone 2 to meet storage deficiencies and support Zone 1 through a future Zone 2/1 PRV station. The core area of the City generally has sufficient water

storage. Moreover, Zone 1 has direct access to the clearwell storage at the WTP and could potentially use this storage in an emergency.

At 2040, Zone 3 is projected to have slightly more than 0.5 MG of storage deficiency. Part of this storage deficiency will be mitigated with the current CIP project, Tank 3C (C-3-20) replacement (0.25 MG to 0.50 MG). The remaining deficit in Zone 3 would be mitigated by a second Site 3C replacement project (0.50 MG to 0.75 MG).

Although Zone 4 does not have any storage deficits, the City may want to consider adding storage to the southern part of Zone 4 to provide reliability and increased pressures. This added storage could be constructed as part of the Bluewater project to support a Zone 5 closed pressure system. However, there is limited future development toward the City boundary, and the demand may not justify the tank project, which would likely be two 0.25-MG tanks, similar to Foothills Estates.

Zone 6 is the only other zone showing a 2040 storage deficit based on forecasted growth north of Foothills Estates. Should this area develop, and a second access is created north of Foothills Estates, Zone 6A tanks (assumed at 0.25 MG each) could provide the required fire flow and operational storage. The City has identified property for a future 6A site to the north within the State Lands area. If a future 6A site is developed, Zone 6A tanks could provide future storage if paid for and driven by development.

Table 7-3. Lake Havasu City Future Storage Analysis

Pressure Zone	Existing Zone ADD[a]		Maximum Day PF	MDD (ADD x PF)		Number of Tanks	Capacity by Tank (MG)	Operational (0.20 x MDD) (MG)	Fire Flow (MG)	Emergency (1.0 x ADD) (MG)	Total Required Storage (MG)	Available (MG)	Surplus/ Deficit (MG)
	(gpm)	(mgd)		(gpm)	(mgd)								
1	3,469	5.00	1.5	5,204	7.49	5	1	1.50	1.20[b]	5.00	7.69	5.25	-2.44
						1	0.25						
2	2,533	3.65	1.5	3,800	5.47	4	1	1.09	1.20[b]	3.65	5.94	5.75	-0.19
						1	1.5						
						1	0.25						
3	1,789	2.58	1.5	2,683	3.86	3	1	0.77	1.20[b]	2.58	4.55	4.00	-0.55
						1	0.5						
						2	0.25						
4	911	1.31	1.5	1366	1.97	3	1	0.39	0.54[c]	1.31	2.25	3.25	1.00
						1	0.25						
5	479	0.69	1.5	718	1.03	1	0.75	0.21	0.18[d]	0.69	1.08	1.25	0.17
						1	0.5						
6a	63	0.09	1.5	94	0.14	-	-	0.03	0.18[d]	0.09	--	0.0[e]	--
6	265	0.382	1.5	398	0.57	2	0.33	0.18	0.18[d]	0.59	0.95	0.67	-0.28
7	144	0.208	1.5	217	0.31	-	-	0.06	--	0.21	--	0.0[f]	--
H6	49	0.07	1.5	73	0.11	-	-	0.02	--	0.07	--	0.0[g]	--
						-	-						

Table 7-3. Lake Havasu City Future Storage Analysis

Pressure Zone	Existing Zone ADD[a]		Maximum Day PF	MDD (ADD x PF)		Number of Tanks	Capacity by Tank (MG)	Operational (0.20 x MDD) (MG)	Fire Flow (MG)	Emergency (1.0 x ADD) (MG)	Total Required Storage (MG)	Available (MG)	Surplus/ Deficit (MG)
	(gpm)	(mgd)		(gpm)	(mgd)								

[a] ADD is based on 2024 adjusted billing data.

[b] Assumed 5,000 gpm fire flow x 4 hours = 1.20 MG.

[c] Assumed 3,000 gpm fire flow x 3 hours = 0.54 MG.

[d] Assumed 1,500 gpm fire flow x 2 hours = 0.18 MG.

[e] Zone 6A is a closed pressure zone with no existing storage.

[f] Zone 7 is a closed pressure zone with no existing storage.

[g] Horizon 6 Zone is served by the County. Storage is included in Zone 4.

Notes:

Tank 1C (1 MG) is out of service. CIP has replacement within next 5 years.

-- = not applicable

7.6.3 2040 PUMP STATION CAPACITY ANALYSIS

The 2040 water demands were incorporated into a pump capacity analysis to evaluate the need to expand existing pump stations. Each zone's pump station capacity must be able to supply MDD to the zone, plus MDD to the zones it pumps up to, for sufficient supply. Smaller, closed pressure zones must be able to supply demands in accordance with the design criteria. Table 7-4 presents the 2040 pumping capacity analysis by pressure zone. Based on the assumptions and demand forecast, the City shows no pumping capacity deficiencies through 2040. This further illustrates the flexibility of the water system with multiple pump stations serving a single zone.

The highest pumped zones must be sized for MDD plus fire flow because they are not served by a tank. In the future, if Tank 6A is constructed, then Pump Station 5A would only have to supply MDD and would have an increase in pumping capacity to a new open system. This recently occurred at Pump Station 6 (Foothills Estates), which benefited from two new Zone 6 tanks and increased the station pumping capacity to meet Zone 6 and 7 demands.

The City does not operate a BPS at Tank 3C into Zone 4. As part of the water system to serve Bluewater and Campbell, a new BPS 3C, Tank 4C, and BPS 5 should be evaluated by the developers and reviewed with the City once firm land development proposals are known.

The 2040 water system analyses recommend transmission main capacity improvements from Tank 1A up to Tank 5A, although one section is not needed. As part of these improvements, it is recommended that the City consider a new pump station at Site 1A to convey supply from Tank 1A storage. Although not a high-priority project, a new pump station at Site 1A would further strengthen the system and turnover at Site 1A. The existing pump station is gas-powered; therefore, a new three-phase power supply would be needed, adding to the construction costs.

The City has continued with its BPS rehabilitation program, completing 5 major station upgrades in the past 10 years. The City's current 5-year CIP includes an upgrade to Pump Station 2A.

Table 7-4. Lake Havasu City Future Pumping Capacity Analysis

Primary Zone Served	Available Zone Pump Capacity (gpm)	Pump Station	Number of Pumps	System	Rated Capacity Design		Firm Capacity		All Zones Served	Zone ADD (mgd)	Zone ADD (gpm)	MDD[a]	Surplus/ Deficit (calculated)
1	35,000	North Bank WTP High Service Pump Station	6	North	3,500	5.0	17,500	25.2	1 1.1 1.2 1A 2 2A 3 4 5 6 6.1 6A 7 H6	14.0	9,701	14,552	20,448
		South Bank WTP High Service Pump Station	6	South	3,500	5.0	17,500	25.2					
2	19,100	Station 1A	1	North	1,000	1.4	1,000	1.4	2 3 4 5 6 6.1 6A 7 H6	9.0	6,225	9,337	9,763
		Station 1B	4	North	3,300	4.8	9,900	14.3					
		Station 1	4	Central	1,400	2.0	4,200	6.0					
		Station 1C	2	South	2,750	4.0	4,000	5.8					
			1		1,250	1.8							
2A	7,170	North Havasu Pump Station	1	North	170	0.2	7,170	10.3	1A 2A	1.5	1,037	6,556[b]	614
			2		1,500	2.2							
			3		2,000	2.9							
3	7,785	Station 2A	2	North	1,435	2.1	2,485	3.6	3 4 5 6 6.1 6A 7 H6	5.3	3,699	5,548	2,237
			1		1,050	1.5							
		Station 2	3	Central	1,400	2.0	2,800	2.1					
		Station 2C	2	South	1,750	2.5	2,450	3.5					
			1		700	1.0							

Table 7-4. Lake Havasu City Future Pumping Capacity Analysis

Primary Zone Served	Available Zone Pump Capacity (gpm)	Pump Station	Number of Pumps	System	Rated Capacity Design		Firm Capacity		All Zones Served	Zone ADD (mgd)	Zone ADD (gpm)	MDD[a]	Surplus/ Deficit (calculated)
4	5,600	Station 3A	3	North	1,300	1.9	2,600	3.7	4 5 6 6.1 6A 7	2.7	1,862	2,793	2,807
		Station 3	4	Central	1,000	1.4	3,000	4.3					
	1,150	Station 4A	2	North	650	0.9	1,150	1.7	5 6 6.1 6A 7	1.4	951	1,426	-276
			1		500	0.7							
Horizon Six[c]	300	Station 3C	4	South	100	0.1	300	0.4	H6	0.1	49	78[e]	--
6 (Foothills Estates)	920	Station 4 (Foothills Estates)[d]	5	Central	230	0.3	920	1.3	6 6.1 7	0.7	472	708	212
6.1	--	Served by PRVs from Zone 6		Central	--	--	--	--	6.1	0.27	189	283	--
6a	1,320	Station 5A[e]	4	North	440	0.6	1,320	0.6	6A	0.1	62	1,094[f]	226
7	2,465	Station 6 (Foothills)[g]	2	South	240	0.3	2465	3.55	7	0.2	144	1,7177[g]	748
			1		485	0.7							
			2		1500	2.2							

[a] MDD in mgd = 1.5 x ADD.

[b] North Havasu BPS assumed sized for MDD + 5,000 gpm fire flow.

[c] Served by Mohave County. Pump station was replaced with four 100-gpm pumps. No fire pumps included.

[d] Pump Station 4 (Foothills Estates) is an interim closed zone; future open system when Zone 6 tanks are built.

[e] Peaking factor based on 1.6 x average.

[f] Pump Station 5A is assumed sized for MDD + 1,000 gpm fire flow.

[g] North Havasu BPS assumed sized for MDD + 1,500 gpm fire flow.

7.6.4 2040 RELIABILITY PROJECTS

As part of this 2025 WMP, the following areas were identified as single points of failure that could affect water service to many customers and need redundant facilities:

- Havasu Riveria: Large number of planned residential units served by single water main.
- Foothills Estates: A cross-country single 12-inch transmission main failure would affect service to many customers.
- Pressure zone boundary areas of marginal static pressures: Pipeline outages serving these areas would further affect service pressures.
- Water transmission mains near the WTP site: The northern and southern transmission mains are collocated in the same street before branching out and have had a history of breaks.
- Island development: Water service is provided by two PRV stations and transmission mains. As the areas grow and require higher flows, additional reliability is warranted.

Table 7-5 includes the recommended reliability mitigation measures, which primarily include redundant water mains. The pressure boundary edge conditions could be mitigated during a pipeline break with strategically located PRV stations between pressure zones, to supplement the zone in an outage. These PRV stations can be adjusted for small flow circulation, thus enhancing water quality and supporting peak hour pressure drops, if needed.

7.6.5 2040 DISTRIBUTION SYSTEM ANALYSIS

Chapter 6 describes the 2040 water system model and demand allocations for 2040 simulations. Figure 7-11 and Figure 7-12 illustrate peak hour demand pipeline velocities and residual pressures at model nodes, respectively. The following pipeline upgrades to the existing water system are recommended in Table 7-5 to meet 2040 capacity needs. Table 7-5 also includes the reliability projects noted in the list under Section 7.6.4. Chapter 8 presents the proposed CIP and estimate of probable costs.

