CITY OF EAST PALO ALTO WATER SYSTEM ASSET MANAGEMENT PLAN

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Harris & Associates

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ACRONYMS AND ABBREVIATIONS

AC	asbestos cement
AMP	Asset Management Plan
AMSS	Asset Management Software System
ARMP	Asset Register Management Plan
CI	cast iron
CIP	Capital Improvement Program
City	City of East Palo Alto
County	San Mateo County
CU	copper
DC	double-check valve backflow prevention assembly
DCDA	double-check detector backflow prevention assembly
DDW	California State Water Resources Control Board Division of Drinking Water
GAL	galvanized
GIS	geographic information system
GPS	Global Positioning System
KPI	key performance indicator
LOS	level of service
O&M	operations and maintenance
PHD	peak-hour demand
PL	plastic
PRV	pressure-regulating valve
PVB	pressure vacuum breaker backsiphonage prevention assembly
PVC	polyvinyl chloride
RPBA	reduced-pressure principle backflow prevention assembly
RPDA	reduced-pressure principle detector backflow prevention assembly
SFPUC	San Francisco Public Utilities Commission
SOP	standard operating procedure
SVB	spill-resistant pressure vacuum breaker backsiphonage prevention assembly
USC	University of Southern California
WSMP	Water System Master Plan

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1 INTRODUCTION

1.1 WATER SYSTEM DESCRIPTION

The City of East Palo Alto (City) is located in the San Francisco Bay Area on the San Francisco Peninsula. The City covers 2.5 square miles and has a population of over 25,000 residents.

The City is the primary water provider within the City limits. The City provides water to approximately 4,000 residential, commercial, industrial, and governmental customers. Small areas within the City boundaries are served by the O'Connor Tract Cooperative Water Company and the Palo Alto Park Mutual Water Company.

The City's primary water source is treated water provided by the San Francisco Public Utilities Commission (SFPUC). The water is supplied via three connections to Hetch Hetchy Water System. A groundwater well located at the intersection of Bay Road and Gloria Way in the City is the only other source of water. Groundwater is treated at the well site. The City operates and maintains over 66 miles of pipe, as well as a groundwater well and a water treatment facility. The City does not currently have any water storage tanks.

The City operates the water system under State Water Resources Control Board, Division of Drinking Water (DDW) Permit Number 02-17-20P-4110024, dated January 30, 2020 (Permit).

The Permit addresses operating requirements categorized as General; Gloria Way Well Treatment Plant Operations, Monitoring, and Reporting; Distribution System Water Quality Monitoring; Operations and Maintenance (O&M); and Asset Management and Capital Improvement Planning. This Asset Management Plan (AMP) addresses Requirement Number 26 under the last category.

1.2 PURPOSE OF THE ASSET MANAGEMENT PLAN

The AMP is a strategic plan that combines multi-disciplinary management techniques (including technical and financial) to determine best practices for operating, maintaining, and replacing assets over the life cycle of the asset in the most cost-effective manner to provide the agreed level of service (LOS).

The AMP provides visibility of the costs and benefits associated with providing the agreed LOS with the intent to minimize the whole life cycle cost for operating, maintaining, and replacing assets.

The City's Capital Improvement Program (CIP) includes projects to replace existing assets and projects to construct new assets or upgrade existing assets.

The AMP describes the risk-based asset management approach to planning the replacement of existing assets. The approach considers the criticality of each asset and the condition of each asset. Those assets whose failure would have the greatest adverse consequences and that are in the poorest condition and more likely to fail are prioritized for replacement.

The AMP describes the processes for determining and prioritizing new assets or upgrading existing assets to meet water demands of future development, as well as other requirements, including water storage, as part of a Water System Master Plan.

The implementation of the AMP provides a strong foundation for making wise financial decisions about how to operate, manage, and improve the water system. As the amount of asset information becomes available to staff, the staff's ability to prioritize investments in the water distribution system improves.

1.3 ASSET MANAGEMENT PLAN ORGANIZATION

This AMP includes the following:

- **Chapter 2: Asset Register Management Plan (ARMP).** The chapter describes the process of identifying and collecting data for each asset (Appendix A, Asset Register Management Plan).
- **Chapter 3: Operational and Maintenance Requirements.** The chapter describes and documents the operational and maintenance requirements (including the requirements to comply with all permit requirements; federal, state, and local regulations; and industry best practices) necessary to provide the agreed LOS. It also describes the process for identifying the operational and maintenance data to be collected for each asset.
- **Chapters 4: Asset Replacement Planning.** The chapter lays the foundation for collection of asset condition data and the analyses that will ultimately provide a more cost-effective approach to planning for asset replacement.
- **Chapter 5: Level of Service:** The chapter describes the process for developing the water utility's LOS by examining the numerous services and activities performed for its stakeholders, including its customers and employees.
- **Chapter 6: Capital Improvement Program.** This chapter describes the development of the CIP, including the funding of projects.

2 ASSET REGISTER MANAGEMENT PLAN

2.1 PURPOSE

The chapter describes the plan to improve, maintain, and manage the asset register. The asset register is complete inventory of water system assets and all relevant information about each asset.

The asset register is maintained in a commercially available asset management software system.

Understanding the number, type, and condition of assets is a key building block to an overall AMP. The asset register is the basis for gaining that understanding. It includes the entire data set related to the City's water assets—a detailed list of all the City's water assets and key data associated with each asset, including maintenance data.

2.2 CONTENT

The ARMP provides guidance to ensure the following is consistent throughout all facilities:

- Standard definitions for assets and the different ways they are handled
- Standard format for the asset register, including descriptions for assets entered into the appropriate fields in the asset register
- Standard definitions for assets and hierarchical positions
- Standard naming conventions and definitions for asset types, including a list of asset types provided by the City and implemented into the asset register
- Standard definitions for the attribute information collected for each asset type
- Standard process to develop and update the asset register

2.3 ASSET MANAGEMENT SOFTWARE SYSTEM

The asset register is maintained in a commercially available asset management software system. All data shall be transferrable to other commercially available asset management systems.

Multiple software systems may be used to maintain and operate the water system. For example, separate software may be used for asset management, a customer billing, and water quality reporting. Data from all software systems shall be transferrable to the asset management software system. See Appendix B for Asset Register Standard Format.

The asset management software system shall be able to create custom reports. Reports allow the City to verify that assets are being operated and maintained in accordance with contract and permit requirements, as well as industry standards.

2.4 QUALITY CONTROL

Quality control is a key component of the AMP. The asset register is only as good as the reliability of the information in the database. The quality control processes ensure they meet the following objectives:

- Verify current asset inventory information maintained by the City
- Identify missing assets
- Identify assets no longer in service
- Collect missing relevant asset attributes

3 OPERATIONAL AND MAINTENANCE REQUIREMENTS

3.1 PURPOSE

The chapter describes the operational and maintenance requirements for each asset class and type necessary to provide the agreed LOS in the most cost-effective manner. Those requirements shall never fall below the requirements required by federal, state, or local laws, regulations, codes, and permits.

The requirements determine the operational and maintenance activities of each asset class and/or type.

Each asset may have one or more operational requirement and maintenance requirement. As part of the asset management, the operational and maintenance requirements for each are identified.

The purpose of these operational and maintenance requirements is to communicate the expected approach and guidelines to manage specific water-related asset categories. For each asset type, the following information is provided:

- **Operational Requirements:** This provides minimum operating conditions for each type of asset to meet or exceed the agreed LOS. When an asset fails the operational requirements, it must be repaired or replaced.
- **Maintenance Requirements:** This provides minimum maintenance requirements for each type of asset to meet or exceed the agreed LOS.
- **Life Expectancy**: When an asset can no longer meet the operational requirements, it will be repaired and returned to operational effectiveness. If it cannot be repaired, it will be determined to have reached its end-of-life, either structurally or operationally, and will be replaced. If there are additional criteria for determining an asset is at its end-of-life, those criteria are included in the sections below.

3.2 WATER METERS

Water meters are an active asset meant to meter volumes of water over a wide range of flows. They are an essential element for the assessment and collection of water revenues, as well as rate making, loss control (leakage), and conservation. Unfortunately, meters are mechanical in nature and typically lose their sensitivity over time, thus failing to accurately monitor water consumption. Meters that are not functioning properly tend to under-register water usage, although it is not unheard of for a meter to over-register water usage.

Although meters have been historically monitored through manual “readings” of the meters themselves, recent advances in technology have introduced meters that electronically communicate water usage. This saves significant labor resources with respect to meter reading. It also allows for real-time alerts where there are probably leaks. Thus, utilities can monitor customer usage more closely and detect issues that may be occurring on the system or on the customer’s property (on the customer side of the meter).

A large part of utility revenue depends on meter accuracy. Small changes in meter accuracy can translate into thousands of dollars of revenue. Additionally, newer "smart" meters greatly improve the speed at which leaks can be detected, which is an important consideration in water conservation. Finally, smart meters save significant labor costs related to reading meters.

Due to these benefits, the City plans to replace all non-Neptune meters with Neptune meters over the next three years. The City also plans to enact a program to replace meters on a 15- to 20-year cycle, depending on the Neptune meter performance.

These operational and maintenance requirements provide the policy for maintenance, calibration, and analysis that will ultimately determine the replacement of water meters.

3.2.1 OPERATIONAL REQUIREMENTS

Minimum daily operational requirements of water meters are as follows:

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the water main
- Maintain accurate metering/measuring over a wide range of flows for the given size and type of meter in accordance with American Water Works Association Manual M6, Water Meters – Selection, Installation, Testing, and Maintenance

3.2.2 MAINTENANCE REQUIREMENTS

Water meters tend to wear and/or accumulate deposits and, thus, require regular maintenance to ensure that they meet daily operational requirements. Maintenance activities occur when data indicates that the meter has stopped working (zero read) or is inaccurately metering consumption (over-registering or under-registering). While large changes in meter readings may raise a red flag, periodic meter calibration/testing is also required to determine accuracy.

Record keeping of customer billing complaints, calibration/testing results, meter replacement, and O&M activities is integral to an effective maintenance program. The following records will be maintained:

- Customer complaints related to meter accuracy and billing issues. Each customer complaint will be associated with the water meter serving the customer. The complaint will also show actions taken to address the customer's complaint.
- Meter replacements. The asset data will also be updated with appropriate information about the new meter (e.g., date of replacement, manufacturer, account/meter number).
- Maintenance actions performed on the meter to bring the meter into compliance with accuracy standards.

