KINNELOA IRRIGATION DISTRICT

SPECIAL DISTRICT • PUBLIC WATER AGENCY

1999 KINCLAIR DRIVE, PASADENA, CALIFORNIA 91107-1017

WATER SYSTEM EVALUATION AND CAPITAL IMPROVEMENT PLAN

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LIST OF ABBREVIATIONS - TECHNICAL

ACP	Asbestos Cement Pipe
AF	Acre-Foot
AFY	Acre-Feet per Year
ASL	Above Sea Level
CCF	Hundred Cubic Feet
CFS	Cubic Feet per Second
DIP	Ductile Iron Pipe
FFD	Fire Flow Demand
GPCD	Gallons per Capita per Day
GPD	Gallons per Day
GPM	Gallons per Minute
HP	Horsepower
HWL	High Water Level
MDD	Maximum Daily Demand
MGD	Millions of Gallons per Day
MMD	Maximum Monthly Demand
PHD	Peak Hour Demand
PC	Production Capacity
PSI	Pounds per Square Inch
PVC	Polyvinylchloride
PRV	Pressure Reducing Valve
PSV	Pressure Sustaining Valve
SCADA	Supervisory Control and Data Acquisition
SF	Square Feet
TDH	Total Dynamic Head
STL	Steel
KW	Kilowatt

LIST OF ABBREVIATIONS – ENTITIES/AGENCIES

AWWA	American Water Works Association
DDW	Division of Drinking Water
FMWD	Foothill Municipal Water District
KID	Kinneloa Irrigation District
LACFCD	Los Angeles County Flood Control District
LACoFD	Los Angeles County Fire Department
LADPW	Los Angeles County Department of Public Works
MWD	Metropolitan Water District
PWAG	Public Water Agencies Group
PWP	Pasadena Water and Power
RBMB	Raymond Basin Management Board
SWRCB	State Water Resources Control Board

SECTION 1: EXECUTIVE SUMMARY

1.1 System Summary

The Kinneloa Irrigation District (KID) is a California Special District organized under Division 11 of the California Water Code. KID owns and operates a water system in the north-central part of Los Angeles County, generally bordered by the City of Pasadena on its west, south and east sides and the Angeles National Forest to the north. Most of the service area is in unincorporated Los Angeles County with a few customers residing within the City of Pasadena boundaries. The present developed service area of the KID covers an area of approximately 460 acres. Additionally, there is approximately 440 acres of undeveloped watershed area within District boundaries north of the present service area.

The KID services a population of approximately 1,950 and there are currently 591 active metered services. The KID is regulated by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) as Water System Number CA1910035. KID's water is supplied exclusively through production of local groundwater sources.

The current Kinneloa Irrigation District system includes:

- Two (2) active vertical groundwater wells
- Five (5) active groundwater tunnels
- Six (6) chlorination stations
- Five (5) interconnections with Pasadena Water and Power
- Six (6) Pressure Zones
- Five (5) Booster Pump Stations (11 pumps)
- Ten (10) potable water storage tanks (~4,000,000 gallons)
- Distribution system infrastructure including
    - Distribution Piping (approx. 91,000 lineal feet)
    - Fire Hydrants (114)
    - System Valves (353)
    - Control Valves (31)
    - Blow-Offs (60)
    - Air Release Valves (91)

District records and system maintenance records indicate that much of the distribution system is nearing 75 years old, surpassing the typical service life of these assets. Approximately 25% of the distribution piping is less than 6-inches in diameter, constricting available fire-flow rates. A comprehensive program to replace aging, undersized and deteriorating piping is recommended to improve the condition, capacity, and reliability of the distribution system.

1.2 System History

The Kinneloa Irrigation District was formed and incorporated under the provisions of the Irrigation District Law (Division 11, Water Code) by Resolution of the Los Angeles County Board of Supervisors on October 13, 1953. It is governed by a five member, publicly elected Board of Directors. At time of formation the newly formed KID acquired the Kinneloa Water Company and served the general area of Kinneloa Canyon, Kinneloa Mesa and the Kinneloa Ranch. In 1974 an improvement district was formed with the addition of the Mira Loma, Canyon Mutual and Osborn Water Companies to the Kinneloa Irrigation District. In 1983 new single-family homes were built in the neighborhood known as Hastings Heights which is formally within the boundaries of the City of Pasadena. In 1990 the Dove Creek townhome complex was built at a site at the southeast corner of Altadena and New York Drives.

1.3 Demand Analysis

Water demands were analyzed for the period January 2014 through December 2023. Based on the data analyzed, existing and future minimum month daily demand (MMDD), average daily demand (ADD), maximum daily demand (MDD), and peak hour demand (PHD) were estimated, and summarized in Table 1-1. Average annual water use over this period was 603 Acre-Feet per year (AFY).

Table 1-1. Summary of Existing and Future System Water Use

Criteria	Unit	Existing Demand	Future Demand
MMDD	*GPD*	272,768	361,522
ADD	*GPD*	538,371	627,125
MDD	*GPD*	1,076,743	1,165,497
PHD	*GPH*	112,161	117,969

1.4 Supply Analysis

KID obtains all its water through a combination of producing groundwater according to its rights in the Raymond Basin and by producing groundwater through a series of groundwater tunnels accessing groundwater in the mountainous formations that surround the District.

The Raymond Basin, adjudicated in 1944, *City of Pasadena v City of Alhambra et al.* was the first basin wide adjudication of groundwater rights in California. The Raymond Basin Management Board was appointed Watermaster in 1984. The KID has decreed rights to 516 AFY; however, due to declining levels in the basin in January 2008 a self-imposed pumping reduction of 30% was implemented resulting in the current annual baseline production right reduced to 361.2 AFY. The KID may supplement its annual production right by conducting spreading operations where parties may receive credit for spreading of canyon surface water diversions into designated spreading grounds. The KID may further supplement its annual production right by leasing rights from another member agency.

Since the 2008 pumping reductions were implemented, groundwater levels in the Raymond Basin have been relatively stable and have risen following the back-to-back wet water years of 2022-2023 and 2023-2024. With average annual demand of 603 AFY, supplementing pumping rights by conducting spreading operations and producing tunnel water directly to the system is critical to maintain future water supply reliability.

1.5 Storage Analysis

The KID has 5 steel water tanks and 5 concrete reservoirs to store potable water for use in the distribution system. The steel water tanks are in good condition, an asset management agreement is in place with a private company that completes all inspections and routine maintenance as required. The concrete reservoirs are in fair to poor condition, the capital improvement plan includes various projects to bring the concrete reservoirs into good condition. Table 1-3 indicates existing volume and desired volume of each reservoir based on demands for the pressure zone it serves as well as the current condition of the facility. Wilcox Reservoir does not directly serve any pressure zone and acts as a forebay to the distribution system.