Figure 7-11. 2040 Peak Hour Pipe Velocity

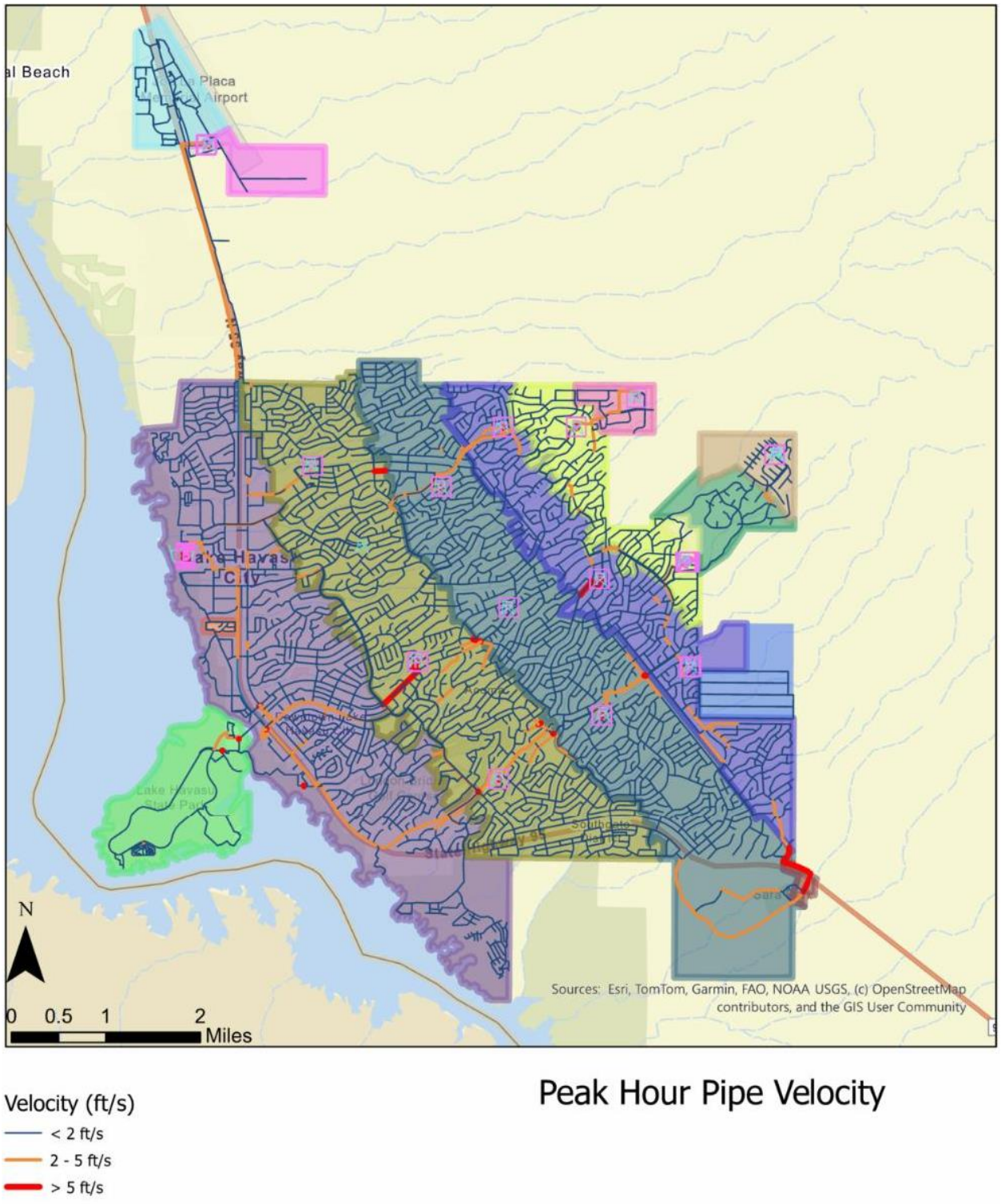


Figure 7-12. 2040 Peak Hour Junction Pressures

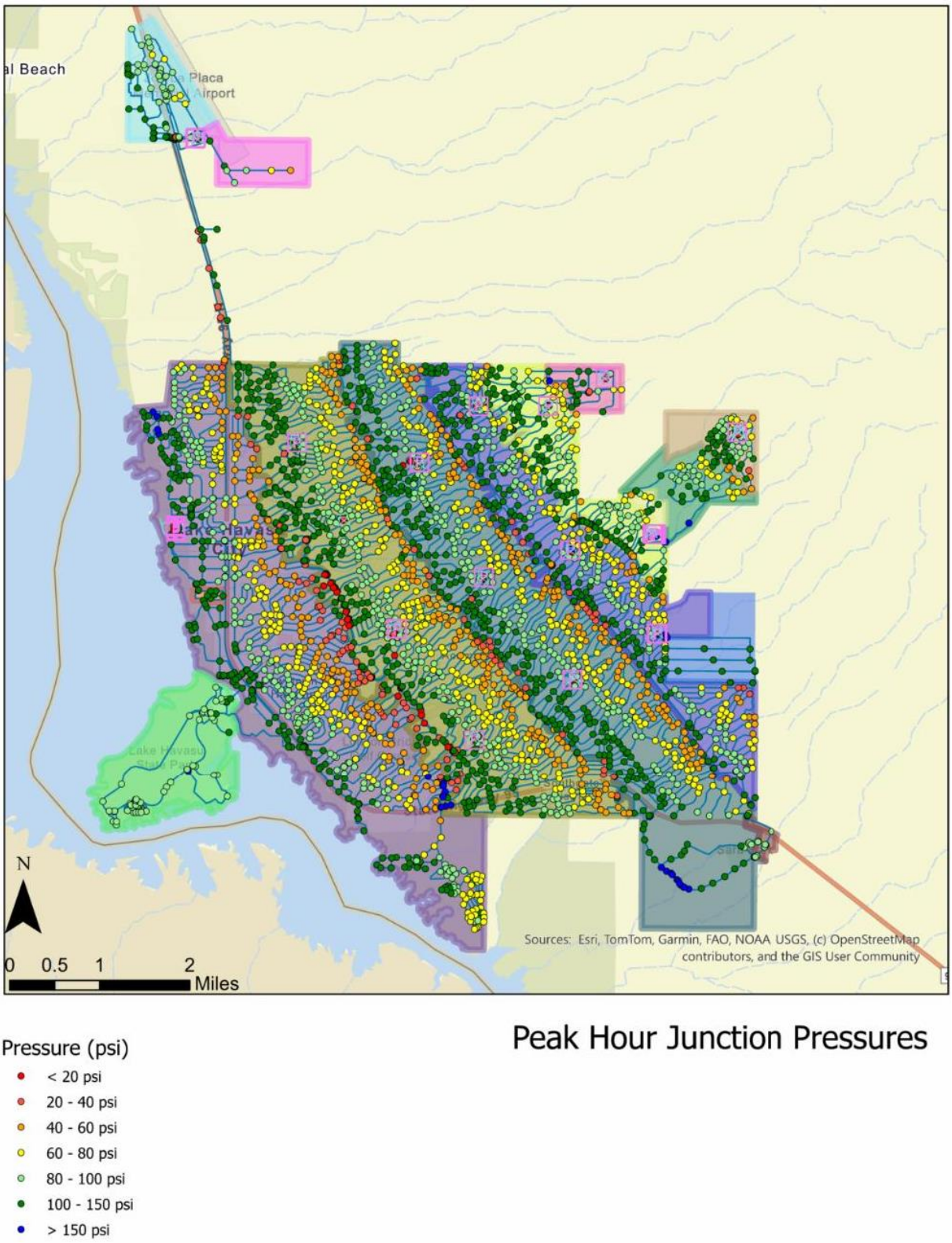


Table 7-5. Pipeline CIP Projects

No.	CIP Need/Type	Description	Justification
1.	Reliability	New 12-inch redundant water main to serve Havasu Riviera	As occupancies increase, there will be a large number of customers and fire hydrants off a single pipeline.
2.	Reliability	Parallel 12-inch transmission main from Pump Station 4 to Zone 6 tanks	Redundant supply to Zone 6 tanks, should existing pipeline be out of service that serves all of Foothills Estates.
3.	Reliability	Three PRV stations, each located between Zones 4 and 3, Zones 3 and 2, and Zones 2 and 1 in the central to southern areas of City	Provide redundant water supply should there be a power outage along the marginal service pressures along the zone boundary.
4.	Capacity	New transmission main in Palo Verde Boulevard, south from BPS 3A, 18-inch (6,000 feet) to Tank 4A	Increase Tanks 4A and 5A fill capacity to meet demand.
5.	Capacity	New transmission main,18-inch (6,000 feet) from new BPS 1A to Tank 2A	Increase supply capacity from Tank 1A into upper zones.
6.	Capacity	New transmission main from BPS 4A to Tank 5A, 20-inch (5,000 feet)	Increase Tank 5A fill capacity to meet demand.
7.	Reliability/Capacity	A third PRV station and pipeline to serve the growing Island area	Coordinated with Second Bridge Project to construct redundant pipeline and PRV station from Zone 1.

7.7 DISTRIBUTION SYSTEM RISK ANALYSIS

Jacobs performed an analysis to quantify the relative risk each water main has in the City's water distribution system. The primary goal of the risk analysis was to create a uniform and more defensible approach for making repair and replacement decisions. However, the risk analysis process can be used to accomplish the following:

- Prioritize assets.
- Provide insights on where to collect and verify data.
- Guide decision-making when there is either a lack of requisite asset information or when there is sufficient information.
- Inform condition assessment field crews on prioritized areas for fieldwork.
- Identify capital projects for both short- and long-term CIPs.

Jacobs used infrastructure asset attribute data from the City's Lucity asset management system and GIS data, such as roads, land use, and locations of critical customers. Risk scores were calculated for City-owned pipelines in the City's asset management system. The risk scores were then grouped into risk categories to identify assets that pose the greatest risk of failure. By understanding what is driving the risk, the City can determine the appropriate risk mitigation option, which may be asset repair, replacement, condition assessment, or more frequent maintenance.

7.7.1 RISK MATRIX DEVELOPMENT

In everyday use, "risk" is the expectation of a negative impact generated by some action or inaction. Commonly, risk is used synonymously with the likelihood (or probability) of a negative impact occurring. Sometimes, risk is used to describe the severity of the consequence of a potential failure. However, it is the combination of both factors—likelihood and consequence—that contributes to risk.

Mathematically, risk from an incident can be expressed as a function of the consequence of the incidence or occurrence and the likelihood of the incidence. Thus, risk can be quantified through the following equation:

$$Risk = Consequence\ of\ Failure \times Likelihood\ of\ Failure$$

The risk posed by the failure of an infrastructure asset is not only the result of the asset's physical failure but is also the result of an asset's inability to perform its function or purpose, such as providing sufficient capacity. Additionally, risk can be attributed to indirect consequences of an asset's physical failure or its failure to perform, such as payment of damage claims, litigation costs, and higher insurance premiums. Therefore, when quantifying risk through an evaluation of its inputs (i.e., consequence and likelihood), it is important to consider the consequences from the broader idea of an asset's being unable to meet expected level of service goals rather than just a physical or functional failure. Likewise, the second input to the risk equation, "likelihood," should be based on an asset's overall inability to meet expected level of service goals rather than just the likelihood of a physical or functional failure.

Consequence of failure (COF) is defined as the impact on service that is a result of an asset failure. For example, the consequence of a water main failure could result in loss of service for residents or critical customers. Likelihood of failure (LOF), on the other hand, is the potential for an asset to fail. For example, an old cast-iron water main may be more likely to fail than a new ductile iron water main.

In the risk framework, consequence and likelihood scores are assessed based on several criteria or categories. Weighting is applied to each of the COF and LOF categories such that relative importance of each criterion is captured; weighting for each category was assessed based on input from the City. Therefore, the consequence and likelihood scores used in the risk equation are the sum of the individual criterion's weights and scores.

$$COF\ or\ LOF = \sum Category\ Weight \times Category\ Score$$

An asset that would have a low consequence associated with its failure but a high LOF could have a lower overall risk compared with an asset that has low LOF but high COF. In some cases, paying more attention to an asset or a group of assets in good condition could be of greater importance because failure might result in highly undesirable consequences, such as loss of water service to many customers.

Jacobs took the following steps to assess the relative risk of the City's water mains:

- Identify available sources of data, which include:
  - Lucity asset management system, including main breaks and pipeline data
  - GIS data available from the City or County

- Develop COF and LOF scoring matrixes.
- Prepare the data for asset scoring using Innovyze's InfoAsset Planner.
- Calculate the risk scores.
- Analyze risk scores and results.

The COF matrix is shown in Table 7-6. The consequences of the failure are expressed in terms of criteria applicable to the City.

A numerical score, ranging from 1 to 10, was assigned to each criterion. For all criteria, a score of 1 (negligible) was given to the target result. The COF matrix summarizes each criterion weight and score range, as follows:

- Fiscal, Health and Safety, and Public Confidence: Includes both the diameter of each pipe and the location of each pipe as intersecting residential versus nonresidential land uses. Large-diameter pipes in nonresidential areas have higher scores than small-diameter pipes in residential areas.
- Proximity to Transportation: Pipes in major transportation corridors such as SR 95 would receive higher scores than pipes in neighborhoods.
- Parcel Infringement: Pipes in an easement adjacent to private property would receive the maximum score, whereas pipes in rights-of-way would receive the minimum score.
- Loss of Service to Critical Facilities: Pipes close to several critical customers receive higher scores than pipes that are not near critical customers.

Table 7-6. Consequence of Failure Scoring Matrix

COF Criteria	Weight (%)	Score=1	Score=3	Score=5	Score=7	Score=10
Fiscal, Health and Safety, and Public Confidence	25	<=8-inch in residential	<10-inch in nonresidential or >=10-inch and <=24-inch in residential	>=10-inch and <=16-inch in nonresidential or >=30-inch in residential	>=18-inch and <=24-inch in nonresidential	>=30-inch in nonresidential
Proximity to Transportation	25	Residential/ alley	n/a	0.5 mile	1 mile	State route/ frontage
Parcel Infringement	30	No infringement	n/a	n/a	n/a	Infringement
Loss of Service to Critical Facilities	20	No critical customers affected	n/a	One critical customer within 250 feet	Two critical customers within 250 feet	Three critical customers within 250 feet

The roadway risk classifications, parcels marked as infringing on a pipeline, and locations of critical customers are shown on Figure 7-13.

Figure 7-13. Consequence of Failure Criteria Map

The LOF matrix is shown in Table 7-7. LOF scores also range from 1 to 10, similar to COF scores. Table 7-7 includes three criteria along with each criterion's weight and score range, as follows:

- Break History: Pipes that have multiple breaks as recorded in Lucity receive higher scores than pipes that have not failed.
- Age: Pipes that are older receive higher scores than newer pipes.
- Material: The material of each pipe affects the score.

Table 7-7. Likelihood of Failure Scoring Matrix

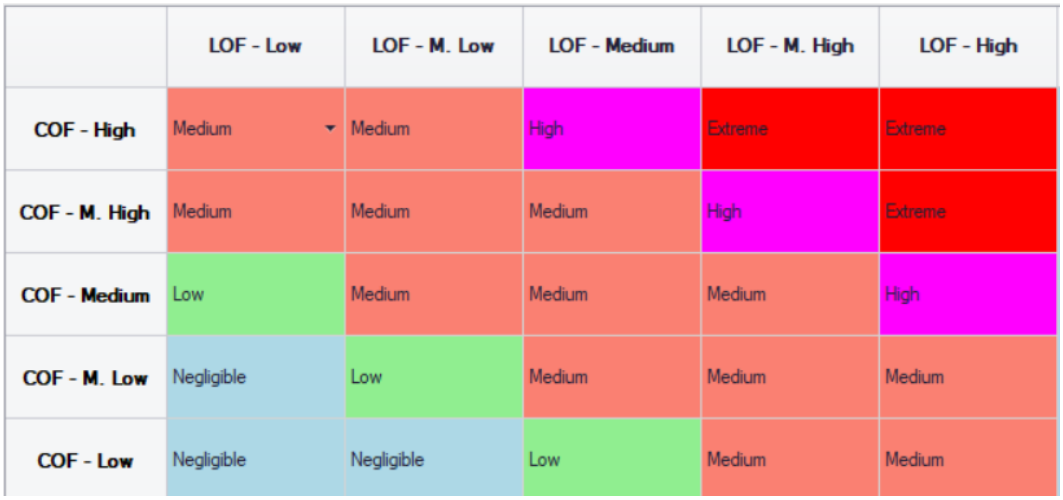
LOF Category	Weight (%)	Score=1	Score=3	Score=5	Score=7	Score=10
Break History (count of breaks per pipe segment)	35	Null (no breaks)	1	2 or 3	4 or 5	6 or more
Age (years)	35	Less than or equal to 10	> 10 and less than or equal to 20	> 20 and less than or equal to 30 or Blank	> 30 and less than or equal to 40	> 40
Material	30	Ductile iron pipe or High-density polyethylene or Copper	C-900 or concrete cylinder pipe or PCCP	Asbestos-cement pipe or PVC or Polyethylene	Blank or unknown	Acrylonitrile butadiene styrene or Corrugated metal pipe or Galvanized

7.7.2 RISK ASSESSMENT

The risk associated with each pipe segment was quantified by multiplying the weighted consequence and likelihood scores to arrive at a risk score of 1 to 100 (where 1 is the lowest risk and 100 is the highest risk) for each pipe segment. Applying the risk equation to each facility type under consideration allowed for a comparison of pipes by their relative risks. By listing pipe segments according to their risk value, it becomes clear which assets pose the highest risk, which pose the next highest risk, and so on.

The scores were then normalized by Innovyze's InfoAsset Planner software using a 100-point scale. The results were analyzed and grouped into five priority categories within the software: negligible, low, medium, high, and extreme, as shown on Figure 7-14. Pipelines with both a high COF and high LOF are considered extreme risks, whereas pipelines with both a low COF and low LOF are considered negligible risks.

Figure 7-14. Pipeline Risk Categories



	LOF - Low	LOF - M. Low	LOF - Medium	LOF - M. High	LOF - High
COF - High	Medium	Medium	High	Extreme	Extreme
COF - M. High	Medium	Medium	Medium	High	Extreme
COF - Medium	Low	Medium	Medium	Medium	High
COF - M. Low	Negligible	Low	Medium	Medium	Medium
COF - Low	Negligible	Negligible	Low	Medium	Medium

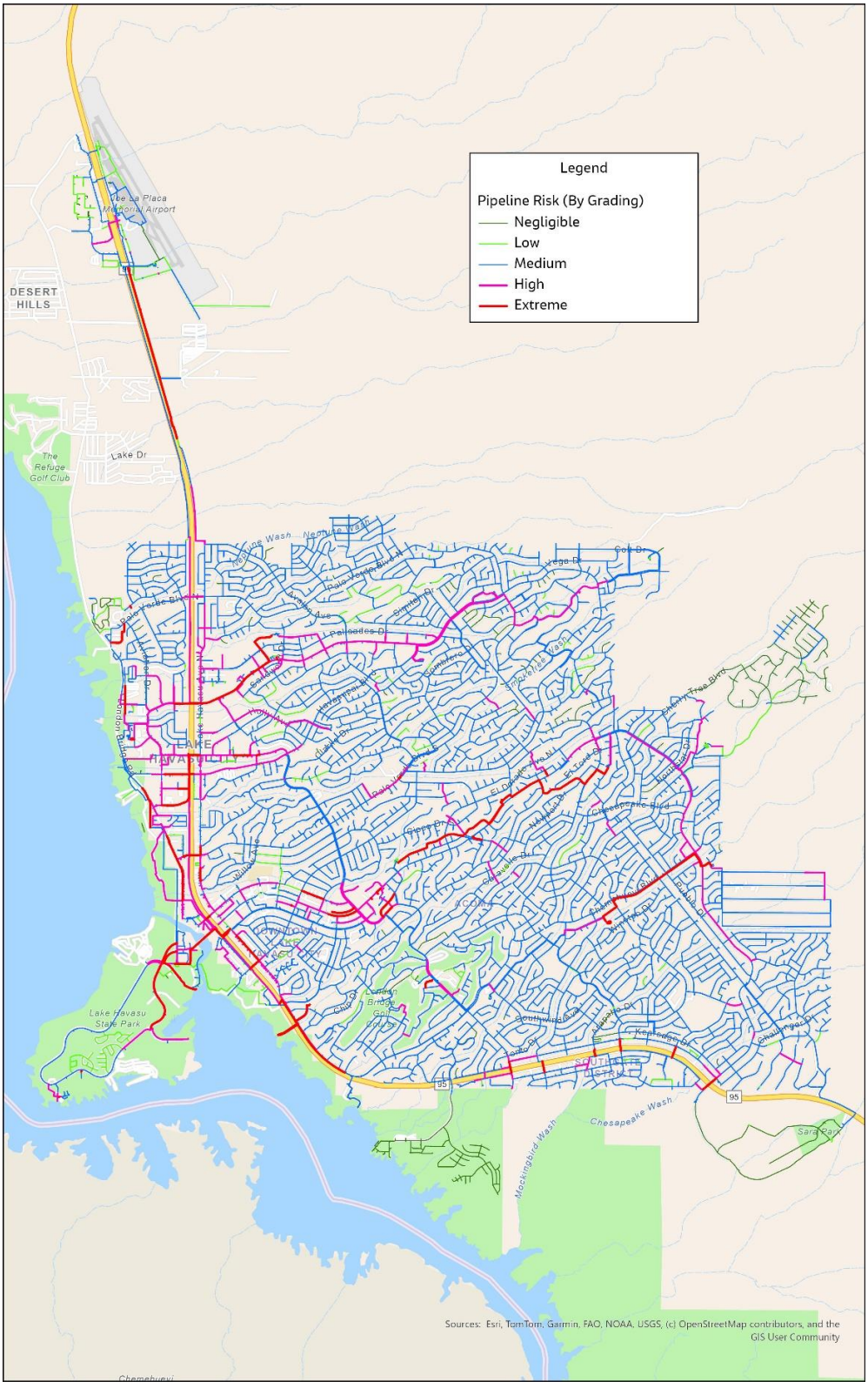
The risk category boundaries were determined using the InfoAsset Planner software. The goal was to distribute the top 10 percent of assets into the high and extreme risk categories. The remaining 90 percent was divided among the remaining risk categories. Separating assets into priority categories makes identification and implementation of risk reduction measures more manageable for the City. Table 7-8 shows the City-wide summary of the risk analysis by miles of pipe within each risk category.