Meter maintenance consists of finding meters that have stopped registering, have become highly inaccurate, or through a regular meter testing program have been found to be inaccurate. Per Neptune Technology:

> *The only way to determine whether a specific meter is operating efficiently is to test it. Establishing a meter maintenance program is recommended for all utilities. In a utility, large meters move the most water, so they in turn generate the most revenue. Maintaining the accuracy of these meters means maintaining or improving revenue for the utility.*[1]

The Bay Area Water Supply & Conservation Agency provides meter testing to member agencies. The American Water Works Association (Manual M6) recommends the following testing frequency:

- **Intermediate Meters:** Medium-sized meters measuring 1.5 and two inches should be tested for accuracy on a five-year rotating basis. When meters are removed based on age, 10 percent of removed meters will be tested for accuracy to validate the assumed meter life cycle.

- **Large Meters:** Large meters measuring greater than two inches should be tested for accuracy on an annual basis. When a significant statistical profile of meter accuracy is attained, the rate of testing per year can be adjusted.

All tested meters shall conform to the low-, medium-, and high-flow accuracy test limits given in the latest edition of American Water Works Association Manual M6.

3.2.3 LIFE EXPECTANCY

Small Meters: Small meters will be replaced on a 20-year cycle.

Intermediate Meters: Intermediate meters will be rebuilt or replaced on a 20-year cycle.

Large Meters: Large meters will be rebuilt or replaced when found to be metering outside of accepted metering accuracy.

3.3 PIPES AND FITTINGS

The City's existing distribution system is a network of pipes and fittings connecting the pipes. The pipes and fittings are tracked as separate asset classes; however, the maintenance and operation requirements are similar.

3.3.1 OPERATIONAL REQUIREMENTS

Water mains are a passive type asset meant to convey safe water by maintaining sufficient dynamic pressure from the source elevation to the discharge elevations. Daily water main operational requirements are as follows:

[1] Neptune Technology Group. 2016. HP Turbine Field Testing Guide. Accessed December 2021. https://www.neptunetg.com/globalassets/products/literature/publication_ft-hp-turbine-01.16.pdf.

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the water main
- Meet minimum pressure requirements during peak-hour demand (PHD) and fire flow demand
- Meet minimum flow requirements during PHD and fire flow demand
- Do not degrade water quality in the daily conveyance of water

3.3.2 MAINTENANCE REQUIREMENTS

Although water mains are passive assets, they require regular maintenance to ensure that they meet daily operational requirements. Water quality flushing and, as appropriate, uni-directional flushing are performed as part of its regular maintenance program.

Water Quality Flushing: Flushing mains to eliminate taste and odor issues:

- Water mains with low flows and dead-end mains are susceptible to taste and odor issues. These issues generate customer complaints, which in time erode customer confidence in the provider and may also be precursor events to disinfection by-product violations or bacterial outbreaks. Water quality flushing on a regular basis to maintain a detectable chlorine residual will prevent these issues.
- Monitoring known low-flow areas and dead-end mains for customer complaints of taste and odor, as well as areas of known and potential bacteriological issues, will be performed. Water quality flushing will be performed in low-flow areas and dead-end mains at intervals to minimize customer complaints, maintain detectable chlorine residuals, and prevent bacteriological issues from arising. Flushing intervals will depend on customer sensitivity, seasonal variations, water temperature, seasonal flow, and age and cleanliness of the water main. The City may consider the installation and use of automated flushing valves in lieu of manual flushing operations.

Uni-Directional Flushing: Flushing mains with high-velocity water scouring to remove sediment, biofilm, and rust:

- Uni-directional flushing creates a high-velocity scouring flow in a single length of pipe to remove sediment, biofilm, and rust that contribute heavily to long-term taste and odor issues and bacteriological issues. Conducting uni-directional flushing will reduce the number of customer complaints, improve the carrying capacity of the main, and cut down on the amount of water quality flushing that must be performed. Because uni-directional flushing requires isolation of lengthy sections of pipe, it can be coordinated with the City's valve exercising program.
- Uni-directional flushing on all of its mains four inches and larger will be performed at an interval no greater than once every five years. The interval may be increased or

decreased based on customer complaints, taste and odor issues, changes in bacteriological incidents, and rates of water quality flushing.

- A no discharge elimination system may be used to return flush water to the system after filtering and disinfecting.

Record keeping of customer complaints, water quality sampling, O&M activities, and photographs of the pipe is integral to an effective maintenance program. The following records will be maintained:

- Customer complaints related to taste and odor, water quality, pressure, and flow. Each customer complaint will be associated with the service line and the water main serving the customer. The complaint will also show actions taken by the City to address the customer's complaint.
- Water quality sampling. Samples will be associated with the water main from which each sample is collected, and the test results will become part of the water main record. Water quality samples will include those for following up on routine customer complaints, regulator-required water quality sampling, and routine chlorine residual testing.
- All maintenance activities performed on the water main. This includes water quality flushing to address taste, odor, and low chlorine residuals in dead-end mains or low-demand areas of the system, as well as uni-directional flushing for scouring water mains of accumulated sediment and biofilm. The City shall collect the following information when repairing a water main break:
    - Location of the break
    - Type of break – longitudinal, circumferential, joint separation, or construction
    - Pipe construction material
    - Condition of exterior pipe coating, if present
    - Pitting depth on exterior of pipe
    - If interior of the pipe is visible:
        - Condition of interior pipe lining, if present
        - Visible pitting or corrosion
        - Pipe wall thickness
- Pictures of the exterior and interior of the pipe and pipe break.

3.3.3 LIFE EXPECTANCY

Operational Life Expectancy

Operational life expectancy of a water main is a factor of pipe size (diameter), length, internal roughness, and the demands placed on the water main. The water main in the City is assumed to be at the end of its operational life if it is unable to meet the following:

- Minimum pressure requirements for PHD or fire flow demand
- Minimum flow requirements for PHD for fire flow demand

Water mains falling into one or both of the above categories shall be added to the CIP for rehabilitation or replacement.

Structural Life Expectancy

Structural life expectancy of a water main highly depends on the pipe construction materials, pressures exerted on the pipe over its lifetime, corrosivity of soils, corrosivity of water, and original construction conditions (particularly underlayment). The following categories determine water main life expectancy in the City:

- **Water Main Breaks:** A water main break shall be considered a structural main break when the main experiences a longitudinal or circumferential break of the pipe wall or the joint between two sections of pipe has separated. Breaks as a result of tap failures or external construction activities (excavations, drilling, and borings) shall not be counted as breaks related to the structural life of the water main.
- **Water Main Leak:** A water main leak shall be considered a structural leak when (1) the main experiences a leak through the side wall of the pipe as a result of failure of the seal at the joint between two sections of pipe, or (2) corrosion either internally or externally has compromised the wall of the pipe. Leaks as a result of tap failures or external construction activities (excavations, drilling, and borings) shall not be counted as leaks related to the structural life of the water main.

A water main shall be considered at its end of structural life and will receive an enhanced condition assessment to estimate the remaining life of the water main when it experiences either of the following:

- More than seven structural breaks per mile since installation
- Five structural breaks per mile in the past 10 years

Design Life Expectancy

Pipe at its engineered end-of-life is at the end of its design life but may or may not be at operational or structural end-of-life. The typical design life of a pipe installed on the City's water system is shown in Table 3-1.

TABLE 3-1. PIPE DESIGN LIFE

Type	Design Life (Years)	80% Life (Years)
CI	100	80
AC	75	60
PVC	125	100

Notes: AC = asbestos cement; CI = cast iron; PVC = polyvinyl chloride

A water main at 80 percent of its design life shall receive an enhanced condition assessment to determine the remaining life of the water main.

3.4 VALVES

Valves are commonly used to direct flow, shut off water access, prevent backflow, and adjust water pressure within a system.

3.4.1 OPERATIONAL REQUIREMENTS

Valves are an active type asset meant to regulate the flow of water while containing the developed static head of the water. Daily operational requirements of valves are as follows:

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system.
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the valve.
- Continue to operate through the full spectrum of its intended purpose:
    - **Gate valves** are intended to be used in a fully open or fully closed position and very rarely as flow regulators for short durations. In the fully open position, a gate valve will not hinder water flow and, in the fully closed position, will remain watertight.
    - **Pressure Reducing Valves** reduce incoming water pressure to a lower predetermined water pressure.
    - **Butterfly, ball,** and **check valves** will be added to these operational and maintenance requirements as they are added to or found to exist on the system.
- Do not degrade water quality in the daily conveyance of water.

3.4.2 MAINTENANCE REQUIREMENTS

Valves are active assets that require regular maintenance to ensure that they meet operational requirements.

Valve Exercising Program

The role of a system isolation valve is to be in a standby ready position in the event of a water main break, maintenance, or other event requiring that a section of water main be isolated from the rest of the system. To ensure that all system isolation valves are available and in a standby ready

position, each valve will be exercised at least once in a one-year period. All preventive maintenance data shall be collected when the valve is exercised.

The role of a PRV on the City's system is to reduce the static water pressure from the City's water system into two neighboring water districts. The valves can be expected to operate only when an emergency source of supply is needed from the City to the neighboring water districts. PRVs at the turnouts will be serviced weekly and at interties weekly, and interties will be exercised at least once per year. All preventive maintenance, which includes rebuilding the PRV, shall be performed every four years or as required.

Record Keeping

Record keeping of O&M activities is integral to an effective maintenance program. The following records will be maintained:

- All preventive maintenance activities performed on the valve. Typically, each system isolation valve is visited at least once during a set period to exercise the valve from a fully open position to a fully closed position and back to a fully open position. When preventive maintenance is performed, the City shall verify the asset location and note the condition of the valve box, any leakage from the stuffing box or valve body, the number of turns to close the valve, the direction of valve closure, and any other unusual conditions.

- All corrective maintenance activities performed on the valve. When corrective maintenance is called for on a system isolation valve or a PRV, the City shall document the extent of the corrective maintenance, note the valve's condition (internally and externally, when possible), collect a visual record, and collect or reaffirm asset attribute information.