Although desired volume is less than the existing volume in some instances, the ability to enlarge existing, or construct new reservoirs, is neither economically nor practically feasible and therefore is not contemplated in this plan. To meet the demands of each pressure zone, pipeline and control valve projects are included in the capital improvement plan.

Table 1-3. Summary of Reservoir Sizing and Condition

Facility	Existing Volume (MG)	Desired Volume (MG)	Condition
West Tank	0.500	0.330	Good
East Tank	0.150	0.330	Good
Sage Tank	0.225	0.268	Good
Holly Tank East	0.150	0.268	Good
Holly Tank West	0.150	0.268	Good
Eucalypus Reservoir	0.185	0.290	Fair
Brown Reservoir	0.125	0.211	Poor
Glen Reservoir	0.125	0.211	Poor
Vosburg Reservoir	1.250	0.718	Fair
SUBTOTAL	2.860	2.894	
Wilcox Reservoir	1.125	0.000	Fair
TOTAL	3.985	2.894	

1.6 Condition Assessment

Field inspections of existing water infrastructure were completed by KID General Manager Tom Majich and Facilities Supervisor Chris Burt. The following specialty consultants were engaged for detailed condition assessments where required:

Pump Station Electrical Systems: Building Solutions Group – Jose Cortes, PE
Automatic Transfer Switches: ASCO Power Technologies
Diesel Backup Generators: Generator Services Co., Inc.
Booster and Well Pumps: General Pump Company, Inc.
Steel Potable Water Storage Tanks: USG Water Solutions
Concrete Potable Water Storage Tanks: Municipal Diving Services, Inc.
SCADA System: Cricket Consulting

Identified condition deficiencies are documented in Section 7.

1.7 Capital Improvement Projects

Capital improvement projects were developed based on the results of the condition assessment and other evaluations performed in preparation of this plan. A preliminary estimate of project costs for each of the identified capital projects was developed. As a basis for developing an implementation plan, the recommended projects were assigned a priority number between One (1) and Five (5) based on project necessity; with a priority number of 1 being the highest priority. Assigned priorities and budgetary project costs are summarized in Table 1-4. Detailed project descriptions are included in Section 8.

Table 1-4. Capital Project List and Priority

CAPITAL PROJECT DESCRIPTION		PROJECT PRIORITY	BUDGETARY COST ESTIMATE
G-1	Headquarters: New Roof, Solar/Battery Storage, interior refresh	2	$ 185,323
G-2	Physical Site Security Improvements	1	$ 95,450
G-3	Fire and Water Wise Landscape Improvements	5	$ 75,000
G-4	Roofing on Booster Stations and CL2 Rooms	3	$ 60,000
G-5	SCADA Obsolete RTU Upgrades	3	$ 100,000
G-6	Solar Panels/Batteries for Comms at all Generator Powered Sites	3	$ 125,000
G-7	SCADA Radio/Antenna Upgrades	5	$ 110,000
G-8	District Storage Facilities	3	$ 45,000
G-9	Driveway Paving/Improvements at Various Sites	3	$ 60,000
ST-1	Vosburg Reservoir - Exterior Rehab	3	$ 100,000
ST-2	Glen Reservoir - Full Rehab of Reservoir and Site	1	$ 305,285
ST-3	Brown Reservoir -Roof and Interior Rehab	5	$ 150,000
ST-4	Eucalyptus Reservoir - General Exterior Refurbishment	3	$ 25,000
ST-5	Wilcox Reservoir -General Exterior Refurbishment	3	$ 50,000
ST-6	East Tank - Erosion Control	1	$ 6,000
P-1	K3 Well Pump Rehab/Upgrade	1	$ 250,000
P-2	Wilcox Well - New Pump/Motor/Electrical	3	$ 437,500
P-3	Eucalyptus Booster 1 Pump and Motor R&R	1	$ 75,000
P-4	Wilcox Booster: Booster Station Upgrade	2	$ 700,000
P-5	Glen Reservoir Booster Pump/Motor R&R	2	$ 121,000
P-6	Booster Station Power Backup Generators	4	$ 250,000
T-1	Fluoride Blending Treatment for Delores and Far Mesa Tunnels	1	$ 132,250
T-2	Fluoride Blending Treatment for Hi-Low Tunnel to West Tank	1	$ 85,000
T-3	K3 Chlorination System and Controls Upgrade	1	$ 75,000
SP-1	Delores Tunnel - Pipeline Repair and Protection	1	$ 25,000
SP-2	Far Mesa Tunnel: Source Security and Projection	3	$ 50,000
SP-3	Hi-Lo Tunnel - Pipeline Resilience Project	3	$ 25,000
D-1	Control Valve Retrofit at Sage, Eucalyptus and Holly	2	$ 65,000
D-2	Earthquake Valve Actuators at Storage Tanks	3	$ 340,000
D-3	Upgrade Wharf Hydrant Heads	5	$ 225,000
D-4	Gate Valve Replacement Program	4	$ 150,000
D-5	Brown-Glen to Villa Knolls/Edgecliff Pipeline Project	1	$ 2,070,000
D-6	Villa Mesa/Villa Rica Pipeline Project	2	$ 554,063
D-7	Lower Pasadena Glen Road Pipeline Project	2	$ 588,750
D-8	East Mesaloa/Meyerloa/Clarmeya Pipeline Project	3	$ 805,000
D-9	Eucalyptus-Holly Loop Pipeline Project Phase I and II	3	$ 826,250
D-10	Eucalyptus-Holly Loop Pipeline Project Phase III	5	$ 500,000
D-11	Glen Pumping/Drain Line Project	4	$ 426,250
D-12	Brown Pumping Line Replacement	4	$ 675,000
D-13	East Fairpoint Street Pipeline Project	4	$ 80,000
D-14	West Windover Pipeline Project	4	$ 142,500
D-15	Western Vosburg Street Pipeline Project	5	$ 250,000
D-16	North Villa Heights Road Pipeline Project	5	$ 56,250
D-17	1770-1790 Sierra Madre Villa Pipeline Project	5	$ 106,250
		TOTAL	$ 11,578,120

SECTION 2: SYSTEM DESCRIPTION

This section provides an overview of the existing water production, storage, and distribution facilities in the Kinneloa Irrigation District (KID) potable water system (System.) Figure 2-1 shows the outline of the system service area and political boundaries for Divisions represented on the Board of Directors.