Table 7-8. City-wide Pipeline Risk Summary

Risk	Length (miles)	% of Total Length
Negligible	30.5	6.0
Low	27.0	5.3
Medium	393.0	77.0
High	44.9	8.8
Extreme	15.1	2.9

The spatial results of the risk scoring exercise are shown on Figure 7-15.

Figure 7-15. City-wide Pipeline Risk Results



Jacobs also delineated the risk results by distribution mains versus transmission mains. The City considers pipelines 12 inches and less as distribution mains; pipelines that are 16 inches or greater are transmission mains. Table 7-9 shows the pipeline risk summary differentiated by distribution versus transmission mains.

Table 7-9. Distribution versus Transmission Pipeline Risk Summary

Risk	Distribution Length (Miles)[a]	Transmission Length (miles)[b]
Negligible	31.2	0.1
Low	26.8	1.2
Medium	388.7	7.2
High	38.3	7.9
Extreme	7.7	7.7

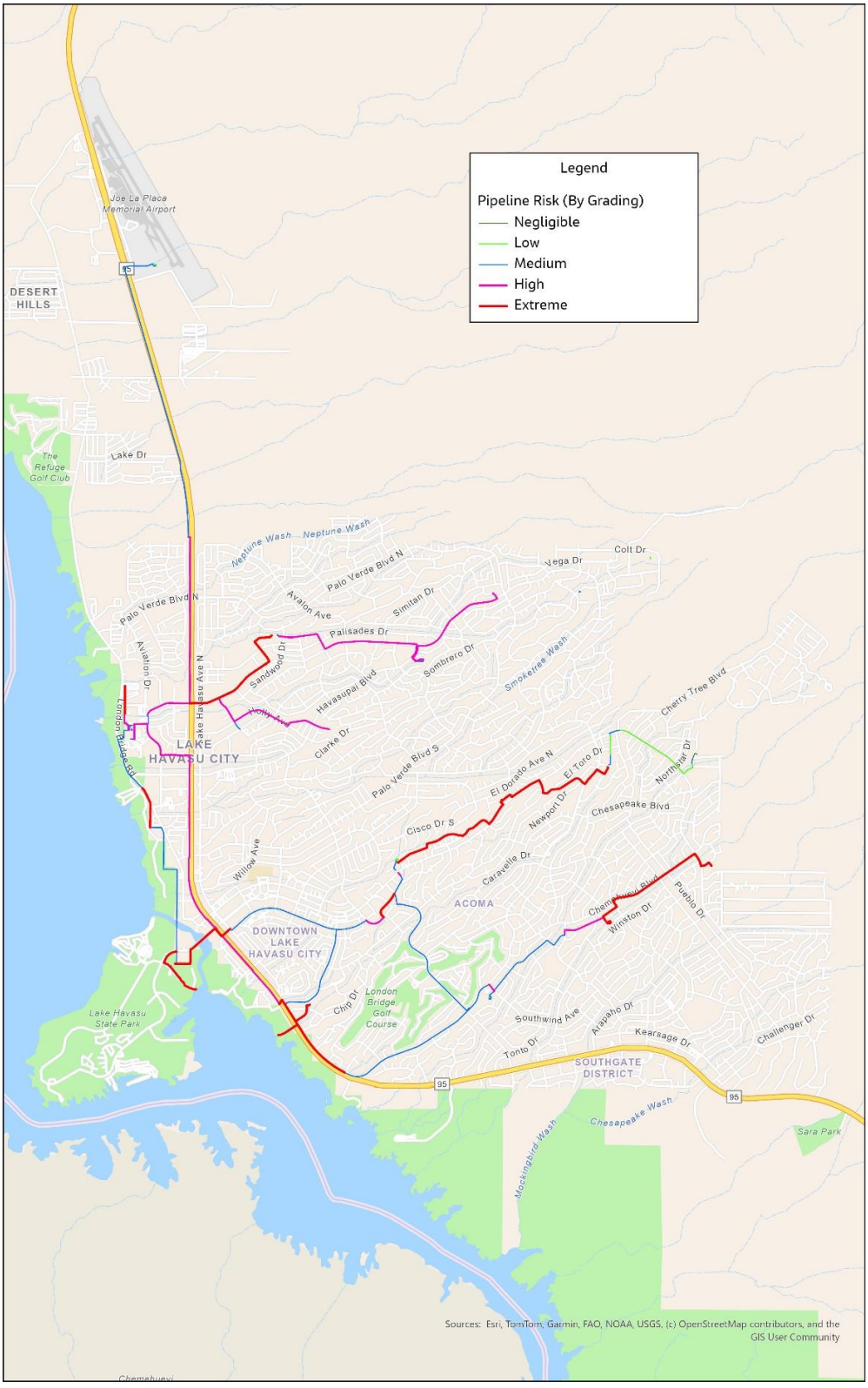
[a] Includes blank diameters and those labeled as 99

[b] Includes 14-inch pipelines

A map of the risk assessment for distribution mains is shown on Figure 7-16, and a map of the risk assessment for transmission mains is shown on Figure 7-17. Appendix C provides summary tables of the extreme and high-risk pipelines differentiated by distribution mains versus transmission mains. These extreme and high-risk pipelines should be included in near-term main replacement and rehabilitation programs in the CIP.

Figure 7-16. Distribution Main Risk Assessment

Figure 7-17. Transmission Main Risk Assessment



8. Recommended Capital Improvement Plan

This chapter presents a recommended CIP for the City through the planning year 2040. The CIP will help the City to meet its water supply, treatment, and distribution infrastructure goals. The projects are primarily based on the findings and analyses from this2025 WMP but includes project recommendations from the 2019 WMP (Jacobs 2019) and the *Water Facility Inventory and Prioritization Report* (Atkins 2016).

A comprehensive 10-year CIP (2026 to 2036) is presented by fiscal year, with the first 5 years, incorporating the City's current CIP, plus new projects from this 2025 WMP. Longer-term projects to meet future water system requirements and 2040 demand conditions are lumped into a single period (2036 to 2041). Many of these projects will need to be reviewed and evaluated to confirm final sizing and timing.

8.1 OVERVIEW

The CIP associated with this 2025 WMP builds upon the water supply reliability focus from the 2019 WMP and further recommends investments in upgrading facility components of the City's 20-year-old WTP, to continue to provide a high level of water service to its customers. The CIP includes the water tank rehabilitation and replacement program, and plans to increase storage commensurate with continued growth. The City's water pump stations have surplus capacity and should continue to provide robust supply flexibility throughout the distribution system. The City would also benefit from a few interconnections (via PRV stations) between higher- and lower-pressure zones to increase reliability and system flexibility.

In addition to hydraulic and capacity analyses, the 2025 WMP presents an examination of the risk of the City's water pipeline system (discussed in Section 7.7). The City currently replaces approximately 2 to 3 miles per year of aging pipelines, mostly small-diameter mains (12-inch and smaller). This risk assessment will help the City prioritize its pipeline replacement investment of approximately 2 to 3 miles per year. Moreover, the risk assessment does include larger-diameter mains and difficult- to-access pipelines, outside of the public right-of-way. It will be important for the City to anticipate a likely higher cost per linear foot each year.

The following are recommended improvement projects:

- Water Resources: Water supply (new supply and replacement wells) and WTP upgrades
- Reservoirs (Tanks) and BPSs: Includes replacement and rehabilitation projects, as well as new projects
- Water Distribution System: Pipeline replacement, reliability and capacity projects, and PRV stations

8.2 COST METHODOLOGY AND ASSUMPTIONS

Unit construction costs were developed using AACE International guidelines for a Class V estimate and information from recent construction projects within the City and from regional areas that have undergone similar types of construction. Costs are presented in 2025 dollars. The CIP project costs include both a construction estimate and a total CIP project budget, with soft costs to reflect the full capitalization, including the following:

- Planning and engineering design (15 percent)
- Environmental, legal, construction management, contract administration (15 percent)
- Contingency (25 percent)

These estimates are based on representative available data at the time of this report; however, given that project-specific conditions are not for every project, and because costs of materials and labor fluctuate over time, new estimates should be obtained at or near the time of construction of proposed facilities or execution of proposed programs. The estimated basis for unit construction costs, not including soft costs, for various CIP projects are the following:

- Wells (includes vertical well, pump, motor, electrical, SCADA, and telemetry) were based on recent construction work for Wells 22 and 23 in the North Wellfield.
- Pipelines (approximately $15 per diameter per inch) were based on the City's replacement program in existing streets.
- New reservoirs ($2.5 to $3 per gallon) were based on a recent steel tank project in the City.
- Pump stations were also based on past City projects and it was assumed they would be outdoor facilities.

8.3 CAPITAL IMPROVEMENT PLAN (2025 to 2040)

The CIP includes improving the water delivery system, increasing system reliability and flexibility, and meeting future population growth. The CIP projects are categorized by capacity, reliability, or rehabilitation improvements. The recommended CIP should provide the City's customers with a water system that meets the design criteria and can be operated efficiently and reliably. Should water demands forecasted during the planning period (through 2040) not be realized, there may be opportunities to defer or eliminate some projects. The proposed 2025 WMP improvements are listed in Table 8-1.

The 10-year CIP gives high priority to increasing water system reliability through major investment increases in upgrades to the City's 20-year-old WTP and the annual pipeline replacement program. The WTP improvements identified in Chapter 5 are planned for 2026-2036 to correspond with the 20-year scheduled maintenance work. Given its age, the WTP continues to perform well with the City's ongoing maintenance. A second WTP to further increase supply reliability is recommended for site planning over the next 10 years. Annual pipeline replacement costs have been included to continue the City's ongoing program of smaller-diameter pipelines (less than 12 inches) but also incorporate the results from the risk assessment (Section 7.7). It is recommended that this annual program continue over the next 15 years.

The City's other priority projects over the next 5 years include increasing water storage and rehabilitating existing tanks. These tanks serve as critical facilities in a water distribution system with multiple pressure zones. In addition, several areas of the water system need greater reliability and flexibility, which can be achieved with the construction of PRV stations.

The 10-year CIP will require an annual expenditure between $10 and $15 million per year. It reflects the continued major investment in water infrastructure as the system ages. The increase in expenditures is also a attributed to a major upgrade and replacement program at the WTP. The City should review current water revenues and determine the adequacy of existing water rates to fund a larger proposed capital program.

Table 8-1 presents water resources projects. Table 8-2 presents water treatment projects. Table 8-3 presents water storage and pumping projects. Table 8-4 presents water distribution projects.

8.4 NEW DEVELOPMENT PROJECTS (NON-WATER CIPS)

Since the 2019 WMP, the City has seen an expansion of the water system associated with large development projects. As the City continues to grow, developers of major development projects should be required to design and construct their water systems consistent with the design criteria and goals outlined in the 2025 WMP. Table 6-1 and Section 7.6 discuss several of these large development projects and notes that these projects may be required to fund water infrastructure, such as tanks and pump stations, in addition to local distribution systems. These new water facilities would be required to be fully integrated into the City system. In some cases, the City may realize capacity and reliability benefits to the existing water system, and those projects could allow for cost sharing between a developer and the City.

Table 8-1. Water Resources Projects

Description	Location / Description	Total CIP Cost	Fiscal Year
North Well Cost Summary			
North Wellfield Well Performance Testing	Engineered pump tests of up to 8 wells	$80,600	26/27
Test boring program north of North Wellfield	Drill 3 borings to identify potential new well locations	$500,650	27/28
Well Design/Wellhead/Construction (Well 24)	Replacement for wells 14/15	$3,875,000	29/30
Well Design/Wellhead/Construction (Well 25)	Replacement for wells 10/11/12	$3,875,000	33/34
Collection Pipeline	North Wellfield in LBR (3500 feet, 18 inches/24 inches)	$1,627,500	30/31
Subtotal		**$9,958,750**	
Central Wellfield Cost Summary			
Well Design/Wellhead/Construction (Well 26)	State Park site with pipeline	$4,107,500	35/36
Well Design/Wellhead/Construction (Well 27)	Second Bridge site	$3,875,000	28/29
Well Construction	Replacement for Well 2	$3,875,000	34/35
Horizontal Collector Well Redevelopment (FY 26 Budget book) 108030	Pump replacement and header pipeline	$1,499,480	25/26 Construction
Horizontal Collector Well Redevelopment (Lateral Cleaning)	Dive, inspection, and cleaning	$1,000,000	31/32
Subtotal		**$11,857,500**	

Notes:

Soft costs were incorporated into the Total CIP Cost. Percent increases are noted as follows:

- Planning and engineering design: 15%
- Environmental, legal, construction management, contract administration: 15%
- Contingency: 25%
- Total percent increase from construction cost: 55%

FY = fiscal year
LBR = London Bridge Road

Table 8-2. Water Treatment Projects

Description	Location/Description	Total CIP Cost	Fiscal Year
Water Treatment Plant Projects			
Raw Water Flow Meter	Study; desktop evaluation of alternate flow metering. Project; flow metering construction.	$230,800	26-28
Cascade Aerator	Study; onsite structural inspection. Project; installation of concrete structure.	$1,298,800	26-28
Biological Filters	Replace filter valves and actuators and add enclosure over the filter basins for dust protection.	$5,480,000	28-30
Backwash System	Replace 2 backwash pumps and 2 air scour blowers.	$1,726,000	28-30
UV Disinfection	Study; evaluate isolation options. Identify components that pose water quality risks.	$72,000	29-31
Chlorine Contact Basin	Study; evaluate isolation options and inspect concrete condition. Project; concrete rehabilitation and CCB isolation capability.	$2,756,400	29-31
Finished Water Pump Station	Study; assess pump sizing and flow metering needs. Project; replace pumps and install flow meters as needed.	$1,953,200	30-32
Chemical Feed Systems	Install buildings around chemical pumps.	$72,900	31/32
Wastewater and Solids Handling	Study; evaluate feasibility of automated cleaning systems. Project; replace solids and decant pumps. Replace entire clarifier.	$2,816,400	31-33
Backup Power Supply	Study; evaluate condition of six standby generators. Project; replace six diesel generators near end of life.	$3,747,600	32-34
SCADA and Cybersecurity	Study; AWWA Cybersecurity Assessment Tool and SCADA needs. Project; upgrade SCADA per study recommendations.	$145,800	33-35
Operations Building (include new 1,500 square feet)	Study; evaluate building expansion needs for meeting, controls, and admin space. Project; design and construct expanded operations building.	$3,433,200	33-35
Production Warehouse (include new 5,000 square feet) PEMB	Study; evaluate building expansion needs for storage space. Project; design and construct expanded production and maintenance space.	$4,133,200	34-36
Subtotal		**$14,276,200**	