3.4.3 LIFE EXPECTANCY

Life expectancy of a valve is based on the continuing ability of the valve to meet its expected role on the system. At any time, if a valve cannot meet its expected role and corrective maintenance is unlikely to address the issue, the valve shall be considered at its end-of-life and shall be replaced. More specifically, a valve shall be replaced if:

- The valve cannot meet its expected role, and replacement parts are not available.

- The valve has a damaged body or flanges.

- The water main adjacent to the valve is replaced.

3.5 BACKFLOW DEVICES

Chapter 15.44 of the City's Municipal Code provides for the regulations for backflow prevention and cross-connection control. The City has a contract with the San Mateo County Environmental Health Services Division to implement a Cross-Connection Control Program, including compliance with required program personnel certifications; surveying of residential, industrial, and commercial use facilities for potential cross-connection hazards; designation of appropriate backflow preventers; requirements for testers and testing of backflow prevention assemblies; and maintenance of records.

The State of California and the San Mateo County Health Department recognize the need to protect public health on a water system through implementation of a Cross-Connection Control Program. Based on the degree of hazard to the premise being served, a backflow prevention assembly may be required. The state and the County regulate the following devices:

- Double-check valve backflow prevention assembly (DC)
- Double-check detector backflow prevention assembly (DCDA)
- Pressure vacuum breaker backsiphonage prevention assembly (PVB)
- Reduced-pressure principle backflow prevention assembly (RPBA)
- Reduced-pressure principle detector backflow prevention assembly (RPDA)
- Spill-resistant pressure vacuum breaker backsiphonage prevention assembly (SVB)

3.5.1 OPERATIONAL REQUIREMENTS

Backflow devices are an active type asset meant to prevent the entry of non-potable waters into the water system. Daily operational requirements of backflow devices are as follows:

- Prevent the entry of non-potable water into the water system via either backsiphonage or backpressure or both
- Provide water service to the customer up to the device's rated flow with a minimum of static pressure head loss

At the time of a new water service connection, the City is required to determine if a backflow prevention assembly is required. This determination is made by a licensed cross-connection specialist either employed by or contracted to the City.

The premise owner is responsible for the ongoing O&M of the backflow prevention assembly. The San Mateo County Health Department will notify the premise owner of the need to test the device annually by a certified backflow prevention tester. Devices that fail a test have 30 days to be corrected and to pass the test. Devices that fail and are not on the University of Southern California (USC)-approved device list must be replaced.

3.5.2 MAINTENANCE REQUIREMENTS

The backflow device owner is responsible for maintaining the backflow device. The San Mateo County Health Department issues notices for device testing. The backflow device owner is responsible for repair or replacement when a device fails the annual test. Devices that fail the test and are no longer on the USC-approved device list must be replaced.

Backflow device data, including corresponding account/location data, device type, installation date, and testing results, will be collected and maintained, as well as a current list of the USC-approved device list. The City will work with the County when devices are out of compliance or need testing.

3.5.3 LIFE EXPECTANCY

Backflow devices are considered to have reached their end-of-life when they fail certification and cannot be repaired or are not on the USC-approved device list. The premise owner is responsible for replacing these devices.

3.6 HYDRANTS

A fire hydrant is a connection point by which firefighters can tap into a water supply. A sufficient number of fire hydrants that are served by sufficient water pressure provide a critical component of fire protection to a community.

3.6.1 OPERATIONAL REQUIREMENTS

Hydrants are an active type asset meant to provide access points to the system for high volumes of water without significant static head loss. Daily operational requirements of hydrants are as follows:

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system.
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the hydrant.
- Continue to operate through the full spectrum of its intended purpose. Most importantly, hydrants need to provide rapid and reliable water access points for firefighting equipment.

3.6.2 MAINTENANCE REQUIREMENTS

Hydrants require regular maintenance to ensure that they meet operational requirements. Hydrants will be exercised at least once per year. All preventive maintenance data shall be collected when the hydrant is exercised.

Record Keeping

Record keeping of O&M activities is integral to an effective maintenance program. The following records will be maintained:

- All preventive maintenance activities performed on the hydrant. Typically, each hydrant is visited at least annually to exercise the hydrant from a fully closed position to a fully open position and returned to a fully closed position. When preventive maintenance is performed, the City shall collect and record the following:
    - The location of the hydrant and its associated auxiliary valve
    - The condition of the hydrant and auxiliary valve

  - Notes on any leakage from the hydrant or auxiliary valve body
  - The number of ports, the size of the ports, and any other unusual conditions

- All corrective maintenance activities performed on the hydrant. The City shall document the extent of the corrective maintenance, note the hydrant condition (internally and externally, when possible), collect a visual record, and collect or reaffirm hydrant asset attribute information.

3.6.3 LIFE EXPECTANCY

Any hydrant that has a damaged body or flanges shall be considered at its end-of-life and shall be replaced.

A fire hydrant shall be considered to be at the end-of-life if the hydrant needs repair and parts are no longer available.

If the water main serving the hydrant is replaced, the hydrant shall be replaced with a new hydrant at that time.

3.7 TREATMENT WORKS INCLUDING WELL

The Gloria Way Well produces water with relatively high levels of iron and manganese. Treatment consists of iron and manganese removal via chlorination and pyrolusite media filtration, chloramination using ammonia addition, corrosion control by means of sodium hydroxide addition for pH management, and blending of well water with purchased surface water.

3.7.1 OPERATIONAL REQUIREMENTS

Wells are a passive type asset meant to provide a conduit for the extraction of water from an aquifer. The water may meet drinking water standards or may require further treatment to meet drinking water standards. Daily operational requirements of wells are as follows:

- Remain structurally intact over its full length, holding back surrounding soil pressure while simultaneously allowing groundwater to flow in from the aquifer with minimum sand and sediment
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the well
- Continue to operate through the full spectrum of its intended purpose

If, at any time, these conditions are not being met, the well will need additional maintenance or will be considered to have reached its end-of-life, either structurally or operationally.

3.7.2 MAINTENANCE REQUIREMENTS

Wells are passive assets that require regular maintenance to ensure that they meet operational requirements.

Water Quality Station Maintenance Program

The role of a well is to provide a conduit from the ground surface to an aquifer for the extraction of groundwater.

The following maintenance shall be performed to ensure that a well continues to perform as intended:

Quarterly:

- Inspect the integrity of the sanitary seal of the well
- Inspect the surrounding area around the well within a 100-foot radius for possible sources of contamination

Every 10 years:

- Inspect the full length of the well with a down-hole camera and perform a full well inspection

If, at any time, the well experiences the following, the well should be inspected and guidance should be sought from well drilling and maintenance experts:

- A 25 percent or more decrease in well yield
- A decreased pumping rate
- A decreased groundwater level
- A decreased specific capacity
- An increase in sand or sediment content in the water
- A decreased well water depth (recharge rate)

3.8 WATER SAMPLING STATION

The role of a water sampling station is a sampling station that is used to provide daily or weekly representative water samples from the water system.

3.8.1 OPERATIONAL REQUIREMENTS

Water sampling stations are a passive type asset meant to provide access points to the system for collecting water sampling samples. Daily operational requirements of water sampling stations are as follows:

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system.
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the station.
- Continue to operate through the full spectrum of its intended purpose. Most importantly, water sampling stations need to provide representative water samples from the system.

3.8.2 MAINTENANCE REQUIREMENTS

To ensure that stations are providing representative water samples, the stations will be maintained at intervals contingent on the water quality of the system. For example, the maintenance interval of a station depends on the biofilm accumulation on the service line; deposition of calcium, manganese, and rust; insect control; and a host of issues unique to each station. The stations will be maintained at an interval that will ensure that each station is providing samples representative of water in the main.

Record keeping of O&M activities is integral to an effective maintenance program. The following records will be maintained:

- All preventive maintenance activities performed on the water quality station. Typically, each station is visited at least once during a set period to flush the station, exercise valves, sanitize the station, and note any deficiencies. When preventive maintenance is performed, the City shall verify the location of the stations and note the condition of the station.
- All corrective maintenance activities performed on the water quality station. When corrective maintenance is called for on water quality stations, the City shall document the extent of the corrective maintenance, note the stations' condition (internally and externally, when possible), collect a visual record, and collect or reaffirm asset attribute information.

3.8.3 LIFE EXPECTANCY

In the event that the water main serving the station is replaced, the station shall be replaced with a new station at that time.

3.9 GENERATORS

Generators are used for emergency power. One emergency generator is located at the Gloria Way Well.

3.9.1 OPERATIONAL REQUIREMENTS

Generators are an active type asset meant to provide emergency backup power to essential equipment operating during periods of power outages. Daily operational requirements of generators are as follows:

- Provide ready standby power at rated voltage and amperage of the generator
- While operating, meet air pollution requirements
- Continue to operate through the full spectrum of its intended purpose as a Type M, Class 48, Level 2, generator in accordance with National Fire Protection Association 110 Standard for Emergency and Standby Power Systems

3.9.2 MAINTENANCE REQUIREMENTS

Maintenance activities will include the following:

- Operate the generator for at least one hour each week.
- Load test the generator at least once per month and perform basic fuel, oil, power output, and general condition inspection.
- Annually, perform oil and oil filter change, coolant change, battery test and replacement (if necessary), transfer switch inspection, and fuel and air filter change. Perform this maintenance more often, as necessary, if manufacturer requirements are more stringent.

Record keeping of O&M activities is integral to an effective maintenance program. The following records will be maintained:

- All preventive maintenance activities performed on the generator. Typically, each generator is run once per week for a minimum of one hour. At least once per month, the generator is physically inspected for fuel quantities, oil levels, power output, and general condition. When preventive maintenance is performed, the City shall collect run time, fuel and oil usage, power output, and any other unusual conditions.
- All corrective maintenance activities performed on the generator. When corrective maintenance is performed on a generator, the City shall document the extent of the corrective maintenance, note the generator's condition (internally and externally, when possible), and collect or reaffirm asset attribute information.

3.9.3 LIFE EXPECTANCY

The typical life span of a diesel generator is between 12,000 hours and 20,000 hours. For most water systems, this in usually in the range of 25 to 30 years, and a generator will typically age out before reaching 12,000–20,000 hours of use.

Any generator that needs corrective maintenance that would cost over 60 percent of the remaining life of the generator shall be considered at its end-of-life and shall be replaced.

It is recommended that the automatic transfer switch be replaced when the emergency generator is replaced.