2.1 Setting

KID's service area is in the foothills of the San Gabriel Mountains, adjacent to and bordered by the City of Pasadena on the west, south and east. The Angeles National Forest borders the service area to the north. The service area is in unincorporated Los Angeles County, approximately 16 miles northeast of downtown Los Angeles. The area has varied topography with ground surface elevations ranging from 875 to 1,615 feet above sea level (asl).

2.2 Water System Overview

The KID provides potable water service to 591 customers within the service area, approximately 460 acres in size. Most of the customers are single-family homes in hillside or canyon settings. The subarea informally referred to as the "westside" of the system includes the neighborhoods known as Kinneloa Mesa, Kinneloa Canyon, Kinneloa Estates, Kinneloa Ridge and Dove Creek. The subarea informally referred to as the "eastside" of the system includes the Kinneloa Ranch, Pasadena Glen and Sierra Madre Villa neighborhoods. In addition to the residential customers the KID serves a limited number of commercial customers that include an independent kindergarten through eighth grade school, a church, a Los Angeles County Fire Department Station and a wholesale plant nursery.

The assigned California State Water Resources Control Board, Division of Drinking Water (DDW) System Number is CA1910035. It is classified as a "D3" distribution system and a "TD" max treatment plant classification. At the present time the KID performs no classified treatment as it is only required to perform precautionary disinfection of its groundwater sources. The current Domestic Water Supply permit was issued in 2005 by the California Department of Health Services, Division of Drinking Water and Environmental Management Branch. The most recent sanitary survey by the DDW was conducted in 2019; however, a DDW engineer performed a site visit in February of 2024 and is expected to issue a new sanitary survey report sometime in 2024.

The system component locations are shown in Figure 2-2. A hydraulic profile of the system is shown in Figure 2-3.