Table 8-2. Water Treatment Projects

Description	Location/Description	Total CIP Cost	Fiscal Year
Water Treatment Plant Transmission System			
South Transmission Reliability Project (Treated Water)	24-inch Main South in London Bridge Road.	$3,255,000	36-41
North Transmission Reliability Project (Treated Water)	18-inch Main North in London Bridge Road.	$3,836,250	36-41
Subtotal		**$7,091,250**	
Second Water Treatment Plant Project			
Second Water Treatment Plant Siting Study	Treatment plant.	$500,000	36-41
Second Water Treatment Plant Phase 1 (7.5 mgd)	Treatment plant.	$139,500,000	36-41
Total		**$140,000,000**	

Notes:

Soft costs were incorporated into the Total CIP Cost. Percent increases are noted as follows:

- Planning and engineering design: 15%
- Environmental, legal, construction management, contract administration: 15%
- Contingency: 25%
- Total percent increase from construction cost: 55%

CCB = chlorine contact basin

Table 8-3. Water Storage and Pumping Projects

Description	Location/Description	Total CIP Cost	Fiscal Year
Current 5-Year CIP Replacement and Rehab			
Tank N-4A-11 Improvements (FY26 Budget Book) 108024	Existing tank improvements and rehabilitation	$1,411,700	25/26
Tank C-2-18 Replacement and Upsize (FY26 Budget Book) 108026	Replace 0.25 MG with 0.5 MG New	$1,820,000	26-28
Tank C-3-19 Replacement and Upsize (FY26 Budget Book) 108027	Replace 0.25 MG with 0.5 MG New	$1,144,000	26-28
Water Tank C-4-21 Rehabilitation (FY26 Budget Book) 108039		$1,540,000	25-27
Tank S-1C-24 Replacement (FY26 Budget Book) 108028	Replace 1.0 MG with 1.0 MG	$2,645,500	28/29
Tank N-5A-13 Rehabilitation (FY26 Budget Book)	Replace 1.0 MG with 1.0 MG	$2,645,500	29/30
Tank S-3C-29 Rehabilitation (FY26 Budget Book) 108043	Existing tank improvements and rehabilitation	$1,540,000	28-30
North Havasu Tank and Pipeline Line (FY 26 Budget Book) 108031	Existing tank improvements and rehabilitation	$1,500,000	29-31
Master Plan Storage Recommendation			
New 0.5-MG Water Tank at Site 1A	Reduce storage deficiency in Zone 1	$1,162,500	32-34
New 1.5-MG Water Tank at Site 2C	Available storage site for Zone 1 and 2 deficiencies	$3,487,500	31-33
Water Tank C-3-20 Replacement at Site 3	Replace 0.50 MG with 0.75 MG	$1,743,750	34-36
Developer			
Water Tank 6A supplied by Pump Station 5A	Two new storage tanks at 0.25 MG	Cost based on developer agreement	36-41 Cost based on developer agreement
Water Tank 7 supplied by Pump Station 6	Two new storage tanks at 0.25 MG	Cost based on developer agreement	36-41 Cost based on developer agreement
Water Tank Zone 4C	Two new storage tanks at 0.25 MG (Campbell/Bluewater area)	Cost based on developer agreement	36-41 Cost based on developer agreement
Subtotal		**$20,640,450**	

Table 8-3. Water Storage and Pumping Projects

Description	Location/Description	Total CIP Cost	Fiscal Year
Pump Stations			
Booster Station 2A Improvements (FY26 Budget Book) 108041	Station 2A	$1,397,500	25-27
New Booster Station Site 1A (three pumps, 1,500 gpm each)	New station built with new storage	$3,100,000	36-41
New Booster Station Site 4 (supply southern area of Zone 5)	Provide new south source of water supply to Zone 5, to improve reliability and increase water circulation	$3,100,000	36-41
Subtotal		**$7,597,500**	

Notes:

Soft costs were incorporated into the Total CIP Cost. Percent increases are noted as follows:

- Planning and engineering design: 15%
- Environmental, legal, construction management, contract administration: 15%
- Contingency: 25%
- Total Percent Increase from construction cost: 55%

Table 8-4. Water Distribution Projects

Description	Location / Description	Total CIP Cost	Fiscal Year
Water Main Replacement Program (FY26 Budget Book) 108037	Annual replacement program of 2 miles.	$87,930,000	25-41
Water System Risk Reduction Improvements	Details in Appendix C.		
Advanced Metering Infrastructure (FY26 Budget book) 108038		$3,500,000	25-30
Pipeline - SR 95 Crossing to SARA Park (FY26 Budget Book) 108044		$900,000	27/28
Redundant Pipeline Riveria Development - 12-inch Pipeline	Sweetwater Avenue (Zone 2) to Development. Project to include Zone 2/1 PRV Station and 12-inch pipeline.	$1,550,000	29-31
Pressure Reducing Station Program - South City Service Area	Reducing valves to improve peak hour pressures, reliability, and water quality.	$1,395,000	31-33
Second Bridge, Water Utility Infrastructure (FY26 Budget Book) 108040		$2,000,000	25-27
Foothills Estates Redundant Transmission Main	Redundant supply to Zone 7 tanks and future Zone 6 to north. New Zone 6 PRV Station included.	$3,875,000	32-34
Site 1A to Zone 2A Transmission Main Upgrades	Project to be constructed with Site 1A upgrades to increase water supply (18-inch).	$2,557,500	36-41
Zone 3A and Zone 4A Transmission Main Upgrades	Project to be constructed with Site 1A upgrades to increase water supply (18-inch).	$2,557,500	36-41
Zone 4A and Zone 5A Transmission Main Upgrades	Project to increase water supply from Zone 4 to Zone 5 (16-inch).	$1,937,500	36-41
Zone 6 Transmission/Reliability (12-inch)	Interconnect Zone 6 systems.	$2,170,000	36-41 Cost based on developer agreement
Subtotal		**$110,372,500**	

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Appendix A
Water Capital Improvement Plan

Capital Improvement Plan

Description	CIP No.	Project Type	Location / Description	Quantity	Units	Base Unit Cost	Construct-ion Cost	Total CIP Cost[a]	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY36-41
WATER RESOURCE PROJECTS																				
North Well Cost Summary																				
North Wellfield Well Performance Testing		Supply	Engineered pump tests of up to 8 wells in the North Wellfield (10, 11, 12, 14,15, 18, 22, and 23)	1	EA	$52,000	$52,000	$ 80,600		$ 80,600										
Test boring program north of NWF		Supply	Drill 3 borings to identify potential new well locations	1	EA	$323,000	$323,000	$ 500,650			$ 500,650									
Well Design /Wellhead/ Construction (Well 24)		Supply	Replacement for wells 14/15	1	EA	$2,500,000	$2,500,000	$ 3,875,000					$ 3,875,000							
Well Design /Wellhead/ Construction (Well 25)		Supply	Replacement for wells 10/11/12	1	EA	$2,500,000	$2,500,000	$ 3,875,000									$ 3,875,000			
Collection Pipeline		Supply	North Wellfield in LBR (3500', 18"/24")	1	LS	$1,050,000	$1,050,000	$ 1,627,500				$ 1,627,500								
Subtotal								**$ 9,958,750**												
Central Wellfield Cost Summary																				
Well Design /Wellhead/ Construction (Well 26)		Supply	State Park site with PL	1	EA	$2,650,000	$2,650,000	$ 4,107,500											$ 4,107,500	
Well Design /Wellhead/ Construction (Well 27)		Supply	Second Bridge site	1	EA	$2,500,000	$2,500,000	$ 3,875,000				$ 3,875,000								
Well Construction		Supply	Replacement for Well 2	1	EA	$2,500,000	$2,500,000	$ 3,875,000										$ 3,875,000		
Horizontal Collector Well Redevelopment (FY 26 Budget book) 108030		Supply	Pump replacement and Header PL	1	EA		$1,499,480	$ 1,499,480	Construction											
Horizontal Collector Well Redevelopment (Lateral Cleaning)		Supply	Dive, Inspection and Cleaning	1	EA	$1,000,000	$1,000,000	$ 1,000,000							$ 1,000,000					
Subtotal								**$ 11,857,500**												
WATER TREATMENT PROJECTS																				
Water Treatment Plant Projects																				
Raw Water Flow Meter		Pipeline	Replace existing water treatment plant meter	1	EA		$ 202,000	$ 202,000			$ 202,000									
Cascade Aerator		Treatment	Study; onsite structural inspection. Project; installation of concrete structure	1	EA		$ 1,298,800	$ 1,298,800		$ 28,800	$ 1,270,000									
Biological Filters		Treatment	Replace filter valves and actuators and add enclosure over the filter basins for dust protection	1	EA		$ 5,480,000	$ 5,480,000				$ 2,740,000	$ 2,740,000							
Backwash System		Treatment	Replace 2 backwash pumps and 2 air scour blowers	1	EA		$ 1,726,000	$ 1,726,000				$ 863,000	$ 863,000							
UV Disinfection		Treatment	UV insulation of spools for abandoned system. If concerns, evaluate isolation options. Identify components pose water quality risks	1	EA		$ 36,000	$ 36,000						$ 36,000						
Chlorine Contact Basin		Treatment	Study; evaluate isolation options and inspect concrete condition. Project; Concrete rehabilitation and CCB islation capability	1	EA		$ 2,756,400	$ 2,756,400					$ 86,400	$ 2,670,000						
Finished Water Pump Station		Treatment	Study; assess pump sizing and flow metering needs. Project; replace pumps and install flow meters as needed	1	EA		$ 1,953,200	$ 1,953,200						$ 43,200	$ 1,910,000					
Chemical Feed Systems		Treatment	Install buildings around chemical pumps	1	EA		$ 72,900	$ 72,900							$ 72,900					
Wastewater & Solids Handling		Treatment	Study; evaluate feasibility of automated cleaning systems. Project; replace solids and decant pumps. Replace entire clarifier	1	EA		$ 2,816,400	$ 2,816,400							$ 86,400	$ 2,730,000				
Backup Power Supply		Treatment	Study; evaluate condition of six standby generators. Project; replace 6 diesel generators near end of life	1	EA		$ 3,747,600	$ 3,747,600								$ 57,600	$ 3,690,000			

Capital Improvement Plan

Description	CIP No.	Project Type	Location / Description	Quantity	Units	Base Unit Cost	Construct-ion Cost	Total CIP Cost[a]	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY36-41
SCADA & Cybersecurity		Treatment	Study; AWWA Cybersecurity Assessment Tool and SCADA needs. Project; upgrade SCADA per study recommendations	1	EA		$ 145,800	$ 145,800									$ 28,800	$ 117,000		
Operations Building (Include new 1500 sq ft)		Site Work	Study; Evaluate building expansion needs for meeting, controls, and admin space. Project; Design and construct expanded operations building.	1	EA		$ 3,433,200	$ 3,433,200									$ 43,200	$ 3,390,000		
Production Warehouse (Include new 5000 sq ft) PEMB		Site Work	Study; Evaluate building expansion needs for storage space. Project; Design and construct expanded production and maintenance space.	1	EA		$ 4,133,200	$ 4,133,200										$ 43,200	$ 4,090,000	
Subtotal								**$ 14,276,200**												
Water Treatment Plant Transmission System																				
South Transmission Reliability Project (Treated Water)		Pipeline	24-inch Main South in London Bridge Road	6,000	LF	$350	$2,100,000	$ 3,255,000												$ 3,255,000
North Transmission Reliability Project (Treated Water)		Pipeline	18-inch Main North in London Bridge Road	9,000	LF	$275	$2,475,000	$ 3,836,250												$ 3,836,250
Subtotal								**$ 7,091,250**												
Second Water Treatment Plant Project																				
Second Water Treatment Plant Siting Study		Treatment	Treatment plant	1	EA			$ 500,000				$ 250,000	$ 250,000							$ 500,000
Second Water Treatment Plant Phase 1 (7.5 MGD)		Treatment	Treatment plant	7.5	MGD	$12,000,000.00	$90,000,000	$ 139,500,000												$ 139,500,000
Total								**$ 140,000,000**												
WATER STORAGE AND PUMPING PROJECTS																				
Current 5 Year CIP Replacement and Rehab																				
Tank N-4A-11 Improvements (FY26 Budget Book) 108024		Reservoir	Existing Tank improvements and rehabilitation	1	EA		$1,411,700	$ 1,411,700	Construction											
Tank C-2-18 Replacement & Upsize (FY26 Budget Book) 108026		Reservoir	Replace 0.25 MG with 0.5 MG New	0.5	MG		$ 1,820,000	$ 1,820,000		$ 104,000	$ 1,716,000									
Tank C-3-19 Replacement & Upsize (FY26 Budget Book) 108027		Reservoir	Replace 0.25 MG with 0.5 MG New	0.5	MG		$ 1,144,000	$ 1,144,000		$ 104,000	$ 1,040,000									
Water Tank C-4-21 Rehabilitation (FY26 Budget Book) 108039		Rehabilitation					$1,540,000	$ 1,540,000	$ 90,000	$ 1,450,000										
Tank S-1C-24 Replacement (FY26 Budget Book) 108028		Reservoir	Replace 1.0 MG with 1.0 MG	1	MG		$ 2,645,500	$ 2,645,500				$ 2,645,500								
Tank N-5A-13 Rehabilitation (FY26 Budget Book)		Reservoir	Replace 1.0 MG with 1.0 MG	1	MG		$ 2,645,500	$ 2,645,500					$ 2,645,500							
Tank S-3C-29 Rehabilitation (FY26 Budget Book) 108043		Reservoir	Existing Tank improvements and rehabilitation	1	EA		$1,540,000	$ 1,540,000				$ 90,000	$ 1,450,000							

Capital Improvement Plan

Description	CIP No.	Project Type	Location / Description	Quantity	Units	Base Unit Cost	Construct-ion Cost	Total CIP Cost[a]	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY36-41
North Havasu Tank and Pipeline Line (FY Budget Book) 108031		Reservoir/PL	Existing Tank improvements and rehabilitation	1	EA		$1,500,000	$ 1,500,000					$ 50,000	$ 1,450,000						
Master Plan Storage Recommendation																				
New 0.5 MG Water Tank at Site 1A		Storage	Reduce storage deficiency in Zone 1	0.5	MG	$ 1,500,000	$ 750,000	$ 1,162,500								$ 104,000	$ 1,058,500			
New 1.5 MG Water Tank at Site 2C		Storage	Available storage site for Zone 1 and 2 deficiencies	1.5	MG	$ 1,500,000	$ 2,250,000	$ 3,487,500							$ 104,000	$ 1,396,000				
Water Tank C-3-20 Replacement at Site 3		Storage	Replace 0.50 MG with 0.75 MG	0.75	MG	$ 1,500,000	$ 1,125,000	$ 1,743,750										$ 104,000	$ 1,639,750	
Developer																				
Water Tank 6A supplied by PS 5A		Storage	Two new storage tanks @0.25 MG	0.5	MG		Cost based on developer agreement	Cost based on developer agreement												Cost based on developer agreement
Water Tank 7 supplied by PS 6		Storage	Two new storage tanks @0.25 MG	0.5	MG		Cost based on developer agreement	Cost based on developer agreement												Cost based on developer agreement
Water Tank Zone 4C		Storage	Two new storage tanks @0.25 MG (Campbell/Bluewater area)	0.5	MG		Cost based on developer agreement	Cost based on developer agreement												Cost based on developer agreement
Subtotal								**$ 20,640,450**												
Pump Stations																				
Booster Station 2A Improvements (FY26 Budget Book) 108041		Pumping	Station 2A					$ 1,397,500	$ 227,500	$ 1,170,000										
New Booster Station Site 1A (Three pumps, 1500 gpm each)		Pumping	New station built with new storage	1	EA	$2,000,000	$2,000,000	$ 3,100,000												$ 3,100,000
New Booster Station Site 4 (Supply southerly area of Zone 5)		Pumping	Provide new south source of water supply to Zone 5, to improve reliablity and increase water circulation	1	EA	$2,000,000	$2,000,000	$ 3,100,000												$ 3,100,000
Subtotal								**$ 7,597,500**												
WATER DISTRIBUTION PROJECTS																				
Water Main Replacement Program (FY26 Budget Book) 108037		Pipeline	Annual replacement program of 2 miles				$ 87,930,000	$ 87,930,000	$ 4,740,000	$ 5,210,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 5,570,000	$ 27,850,000
Water System Risk Reduction Improvements			Details in Appendix C				$ -													
Advanced Metering Infrastructure (FY26 Budget book) 108038		Distribution					$ 3,500,000	$ 3,500,000	$ 1,200,000	$ 1,200,000	$ 700,000	$ 200,000	$ 200,000							
Pipeline - State Hwy 95 Crossing to SARA Park (FY26 Budget Book) 108044		Pipeline					$ 900,000	$ 900,000			$ 900,000									
Redundant Pipeline Riveria Development - 12" Pipeline		Distribution	Sweetwater Ave (Zone 2) to Development. Project to include Zone 2/1 PRS and 12-inch pipeline	4,000	LF	250	$ 1,000,000	$ 1,550,000					$ 232,500	$ 1,317,500						
Pressure Reducing Station Program - south City service area		Distribution	Reducing valves to improve peak hour pressures, reliability, and water quality	3		$ 300,000	$ 900,000	$ 1,395,000							$ 697,500	$ 697,500				
Second Bridge, Water Utility Infrastructure (FY26 Budget Book) 108040							$ 2,000,000	$ 2,000,000	$ 330,000	$ 1,670,000										