3.10 PUMPS

A pump is a mechanical device used for raising or circulating water. The City currently has three types of pumps at the Gloria Way Well. The well pump pumps water from the aquifer to the treatment facility. Two decanting pumps return backwash water through the filtration system to the blending tanks. Three variable frequency pumps pump water from the treatment facility into the distribution system.

3.10.1 OPERATIONAL REQUIREMENTS

Pumps are an active type asset meant to move water in the treatment facility. Daily operational requirements of pumps are as follows:

- Remain structurally intact at maximum operating pressures and occasional pressure transients experienced on the system
- Remain structurally intact against the corrosive nature of water or against the corrosive nature of soils surrounding the pump, if applicable
- Continue to operate through the full spectrum of its intended purpose

3.10.2 MAINTENANCE REQUIREMENTS

Pumps are active assets that require regular maintenance to ensure that they meet operational requirements.

The role of a pump is to be available to move water at the treatment facility.

Record keeping of O&M activities is integral to an effective maintenance program. The following records will be maintained:

- All preventive maintenance activities performed on the pumps. Pumps can be operated on regular schedules or on an as-needed basis to move water at the treatment facility.
- All corrective maintenance activities performed on the pumps. All corrective maintenance shall be documented.

3.10.3 LIFE EXPECTANCY

The life expectancy of a pump is dependent on its type and usage.

3.11 CUSTOMERS

3.11.1 OPERATIONAL REQUIREMENTS

Customers are endpoint users of water on the system. Customers withdraw (purchase) water from the system and use it for their own purposes. The water is then disposed of through sanitary means. Daily operational requirements of customers are as follows:

- Provide adequate volumes of high-quality water to meet customers' needs.
- Allow customers to withdraw water from the system and do not allow water from the customers' premises back into the water system. The City also provides adequate positive pressure on the system to ensure that water does not backflow from the customers' premises to the water system.

- Meter and bill customer water usage from the system.
- Monitor customer usage and promote efficient usage of water through conservation programs.

3.11.2 MAINTENANCE REQUIREMENTS

Customers are not assets in the physical sense of requiring repair or replacement. Maintenance as follows is required to ensure that services are provided to customers:

- A rate structure to adequately cover the cost of operating and maintaining the water system
- Customer billing system to collect revenue from the sale of water to customers
- Cross-Connection Control Program with its customers
- Water conservation program
- Program to monitor customer complaints with documentation of how the complaint was addressed

The following records will be maintained:

- Land use type for each customer, meter read data, billing data, customer complaints, and backflow prevention requirements

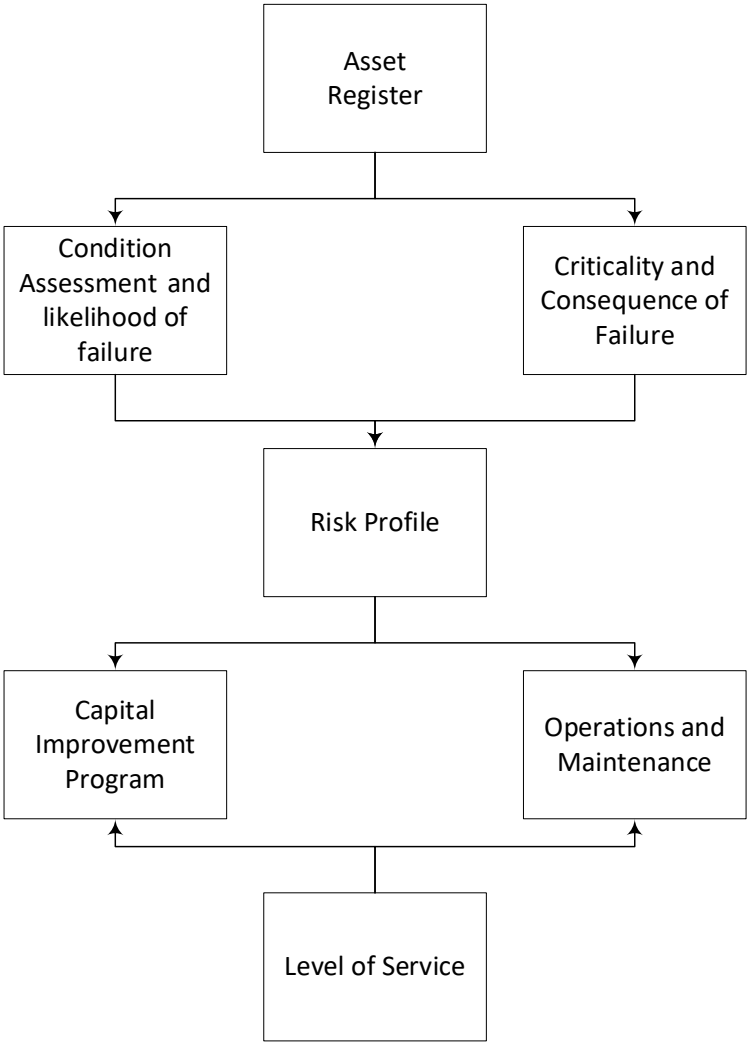
4 ASSET REPLACEMENT PLANNING

4.1 PURPOSE

The chapter describes the risk-based approach to asset replacement planning. The approach focuses on the following: (1) the condition of an asset and its likelihood to fail and (2) the gravity of the consequences of the asset failure, referred to as criticality. Each asset receives a score for condition and criticality based on a scoring criterion. Those scores are combined to establish the asset risk profile score. With limited funding available, the replacement of assets with the greatest risk profile score are prioritized.

The process can be used to focus maintenance efforts, as well as prioritize capital improvement projects.

FIGURE 4-1. RISK-BASED APPROACH TO ASSET REPLACEMENT PLANNING



4.2 ASSET CONDITION ASSESSMENT

Asset condition assessment is an assessment of each asset's likelihood to fail. The asset condition assessment results in an asset condition score for each asset.

A condition assessment scoring criteria are developed for each asset class or type. Assets that have failed or are in extremely poor condition receive higher scores.

Defining failure is an important part of the condition assessment process. Failure may be defined in terms of the asset's physical integrity or failing to meet operational requirements.

Appendix C, Collection of Asset Condition Data Standard Operating Procedures (SOP), describes SOPs for collecting and storing asset condition data. The SOP lays out what data is to be collected by asset type. Remaining useful service life data may be indicative of when an asset may fail.

An asset may be replaced if the producer is no longer fabricating replacement parts or supporting the project.

4.3 ASSET CRITICALITY ASSESSMENT

Criticality looks at the consequences of an asset failure. Criticality is used to determine the relative importance of an asset in relation to other assets based on a set of criteria. The criteria are ranked in levels of consequence based on their impact. The following categories have been selected:

- **Service**: Does the asset or project meet, marginally meet, or fail to meet DDW requirements?
- **Environmental**: Does the asset or project create environmental issues that have little impact on relatively few people or, conversely, far-reaching consequences affecting the community for the long term?
- **Safety**: Does that asset or project have little bearing on safety and health, or could it kill or critically injury one or more people?
- **Supply**: Does the asset or project affect water supply to a very small group of customers, or does it affect a wide group of customers over the long term?

As shown in Table 4-1, each category has three to five levels of consequence, with a minimum score of one for low consequence and a maximum score of five for high consequence. For example, within the Safety category, there are five levels of consequence. The levels rank from one, which is "no injury or illness," to five, which is "fatal injury or illness to one or more persons." To score an asset, its score in each category is determined (if unable to discern between two levels of consequence, the higher level would be selected). The scores in all categories are then summed to provide a total score.

In the example in Table 4-1, the asset/project has received the following consequence scores:

- **Service:** This asset/project does not meet DDW requirements and a consequence score of five.
- **Environmental:** This asset/project will cause moderate environmental damage, public may be affected, and press will notice, <$10,000 fine score of three.
- **Safety:** This asset/project will create minor injury or illness, can be treated with on-site first aid score of two.
- **Supply:** This asset/project supply to customers is affected to an extended area for a moderate period. Typically, a loss of a 12-inch looped water main or undersized main unable to meet peak-hour flows scores a three.

These scores are then summed (5+3+2+3) for a total score of 13 out of a possible 20.

The Asset Criticality Table is used to provide a total score for each asset based on the above categories. The scores are then used in conjunction with the condition assessment to create a risk assessment score.

An Asset Criticality Assessment Worksheet is provided in Appendix D. Results are provided in the Draft Asset Criticality Assessment in Appendix E.

4.4 ASSET RISK ASSESSMENT

Asset risk assessment results in an asset risk score, which is the combination of the asset condition score and the asset criticality score. The replacement of assets with higher risk scores in a given asset class should be prioritized over assets with lower scores.

TABLE 4-1. ASSET CRITICALITY TABLE

Category		Consequence 1	2	3	4	5	Score
	Service	Asset meets or exceeds all DDW requirements		Asset marginally meets DDW requirements and may go out of compliance from time to time		Asset does not meet ~~DDW~~ requirements	5
	Environ-mental	Loss of Asset will not cause Environmental damage	Loss of asset will cause minimal environment damage, very little press or public notice, <$1000 fine	Loss of asset wil cause moderate environmental damage, public may be affected, and press will notice, <$10,000 fine	Loss of asset will cause heavy environmental damage, public will be heavily affected, press will take notice for an extended period, <$100,000 fine	Loss of asset will cause severe environmental damage, public will be severly affect over a long term, press will notice for long term, >$100,000 fine, possible prison sentences	3
	Safety	No injury or illness	Minor injury or illnesses, can be treated with onsite first aide	Moderate injury or illness results in loss time injury, injuries and illness will require from medical staff	Severe injury or illness results in extend loss time injuries, injuries will require extended in patient care by medical staff	Fatal injury or ~~illness to one or~~ more persons.	2
	Supply	Supply to all customers is unaffected	Supply to customers is affected to a limited area and a limited time. Typically loss of 8" looped water main	Supply to customers is affected to an extended area for moderate period. Typically a loss of a 12 inch looped water main or undersized main unable to meet peak hour flows.	Supply to customers is affected to a wide area for extended periods, Typically a loss of a transmission ~~water main (not~~ looped), or undersized main unable to meet daily water demands or fire flow	Supply to the entire district is affected for extended periods. Typically in adequate storage to meet peak demands, loss of supply from wholesaler, or unable to meet peak hour, fire flow, or daily demands for extended periods	3
							13

5 LEVEL OF SERVICE

5.1 PURPOSE

This chapter describes the process for developing the water utility's LOS by examining the numerous services and activities performed for its stakeholders, including its customers and employees. The process results in a system for measuring the water utility's performance of services and activities.