FIGURE 2-1 SYSTEM AND POLITICAL DIVISION BOUNDARY MAP

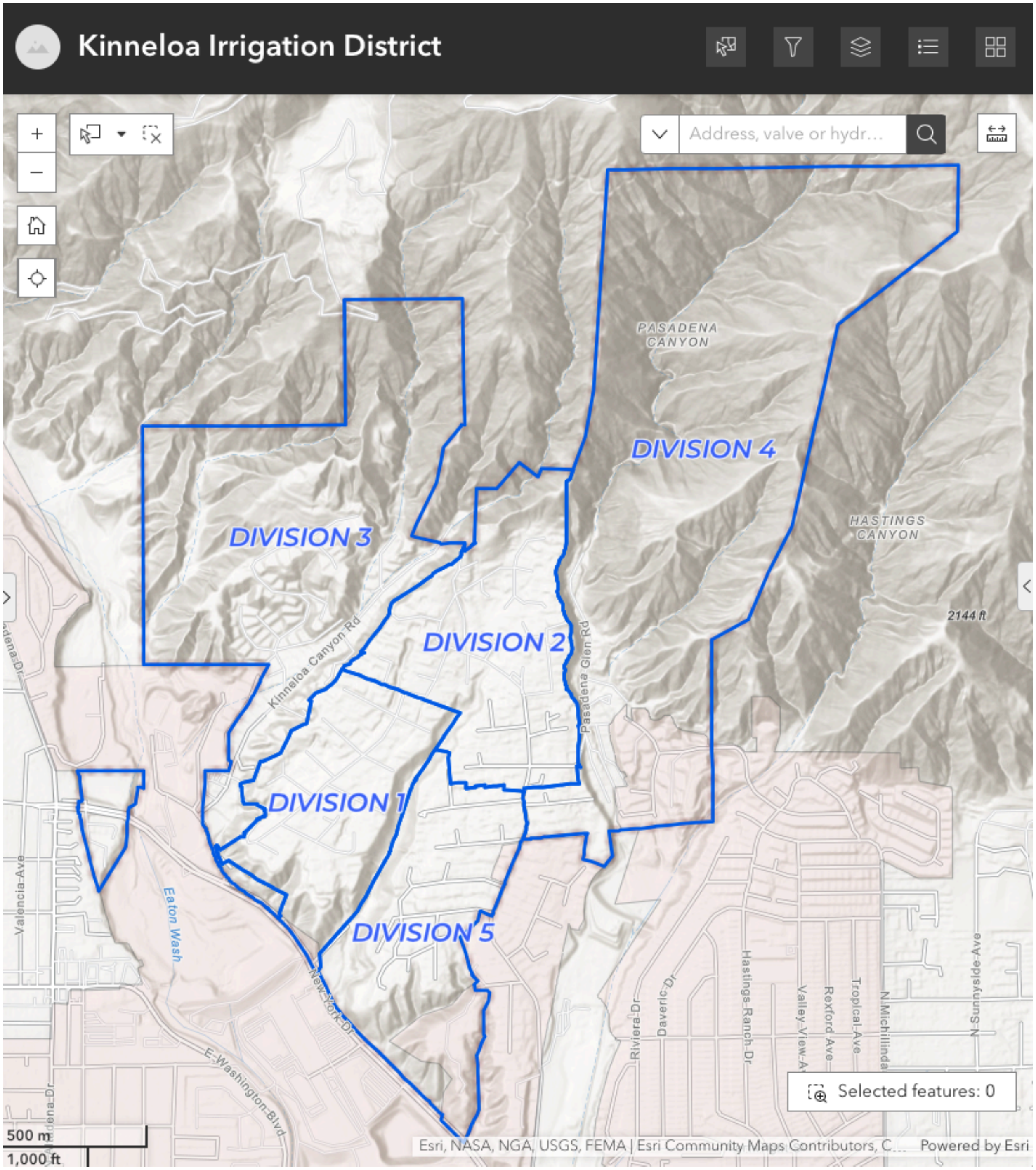


FIGURE 2-2 SYSTEM COMPONENT LOCATIONS

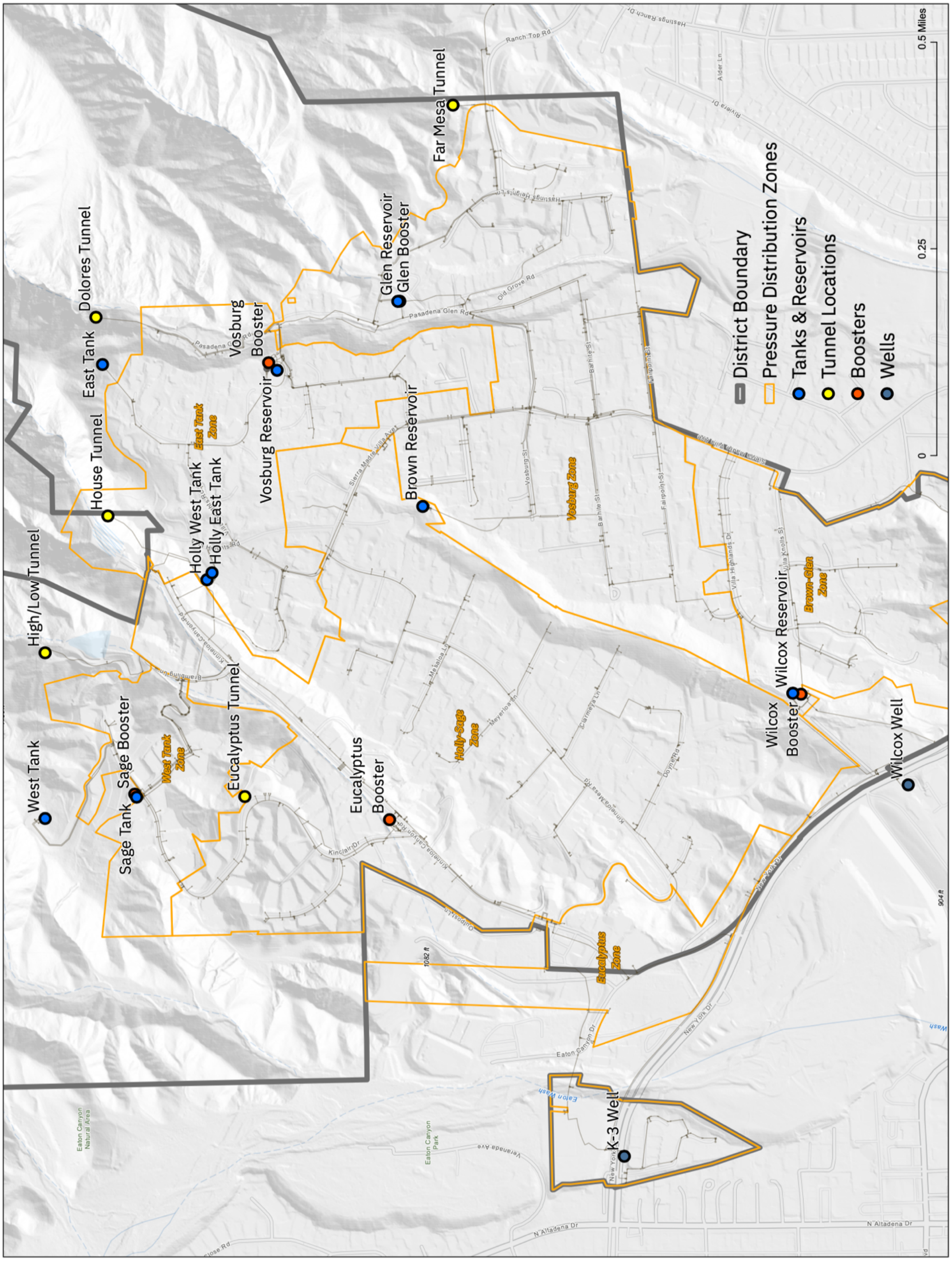
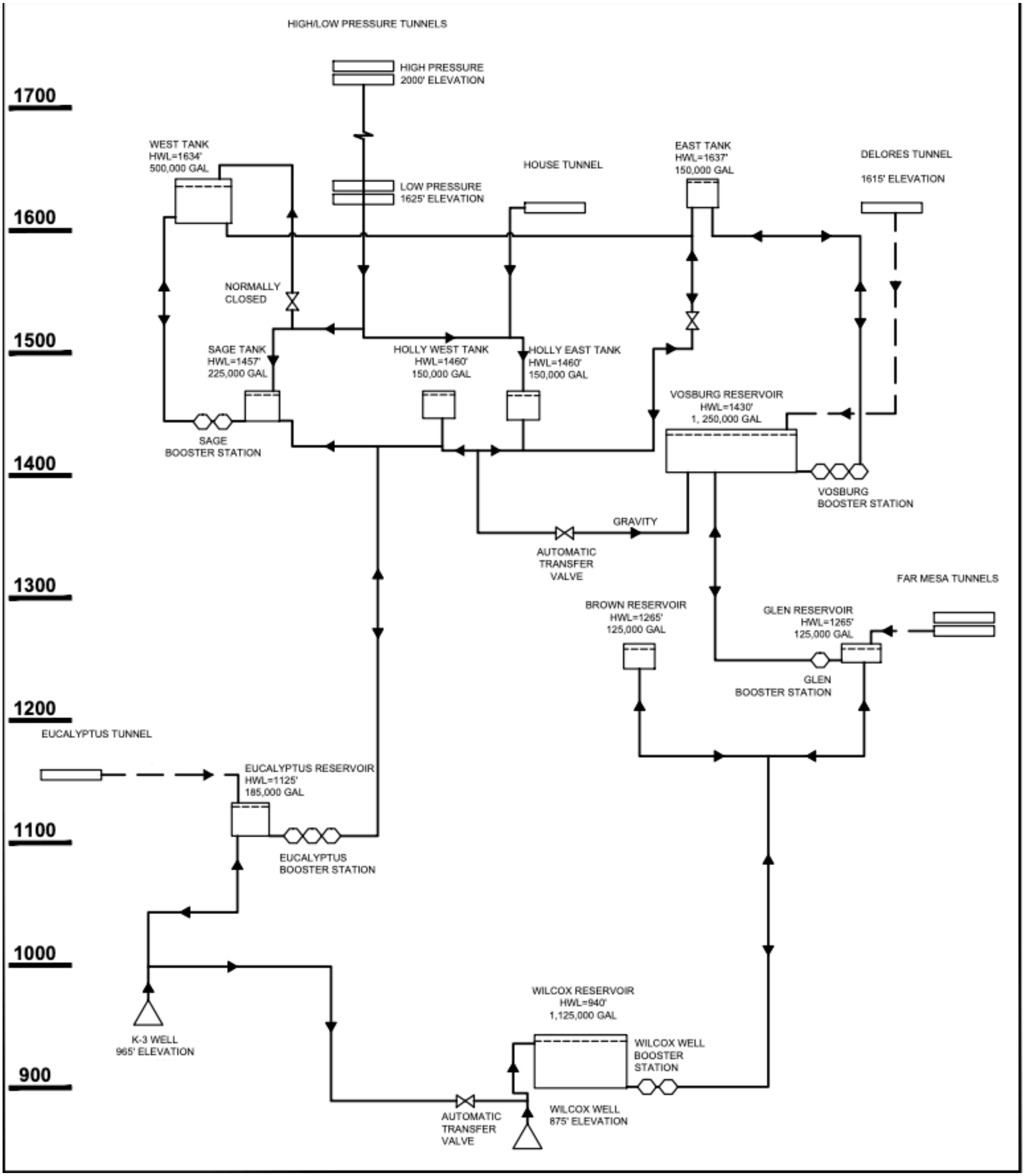


FIGURE 2-3 SYSTEM HYDRAULIC PROFILE



2.3 Water Sources

KID presently obtains water exclusively from local groundwater by producing its rights in the Raymond Basin or diverting water directly from its tunnels into the system. KID is a member of the Foothill Municipal Water District (FMWD), which is a member agency of the Metropolitan Water District; however, KID has no physical means of receiving water from FMWD and therefore has never purchased imported water. KID maintains multiple interconnections with the neighboring water agency, Pasadena Water and Power, for mutual use in times of emergencies.