Capital Improvement Plan

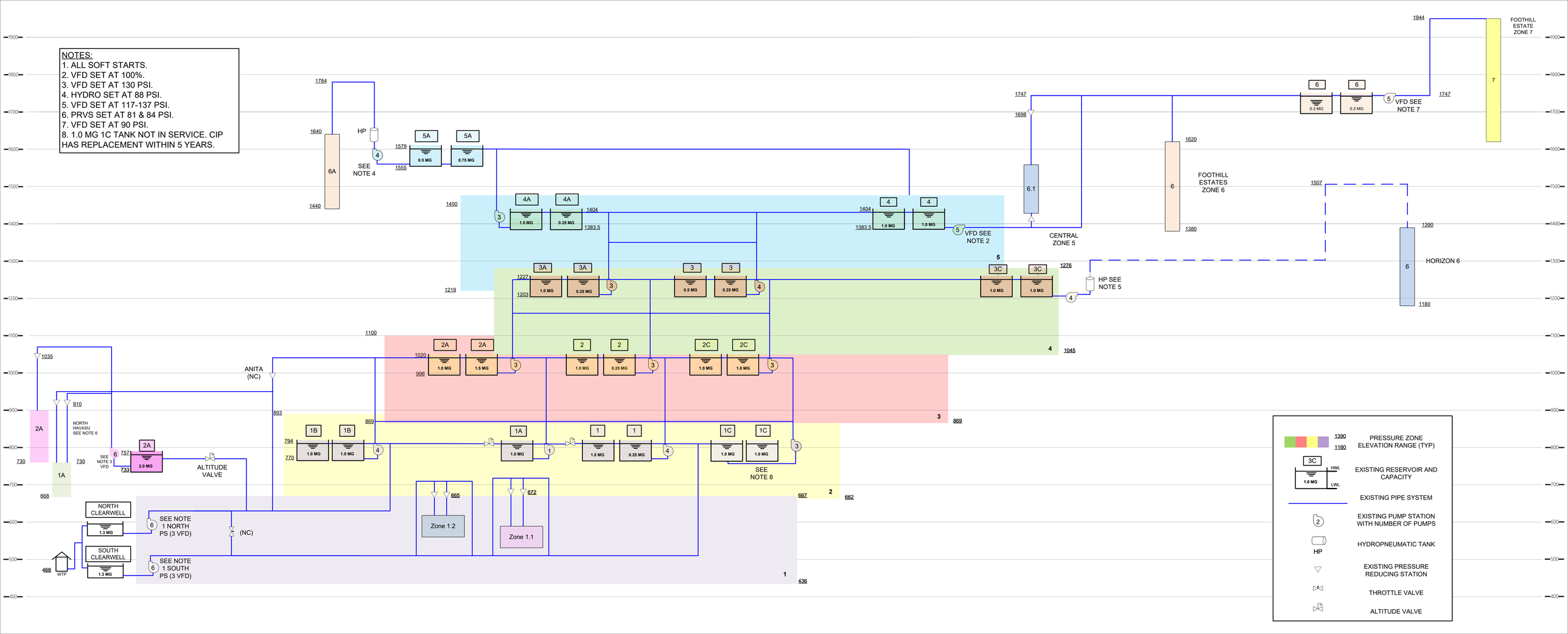
Description	CIP No.	Project Type	Location / Description	Quantity	Units	Base Unit Cost	Construct-ion Cost	Total CIP Cost[a]	FY 25/26	FY 26/27	FY 27/28	FY 28/29	FY 29/30	FY 30/31	FY 31/32	FY 32/33	FY 33/34	FY 34/35	FY 35/36	FY36-41
Foothills Estates Redundant Transmission Main		Pipeline	Redundant supply to Zone 7 Tanks and future Zone 6 to north. New Zone 6 PRS included.	10,000	LF	250	$ 2,500,000	$ 3,875,000								$ 581,250	$ 3,293,750			
Site 1A to Zone 2A Transmission Main Upgrades		Pipeline	Project to be constructed with Site 1A upgrades to increase water supply. (18-inch)	6,000	LF	275	$ 1,650,000	$ 2,557,500												$ 2,557,500
Zone 3A and Zone 4A Transmission Main Upgrades		Pipeline	Project to be constructed with Site 1A upgrades to increase water supply. (18-inch)	6,000	LF	275	$ 1,650,000	$ 2,557,500												$ 2,557,500
Zone 4A and Zone 5A Transmission Main Upgrades		Pipeline	Project to be increase water supply from Zone to Zone 5. (16-inch)	5,000	LF	250	$ 1,250,000	$ 1,937,500												$ 1,937,500
Zone 6 Transmission/Reliability (12-inch)		Pipeline	Interconnect Zone 6 Systems	7,000	LF	200	$ 1,400,000	$ 2,170,000												Cost based on developer agreement
Subtotal								**$ 110,372,500**												
										$11,017,400	$11,898,650	$17,861,000	$17,962,400	$11,086,700	$9,440,800	$11,136,350	$17,559,250	$13,099,200	$15,407,250	FY36-41
																		10 Year CIP	$136,469,000	$188,193,750

Notes:

[a] Soft costs were incorporated into the Total CIP Cost. Percent increases are noted below.

Planning and engineering design	15%
Environmental, legal, construction management, contract administration	15%
Contingency	25%
Total Percent Increase from construction cost	55%

Appendix B
Hydraulic System Profile


NOTES:
1. ALL SOFT STARTS.
2. VFD SET AT 100%.
3. VFD SET AT 130 PSI.
4. HYDRO SET AT 88 PSI.
5. VFD SET AT 117-137 PSI.
6. PRVS SET AT 81 & 84 PSI.
7. VFD SET AT 90 PSI.
8. 1.0 MG 1C TANK NOT IN SERVICE. CIP HAS REPLACEMENT WITHIN 5 YEARS.
1944
FOOTHILL ESTATE ZONE 7
7
1784
1640
6A
1440
HP
SEE NOTE 4
5A
0.5 MG
0.75 MG
1579
1555
1450
4A
1.0 MG
0.25 MG
1404
1383.5
1219
3A
1227
1203
3
0.5 MG
0.25 MG
1100
2A
1.5 MG
1020
996
2
2C
1035
910
NORTH HAVASU SEE NOTE 6
2A
2.0 MG
757
733
730
SEE NOTE 3 VFD
ALTITUDE VALVE
ANITA (NC)
893
1B
794
770
1A
1
668
NORTH CLEARWELL
1.3 MG
SOUTH CLEARWELL
1.3 MG
WTP
468
SEE NOTE 1 NORTH PS (3 VFD)
SEE NOTE 1 SOUTH PS (3 VFD)
(NC)
Zone 1.2
665
Zone 1.1
672
869
667
662
436
SEE NOTE 8
1C
1747
1698
6.1
CENTRAL ZONE 5
VFD SEE NOTE 2
1620
6
FOOTHILL ESTATES ZONE 6
1380
0.3 MG
VFD SEE NOTE 7
1507
1390
1180
HORIZON 6
1276
1045
HP SEE NOTE 5
PRESSURE ZONE ELEVATION RANGE (TYP)
EXISTING RESERVOIR AND CAPACITY
HWL
LWL
EXISTING PIPE SYSTEM
EXISTING PUMP STATION WITH NUMBER OF PUMPS
HYDROPNEUMATIC TANK
EXISTING PRESSURE REDUCING STATION
THROTTLE VALVE
ALTITUDE VALVE

Appendix C
High-risk Pipelines Summary Tables

Table C-1. Transmission

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
8746-wMAIN	18303	1/1/1970	ACP	Resort	1	18	1	0	1.75	0.25	3	0.2	5.2	1.05	3.5	1.5	6.05	31.46	87.938505	5	54.3
8746-wMAIN	18303	1/1/1970	ACP	Resort	1	18	1	0	1.75	0.25	3	0.2	5.2	1.05	3.5	1.5	6.05	31.46	87.938505	5	54.3
6599-wMAIN	16234	1/1/1970	ACP	Resort Related	1	16	1	0	1.25	2.5	0.3	1	5.05	1.05	3.5	1.5	6.05	30.5525	85.401817	5	4042.6
519-wMAIN	10470	1/1/1970	ACP	Low Density Residential	<Null>	20	3	0.75	0	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	582.1
522-wMAIN	10473	1/1/1970	ACP	Low Density Residential	<Null>	24	3	0.75	0	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	6910.7
519-wMAIN	10470	1/1/1970	ACP	Low Density Residential	<Null>	20	3	0.75	0	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	582.1
7740-wMAIN	17335	1/1/1970	DIP	Resort Related	<Null>	36	1	0	2.5	2.5	0.3	2	7.3	0.35	3.5	0.3	4.15	30.295	84.682041	4	18387.3
8800-wMAIN	18349	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	1.5	5.35	29.425	82.250175	5	1481.7
8801-wMAIN	18350	1/1/1970	ACP	Employment	1	30	1	0	2.5	1.75	0.3	0.2	4.75	1.05	3.5	1.5	6.05	28.7375	80.328442	5	1334.3
3950-wMAIN	13805	1/1/1970	CCP	Low Density Residential	<Null>	18	4	0.75	0	1.75	3	0.2	5.7	0.35	3.5	0.9	4.75	27.075	75.681342	5	7354.2
8000-wMAIN	17591	1/1/1970	ACP	Commercial Mixed Use	3	24	2	0	1.75	1.75	0.3	0.2	4	1.75	3.5	1.5	6.75	27	75.471698	5	1432.8
3290-wMAIN	13181	1/1/2000	ACP	Employment	<Null>	27	3	0	2.5	1.75	3	0.2	7.45	0.35	1.75	1.5	3.6	26.82	74.968553	4	12.4
3290-wMAIN	13181	1/1/2000	ACP	Employment	<Null>	27	3	0	2.5	1.75	3	0.2	7.45	0.35	1.75	1.5	3.6	26.82	74.968553	4	12.4
7826-wMAIN	17418	1/1/1970	CCP	Resort Related	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	0.9	4.75	26.125	73.025856	5	249.3
9944-wMAIN	19415	1/1/1970	CCP	Resort Related	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	0.9	4.75	26.125	73.025856	5	4.0
7879-wMAIN	17471	1/1/1970	ACP	Open Space and Park	<Null>	18	1	0	1.75	2.5	0.3	0.2	4.75	0.35	3.5	1.5	5.35	25.4125	71.034242	5	2470.4
1458-wMAIN	11400	1/1/1970	ACP	Employment	2	16	2	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	6493.0
6362-wMAIN	16006	1/1/1970	DIP	Commercial Mixed Use - Nodal	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	0.3	4.15	22.825	63.801537	4	2236.5
6362-wMAIN	16006	1/1/1970	DIP	Commercial Mixed Use - Nodal	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	0.3	4.15	22.825	63.801537	4	2236.5
6362-wMAIN	16006	1/1/1970	DIP	Commercial Mixed Use - Nodal	<Null>	30	1	0	2.5	2.5	0.3	0.2	5.5	0.35	3.5	0.3	4.15	22.825	63.801537	4	2236.5
6622-wMAIN	16256	1/1/1970	PCCP	Open Space and Park	<Null>	48	1	0	2.5	1.75	0.3	0.2	4.75	0.35	3.5	0.9	4.75	22.5625	63.067785	5	3027.8
7827-wMAIN	17419	1/1/1970	CCP	Commercial Mixed Use	<Null>	30	1	0	2.5	1.75	0.3	0.2	4.75	0.35	3.5	0.9	4.75	22.5625	63.067785	5	234.4
7828-wMAIN	17420	1/1/1970	CCP	Commercial Mixed Use	<Null>	27	1	0	2.5	1.75	0.3	0.2	4.75	0.35	3.5	0.9	4.75	22.5625	63.067785	5	3535.1
7833-wMAIN	17425	1/1/1970	CCP	Resort Related	<Null>	27	1	0	2.5	1.75	0.3	0.2	4.75	0.35	3.5	0.9	4.75	22.5625	63.067785	5	968.6
8729-wMAIN	18289	1/1/1970	PCCP	Open Space and Park	<Null>	48	1	0	2.5	1.75	0.3	0.2	4.75	0.35	3.5	0.9	4.75	22.5625	63.067785	5	2023.1
5087-wMAIN	14899	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	182.3
5088-wMAIN	14900	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	67.9
5089-wMAIN	14901	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	40.9
5090-wMAIN	14902	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	29.7
5091-wMAIN	14903	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	7.0
5092-wMAIN	14904	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	12.5
5093-wMAIN	14905	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	10.8
5094-wMAIN	14906	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	10.9
5095-wMAIN	14907	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	10.6
5096-wMAIN	14908	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	12.0
5097-wMAIN	14909	1/1/1970	ACP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	143.7
8749-wMAIN	18306	1/1/1970	DIP	Resort Related	<Null>	18	1	0	1.75	0.25	3	0.2	5.2	0.35	3.5	0.3	4.15	21.58	60.321454	4	17.3
8749-wMAIN	18306	1/1/1970	DIP	Resort Related	<Null>	18	1	0	1.75	0.25	3	0.2	5.2	0.35	3.5	0.3	4.15	21.58	60.321454	4	17.3
3325-wMAIN	13214	1/1/1970	ACP	Employment	<Null>	24	2	0	1.75	1.75	0.3	0.2	4	0.35	3.5	1.5	5.35	21.4	59.818309	5	2109.7
8320-wMAIN	17895	1/1/1970	ACP	Employment	<Null>	24	2	0	1.75	1.75	0.3	0.2	4	0.35	3.5	1.5	5.35	21.4	59.818309	5	1719.4
7839-wMAIN	17431	1/1/1970	CCP	Open Space and Park	<Null>	27	2	0	2.5	1.25	0.3	0.2	4.25	0.35	3.5	0.9	4.75	20.1875	56.429071	4	29.4
7842-wMAIN	17434	1/1/1970	CCP	Open Space and Park	<Null>	27	2	0	2.5	1.25	0.3	0.2	4.25	0.35	3.5	0.9	4.75	20.1875	56.429071	4	394.6
1562-wMAIN	11503	1/1/1970	CCP	Low Density Residential	<Null>	24	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	2384.0
5098-wMAIN	14910	1/1/1970	CCP	Low Density Residential	<Null>	18	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	122.0
5099-wMAIN	14911	1/1/1970	CCP	Low Density Residential	<Null>	24	3	0.75	0	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	131.3
2166-wMAIN	12098	1/1/1970	CCP	Commercial Mixed Use	<Null>	18	3	0	1.75	1.75	0.3	0.2	4	0.35	3.5	0.9	4.75	19	53.109713	4	5954.7
8206-wMAIN	17785	1/1/1970	CCP	Commercial Mixed Use	<Null>	24	1	0	1.75	1.75	0.3	0.2	4	0.35	3.5	0.9	4.75	19	53.109713	4	14.0
3348-wMAIN	13237	1/1/1970	ACP	Commercial Mixed Use	<Null>	27	2	0	2.5	0.25	0.3	0.2	3.25	0.35	3.5	1.5	5.35	17.3875	48.602376	4	24.4
7997-wMAIN	17588	1/1/1970	ACP	Low Density Residential	<Null>	24	2	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	158.3
8001-wMAIN	17592	1/1/1970	ACP	High Density Residential	<Null>	24	2	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1012.0