The International Infrastructure Management Manual defines LOS as "the defined service quality for a particular activity or service area against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, environmental acceptability and cost."

5.2 DEVELOPMENT PROCESS

The community outcomes and core values are defined. Community outcomes are based on the reasonable expectations of the community. Core values are principles that define and drive the success of the organization.

The services and activities to be measured to align with the community outcomes and core values are identified.

Key performance indicators (KPIs) used to measure the services or activity are defined. KPIs are measurable in the sense that they must be able to yield a number. Where possible, a numerical measure is preferable to a "Yes" or "No" answer. For instance, if the KPI is "no more than two outages/1,000 customers per month lasting four or more hours," it is preferable to utilize a KPI that provides a measurement of the average number of outages per 1,000 customers, rather than a Yes/No answer to the KPI. A numerical figure is more likely to:

- Indicates if the performance is marginally better or significantly better. If the performance is only marginally better, the service or activity may require closer review. If the performance is significantly better, the standard needs to be raised.
- Demonstrates over time whether performance is improving or declining.
- Supports a higher level of accountability. "What gets measured gets managed."
- May demonstrate that the KPI has become a poor indicator and needs to be revisited.

The AMP defines how KPIs are measured, including:

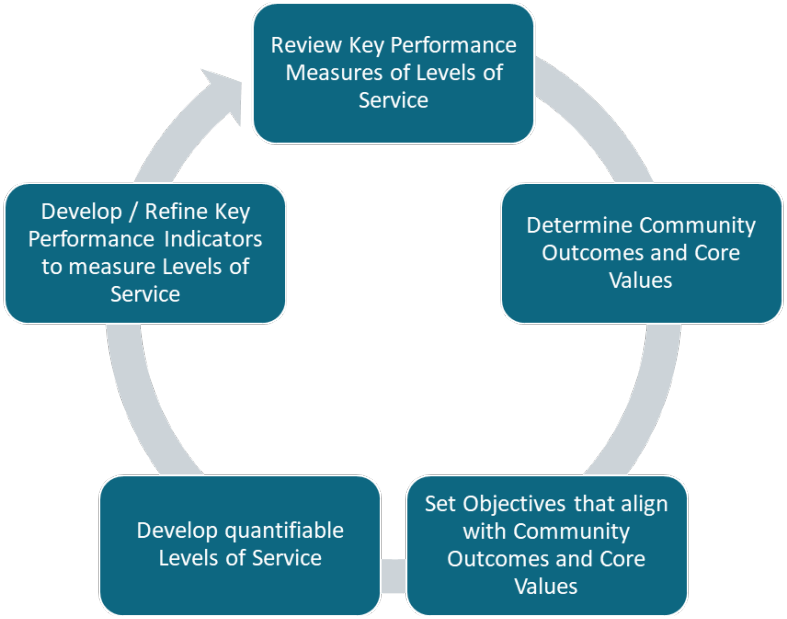
- Who is responsible for each KPI?
- How the measuring will be performed?

- How often will KPI measurements be collected?
- How often will KPIs be reported and in what format?

KPIs should not be difficult to measure.

Over time, these elements of the process will be updated. The process is shown on Figure 5-1.

FIGURE 5-1. DEVELOPMENT CYCLE FOR LEVELS OF SERVICE



The LOSs defined in Table 5-1 are a result of the above process. As the City collects information on its KPIs, it may revise each element as appropriate.

TABLE 5-1. COMMUNITY OUTCOMES, CORE VALUES, OBJECTIVES, AND LEVELS OF SERVICE

Community Outcome: Sufficient Quantity of Water is Available (Water Supply) ***We provide water that is available to meet the needs of the Customers of East Palo Alto with minimal interruption.***
Core Value: Reliable Water Service
Activity: Maintain adequate pressure on the water system.
KPI: Maintain a minimum of 20 psi pressure to all customers on a full-time basis (at PHD and at minimum demand).
Service: Provide timely service to customers.
LOS: New water services are approved or denied to customers within 6 weeks of application for service.
Activity: Consolidate and minimize scheduled outages.
KPI: Maintain number of scheduled outages of 12 hours or less at or below industry standard.
Service: Minimize unscheduled outages.
KPI: No more than 2 outages/1,000 customers a month lasting more than 4 hours.
Community Outcome: Drinking Water is Safe ***We provide water to our customers that is in full compliance with federal, state, and local laws pertaining the quality of the water.***
Core Value: Water Quality
Activity: Meet all regulatory requirements.
KPI: Meet regulatory requirements 100% of the time.
KPI: Cooperate with stakeholders as required by County Cross-Connection Program.
KPI: Maintain proper disinfection, per industry standards, in the distribution system 100% of the time.
Core Value: Customer Service
Service: Respond to customer complaints.
KPI: Respond to all customer complaints within 24 hours.
Community Outcome: Drinking Water is High Quality ***We provide water to our customers that is desirable as a product.***
Core Value: Water Quality
Service: Reduce customer water quality complaints.
KPI: 100% compliance with DDW regulation for source monitoring.
Objective: Provide customer service.
KPI: Respond to all customer complaints within 24 hours.
Community Outcome: Water System Operations are Transparent ***Our strategies, business, and actions are available for customer review and are driven to the City's and Customers best interests.***
Core Value: Transparency
Activity: Publish the annual budget.
KPI: Publish draft annual budget within 2 days of submitting to City Council for acceptance.
KPI: Publish accepted annual budget within 2 days of acceptance by City Council.
Service: Respond to public requests for information.
KPI: Respond to public requests for information within 10 days of receiving the request.
Core Value: Water Quality
Activity: Meet all regulatory requirements.
KPI: Make reports to DDW available to the public within 10 days of submitting to DDW.

TABLE 5-1. COMMUNITY OUTCOMES, CORE VALUES, OBJECTIVES, AND LEVELS OF SERVICE

Core Value: Customer Service
Service: Customers will be responded to.
KPI: Respond to customer phone calls (non-emergency) and emails before the close of business.
KPI: Customer emergency calls will be responded within one hour during normal business hours and during non-business hours.
Activity: Meet all regulatory requirements.
KPI: Publish Consumer Confidence Report by July 1 of every year.
Community Outcome: Drinking Water is Affordable ***We provide water to our customers that is brings a high level of value and is affordable to a wide range of customers.***
Core Value: Customer Service
Activity: Perform rate studies and cost of service studies.
KPI: Rate and cost of service studies every 5 years.
Service: Provide accurate and timely billing.
KPI: Annually less than 0.5% customer bills are in error.
Core Value: Fiscal Responsibility
Service: Provide cost-effective water service to customers.
KPI: Notify customer within 1 billing cycle of a possible leak on premise.
Activity: Meet bond requirements.
KPI: Maintain a bond rating of A+ for the water utility.
Community Outcome: Information is Secure ***We maintain a safe information system to protect customer information as well as provide for the continued operation of the water system.***
Core Value: System Security
Activity: Provide appropriate security measures (infrastructure, data).
KPI: Ensure customer data is secure.
KPI: Meet or exceed national standard for business network security for systems of City size and location.
KPI: Meet or exceed national standard for control system security for systems of City size and location.

6 CAPITAL IMPROVEMENT PROGRAM

6.1 PURPOSE

The purpose of the chapter is to describe the process of developing the City's Bi-Annual, 10-Year CIP. The CIP identifies projects, as well as each project's scope of work, budget, and funding source.

6.2 WATER SYSTEM MASTER PLAN

A Water System Master Plan (WSMP) identifies projects to be implemented over the next 20-year period. The WSMP is typically updated every five to 10 years.

As part of the WSMP, the capital improvement surcharge rates necessary to deliver the projects are calculated. In addition, a cashflow analysis is performed to determine when projects may be scheduled. This type of financial analysis is best performed over a longer period, as opposed to the two-year period associated with the CIP.

As the affordability of water rates and capital improvement surcharges is a concern of customers, the WSMP balances affordability of water fees with the need to improve and enhance the water system.

The WSMP typically addresses the following three types of projects: (1) asset replacement projects, as addressed above; (2) known, required studies and reports, such as updating the WSMP; and (3) water system upgrades.

The process of identifying water system upgrades projects is the significant effort and requires the consultant to perform the following tasks:

- Create a model of the existing water system
- Develop existing and future service area descriptions based on existing and future land uses to model existing and future water demands
- Evaluate the existing water system to determine if the infrastructure has capacity to meet existing and future water demands
- Modify the existing water system model (e.g., increasing pipe sizes or adding new waterlines) to determine what upgrades and/or enhancements are required to meet existing and future water demands

Other potential projects are related to (1) alternative water storage locations, (2) the resiliency and reliability the water supply, and (3) utilizing recycled water.

Concurrent with each comprehensive WSMP or periodic update, a Capital Funding Plan will be developed that incorporates the annual capital projects identified for the planning period, associated costs escalated to the year of anticipated construction, and the funding sources anticipated to fund the projects. Potential funding sources may include revenues generated from water capital surcharges, water capacity fees, grants and other outside contributions, debt issuance, and other resources applicable to water enterprise funds. Resulting rate requirements for funding the annual capital

program will be identified to evaluate the sufficiency of water rates and fees over the planning period. Customer bill impacts will be summarized and evaluated for adequacy and reasonableness.

WSMPs typically include a water rate analysis for funding the projects. The City will evaluate funding alternatives and water capital surcharge impacts for funding capital improvements identified in the WSMP. A 20-year water enterprise financial projection will detail the annual funding requirements for completing capital projects identified in the WSMP and the corresponding impacts on water capital rates over the planning period. Alternative capital funding and financing scenarios will be evaluated to identify their impacts on future water capital rates and finances.

Water system O&M costs and capital-related costs are recovered through water rates and charges. The current water rate structure includes the following rate components and utility tax applied to customer bills:

- **O&M Rates:** Recovers O&M costs, emergency repairs, and replacement projects depending on the type of repair and dollar amount.
- **Meter Replacement Surcharges:** Funds the meter replacement program.
- **Capital Improvement Surcharges:** Funds major repairs, replacements, and improvement projects.
- **Utility Tax:** Used for utility tax-related items.