Groundwater – Raymond Basin

KID owns and operates two (2) vertical wells that produce from the Raymond Basin, Pasadena subarea. Both wells receive chlorine disinfection at the well head prior to entering the distribution system. The K3 Well delivers water to the Eucalyptus Reservoir or the Wilcox Reservoir. The Wilcox Well delivers water only to the Wilcox Reservoir. Controls for the wells are based on operating levels in the destination reservoirs. The groundwater supply well locations are shown on Figure 2-2.

Groundwater – Tunnels

KID operates several groundwater tunnels that produce potable water directly to the system or are diverted to spreading grounds for groundwater recharge purposes, all tunnels are metered. The Long Tunnel delivers non-potable water for spreading purposes only. The remaining active tunnels may be diverted to the system, or to spreading, depending on system demand and fluoride levels of the source water. As of the report date the only tunnel that is being produced directly to the system is the Delores Tunnel. The Far Mesa, House and High-Low Pressure Tunnels are being diverted to spreading due to high fluoride content levels. A permit application is under review by DDW for fluoride treatment via blending, when approved, the District may produce these tunnels directly to the system again. The Eucalyptus Tunnel has been offline since April 2023 due to repeated positive water sample results for total coliform. The condition, capacity and status of each tunnel is discussed further in Section 7.

Imported Water – Foothill Municipal Water District

KID is a member agency of the Foothill Municipal Water District (FMWD). FMWD operates as one of the 26 member agencies of the Metropolitan Water District of Southern California (MWD). MWD was originally formed in 1928 to build the Colorado River Aqueduct and bring water from the Colorado River to Southern California. MWD later contracted with the state to help bring Northern Sierra water south through the State Water Project. Once State Project and Colorado River water reach Southern California, it is distributed across MWD's region. Given that there are no physical pipelines or interconnections to access any of FMWD's, MWD's or another FMWD member's system the KID has never received water through its membership in FWMD. The KID pays an annual fee to FMWD as a share of its administrative expenses. KID customers are assessed an ad valorem tax based on their assessed property value for inclusion in the MWD service area and pay an MWD Standby charge on their property tax bill.

Emergency Interconnections – Pasadena Water and Power

KID maintains multiple interconnections with neighboring Pasadena Water and Power (PWP) to provide water on an emergency basis to each other as required. The interconnection agreement outlines the mechanism for reimbursement of the delivering agency by receiving an equivalent amount of water in return, or financial reimbursement as specified by the agreement. There is a separate agreement for wholesale delivery of water by KID to PWP at an agreed upon price, no wholesale water deliveries were made for the most recent water year of July 2023-June 2024. The interconnection locations are shown on Figure 2-2 and summarized in Table 2-3.

Table 2-3. Interconnections with Pasadena Water and Power

Connection Name	Connection Size	Capacity (GPM)	Delivering Entity	Delivering Pressure Zone	Receiving Entity	Receiving Pressure Zone	Status
Outpost-West	4"	800	PWP	Calaveras	KID	Eucalyptus	Manual, Normally Closed
Outpost-East	4"	800	KID	Eucalyptus	PWP	Sheldon	Manual, Normally Closed
Ranch Top	8"	1200	KID	Vosburg	PWP	Don Benito	Automatic, Pressure Sustaining
Ranch Top	8"	1200	PWP	Don Benito	KID	Vosburg	Automatic, Pressure Sustaining
Fairpoint	6"	800	KID	Vosburg	PWP	Murray	Automatic, Pressure Sustaining
Fairpoint	2"	200	KID	Vosburg	PWP	Calaveras	Manual, Normally Closed
Wilcox*	6"	unknown	PWP	Sheldon	KID	Wilcox Resv.	Manual, Normally Closed

*Wilcox Intertie does not currently have a meter installed which is required for use, a meter will be installed in 2024

2.4 Water Treatment

Disinfection

The operating permit for KID requires that a chlorine residual of at least 0.5 mg/L shall be maintained in the distribution system at all times. Additionally, it requires that all chlorination facilities shall be inspected daily, and operational records of their operations including chlorine residuals shall be maintained. The District has seven (7) DDW approved treatment facilities as listed in Table 2-4 indicating their current operational status.

At high-volume production facilities the District operates Clortec® on-site sodium hypochlorite generators that generate low-strength (0.8%) sodium hypochlorite from salt via electrochlorination. The solution is stored in day tanks onsite and injected via metering pump into the well discharge line.

At facilities that do not have onsite sodium hypochlorite generators, HASA Multi-Chlor ®, a 12.5% sodium hypochlorite solution, is purchased and is mixed with potable water in the day tank at the treatment facility to achieve the desired concentration and then injected via metering pump into the reservoir inlet when the tunnel source is online.

Table 2-4. DDW Approved Treatment Facilities

Facility Name	Status	Treatment
K-3 Well	Operational	Disinfection using ClorTec onsite sodium hypochlorite generation system injected via metering pump at well discharge line.
Wilcox Well	Operational	Disinfection using ClorTec onsite sodium hypochlorite generation system injected via metering pump at well discharge line.
Eucalyptus Tunnel	Operational	Disinfection using commercially purchased HASA Multi-Chlor, injected at reservoir inlet.
Hi-Lo Tunnel at Sage Tank	Non-operational	Disinfection using commercially purchased HASA Multi-Chlor, injected at reservoir inlet.
Hi-Lo and House Tunnels at Holly Tanks	Operational	Disinfection using ClorTec onsite sodium hypochlorite generation system injected via metering pump at reservoir inlet
Far Mesa Tunnel at Glen Reservoir	Operational	Disinfection using commercially purchased HASA Multi-Chlor, injected at reservoir inlet.
Delores Tunnel at Vosburg Reservoir	Operational	Disinfection using ClorTec onsite sodium hypochlorite generation system injected via metering pump at reservoir inlet

Blending

KID has submitted a permit amendment application to the DDW for review of a proposed blending strategy to blend higher fluoride concentration sources with lower fluoride concentration sources. At the present time that application is still under review and pending action by DDW. Blending is a treatment technique and, if approved, the blending strategy would be formalized and memorialized in a permit amendment. The District has requested that the following sources be blended to treat for Fluoride concentrations that are above the Maximum Contaminant Level (MCL) of 2.0 mg/L: Delores Tunnel, Far Mesa Tunnel and High-Pressure Tunnel.