ACP = asbetos concrete pipe
CCP = concrete cylinder pipe
COF = consequence of failure
Crit. = critical
DIP = ductile iron pipe
LOF = likelihood of failure
PCCP = prestressed concrete cylinder pipe

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
7793-wMAIN	17386	1/1/1970	ACP	Resort Related	2	12	1	0	1.25	1.75	0.3	2	5.3	1.75	3.5	1.5	6.75	35.775	100	5	12.7
7793-wMAIN	17386	1/1/1970	ACP	Resort Related	2	12	1	0	1.25	1.75	0.3	2	5.3	1.75	3.5	1.5	6.75	35.775	100	5	12.7
7169-wMAIN	16791	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	77.3
7181-wMAIN	16803	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	91.6
8296-wMAIN	17872	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	1.5	5.35	30.495	85.24109	5	99.7
8154-wMAIN	17736	1/1/1970	ACP	Commercial Mixed Use	2	6	1	0	0.75	1.25	0.3	2	4.3	1.75	3.5	1.5	6.75	29.025	81.132075	5	1141.7
565-wMAIN	10515	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	1.75	3	0.2	5.2	0.35	3.5	1.5	5.35	27.82	77.763802	5	493.9
704-wMAIN	10654	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	1.75	3	0.2	5.2	0.35	3.5	1.5	5.35	27.82	77.763802	5	300.5
816-wMAIN	10766	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	1.75	3	0.2	5.2	0.35	3.5	1.5	5.35	27.82	77.763802	5	1466.0
9720-wMAIN	19202	1/1/1971	PVC	Low Density Residential	<Null>	4	3	0.25	0	1.75	3	0.2	5.2	0.35	3.5	1.5	5.35	27.82	77.763802	5	25.5
9976-wMAIN	19435	1/1/1984	PVC	Low Density Residential	<Null>	4	1	0.25	0	1.75	3	0.2	5.2	0.35	3.5	1.5	5.35	27.82	77.763802	5	1505.8
6250-wMAIN	15901	1/1/1970	ACP	Commercial Mixed Use	1	10	2	0	0.75	2.5	0.3	1	4.55	1.05	3.5	1.5	6.05	27.5275	76.946191	5	3079.3
7329-wMAIN	16947	1/1/1970	DIP	Open Space and Park	<Null>	12	2	0	1.25	1.75	3	0.2	6.2	0.35	3.5	0.3	4.15	25.73	71.921733	4	23.1
8279-wMAIN	17856	1/1/1970	ACP	Commercial Mixed Use	2	8	2	0	0.75	1.75	0.3	1	3.8	1.75	3.5	1.5	6.75	25.65	71.698113	5	147.3
6513-wMAIN	16154	1/1/1970	ACP	Resort Related	6	4	1	0	0.75	1.75	0.3	0.2	3	3.5	3.5	1.5	8.5	25.5	71.278826	4	697.1
6424-wMAIN	16066	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	1.5	5.35	25.145	70.286513	5	12.3
8492-wMAIN	18060	1/1/1970	PVC	Low Density Residential	2	6	6	0.25	0	0.25	3	0.2	3.7	1.75	3.5	1.5	6.75	24.975	69.811321	4	403.0
7588-wMAIN	17190	1/1/1980	C-900	Low Density Residential	<Null>	6	2	0.25	0	1.75	3	0.2	5.2	0.35	3.5	0.9	4.75	24.7	69.042628	5	585.2
6524-wMAIN	16160	1/1/1970	DIP	Resort Related	<Null>	8	1	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	4664.1
6733-wMAIN	16363	1/1/1970	DIP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	762.5
7195-wMAIN	16815	1/1/1970	DIP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	109.8
7196-wMAIN	16816	1/1/1970	DIP	Public/Semi Public	<Null>	6	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	123.2
7353-wMAIN	16968	1/1/1970	DIP	Open Space and Park	<Null>	6	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	9.5
7617-wMAIN	17219	1/1/1970	DIP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	31.8
7737-wMAIN	17332	1/1/1970	DIP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	178.8
6432-wMAIN	16073	1/1/1970	DIP	Resort	<Null>	8	1	0	0.75	1.75	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	1321.4
6211-wMAIN	15864	1/1/1970	DIP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.25	3	0.2	5.7	0.35	3.5	0.3	4.15	23.655	66.121593	4	1875.8
431-wMAIN	10383	1/1/1970	ACP	Commercial Mixed Use	2	12	3	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	1267.4
8256-wMAIN	17834	1/1/1970	ACP	Commercial Mixed Use - Nodal	2	12	1	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	1019.2
8965-wMAIN	18491	1/1/1970	ACP	Resort Related	2	12	1	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	364.3
8965-wMAIN	18491	1/1/1970	ACP	Resort Related	2	12	1	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	364.3
7236-wMAIN	16856	1/1/1970	ACP	Resort Related	2	12	1	0	1.25	1.75	0.3	0.2	3.5	1.75	3.5	1.5	6.75	23.625	66.037736	4	306.8
8194-wMAIN	17773	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	1	3.8	1.05	3.5	1.5	6.05	22.99	64.262753	5	1630.7
7789-wMAIN	17382	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	1.75	0.3	1	3.8	1.05	3.5	1.5	6.05	22.99	64.262753	5	1296.2
7930-wMAIN	17522	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	1	3.8	1.05	3.5	1.5	6.05	22.99	64.262753	5	444.4
7930-wMAIN	17522	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	1	3.8	1.05	3.5	1.5	6.05	22.99	64.262753	5	444.4
6444-wMAIN	16085	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	238.0
7389-wMAIN	17002	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	7.6
8355-wMAIN	17923	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	31.4
8356-wMAIN	17924	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	502.1
8798-wMAIN	18348	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	333.2
8973-wMAIN	18498	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	380.6
8973-wMAIN	18498	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	380.6
8794-wMAIN	18344	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	988.2
6482-wMAIN	16123	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	474.9
6485-wMAIN	16126	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	699.6
7542-wMAIN	17144	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	2.5	0.3	0.2	4.25	0.35	3.5	1.5	5.35	22.7375	63.556953	5	301.5
6094-wMAIN	15775	1/1/1970	ACP	Commercial Mixed Use	1	10	2	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	4.1
6251-wMAIN	15902	1/1/1970	ACP	Employment	1	10	2	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	3437.4
9108-wMAIN	18629	1/1/1970	ACP	Commercial Mixed Use	1	8	2	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	587.6
6480-wMAIN	16121	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	1452.8
6448-wMAIN	16089	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	14.5

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
6448-wMAIN	16089	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	2.5	0.3	0.2	3.75	1.05	3.5	1.5	6.05	22.6875	63.417191	5	14.5
2401-wMAIN	12315	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	1.4	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	188.6
6083-wMAIN	15764	1/1/1970	ACP	Low Density Residential	<Null>	12	1	0.75	0	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	98.7
6401-wMAIN	16043	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	210.1
6402-wMAIN	16044	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	22.7
6611-wMAIN	16245	1/1/1970	ACP	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	20.2
6645-wMAIN	16279	1/1/1970	ACP	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	37.6
7129-wMAIN	16753	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	1.4	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	1132.4
7734-wMAIN	17329	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	1.4	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	263.9
8168-wMAIN	17749	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	14.6
9756-wMAIN	19236	1/1/1960	ACP	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	1.5	5.35	22.47	62.809224	5	4.8
899-wMAIN	10848	1/1/1970	ACP	Low Density Residential	1	4	4	0.25	0	0.25	3	0.2	3.7	1.05	3.5	1.5	6.05	22.385	62.571628	4	537.4
3219-wMAIN	13113	1/1/1970	ACP	Low Density Residential	1	8	2	0.25	0	0.25	3	0.2	3.7	1.05	3.5	1.5	6.05	22.385	62.571628	4	497.5
7108-wMAIN	16734	1/1/1970	PVC	Commercial Mixed Use	4	4	1	0	0.75	1.75	0.3	0.2	3	2.45	3.5	1.5	7.45	22.35	62.473795	4	539.3
8754-wMAIN	18310	1/1/1970	ACP	Resort Related	4	6	1	0	0.75	1.75	0.3	0.2	3	2.45	3.5	1.5	7.45	22.35	62.473795	4	731.1
9143-wMAIN	18664	1/1/1970	ACP	High Density Residential	<Null>	8	2	0.25	0	2.5	0.3	1	4.05	0.35	3.5	1.5	5.35	21.6675	60.566038	5	359.5
2385-wMAIN	12300	1/1/1970	DIP	Low Density Residential	<Null>	6	3	0.25	0	1.75	3	0.2	5.2	0.35	3.5	0.3	4.15	21.58	60.321454	4	540.7
7424-wMAIN	17033	1/1/1970	DIP	Low Density Residential	<Null>	8	2	0.25	0	1.75	3	0.2	5.2	0.35	3.5	0.3	4.15	21.58	60.321454	4	492.3
8967-wMAIN	18493	1/1/1970	ACP	Commercial Mixed Use - Nodal	1	12	1	0	1.25	1.75	0.3	0.2	3.5	1.05	3.5	1.5	6.05	21.175	59.189378	4	542.1
7112-wMAIN	16737	1/1/1970	ACP	Resort Related	1	12	1	0	1.25	1.75	0.3	0.2	3.5	1.05	3.5	1.5	6.05	21.175	59.189378	4	871.6
6245-wMAIN	15896	1/1/1970	DIP	Employment	1	12	1	0	1.25	2.5	0.3	0.2	4.25	1.05	3.5	0.3	4.85	20.6125	57.617051	4	384.4
8305-wMAIN	17881	1/1/1970	DIP	Employment	1	6	2	0	0.75	0.25	3	0.2	4.2	1.05	3.5	0.3	4.85	20.37	56.939203	4	77.5
5297-wMAIN	15076	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	632.6
6596-wMAIN	16231	1/1/1970	ACP	Resort Related Mainland	<Null>	8	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	1304.9
6688-wMAIN	16321	1/1/1970	ACP	Resort Related Island	<Null>	8	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	3647.8
7128-wMAIN	16752	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	464.5
7278-wMAIN	16898	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	812.1
7691-wMAIN	17288	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	44.9
8814-wMAIN	18361	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	387.9
9032-wMAIN	18553	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	1	3.8	0.35	3.5	1.5	5.35	20.33	56.827393	5	273.8
7961-wMAIN	17552	1/1/1970	ACP	Open Space and Park	2	8	2	0	0.75	1.75	0.3	0.2	3	1.75	3.5	1.5	6.75	20.25	56.603774	4	68.4
8344-wMAIN	17915	1/1/1970	ACP	Employment	2	8	2	0	0.75	1.75	0.3	0.2	3	1.75	3.5	1.5	6.75	20.25	56.603774	4	1043.9
9213-wMAIN	18731	1/1/1970	ACP	Open Space and Park	2	8	3	0	0.75	1.75	0.3	0.2	3	1.75	3.5	1.5	6.75	20.25	56.603774	4	416.9
8974-wMAIN	18499	1/1/1970	ACP	Resort Related	3	8	1	0	0.75	1.75	0.3	0.2	3	1.75	3.5	1.5	6.75	20.25	56.603774	4	1104.1
7961-wMAIN	17552	1/1/1970	ACP	Open Space and Park	2	8	2	0	0.75	1.75	0.3	0.2	3	1.75	3.5	1.5	6.75	20.25	56.603774	4	68.4
6086-wMAIN	15767	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	20.2
6092-wMAIN	15773	1/1/1970	ACP	Employment	<Null>	10	2	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	14.7
6252-wMAIN	15903	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	2127.6
7100-wMAIN	16726	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	252.0
7745-wMAIN	17339	1/1/1970	PVC	Open Space and Park	<Null>	4	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	1131.5
7801-wMAIN	17394	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	43.4
7803-wMAIN	17396	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	339.5
8179-wMAIN	17760	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	558.0
8196-wMAIN	17775	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	600.6
8790-wMAIN	18340	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	123.0
9002-wMAIN	18523	1/1/1970	ACP	Open Space and Park	<Null>	8	3	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	841.6
9026-wMAIN	18547	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	297.4
9113-wMAIN	18634	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	569.6
9129-wMAIN	18650	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	556.2
13844-wMAIN	19625	1/1/1984	ACP	Resort Related	<Null>	6	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	25.7
6484-wMAIN	16125	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	547.1
8790-wMAIN	18340	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	2.5	0.3	0.2	3.75	0.35	3.5	1.5	5.35	20.0625	56.079665	5	123.0

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
7806-wMAIN	17399	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	1.25	0.3	1	3.3	1.05	3.5	1.5	6.05	19.965	55.807128	4	1498.4
6390-wMAIN	16032	1/1/1980	C-900	Resort Related	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	620.6
6609-wMAIN	16243	1/1/1980	C-900	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	14.8
6669-wMAIN	16303	1/1/1980	C-900	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	154.5
6670-wMAIN	16304	1/1/1980	C-900	Resort Related Island	<Null>	6	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	235.4
6691-wMAIN	16323	1/1/1980	C-900	Resort Related Island	<Null>	8	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	918.5
6707-wMAIN	16339	1/1/1980	C-900	Resort Related Island	<Null>	4	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	85.5
6709-wMAIN	16341	1/1/1980	C-900	Resort Related Island	<Null>	4	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	128.1
8171-wMAIN	17752	1/1/1980	C-900	Commercial Mixed Use	<Null>	8	1	0	0.75	0.25	3	0.2	4.2	0.35	3.5	0.9	4.75	19.95	55.765199	4	933.3
520-wMAIN	10471	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	402.1
547-wMAIN	10497	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	381.8
595-wMAIN	10545	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	507.3
603-wMAIN	10553	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	14.8
604-wMAIN	10554	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	266.4
652-wMAIN	10602	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	398.4
657-wMAIN	10607	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	406.6
791-wMAIN	10741	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	854.9
807-wMAIN	10757	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	403.6
852-wMAIN	10802	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	430.9
854-wMAIN	10803	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	447.1
1049-wMAIN	10998	1/1/1970	ACP	Low Density Residential	<Null>	4	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	17.9
2314-wMAIN	12234	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	518.0
2859-wMAIN	12766	1/1/1970	ACP	Low Density Residential	<Null>	6	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	647.1
2878-wMAIN	12785	1/1/1970	ACP	Low Density Residential	<Null>	6	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	434.4
2914-wMAIN	12820	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	641.8
2951-wMAIN	12856	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	205.7
2953-wMAIN	12858	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	479.8
3013-wMAIN	12917	1/1/1970	ACP	Low Density Residential	<Null>	8	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	706.1
3156-wMAIN	13053	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	598.9
3458-wMAIN	13329	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	252.2
3995-wMAIN	13850	1/1/1970	ACP	Low Density Residential	<Null>	8	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	510.6
6300-wMAIN	15950	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	430.4
6302-wMAIN	15952	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	749.6
6323-wMAIN	15971	1/1/1970	ACP	Rural Residential	<Null>	6	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	967.2
6356-wMAIN	16004	1/1/1970	ACP	Rural Residential	<Null>	6	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	645.9
6357-wMAIN	16005	1/1/1970	ACP	Rural Residential	<Null>	6	4	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	664.0
7012-wMAIN	16639	1/1/1970	ACP	Low Density Residential	<Null>	8	1	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	363.9
7255-wMAIN	16875	1/1/1970	ACP	Low Density Residential	<Null>	4	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	204.8
7406-wMAIN	17018	1/1/1970	ACP	Low Density Residential	<Null>	8	1	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	348.5
7440-wMAIN	17047	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	1.75	0.3	1.4	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	229.1
7556-wMAIN	17158	1/1/1970	PVC	Low Density Residential	<Null>	8	1	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	946.5
8438-wMAIN	18006	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	422.5
8498-wMAIN	18066	1/1/1970	ACP	Low Density Residential	<Null>	8	6	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	178.3
8640-wMAIN	18207	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	67.0
8641-wMAIN	18208	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	483.7
8654-wMAIN	18221	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	389.0
8655-wMAIN	18222	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	244.0
8656-wMAIN	18223	1/1/1970	ACP	Low Density Residential	<Null>	8	5	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	1067.6
9017-wMAIN	18538	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	321.4
9033-wMAIN	18554	1/1/1970	ACP	High Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	647.0
9110-wMAIN	18631	1/1/1970	ACP	High Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	327.5
9205-wMAIN	18723	1/1/1970	ACP	High Density Residential	<Null>	8	2	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	278.9