6.3 CAPITAL IMPROVEMENT PROGRAM

A 10-year CIP is prepared every other year and is adopted by the City Council.

The CIP is typically focused on the first five years of the plan as projects identified in the first two years of the CIP should be completed by the fifth year of the CIP. Projects identified as starting after the two-year period are more likely to change for a variety of reasons.

Preparers of the CIP have a better understanding of the status of the water system and the financial status of the water utility. Some assets may have unanticipatedly failed and require replacement. Also, the City may have receive grants to aid in the cost of implementing projects. CIP preparers may make adjustments to the projects identified in the WSMP.

Appendix A. Asset Register Management Plan

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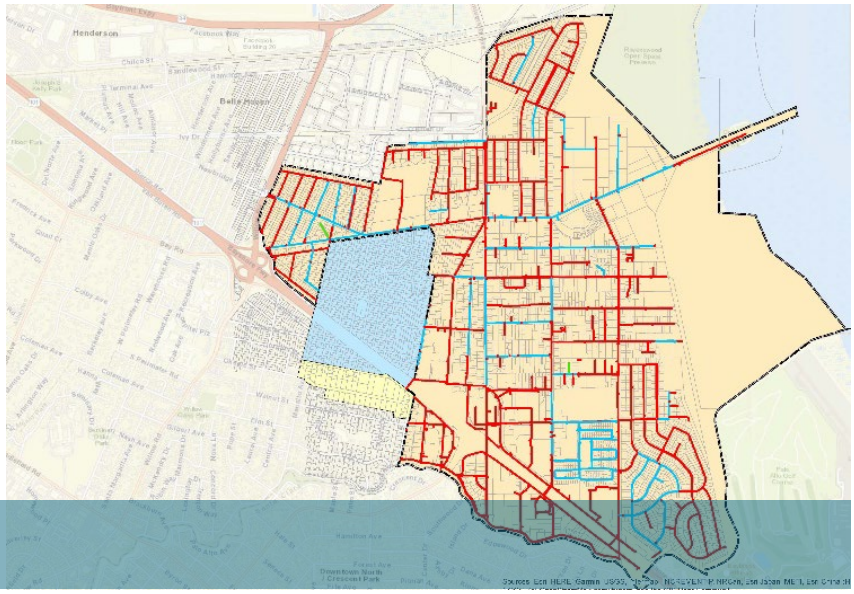

CITY OF EAST PALO ALTO ASSET REGISTER MANAGEMENT PLAN

February 2022

Harris & Associates

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ACRONYMS AND ABBREVIATIONS

ARMP	Asset Register Management Plan
City	City of East Palo Alto
GIS	geographic information system
GPS	Global Positioning System
OUL	original useful life

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1 PURPOSE

The purpose of this Asset Register Management Plan (ARMP) is to provide standards for the development and ongoing maintenance of asset registers used by the City of East Palo Alto's (City's) Department of Public Works. In a utility, assets, as well as their relative positions/locations, are added to the water system to meet growth, removed from the water system as assets reach their end of life, and swapped out during routine maintenance activities. As field conditions change, and without a methodology to manage asset information, the accuracy of asset registers diminishes over time, and asset registers become useless for asset management activities. Complete and current asset registers will assist the City in the procurement, maintenance, renewal, and disposal of assets and will provide a foundation for asset management decision-making.

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2 OBJECTIVES

The objectives of this ARMP are as follows:

- Verify current asset inventory information maintained by the City
- Identify missing assets
- Identify assets no longer in service
- Collect missing relevant asset attributes

This ARMP provides guidance to ensure the following is consistent throughout all facilities:

- Standard definitions for assets and the different ways they are handled
- Standard format for the Asset Register of Record (Asset Register), including descriptions for assets entered into the appropriate fields in the Asset Register
- Standard definitions for asset and hierarchical positions
- Standard naming conventions and definitions for asset types, including a list of asset types provided by the City and implemented into the Asset Register
- Standard definitions for the attribute information collected for each asset type
- Standard process to develop and update the Asset Register

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3 ASSET REGISTER OF RECORD

The Asset Register for the City's water system will be inputted and maintained in accordance with this ARMP.

The City will own all data contained in the Asset Register.

3.1 ASSET REGISTER INTERFACE WITH OTHER ENTITIES

The City will maintain the standards for the database. The City contracted with Veolia to operate and maintain the water system. Veolia uses the software applications SpryPoint (customer billing) and InfoAsset to track assets in the City's water system. The City seeks to have the City and Veolia work simultaneously with the same Asset Register data. To accomplish this, Veolia will provide the City with regular updates of the database of record that the City will subsequently use to update their databases. The file location, file format, and interval of these data updates will be determined by the asset manager working in partnership with the City. Conversely, as the City completes Capital Improvement Program projects and other updates to the systems, its databases will be updated and must be provided to Veolia to update the database of record. The City will provide to Veolia regular updates to its databases that Veolia will subsequently review for conformance with this ARMP and GIS standards before updating the database of record.

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4 ASSETS

4.1 ASSET DEFINED

An asset is a physical item of a network that has value, performs a specific function to provide a service, and typically exists in a field setting rather than a treatment plant setting. It is the lowest level of detail managed by the utility's maintenance strategy to maintain the item in accordance with its designed performance and to repair, rehabilitate, and assist in replacement decisions. Further definition of a qualified asset includes the following:

- The cost of replacement for the asset is greater than $5,000 and does not include a sub-component of an asset.
- A clear need exists to track preventive and predictive maintenance costs.
- The asset has an estimated original useful life (OUL) of one year or greater.
- A work order is written for preventive and/or corrective maintenance of the asset, such as equipment requiring extensive calibration or items that, because of their regulatory nature, require proof of maintenance, such as safety equipment.

4.2 ASSET REGISTER

The City's Asset Register is a database that tracks static and dynamic objects required to complete the daily and long-term functions of the City's water system. Assets can be water mains, isolation valves, fire hydrants, customer meters, water sample stations, backflow devices, pressure-reducing valves, etc. The CWOP tracks its assets in a commercially available asset management system. The AMSS shall have mapping features that allow assets to be displayed on a map. Asset data includes asset class, an asset type, asset attributes, including a unique identifier, and planning asset attributes, including estimated remaining useful life.

The water distribution system is relatively small and has one pressure zone. The City's only treatment facility is located at the Gloria Way Well site. The Gloria Way Well site has approximately 20 assets compared with thousands of assets identified over the entire water system.

4.2.1 ASSET CLASS

The asset class identifies a general category of the asset in which several different configurations may occur. For example, assets classified as Valve can include different asset types, such as Gate, Butterfly, and Check. The water system assets are listed in the Class field. Class fields for the City's Asset Register are listed in Appendix I – Asset Register.

4.2.2 ASSET TYPE

For each asset class, a corresponding asset type may exist. An asset type specifies a unique type or configuration of an asset within a single class of assets. For example, the water distribution system contains several types of valves, e.g., gate, butterfly, check, etc., that may be logged as an asset type

within the AMSS. The asset types that fall under the asset class are identified in Appendix I.

4.2.3 ASSET ATTRIBUTES

Asset attributes are used for the unique identification of each asset. Attributes may include size, material, manufacturer, model, serial number. This information is primarily used for maintenance and repair decisions and stocking of spare parts. The attributes of each asset class and asset type are identified in Appendix I.

4.2.4 PLANNING ASSET ATTRIBUTES

Planning attributes are used for maintenance and renewal decisions for assets. Planning attributes are incorporated into the Asset Register after completing the data collection and migration of physical attributes. The planning asset attributes for each asset class are identified in Appendix I.

Planning asset attributes are defined as follows:

Condition Rating is a numerical rating that reflects the physical condition and performance of the asset. This field may be adjusted throughout the lifecycle of the asset.

Criticality is an assessment of the consequence of failure of the asset. It also reflects the potential of failure by factoring in installed redundancy, current operating demand, and/or condition rating. This field may be adjusted throughout the lifecycle of the asset.

Estimated Remaining Useful Life is the adjusted or forecasted remaining life of the asset based on condition assessments, condition monitoring, non-destructive testing, failure data, or other analytical assessments.

Install Date is the day the asset was placed into service. This information is used to determine a default replacement date based on OUL estimates. This attribute is also used to determine the effective and expiration dates of warranties.

Original Useful Life (OUL) is the expected useful life of the asset, including rehabilitation. The OUL is typically determined by asset type and assigned to the asset. The OUL is determined upon purchase of the asset and is not adjusted for the remaining lifecycle. The OUL field should be “locked” after the asset and its information are entered into the Asset Register. The OUL estimates can be adjusted at the asset level based on application, operating environment, manufacturer’s estimate, or industry failure and lifecycle data.

Replacement Cost is the estimated cost to replace the asset with like-kind equipment. This estimate should be based on equipment removal, purchase, and installation. This is not to be confused with installation cost.

5 ASSET REGISTER DEVELOPMENT AND UPDATES

An Asset Register is developed or updated through reviewing process and instrumentation diagrams, reviewing engineering drawings, interviewing staff, and performing on-site field investigations. Interviews and on-site investigations are essential to determine which assets are currently in use and to obtain additional attribute information. Information will be updated based on the specific utilities facility and input from City staff. The Asset Register should contain assets for each class listed in Appendix I.

Each asset added or maintained in the Asset Register (maintained in GIS) requires the following minimum information:

- **Asset ID:** The asset ID is a unique identifier generated by the GIS. No two assets will have the same asset ID.
- **Position Data:** Position data will depend on the type of asset being added to the register. Single-point assets (e.g., hydrants, blowoffs, valves) will require Global Positioning System (GPS) coordinates entered into the GIS interface to be added to the Asset Register. Water mains will require upstream and downstream node connections. These connections may be at valve locations or at locations where multiple water mains come together (crosses, tees, and bends). The GIS interface will be used to generate these assets into the register.

5.1 ASSET REGISTER MAINTENANCE

Keeping and maintaining an accurate and up-to-date list of assets is important for a utility to meet the required tasks to serve its customers. An Asset Register maintenance process ensures that new assets added to the Asset Register have the minimum required information, data is consistent with established standards, asset updates are made in a consistent format, assets are incorporated into the existing asset hierarchy, and assets are properly decommissioned from the register when removed from service.