2.5 Water Storage

KID owns Ten (10) potable water storage tanks that are either entirely above-ground welded steel tanks or partially below grade concrete reservoirs. All reservoirs are covered and screen to maintain a sanitary condition. The level of water in the reservoirs controls the system operating pressure in the pressure zone served by each storage facility. A summary of the existing storage facilities is provided in Table 2-5. The storage facilities combined provide a total of 3,985,000 gallons of storage capacity.

Table 2-5. Potable Water Storage Reservoirs

Facility Name	Capacity (gallons)	Pressure Zone Serviced	Subarea Served	High Water Level (hwl)	Construction Type
Eucalyptus Reservoir	185,000	Eucalyptus	westside	1125' asl	Concrete, partially below grade
Sage Tank	225,000	Holly-Sage	westside	1457' asl	Steel Tank, above grade
Holly Tank East	150,000	Holly-Sage	westside	1460' asl	Steel Tank, above grade
Holly Tank West	150,000	Holly-Sage	westside	1460' asl	Steel Tank, above grade
West Tank	500,000	East-West	east or westside	1634' asl	Steel Tank, above grade
Wilcox Reservoir	1,125,000	none	eastside	940' asl	Concrete, partially below grade
Brown Reservoir	125,000	Brown-Glen	eastside	1265' asl	Concrete, partially below grade
Glen Reservoir	125,000	Brown-Glen	eastside	1265' asl	Concrete, partially below grade
Vosburg Reservoir	1,250,000	Vosburg	eastside	1437' asl	Concrete, partially below grade
East Tank	150,000	East-West	east or westside	1637' asl	Steel Tank, above grade

Eucalyptus Reservoir

The Eucalyptus Reservoir is supplied with water from the K-3 Well and the Eucalyptus Tunnel. This reservoir has a capacity of 185,000 gallons. The reservoir is half-buried with concrete walls, floor and roof. It was originally constructed in 1960 as a subsurface reservoir but was refurbished and expanded in 1989 to its current configuration. Water from the Eucalyptus Reservoir supplies the Eucalyptus pressure zone as well as the Eucalyptus Booster Pump Station that feeds the Sage and Holly Tanks. The Eucalyptus Reservoir is located on Kinneloa Canyon Road and has a base elevation of 1104’ asl and a high-water level of 1125’ asl. Figure 2-4 shows the reservoir.

Figure 2-4. Eucalyptus Reservoir

Sage Tank

The Sage Tank is supplied with water from the Eucalyptus Booster Station. This tank has a capacity of 225,000 gallons. The tank is a 24' high welded steel tank constructed in 2003. Water from the Sage Tank partially supplies the Holly-Sage pressure zone as well as the Sage Booster Pump Station that feeds the West Tank. Additionally, the Holly-Sage zone may deliver water to Vosburg Reservoir through the Sierra Madre Villa Transfer Valve. The Sage Tank is located on Kinclair Drive and has a base elevation of 1434.5' asl and a high-water level of 1457' asl. Figure 2-5 shows the tank.

Figure 2-5. Sage Tank

Holly Tanks

The Holly Tanks are supplied with water from the Eucalyptus Booster Station and both the Hi-Low Pressure and House Tunnels. Water from the Holly Tanks partially supplies the Holly-Sage pressure. Additionally, the Holly-Sage zone may deliver water to Vosburg Reservoir through the Sierra Madre Villa Transfer Valve. The Holly Tanks float together although there are two separate tanks onsite. Each tank is 150,000 gallons for a combined 300,000 gallons of storage at the site. Holly Tank East was constructed in 1956 with a base elevation of 1436' and a high-water level of 1460'. Holly Tank West was constructed in 1959 with a base elevation of 1440' and a high-water level of 1460'. Both tanks are fully above ground, welded steel tanks. The Holly Tanks are located on Villa Heights Road in the North Kinneloa Ranch neighborhood. Figure 2-6 shows the tanks.

Figure 2-6. Holly Tanks

West Tank

The West Tank, along with East Tank, serves the East-West Pressure Zone. Water is supplied from the Sage Booster Pump Station and the Vosburg Booster Pump Station. West Tank is a 500,000 gallon, above ground, welded steel tank constructed in 2003. The West Tank is located on Kinclair Drive and has a base elevation of 1610' asl and a high-water level of 1634' asl. Figure 2-7 shows the tank.

Figure 2-7. West Tank

Wilcox Reservoir

The Wilcox Reservoir receives water either from the K-3 Well or the Wilcox Well. The Wilcox Reservoir does not serve any pressure zone directly, water is delivered from the Wilcox Reservoir to the Brown and Glen Reservoirs via the Wilcox Reservoir Booster Pump Station. The Wilcox Reservoir was originally constructed in 1924 to serve a sand, gravel and asphalt production facilities on the south side of New York Drive. In the late 1940's the reservoir was retrofitted with a pump stand and booster pumps to serve potable water to the Mira Loma, Osborn and Canyon Mutual water companies. In 1983 KID installed a new pump stand and a new booster pump. The reservoir is a large, partially buried concrete reservoir with a metal panel roof. The reservoir capacity is 1,125,000 gallons; however, given the configuration of the pump stand it is expected that only 750,000 gallons is accessible. In 1990 a new lightweight steel roof was installed. In 1992, following damage from the 1991 Sierra Madre Earthquake, a Hypalon liner was installed. The high-water elevation of the reservoir is 940' asl. The reservoir is located at the end of Wilcox Canyon and is accessible via a private dirt road off New York Drive. Figure 2-8 shows the reservoir.

Figure 2-8. Wilcox Reservoir

Brown Reservoir

The Brown Reservoir receives water from the Wilcox Reservoir Booster Pump Station, along with the Glen Reservoir it serves the Brown-Glen pressure zone. The Brown Reservoir has a capacity of 125,000 gallons. It was built in the early 1920's and has a high-water level of 1265' asl. Brown Reservoir is mostly below ground with concrete walls and floor, a wooden frame roof and composite roofing. The roof was replaced while the frame was refurbished in 2000. The reservoir is located off Sierra Madre Villa and accessed via a driveway easement through a residential property. Figure 2-9 shows the reservoir.