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
9786-wMAIN	19266	1/1/1970	PVC	Low Density Residential	<Null>	6	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	14.1
9799-wMAIN	19277	1/1/1970	ACP	Low Density Residential	<Null>	6	3	0.25	0	0.25	3	0.2	3.7	0.35	3.5	1.5	5.35	19.795	55.331936	4	6.8
6403-wMAIN	16045	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	40.0
6404-wMAIN	16046	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.7
6405-wMAIN	16047	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.8
6406-wMAIN	16048	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.7
6407-wMAIN	16049	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.6
6408-wMAIN	16050	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.5
6409-wMAIN	16051	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.3
6410-wMAIN	16052	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.3
6411-wMAIN	16053	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	39.0
6412-wMAIN	16054	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	38.9
6413-wMAIN	16055	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	38.9
6414-wMAIN	16056	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	38.8
6415-wMAIN	16057	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.4
6416-wMAIN	16058	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6417-wMAIN	16059	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.2
6418-wMAIN	16060	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6419-wMAIN	16061	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.4
6420-wMAIN	16062	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6421-wMAIN	16063	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	49.1
6422-wMAIN	16064	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6423-wMAIN	16065	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6425-wMAIN	16067	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6426-wMAIN	16068	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	12.3
6427-wMAIN	16069	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	94.4
6428-wMAIN	16070	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	5.6
6429-wMAIN	16071	1/1/1970	DIP	Resort Related	<Null>	12	1	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	5.2
8651-wMAIN	18218	1/1/1970	DIP	Mountain Protection Area	<Null>	12	5	0	1.25	0.25	3	0.2	4.7	0.35	3.5	0.3	4.15	19.505	54.521314	4	554.7
8266-wMAIN	17844	1/1/1970	ACP	Employment	1	12	1	0	1.25	0.25	0.3	1.4	3.2	1.05	3.5	1.5	6.05	19.36	54.116003	4	716.3
6249-wMAIN	15900	1/1/1970	DIP	Commercial Mixed Use	<Null>	10	2	0	0.75	2.5	0.3	1	4.55	0.35	3.5	0.3	4.15	18.8825	52.781272	4	12.3
95-wMAIN	10052	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	395.7
98-wMAIN	10053	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	156.2
427-wMAIN	10379	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	3	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	308.2
3250-wMAIN	13143	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	160.4
3251-wMAIN	13144	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	106.4
3273-wMAIN	13164	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	3	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	6.8
4490-wMAIN	14328	1/1/1970	ACP	Neighborhood Commercial	<Null>	12	4	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	330.5
4551-wMAIN	14387	1/1/1970	ACP	Neighborhood Commercial	<Null>	12	4	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	613.7
4565-wMAIN	14401	1/1/1970	ACP	Neighborhood Commercial	<Null>	12	4	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	261.0
6442-wMAIN	16083	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	322.2
6443-wMAIN	16084	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	211.5
6697-wMAIN	16329	1/1/1970	ACP	Resort Related Island	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	613.8
7535-wMAIN	17137	1/1/1969	ACP	Resort Related	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	59.1
8257-wMAIN	17835	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	24.1
8331-wMAIN	17906	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	917.5
8337-wMAIN	17911	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	662.8
8338-wMAIN	17912	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	41.2
8339-wMAIN	17913	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	632.6
8352-wMAIN	17920	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	11.8
8353-wMAIN	17921	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	31.0
8354-wMAIN	17922	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	18.1

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
8796-wMAIN	18346	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	122.9
8797-wMAIN	18347	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	5.5
8803-wMAIN	18352	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	653.9
8920-wMAIN	18450	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	2	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	642.8
8929-wMAIN	18459	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	2	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	68.5
9777-wMAIN	19257	1/1/1970	ACP	Neighborhood Commercial	<Null>	12	4	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	212.9
8978-wMAIN	18503	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	763.0
9669-wMAIN	19163	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	331.8
8734-wMAIN	18294	1/1/1970	ACP	Resort Related	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	639.4
6677-wMAIN	16311	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.75	0.3	0.2	3.5	0.35	3.5	1.5	5.35	18.725	52.34102	4	685.7
433-wMAIN	10385	1/1/1970	ACP	Commercial Mixed Use	1	8	3	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	455.9
437-wMAIN	10388	1/1/1970	ACP	Commercial Mixed Use	1	8	3	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	681.5
1012-wMAIN	10961	1/1/1970	ACP	Neighborhood Commercial	1	8	4	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	1662.1
4395-wMAIN	14233	1/1/1970	ACP	Low Density Residential	1	12	4	0.75	0	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	398.2
5011-wMAIN	14830	1/1/1970	ACP	Low Density Residential	1	12	4	0.75	0	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	1239.6
5171-wMAIN	14965	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	439.1
5180-wMAIN	14969	1/1/1970	ACP	Commercial Mixed Use	1	4	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	153.2
6856-wMAIN	16484	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	430.2
6920-wMAIN	16547	1/1/1970	ACP	Open Space and Park	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	457.2
7093-wMAIN	16719	1/1/1970	ACP	Commercial Mixed Use	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	1269.3
7190-wMAIN	16811	1/1/1970	ACP	Commercial Mixed Use	1	4	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	1081.6
7364-wMAIN	16979	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	613.3
7822-wMAIN	17415	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	274.5
7857-wMAIN	17449	1/1/1970	ACP	Open Space and Park	1	8	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	106.5
7958-wMAIN	17549	1/1/1970	ACP	Open Space and Park	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	789.5
7995-wMAIN	17586	1/1/1970	ACP	Commercial Mixed Use	1	8	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	390.9
8028-wMAIN	17619	1/1/1970	ACP	Commercial Mixed Use	1	6	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	5.7
8219-wMAIN	17798	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	746.9
8996-wMAIN	18518	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	770.4
14861-wMAIN	19698	1/1/1970	ACP	Commercial Mixed Use	1	8	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	348.6
14862-wMAIN	19699	1/1/1970	ACP	Commercial Mixed Use	1	8	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	372.7
8901-wMAIN	18436	1/1/1970	ACP	Commercial Mixed Use - Nodal	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	1985.8
6481-wMAIN	16122	1/1/1970	ACP	Resort Related	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	808.6
8976-wMAIN	18501	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	523.7
5404-wMAIN	15167	1/1/1970	ACP	Resort Related	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	624.2
6483-wMAIN	16124	1/1/1970	ACP	Resort Related	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	790.5
6512-wMAIN	16153	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	415.0
7776-wMAIN	17369	1/1/1970	ACP	Resort Related	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	426.0
7431-wMAIN	17039	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	264.5
7431-wMAIN	17039	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	264.5
7431-wMAIN	17039	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	264.5
7431-wMAIN	17039	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	264.5
6600-wMAIN	16235	1/1/1970	ACP	Commercial Mixed Use	1	8	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	657.2
6441-wMAIN	16082	1/1/1970	ACP	Resort Related	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	320.8
8028-wMAIN	17619	1/1/1970	ACP	Commercial Mixed Use	1	6	2	0	0.75	1.75	0.3	0.2	3	1.05	3.5	1.5	6.05	18.15	50.733753	4	5.7
3528-wMAIN	13396	1/1/1970	ACP	Low Density Residential	<Null>	8	3	0.25	0	1.75	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	297.7
3575-wMAIN	13442	1/1/1970	ACP	Low Density Residential	<Null>	6	3	0.25	0	1.75	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	792.6
6793-wMAIN	16421	1/1/1970	ACP	Low Density Residential	<Null>	8	1	0.25	0	1.75	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	1077.6
7102-wMAIN	16728	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	398.1
7546-wMAIN	17148	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	14.3
7705-wMAIN	17301	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	1007.3
7707-wMAIN	17302	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	898.7

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
9163-wMAIN	18684	1/1/1970	ACP	High Density Residential	<Null>	6	3	0.25	0	1.75	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	358.0
14446-wMAIN	19694	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	381.6
6116-wMAIN	15793	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	585.1
7546-wMAIN	17148	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.25	0.3	1	3.3	0.35	3.5	1.5	5.35	17.655	49.350105	4	14.3
154-wMAIN	10108	1/1/1970	ACP	Low Density Residential	<Null>	8	1	0.25	0	2.5	0.3	0.2	3.25	0.35	3.5	1.5	5.35	17.3875	48.602376	4	1043.7
9191-wMAIN	18710	1/1/1970	ACP	Low Density Residential	<Null>	8	2	0.25	0	2.5	0.3	0.2	3.25	0.35	3.5	1.5	5.35	17.3875	48.602376	4	308.3
7331-wMAIN	16949	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	0.25	0.3	1.4	3.2	0.35	3.5	1.5	5.35	17.12	47.854647	4	677.6
6694-wMAIN	16326	1/1/1980	C-900	Resort Related Island	1	10	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	0.9	5.45	16.35	45.702306	4	2135.3
9990-wMAIN	19963	1/1/1970	C-900	Resort Related	1	6	1	0	0.75	1.75	0.3	0.2	3	1.05	3.5	0.9	5.45	16.35	45.702306	4	634.2
76-wMAIN	10033	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	813.3
77-wMAIN	10034	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.7
79-wMAIN	10036	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	299.4
80-wMAIN	10037	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.1
89-wMAIN	10046	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.8
90-wMAIN	10047	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.3
91-wMAIN	10048	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	486.4
92-wMAIN	10049	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	505.9
93-wMAIN	10050	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	249.7
94-wMAIN	10051	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	95.4
147-wMAIN	10101	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	363.1
149-wMAIN	10103	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	770.1
150-wMAIN	10104	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.0
153-wMAIN	10107	1/1/1970	PVC	Employment	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	195.2
185-wMAIN	10138	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.2
186-wMAIN	10139	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	300.3
432-wMAIN	10384	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	475.6
436-wMAIN	10387	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	637.4
498-wMAIN	10449	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	143.7
838-wMAIN	10788	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	246.5
886-wMAIN	10835	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	567.1
887-wMAIN	10836	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	284.9
1001-wMAIN	10950	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	585.2
1032-wMAIN	10981	1/1/1970	ACP	Low Density Residential	<Null>	12	5	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1269.8
1035-wMAIN	10984	1/1/1970	ACP	Low Density Residential	<Null>	12	5	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1208.4
1084-wMAIN	11031	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	816.9
1449-wMAIN	11391	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	507.0
1459-wMAIN	11401	1/1/1970	ACP	High Density Residential	<Null>	12	2	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	818.2
1466-wMAIN	11408	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	309.6
2298-wMAIN	12223	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	610.0
2324-wMAIN	12243	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	430.6
2327-wMAIN	12245	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	578.8
2396-wMAIN	12310	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	15.9
2400-wMAIN	12314	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.2
2402-wMAIN	12316	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.4
2403-wMAIN	12317	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	234.6
2416-wMAIN	12329	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.3
2429-wMAIN	12342	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	281.4
2638-wMAIN	12545	1/1/1970	ACP	Open Space and Park	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	834.3
2941-wMAIN	12846	1/1/1970	ACP	Rural Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6458.6
3206-wMAIN	13101	1/1/1970	ACP	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	351.7
3232-wMAIN	13125	1/1/1970	ACP	Low Density Residential	<Null>	12	5	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1061.5
3248-wMAIN	13141	1/1/1970	PVC	Employment	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	661.8

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
3249-wMAIN	13142	1/1/1970	PVC	Employment	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.2
3265-wMAIN	13156	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6.9
3266-wMAIN	13157	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.1
3267-wMAIN	13158	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.0
3272-wMAIN	13163	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	3.8
3354-wMAIN	13241	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1169.5
3355-wMAIN	13242	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	263.2
3356-wMAIN	13243	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	261.4
3358-wMAIN	13245	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	477.5
3359-wMAIN	13246	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	491.7
3360-wMAIN	13247	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	497.1
3361-wMAIN	13248	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	506.6
3365-wMAIN	13252	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	577.5
3413-wMAIN	13288	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	571.6
3414-wMAIN	13289	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	262.3
3416-wMAIN	13290	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	4.3
3452-wMAIN	13323	1/1/1982	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	90.8
3457-wMAIN	13328	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	25.9
3703-wMAIN	13568	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	253.2
3936-wMAIN	13791	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.0
4117-wMAIN	13970	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.1
4118-wMAIN	13971	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	716.7
4119-wMAIN	13972	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	773.0
4120-wMAIN	13973	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	13.8
4121-wMAIN	13974	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	535.9
4122-wMAIN	13975	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	18.1
4123-wMAIN	13976	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.8
4124-wMAIN	13977	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	390.2
4125-wMAIN	13978	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	404.4
4126-wMAIN	13979	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	383.7
4127-wMAIN	13980	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	165.6
4129-wMAIN	13981	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	318.5
4130-wMAIN	13982	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	608.7
4394-wMAIN	14232	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	15.4
4397-wMAIN	14235	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	14.0
4398-wMAIN	14236	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	440.6
4471-wMAIN	14309	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	531.1
4474-wMAIN	14312	1/1/1970	ACP	Neighborhood Commercial	<Null>	6	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1033.9
4491-wMAIN	14329	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	187.4
4499-wMAIN	14337	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	391.4
4500-wMAIN	14338	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	952.1
4542-wMAIN	14378	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	336.2
4544-wMAIN	14380	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	325.8
4550-wMAIN	14386	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	522.5
4561-wMAIN	14397	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	356.4
4566-wMAIN	14402	1/1/1970	ACP	Neighborhood Commercial	<Null>	6	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	416.0
4584-wMAIN	14420	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	841.8
4687-wMAIN	14521	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6.9
4690-wMAIN	14524	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.2
4699-wMAIN	14533	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.6
4700-wMAIN	14534	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	12.4
4736-wMAIN	14569	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.6

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
4872-wMAIN	14698	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1419.4
4920-wMAIN	14746	1/1/1970	ACP	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	147.7
4954-wMAIN	14774	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.3
5000-wMAIN	14819	1/1/1970	ACP	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.3
5003-wMAIN	14822	1/1/1970	ACP	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	418.7
5004-wMAIN	14823	1/1/1970	PVC	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	2.2
5005-wMAIN	14824	1/1/1970	PVC	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	31.6
5006-wMAIN	14825	1/1/1970	PVC	Low Density Residential	<Null>	12	3	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.7
5117-wMAIN	14921	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	67.7
5119-wMAIN	14922	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1464.8
5143-wMAIN	14943	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	127.0
5295-wMAIN	15075	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	394.6
5307-wMAIN	15083	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	362.2
5407-wMAIN	15170	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	515.7
6034-wMAIN	15718	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	391.9
6078-wMAIN	15759	1/1/1970	ACP	High Density Residential	<Null>	12	1	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	47.0
6079-wMAIN	15760	1/1/1970	ACP	High Density Residential	<Null>	12	1	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	2.9
6093-wMAIN	15774	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.7
6108-wMAIN	15789	1/1/1970	ACP	Employment	<Null>	12	2	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	91.3
6109-wMAIN	15790	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	36.1
6112-wMAIN	15792	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.7
6136-wMAIN	15808	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	20.7
6137-wMAIN	15809	1/1/1970	ACP	Employment	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.1
6246-wMAIN	15897	1/1/1970	ACP	Open Space and Park	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	3084.6
6445-wMAIN	16086	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	2536.9
6478-wMAIN	16119	1/1/1965	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	75.3
6503-wMAIN	16144	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	27.9
6523-wMAIN	16159	1/1/1986	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	679.8
6598-wMAIN	16233	1/1/1970	ACP	Resort	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	95.3
6614-wMAIN	16248	1/1/1970	ACP	Resort Related Island	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	65.9
6621-wMAIN	16255	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	39.7
6639-wMAIN	16273	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	26.0
6640-wMAIN	16274	1/1/1970	ACP	Open Space and Park	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.5
6646-wMAIN	16280	1/1/1970	ACP	Resort Related Island	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.9
6687-wMAIN	16320	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	373.8
6700-wMAIN	16332	1/1/1970	ACP	Resort Related Mainland	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	929.4
6758-wMAIN	16388	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	703.8
6872-wMAIN	16500	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	546.1
6879-wMAIN	16507	1/1/1970	ACP	Open Space and Park	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	588.5
7014-wMAIN	16641	1/1/1974	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	86.0
7092-wMAIN	16718	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	249.8
7094-wMAIN	16720	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	335.6
7104-wMAIN	16730	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	511.7
7115-wMAIN	16740	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	330.1
7133-wMAIN	16756	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	229.4
7140-wMAIN	16763	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	597.4
7147-wMAIN	16770	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	317.8
7151-wMAIN	16774	1/1/1986	ACP	Resort Related	<Null>	10	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	49.5
7153-wMAIN	16776	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	537.0
7185-wMAIN	16806	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	808.9
7277-wMAIN	16897	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	278.6
7279-wMAIN	16899	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	131.6