5.1.1 ASSET MANAGER

The asset manager will be responsible for maintaining the integrity and accuracy of the Asset Register in accordance with this ARMP. Adding new assets, modifying existing assets, or decommissioning assets in accordance with the requirements of this ARMP will be completed by the asset manager or designated representative.

Changes outside the scope of this ARMP will require approval from the Public Works Director or designated representative. Items outside the scope of this ARMP include but are not limited to creating a new asset class, creating a new asset type, or modifying this ARMP. Final authority on all matters will rest with the Public Works Director or designated representative.

5.1.2 ASSET REPLACEMENT

Adding replacement assets (replacing assets in kind), updating asset attribute data, or decommissioning assets will be completed through the GIS interface. The asset manager or designated representative will review and accept, reject, or modify all changes.

New Assets

New assets (such as a new housing development or water main replacement) may be added to the Asset Register provided that the following occurs:

- All assets be placed in a planning status and cannot be placed into an active status until approved by the asset manager.
- Before placing assets in active status, all asset attribute information must be field verified (including verification of asset location), and additional assets that were found in the field but not on drawings must be added.

Existing Assets

Verification of current asset information must consist of the following:

- Incorporation of information from construction as-built drawings into Asset Register.
- Identification of assets to be verified in the field before conducting the field verification.
- In the field:
    - Location of the asset and capture of its GPS location on a handheld device.
    - Review of the asset's attribute information in the field and notation of any discrepancies.
- Upload asset information to AMSS. The asset manager will review the discrepancies and approve changes before updating the GIS Asset Register.

5.1.3 ASSET REGISTER QUALITY CONTROL PROGRAM

The asset manager will manage a quality control program to verify the quality and accuracy of the Asset Register. This program will be accomplished through a field verification process and include the following:

- A sampling of 10 percent of assets shall occur in the field every five years with assets in the Asset Register or more or less frequently based on the Strategic Asset Management Plan for each specific asset class and type.
- An asset technician shall carry the asset information with them into the field to compare with assets in the field. The asset technician shall identify assets and/or asset data that do not match with the Asset Register.

- The asset manager or designated representative shall review the field verification findings and determine the quality and accuracy of the Asset Register. This may result in additional field verification activities if deemed necessary.

- The asset manager shall be responsible for updating the Asset Register as needed and conducting a wide-scale Asset Register update if deemed necessary.

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Appendix B. Asset Information and Asset Register Data Standard Format

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ASSET INFORMATION AND ASSET REGISTER DATA STANDARD FORMAT

Asset Description, Requirements, and Replacement Planning Information

1. Asset Class or Asset Type
    a. Description
    b. Operational Requirements
        i. Requirements
            1. Federal Requirements
            2. State Requirements
            3. Local Requirements
            4. Permit Requirements
        ii. Operating Manual(s)
        iii. Reporting Requirements
        iv. References
    c. Maintenance Requirements
        i. Requirements
            1. Federal Requirements
            2. State Requirements
            3. Local Requirements
            4. Permit Requirements
        ii. Maintenance Activity Definitions
            1. Inspect
            2. Service
            3. Repair
            4. Rehabilitate
            5. Paint
            6. Flush
            7. Other
        iii. Required Spare Parts
        iv. Maintenance Manual(s)
        v. Reporting Requirements
        vi. References
    d. Testing Requirements
        i. Requirements
            1. Federal Requirements
            2. State Requirements
            3. Local Requirements
            4. Permit Requirements
        ii. Reporting Requirements
        iii. References
    e. Asset Replacement Planning
        i. Condition Assessment
            1. Definitions

        2. Criteria
        3. References
    ii. Criticality Assessment
        1. Definitions
        2. Criteria
        3. References
    iii. Risk Profile
        1. Definitions
        2. Criteria
        3. Reporting Requirements
f. Associated Level of Service(s) Requirements
    i. Level of Service
g. Potential Future Projects

Asset Register Format

1. Asset Class
    a. Asset Type
    b. Asset Identification Number
    c. Asset Location Data
    d. Asset Physical Characteristics Data
        i. Size
        ii. Material
        iii. Other
    e. Asset Manufacturer Data
        i. Manufacturer
        ii. Model
        iii. Serial Number
        iv. Other
    f. Associated Equipment or Devices
    g. Operational Data
        i. Operational Activity Date
        ii. Operational Activity Type
        iii. Performed by
        iv. Description and Observations
        v. Other
    h. Maintenance Data
        i. Maintenance Activity Date
        ii. Maintenance Activity Type
            1. Inspection
            2. Service
            3. Repair

4. Paint
5. Other

iii. Performed by
1. City Staff
2. City Contractor
3. Lessee Staff
4. Lessee Contractor
5. Name
6. Other

iv. Description and Observations
v. Other

i. Testing Data
i. Test Date
ii. Test Type
iii. Test Results
iv. Description and Observations
v. Other

j. Asset Replacement Planning Data
i. Condition Assessment
1. Failure
a. Failure Date
b. Failure Type
c. Description and Observations
d. Other
2. Remaining Service Life
a. Installation Date
b. Service Life
3. Parts Available (Yes/No)
4. Manufacturer Support Available (Yes/No)
5. Condition Assessment Score

ii. Criticality Assessment
1. Criticality Assessment Score

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Appendix C. Collection of Asset Condition Data Standard Operating Procedures

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CITY OF EAST PALO ALTO COLLECTION OF ASSET CONDITION DATA – STANDARD OPERATING PROCEDURES

February 2022

Harris & Associates

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TABLE OF CONTENTS

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1 BACKGROUND AND PURPOSE

The collection of water asset condition data allows a utility to collect vital information on the health and longevity of the assets in its system. With this information, a utility can leverage the data to determine the remaining life of the assets, develop a capital replacement program designed to replace assets at their end of life, and develop a rate structure that is sustainable at the level of service expected of the utility.

The purpose of this document is to develop standard operating procedures for collecting and storing asset condition data. This document will not provide methods to analyze the data once collected and stored. The COWP will regularly review the quality of the data being collected, make adjustments as necessary to maintain data quality, and analyze the data with more in-depth tools and techniques to make better asset management decisions.

The specific condition data to be collected varies by asset and is discussed by asset type in Section 3 below. Once the condition assessment data has been collected, it must be stored, as discussed below.

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2 DATA STORAGE

All data that is required to be collected, as detailed in Section 3 below, shall be stored in the Asset Management Software System (AMSS), linked by a unique identifier to the specific asset.

All asset condition data shall be retained indefinitely or until the data is deemed unnecessary by the City.

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3 CONDITION ASSESSMENT – DATA COLLECTION

Asset condition shall be collected on the following assets in the manner prescribed for each asset type.

3.1 WATER METERS

Water use data by meter shall be saved for a minimum of five years. Data intervals shall be no less than one month (consumption by month), or if a bill is generated on a bi-monthly or quarterly basis, no less than bi-monthly or quarterly.

Water Meter condition assessment data will be collected at the time the meter is tested. Meter testing intervals are given in the Water Meter SAMP. The following asset condition data shall be collected:

1. Date and time of test
2. Initial accuracy readings for the low, medium, and high flow ranges for the meter size given in the AWWA Manual M6
3. Final accuracy readings for the low, medium, and high flow ranges for the meter size given in the AWWA Manual M6
4. If the meter was repaired indicate repair. If the meter was rebuilt update the asset attribute information to the new rebuilt parts.

3.2 WATER MAIN

Water main condition assessment data will be collected at any time a water main is exposed. Water main can be exposed for the following reasons:

- Construction Activity – This can be as result of third-party contractors installing other utilities in the vicinity of the water main or the City installing or repairing service lines, valves, hydrants, or any other water system appurtenances.
- Break or Leak Repairs – In the process of addressing breaks or leaks that occur on the water system, data will be collected about the break or leak, as well as the condition of the water main.

The following asset condition data shall be collected:

1. GPS location of the break, leak, install or repair of appurtenances, or contractor excavation.
2. Condition Assessment Action
    - Break – Identify the break cause

- Structural water main break - The water main experiences a longitudinal or circumferential break of the pipe wall or the joint between two sections of pipe have separated. Categorize the break as:
  - Longitudinal
  - Circumferential
  - Joint Separation
- Other water main break - A break as a result of tap failures or external construction activities such as excavations, drilling, and borings. Categorize the break as either:
  - Tap failure
  - Other construction activity

- Leak – Identify the leak cause
  - Structural water main leak – The water main experiences a leak through the side wall of the pipe as a result of corrosion either internally or externally that has compromised the pipe side wall or a failure of the seal at the joint between two sections of pipe. Categorize the leak as either:
    - Corrosion leak
    - Joint leak

    i. Other water main leak – A leak as a result of tap failures or external construction activities excavations, drilling, and borings. Categorize the leak as either:
    - Tap failure
    - Other construction activity
  - Construction Excavation -- Identify the action as “Construction Excavation”

3. Identify the pipe construction material – Ductile, Cast, PVC, AC, Steel, Other
4. Determine pipe diameter – measure outside diameter of pipe in inches, measure inside diameter of pipe when the situation allows (typically a break).
5. Determine depth of bury from surface to top of pipe in inches
6. Exterior Pipe Assessment -- Isolate a one-foot section of pipe and collect the following information:
   - For metal pipe:

- Record[1] the amount of corrosion on the section of pipe
  - 0 – 25%
  - 26% - 50%
  - 51% - 75%
  - 76% - 100%
- Wire brush the corrosion from the section of pipe to bare metal below. Using a pointed micrometer, ultrasonic metal fitness gauge, or a needle point depth gauge determine the depth of 5 of the most significant points of corrosion.
- Note any weeping or leakage from the corrosion points.

- For Asbestos Cement pipe:
  - Note the amount of spalling on the section of pipe
    - 0 – 25%
    - 26% - 50%
    - 51% - 75%
    - 76% - 100%
  - Using a pointed micrometer or a needle point depth gauge determine the depth of the most significant point of spalling.
  - Note any weeping or leakage from the corrosion points and or the sidewall of the pipe.

- For PVC pipe:
  - Note the amount of oxidation on the section of pipe
    - 0 – 25%
    - 26% - 50%
    - 51% - 75%
    - 76% - 100%

[1] "Record" or "Note" denotes entering the data in the CMMS. In practice, field staff may enter directly in CMMS or may complete forms that are entered later into the CMMS.