Figure 2-9. Brown Reservoir

Glen Reservoir

The Glen Reservoir receives water from the Wilcox Reservoir Booster Pump Station and the Far Mesa Tunnel. Along with the Brown Reservoir it serves the Brown-Glen pressure zone. The Glen Booster Pump is onsite and delivers water to the Vosburg Reservoir. The Glen Reservoir has a capacity of 125,000 gallons. It was built in the early 1920's and has a high-water level of 1265' asl. Glen Reservoir is mostly below ground with concrete walls and floor, a wooden frame roof and composite roofing. The roof framing was constructed in the 1960's. The reservoir is located off of Pasadena Glen Road. Figure 2-10 shows the reservoir.

Figure 2-10. Glen Reservoir

Vosburg Reservoir

The Vosburg Reservoir receives water from the Glen Booster Pump, the Holly-Sage Zone via the Sierra Madre Villa Transfer Valve and the Delores Tunnel. The Vosburg Reservoir serves the Vosburg pressure zone. The Vosburg Booster Pump Station is onsite and delivers water to the East and West Tanks. The Vosburg Reservoir has a capacity of 1,250,000 gallons and a high-water level of 1437' asl. It was built in the early 1920's as a below grade open reservoir, in 1958 above grade concrete walls were constructed along with a wood framed roof system. In 1997 the wood frame roofing system was replaced. The reservoir is located off Windover Road. Figure 2-11 shows the reservoir.

Figure 2-11. Vosburg Reservoir

East Tank

The East Tank, along with West Tank, serves the East-West Pressure Zone. Water is supplied from the Sage Booster Pump Station and the Vosburg Booster Pump Station. East Tank is a 150,000 gallon, above ground, welded steel tank constructed in 1958. The high-water elevation of the tank is 1637' asl. The East Tank is located off Villa Heights Road. Figure 2-12 shows the tank.

Figure 2-12. East Tank

2.6 Water Distribution System

The distribution system is composed of a network of pipes, pump stations, valves, and appurtenances which are used to convey water from the reservoirs and tanks to customers throughout the service area. These facilities are summarized in the following subsections:

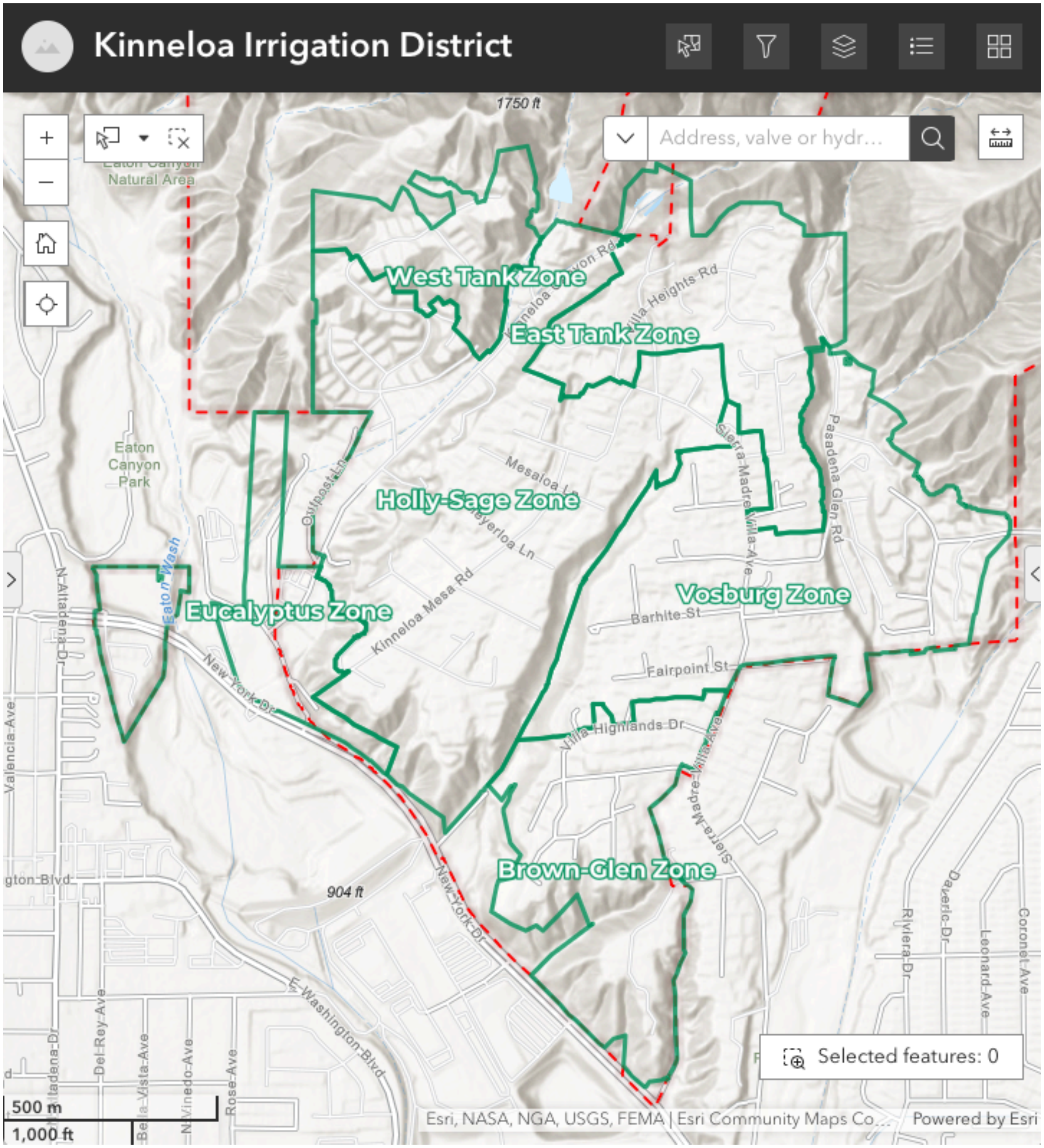
Pressure Zones

The distribution system is divided into six (6) pressure zones. The locations of the pressure zones are shown on Figure 2-13. A summary of the pressure zones is provided in Table 2-6.