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
7281-wMAIN	16901	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	484.7
7282-wMAIN	16902	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	264.6
7283-wMAIN	16903	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	14.1
7284-wMAIN	16904	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1273.4
7288-wMAIN	16908	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	10	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	817.5
7310-wMAIN	16929	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	677.3
7316-wMAIN	16935	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	63.4
7319-wMAIN	16938	1/1/1986	PVC	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1275.2
7359-wMAIN	16974	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	280.8
7362-wMAIN	16977	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.5
7363-wMAIN	16978	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	2.3
7365-wMAIN	16980	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.8
7366-wMAIN	16981	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.3
7371-wMAIN	16986	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	419.1
7376-wMAIN	16991	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	543.4
7378-wMAIN	16993	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	22.5
7441-wMAIN	17048	1/1/1976	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	23.9
7469-wMAIN	17071	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	357.8
7514-wMAIN	17116	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.3
7515-wMAIN	17117	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	23.3
7517-wMAIN	17119	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	13.4
7518-wMAIN	17120	1/1/1965	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	83.4
7519-wMAIN	17121	1/1/1974	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	75.7
7524-wMAIN	17126	1/1/1965	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	31.5
7540-wMAIN	17142	1/1/1970	PE	Resort Related	<Null>	2	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	57.4
7559-wMAIN	17161	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	186.6
7603-wMAIN	17205	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	386.0
7643-wMAIN	17245	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	50.5
7645-wMAIN	17247	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	50.3
7648-wMAIN	17250	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7650-wMAIN	17252	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	22.7
7651-wMAIN	17253	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	27.9
7653-wMAIN	17254	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	49.7
7654-wMAIN	17255	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	49.2
7655-wMAIN	17256	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.4
7656-wMAIN	17257	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7657-wMAIN	17258	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.8
7659-wMAIN	17260	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	49.1
7660-wMAIN	17261	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7661-wMAIN	17262	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7662-wMAIN	17263	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	22.1
7664-wMAIN	17264	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7665-wMAIN	17265	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.9
7666-wMAIN	17266	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7667-wMAIN	17267	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	47.7
7671-wMAIN	17270	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.1
7672-wMAIN	17271	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.6
7673-wMAIN	17272	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.9
7674-wMAIN	17273	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.7
7675-wMAIN	17274	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	28.3
7676-wMAIN	17275	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	45.3
7677-wMAIN	17276	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
7680-wMAIN	17278	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.6
7682-wMAIN	17280	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	45.6
7684-wMAIN	17282	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.5
7685-wMAIN	17283	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7686-wMAIN	17284	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.2
7687-wMAIN	17285	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7689-wMAIN	17287	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.2
7692-wMAIN	17289	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7695-wMAIN	17292	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.8
7696-wMAIN	17293	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.7
7733-wMAIN	17328	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	127.2
7738-wMAIN	17333	1/1/1970	ACP	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	99.3
7750-wMAIN	17343	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	89.6
7751-wMAIN	17344	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	30.8
7752-wMAIN	17345	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	26.7
7756-wMAIN	17349	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	54.9
7757-wMAIN	17350	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	51.9
7758-wMAIN	17351	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	50.4
7759-wMAIN	17352	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	51.3
7761-wMAIN	17354	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	90.2
7762-wMAIN	17355	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	35.3
7764-wMAIN	17357	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	55.5
7765-wMAIN	17358	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	57.1
7766-wMAIN	17359	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	55.0
7774-wMAIN	17367	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	302.2
7818-wMAIN	17411	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	503.6
7823-wMAIN	17416	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	119.1
7929-wMAIN	17521	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.2
7935-wMAIN	17527	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	329.3
7940-wMAIN	17531	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	209.8
7941-wMAIN	17532	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	176.4
7943-wMAIN	17534	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	287.2
7944-wMAIN	17535	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	311.0
7945-wMAIN	17536	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	684.7
7946-wMAIN	17537	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.2
7947-wMAIN	17538	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	304.4
7948-wMAIN	17539	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	288.1
7950-wMAIN	17541	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	807.5
7951-wMAIN	17542	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	339.0
7959-wMAIN	17550	1/1/1970	ACP	Open Space and Park	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	418.2
7972-wMAIN	17563	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.7
7973-wMAIN	17564	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	50.4
7974-wMAIN	17565	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.0
7975-wMAIN	17566	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.7
7976-wMAIN	17567	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.2
7977-wMAIN	17568	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	55.5
7978-wMAIN	17569	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	59.0
7979-wMAIN	17570	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	52.5
7982-wMAIN	17573	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6.7
7983-wMAIN	17574	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	52.9
7984-wMAIN	17575	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	52.6
7985-wMAIN	17576	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	64.4

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
7986-wMAIN	17577	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
7987-wMAIN	17578	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	52.5
7991-wMAIN	17582	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	566.6
7994-wMAIN	17585	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	303.9
8071-wMAIN	17662	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	49.1
8097-wMAIN	17688	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	55.8
8120-wMAIN	17703	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	83.9
8138-wMAIN	17720	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	11.9
8167-wMAIN	17748	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	277.5
8189-wMAIN	17768	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.2
8192-wMAIN	17771	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	437.6
8193-wMAIN	17772	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	295.4
8195-wMAIN	17774	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	54.9
8198-wMAIN	17777	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	57.1
8199-wMAIN	17778	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	72.4
8207-wMAIN	17786	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	56.8
8211-wMAIN	17790	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	111.8
8212-wMAIN	17791	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	36.3
8213-wMAIN	17792	1/1/1970	ACP	Commercial Mixed Use	<Null>	10	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	19.4
8216-wMAIN	17795	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	81.0
8235-wMAIN	17814	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	90.4
8236-wMAIN	17815	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	83.0
8237-wMAIN	17816	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.3
8238-wMAIN	17817	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	83.8
8239-wMAIN	17818	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.3
8264-wMAIN	17842	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	66.7
8267-wMAIN	17845	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	19.3
8273-wMAIN	17850	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.8
8274-wMAIN	17851	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	70.9
8275-wMAIN	17852	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.0
8276-wMAIN	17853	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	18.0
8277-wMAIN	17854	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	14.2
8278-wMAIN	17855	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	12.8
8280-wMAIN	17857	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	687.7
8282-wMAIN	17859	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	300.9
8283-wMAIN	17860	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.0
8285-wMAIN	17862	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	14.9
8292-wMAIN	17869	1/1/1970	ACP	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	735.4
8293-wMAIN	17870	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	30.6
8300-wMAIN	17876	1/1/1970	PVC	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	307.7
8301-wMAIN	17877	1/1/1970	PVC	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	184.8
8303-wMAIN	17879	1/1/1970	ACP	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	46.7
8304-wMAIN	17880	1/1/1970	ACP	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	43.0
8310-wMAIN	17886	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	353.8
8311-wMAIN	17887	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	448.7
8312-wMAIN	17888	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	72.3
8313-wMAIN	17889	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	152.7
8314-wMAIN	17890	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	154.0
8318-wMAIN	17893	1/1/1970	ACP	Employment	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	477.9
8319-wMAIN	17894	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	95.2
8321-wMAIN	17896	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	143.7
8323-wMAIN	17898	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	491.5

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
8330-wMAIN	17905	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	85.5
8334-wMAIN	17908	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	88.9
8335-wMAIN	17909	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	64.9
8336-wMAIN	17910	1/1/1970	ACP	Employment	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	13.8
8341-wMAIN	17914	1/1/1970	ACP	Employment	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	437.3
8345-wMAIN	17916	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	417.3
8346-wMAIN	17917	1/1/1970	ACP	Employment	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	58.5
8350-wMAIN	17919	1/1/1970	PVC	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.6
8357-wMAIN	17925	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	585.0
8358-wMAIN	17926	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	183.8
8361-wMAIN	17929	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	32.7
8362-wMAIN	17930	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	29.6
8601-wMAIN	18169	1/1/1970	ACP	Rural Residential	<Null>	10	5	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1701.2
8791-wMAIN	18341	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	303.2
8802-wMAIN	18351	1/1/1973	ACP	Commercial Mixed Use - Nodal	<Null>	10	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	157.9
8842-wMAIN	18383	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	106.9
8907-wMAIN	18442	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	1	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	32.4
8908-wMAIN	18443	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	2	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	305.0
8909-wMAIN	18444	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	430.7
8912-wMAIN	18446	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	2	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	310.0
8915-wMAIN	18447	1/1/1970	ACP	Commercial Mixed Use	<Null>	12	2	0	1.25	1.25	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	274.5
8949-wMAIN	18475	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	378.9
8984-wMAIN	18509	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	269.6
8988-wMAIN	18512	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1138.4
8994-wMAIN	18516	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	214.9
9003-wMAIN	18524	1/1/1970	ACP	Open Space and Park	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	71.5
9006-wMAIN	18527	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6.6
9011-wMAIN	18532	1/1/1970	ACP	Open Space and Park	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	103.2
9020-wMAIN	18541	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	301.2
9022-wMAIN	18543	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	884.3
9023-wMAIN	18544	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1080.7
9030-wMAIN	18551	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	421.7
9034-wMAIN	18555	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1383.0
9154-wMAIN	18675	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	281.6
9194-wMAIN	18713	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	286.3
9311-wMAIN	18829	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	377.2
9386-wMAIN	18901	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	984.5
9387-wMAIN	18902	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	256.5
9404-wMAIN	18919	1/1/1970	ACP	Public/Semi Public	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	832.6
9459-wMAIN	18973	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	265.9
9628-wMAIN	19133	1/1/1970	PVC	Employment	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.6
9632-wMAIN	19136	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	114.0
9757-wMAIN	19237	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.5
9758-wMAIN	19238	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	17.0
9759-wMAIN	19239	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	18.1
9760-wMAIN	19240	1/1/1970	ACP	Neighborhood Commercial	<Null>	8	4	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.6
9773-wMAIN	19253	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	89.2
9774-wMAIN	19254	1/1/1970	ACP	Low Density Residential	<Null>	12	4	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	150.5
9863-wMAIN	19339	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	548.1
9864-wMAIN	19340	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	10.8
9887-wMAIN	19361	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	<Null>	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	14.7
9916-wMAIN	19387	1/1/1970	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	4.9

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
9917-wMAIN	19388	1/1/1969	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.0
9922-wMAIN	19393	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9924-wMAIN	19395	1/1/1972	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.8
9927-wMAIN	19398	1/1/1967	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9928-wMAIN	19399	1/1/1967	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9932-wMAIN	19403	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9934-wMAIN	19405	1/1/1986	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9935-wMAIN	19406	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9936-wMAIN	19407	1/1/1970	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9937-wMAIN	19408	1/1/1970	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9938-wMAIN	19409	1/1/1970	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.9
9948-wMAIN	19419	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.8
9949-wMAIN	19420	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	9.1
9982-wMAIN	19438	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	183.6
10125-wMAIN	19536	1/1/1986	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	30.8
10128-wMAIN	19538	1/1/1970	ACP	Public/Semi Public	<Null>	6	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.0
10970-wMAIN	19566	1/1/1984	ACP	Commercial Mixed Use - Nodal	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	65.9
11773-wMAIN	19569	1/1/1979	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	57.7
13859-wMAIN	19634	1/1/1980	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	73.7
14303-wMAIN	19652	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	453.2
10079-wMAIN	19771	1/1/1986	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1137.4
10618-wMAIN	19798	1/1/1979	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.9
8950-wMAIN	18476	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	392.9
100151-wMAIN	19854	1/1/1980	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	51.3
8876-wMAIN	18411	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	923.1
5415-wMAIN	15178	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	346.0
8975-wMAIN	18500	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	958.9
8786-wMAIN	18337	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	697.4
10557-wMAIN	19788	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	515.6
8756-wMAIN	18311	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	602.5
8775-wMAIN	18327	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1404.6
6479-wMAIN	16120	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	408.3
6505-wMAIN	16146	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	406.5
10554-wMAIN	19785	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	53.0
6510-wMAIN	16151	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	378.5
6517-wMAIN	16158	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	464.7
6498-wMAIN	16139	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	802.8
7267-wMAIN	16887	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	454.8
7799-wMAIN	17392	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	1219.4
7739-wMAIN	17334	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	429.2
10818-wMAIN	19816	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	33.1
10139-wMAIN	19778	1/1/1970	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	6.4
88305-wMAIN	20115	1/1/1984	ACP	Public/Semi Public	<Null>	4	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	16.9
6639-wMAIN	16273	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	26.0
6639-wMAIN	16273	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	26.0
6640-wMAIN	16274	1/1/1970	ACP	Open Space and Park	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.5
6640-wMAIN	16274	1/1/1970	ACP	Open Space and Park	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.5
88695-wMAIN	20074	1/1/1970	ACP	Low Density Residential	<Null>	12	5	0.75	0	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	725.9
7774-wMAIN	17367	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	302.2
6598-wMAIN	16233	1/1/1970	ACP	Resort	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	95.3
6687-wMAIN	16320	1/1/1970	ACP	Open Space and Park	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	373.8
3358-wMAIN	13245	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	2	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	477.5

Table C-2. Distribution

Facility ID	Legacy ID	Install Date	Material	Land Use	Nearby Critical Customers	Diameter (inches)	Zone	COF Diameter Residential	COF Diameter Non-residential	COF Proximity to Transport (Intersection-Mohave County Road Centerline)	COF Parcel Infringement (Intersection-Parcels)	COF Loss of Service to Crit. Facilities (Pipe Class)	COF	LOF Main Breaks (Roughness)	LOF Age (Install Date)	LOF Material	LOF	Total Risk	Normalized Risk	Risk (by Grading)	Length (feet)
8244-wMAIN	17823	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	23.7
94100-wMAIN	20135	1/1/1970	PVC	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.2
6621-wMAIN	16255	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	39.7
94102-wMAIN	20136	1/1/1970	PVC	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	21.5
151805-wMAIN	20245	1/1/1970	ACP	Commercial Mixed Use	<Null>	4	3	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	3.5
7693-wMAIN	17290	1/1/1969	ACP	Resort Related	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	48.9
156608-wMAIN	20254	1/1/1970	ACP	Resort Related	<Null>	4	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.3
8283-wMAIN	17860	1/1/1970	ACP	Commercial Mixed Use	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	7.0
173017-wMAIN	20272	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	22.0
173018-wMAIN	20273	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	10.5
173019-wMAIN	20274	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	22.0
173020-wMAIN	20275	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	55.4
178224-wMAIN	20288	1/1/1970	ACP	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.3
179029-wMAIN	20283	1/1/1970	ACP	Commercial Mixed Use - Nodal	<Null>	10	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	30.3
182629-wMAIN	20571	1/1/1970	PVC	Resort Related	<Null>	6	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	13.5
7514-wMAIN	17116	1/1/1970	ACP	Commercial Mixed Use	<Null>	8	1	0	0.75	1.75	0.3	0.2	3	0.35	3.5	1.5	5.35	16.05	44.863732	4	8.3

ACP = asbetos concrete pipe
COF = consequence of failure
Crit. = critical
DIP = ductile iron pipe
LOF = likelihood of failure
PE = polyethylene
PVC = polyvinyl chloride