7. During installation of service lines or other taps onto the main, collect the tap coupon and retain for the life of the main. Catalog the coupon to the location it was collected from.

8. For water main breaks inspect interior of the pipe. Note spalling of lining (if lining is present) and or tuberculation (if metal pipe). Provide narrative and supporting picture for database.

9. Photograph the exterior of the pipe sufficiently to give a reviewer at some future date enough information to make an assessment of the pipes exterior condition and possible causes for failure (as in the case of breaks or leaks). For breaks, photograph down the barrel of the pipe in both directions.

10. Make any other notes that may relate to the condition of the pipe such as misalignment of the pipe, recent construction in the area, land subsidence, corrosive soils, etc.

11. While conducting uni-directional flushing of water main, determine the C-factor of the pipe.

3.3 VALVES

Valve condition assessment data will be collected at the valve's scheduled exercise. The following condition data will be collected:

1. Number of turns from full open to full closed

2. Note leakage at the stem packing

3. Note any difficulties in opening or closing the valve as well as seating the valve.

4. Listen at the stem of closed valve and note any sound of flow past closed valve.

3.4 BACKFLOW DEVICES

For accounts with backflow devices, condition assessments are performed annually by a licensed Backflow Device Tester and the data is sent to the County and the City. Per Chapter 15.44 of the City's Municipal Code, the following data will be maintained:

- Assembly type, size, manufacturer, installation date, location, account number, customer or responsible party of record. Assembly records shall be kept for the life of the assembly.

- Testing records shall be kept for a minimum of three (3) years.

- Backflow incident notification to the State Water Resources Control Board within 24 hours of the incident, and any follow up reports, public notifications, or other requirements of the SWRCB.

3.5 HYDRANTS

Hydrant condition assessment data will be collected at the time of the hydrant's scheduled exercise. The following condition data will be collected:

1. Collect auxiliary valve data in accordance with the Valves section of this document.
    - For wet barrel hydrants, note:
        - Any leakage from the hydrant prior to exercising the hydrant. Note the location of the leak, e.g. "cap – leaking seat" or "exercising nut – leaking stem."
        - Number of turns from full open to full closed for each valve
        - Any difficulties in opening or closing the valve as well as seating the valve.
    - For dry-barrel hydrants, note:
        - Any leakage from the hydrant prior to exercising the hydrant.
        - Number of turns from full open to full closed for the main valve
        - Any difficulties in opening or closing the valve as well as seating the valve.
        - Operation of foot valve.

3.6 TREATMENT WORKS INCLUDING WELL

The following information will be collected monthly, or more often if required to meet State regulations:

1. Well level
2. Recharge rate
3. Yield
4. The well pump/motor is discussed in Section 3.11 below.

At the time of the well's ten-year inspection, the following condition data will be collected:

5. A down-hole video inspection of the well and/or such other information collected by the well inspection specialist.

3.7 GENERATOR

The following generator condition data will be collected either monthly, annually, or at 2,000 hours of usage, as follows:

1. Monthly: track water and oil usage.
2. Annually: perform a generator load bank test and record output voltage and amperage for each phase of the generator.
3. Every 2,000 hours of operation:
    - Record compression in pounds per square inch (PSI) of each cylinder of the engine.
    - Meggar test the generator
4. Vibration analysis

3.8 PUMP

Pump condition assessment data will be gathered when routine and predictive maintenance is performed. As appropriate, the following condition assessment data will be collected:

1. Bearing vibration
2. Bearing temperature
3. Meggar test results on motor
4. Motor amperage draw
5. Inlet and outlet pressure (performed annually – outsourced)
6. Pumping rate in gallons per minute (performed annually – outsourced)

3.9 CUSTOMER

Service order and complaint data will be collected by customer. When the complaint is related to water quality (pressure, color, odor, taste, etc.), detailed information about the type of water quality issue will be collected.

Appendix D. Asset Criticality Assessment Worksheet

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		Consequence					*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*
		1	2	3	4	5	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Category	**Service**	Asset meets or exceeds all DDW requirements		Asset marginally meets DDW requirements and may go out of compliance from time to time		Asset does not meet DDW requirements										
	Environ-mental	Loss of Asset will not cause Environmental damage	Loss of asset will cause minimal environment damage, very little press or public notice, <$1000 fine	Loss of asset wil cause moderate environmental damage, public may be affected, and press will notice, <$10,000 fine	Loss of asset will cause heavy environmental damage, public will be heavily affected, press will take notice for an extended period, <$100,000 fine	Loss of asset will cause severe environmental damage, public will be severely affecte over a long term, press will notice for long term, >$100,000 fine, possible prison sentences										
	Safety	No injury or illness	Minor injury or illnesses, can be treated with onsite first aide	Moderate injury or illness results in loss time injury, injuries and illness will require from medical staff	Severe injury or illness results in extend loss time injuries, injuries will require extended in patient care by medical staff	Fatal injury or illness to one or more persons.										
	Supply	Supply to all customers is unaffected	Supply to customers is affected to a limited area and a limited time. Typically loss of 8" looped water main	Supply to customers is affected to an extended area for moderate period. Typically a loss of a 12 inch looped water main or undersized main unable to meet peak hour flows.	Supply to customers is affected to a wide area for extended periods, Typically a loss of a transmission water main (not looped), or undersized main unable to meet daily water demands or fire flow	Supply to the entire district is affected for extended periods. Typically in adequate storage to meet peak demands, loss of supply from wholesaler, or unable to meet peak hour, fire flow, or daily demands for extended periods										
							0	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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Appendix E. Draft Asset Criticality Assessment

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Water Supply CIP

		Consequence				
		1	2	3	4	5
Category	Service	Asset meets or exceeds all DDW requirements		Asset marginally meets DDW requirements and may go out of compliance from time to time		Asset does not meet DDW requirements
	Environmental	Loss of Asset will not cause Environmental damage	Loss of asset will cause minimal environment damage, very little press or public notice, <$1000 fine	Loss of asset wil cause moderate environmental damage, public may be affected, and press will notice, <$10,000 fine	Loss of asset will cause heavy environmental damage, public will be heavily affected, press will take notice for an extended period, <$100,000 fine	Loss of asset will cause severe environmental damage, public will be severely affecte over a long term, press will notice for long term, >$100,000 fine, possible prison sentences
	Safety	No injury or illness	Minor injury or illnesses, can be treated with onsite first aide	Moderate injury or illness results in loss time injury, injuries and illness will require from medical staff	Severe injury or illness results in extend loss time injuries, injuries will require extended in patient care by medical staff	Fatal injury or illness to one or more persons.
	Supply	Supply to all customers is unaffected	Supply to customers is affected to a limited area and a limited time. Typically loss of 8" looped water main	Supply to customers is affected to an extended area for moderate period. Typically a loss of a 12 inch looped water main or undersized main unable to meet peak hour flows.	Supply to customers is affected to a wide area for extended periods, Typically a loss of a transmission water main (not looped), or undersized main unable to meet daily water demands or fire flow	Supply to the entire district is affected for extended periods. Typically in adequate storage to meet peak demands, loss of supply from wholesaler, or unable to meet peak hour, fire flow, or daily demands for extended periods

WS-01A - Emergency Water Connects - City of Palo Alto	WS-01B - Emergency Water Connects - Palo Alto Park Mutual	WS-01C - Emergency Water Connects - O'Conner Tract Co-Op	WS-01D - Emergency Water Connects - O'Brien Kavanaugh	WS-03A - New Storage Tank - East of Highway 101	WS-03B - New Storage Tank - East of Highway 101	Second Groundwater Well	Martin Luther King Jr. Park Stormwater Capture and Reuse	*Asset/Project Name*	*Asset/Project Name*	*Asset/Project Name*
Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
3	**3**	**3**	**3**	**5**	**5**	**5**	**1**			
1	**1**	**1**	**1**	**2**	**2**	**1**	**3**			
2	**2**	**2**	**2**	**2**	**2**	**2**	**2**			
5	**5**	**5**	**5**	**3**	**3**	**4**	**3**			
11	**11**	**11**	**11**	**12**	**12**	**12**	**9**	**0**	**0**	**0**

Distribution CIP

		Consequence				
		1	2	3	4	5
Category	Service	Asset meets or exceeds all DDW requirements		Asset marginally meets DDW requirements and may go out of compliance from time to time		Asset does not meet DDW requirements
	Environ-mental	Loss of Asset will not cause Environmental damage	Supply to customers is affected to a limited area and a limited time. Typically loss of 8" looped water main	Loss of asset wil cause moderate environmental damage, public may be affected, and press will notice, <$10,000 fine	Loss of asset will cause heavy environmental damage, public will be heavily affected, press will take notice for an extended period, <$100,000 fine	Loss of asset will cause severe environmental damage, public will be severely affecte over a long term, press will notice for long term, >$100,000 fine, possible prison sentences
	Safety	No injury or illness	Minor injury or illnesses, can be treated with onsite first aide	Moderate injury or illness results in loss time injury, injuries and illness will require from medical staff	Severe injury or illness results in extend loss time injuries, injuries will require extended in patient care by medical staff	Fatal injury or illness to one or more persons.
	Supply	Supply to all customers is unaffected	Supply to customers is affected to a limited area and a limited time. Typically loss of 8" looped water main	Supply to customers is affected to an extended area for moderate period. Typically a loss of a 12 inch looped water main or undersized main unable to meet peak hour flows.	Supply to customers is affected to a wide area for extended periods, Typically a loss of a transmission water main (not looped), or undersized main unable to meet daily water demands or fire flow	Supply to the entire district is affected for extended periods. Typically in adequate storage to meet peak demands, loss of supply from wholesaler, or unable to meet peak hour, fire flow, or daily demands for extended periods

WS-08 - Water Master Plan	WD-02 - Urban Water Management Plan	WD-04A - Water Main Replacement Plan	WD-04B - University/Cooley Water Line	WD-04C - Water Main Gap on University	WD-05 - Water Meter Replacement Program	WD-06 - Fire Hydrant Replacement Program	WD-07 - Water Valve Replacement Program
Score	Score	Score	Score	Score	Score	Score	Score
3	3	3	3	3	1	5	3
3	3	3	2	3	1	3	2
1	1	3	1	1	1	3	1
1	1	1	4	3	1	2	2
8	8	10	10	10	4	13	8

Appendix F. Asset Information and Asset Register Data by Asset Class (Under Development)

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