Table 2-6. Service Area Pressure Zones

Pressure Zone Name	Pressure Zone Number	HWL (feet asl)	Zone Ground Elevation Range (feet asl)		Operating Pressure (psi)		Pressure Maintained By
			High	Low	Low	High	
Eucalyptus Zone	1	1,125	1,029	936	41	81	Eucalyptus Reservoir
Brown-Glen Zone	2	1,265	1,200	990	28	118	Brown and Glen Reservoirs
Vosburg Zone	3	1,437	1,359	1,093	33	148	Vosburg Reservoir
Holly-Sage Zone	4	1,460	1,358	1,074	44	166	Holly and Sage Tanks
East Tank Zone	5	1,637	1,537	1,321	43	136	East and West Tank
West Tank Zone	6	1,634	1,521	1,365	48	115	East and West Tank

FIGURE 2-13 PRESSURE ZONE MAP



Booster Pump Stations

The system has five (5) booster pump stations to transfer water between pressure zones. Table 2-7 includes information for each pump station. The booster stations are controlled by water level indicators in the destination tank or reservoir. distribution system is divided into six (6) pressure zones. The locations of the pressure zones are shown on Figure 2-13. A summary of the pressure zones is provided in Table 2-6.

Table 2-7. Booster Pump Stations

Facility Name	Pump Motor (HP)	Pump Design Capacity (GPM)	Total Pumping Head (ft)	Supply Zone	Discharge Zone
Eucalyptus Booster 1	50	350	380	Eucalyptus	Holly-Sage
Eucalyptus Booster 2	50	375	380	Eucalyptus	Holly-Sage
Eucalyptus Booster 3	50	375	380	Eucalyptus	Holly-Sage
Sage Booster 1	25	400	200	Holly-Sage	East/West
Sage Booster 2	25	400	200	Holly-Sage	East/West
Wilcox Booster 1	75	500	450	n/a*	Brown-Glen
Wilcox Booster 2	50	300	450	n/a*	Brown-Glen
Glen Booster	25	400	210	Brown-Glen	Vosburg
Vosburg Booster 1	25	300	230	Vosburg	East/West
Vosburg Booster 2	25	300	230	Vosburg	East/West
Vosburg Booster 3	25	300	230	Vosburg	East/West

*Wilcox Booster supply is the Wilcox Reservoir which is a forebay to the distribution system.

A photo of each booster pump station is provided as follows:


Figure 2-14. Eucalyptus Booster Pump Station View 1


Figure 2-15. Eucalyptus Booster Pump Station View 2

Figure 2-16. Sage Booster Pump Station View 1

Figure 2-17. Sage Booster Pump Station View 2

Figure 2-18. Wilcox Booster Pump Station View 1

Figure 2-19. Wilcox Booster Pump Station View 2

Figure 2-20. Glen Booster Pump Station

Figure 2-21. Vosburg Booster Pump Station View 1

Figure 2-22. Vosburg Booster Pump Station View 2

Distribution System Piping

The system includes distribution infrastructure including:

- Distribution Piping
- Fire hydrants
- Control valves
- System valves
- Blow-offs
- Air release valves

The distribution network includes approximately 17.3 miles of distribution piping as summarized in Table 2-8.

Table 2-8. Pipe Length (feet) by Diameter (inch)

Pipe Material	1.5"	2"	2-1/2"	3"	4"	6"	8"	10"	12"	16"	TOTAL
Steel (unlined)	1,629	540	366	1,077	6,789	6,560	1,532	113	74		18,680
Asbestos Cement (AC)					4,200	15,014	13,262	307			32,783
C-900 (PVC)				2,052	5,462	4,702	8,925	414	96		21,651
Ductile Iron (DI)					525	73	3,748	5,564	7,202	1,120	18,232
TOTAL	1,629	540	366	3,129	16,976	26,349	27,467	6,398	7,372	1,120	91,346

Valves and Hydrants

Based on a system-wide valve exercising and fire hydrant assessment completed in 2014 and documented by GIS data, the distribution network includes 343 mainline and hydrant isolation valves and 111 fire hydrants. A summary of the size and type of valves in the system is provided in Table 2-9. Control valves are not included in this summary.

Table 2-9. Valve Count by Type and Size (inch)

Valve Type	unknown	2"	3"	4"	6"	8"	10"	12"	16"	TOTAL
Gate	2	1	2	22	79	12	1			119
Butterly					30	22	3	1	2	58
Resilient Wedge				23	61	53	10	9	1	157
Unknown	9									9
TOTAL	11	1	2	45	170	87	14	10	3	343

2.7 Distribution System Analysis Summary and Recommendations

An analysis of the distribution system was completed based on the information documented in this section. A summary of the finding and recommendations are provided as follows:

- There have been several modifications to the valve and hydrant inventory since the 2014 system wide exercising and condition assessment. KID should update its system maps and GIS inventory with all current valve and hydrant data.
- KID should update its GIS with locations for all meters, blowoffs, air-vacs and other appurtenances.
- KID should modify an existing control valve at the Eucalyptus Reservoir to be able to drop water from the Holly-Sage zone into the Eucalyptus Reservoir should demand justify that.
- KID should modify an existing control valve at the Sage Booster Station to be able to drop water from the East-West zone into the Sage Tank should demand justify that.
- KID should complete removal of the Holly Booster Pumps that were abandoned in 2015 and install a control valve in the pump vault to allow for movement of water from the East-West zone into the Holly Tanks should demand justify that.
- KID could consider combining the Brown-Glen Zone and the Vosburg Zone. The installation of a combination pressure reducing and pressure sustaining valve as part of the Brown-Glen Pipeline project would accommodate this. The Brown Reservoir could be abandoned, and the Glen Reservoir/Booster could act as an interim pumping facility. Alternatively, the Wilcox Reservoir Booster Station could be modified to pump directly to Vosburg which would eliminate the requirement to maintain the Glen Reservoir and Booster as well.
- The Wilcox Interconnection with PWP does not have a meter installed and therefore is not presently usable. Installation of a meter would allow for this interconnect to be utilized if required.
- All steel distribution piping of 4” diameter and smaller does not meet fire flow requirements and should be upgrade.

While the existing distribution system is functional, there are a variety of operational, condition, and capacity concerns. Reservoir storage capacities are discussed in Section 5. Reservoir conditions are discussed in Section 7.

Capacities of pump stations are believed to be adequate to meet existing demands; however, several pump and motor assemblies require immediate replacement for reliability. Pump station conditions are discussed in Section 7.

Much of the distribution system piping is believed to be at or near the expected service life of the pipeline based on material and date of installation. Approximately 20% of distribution piping is less than 6-inches in diameter, constricting available fire flows. A program to replace aging, undersized and deteriorating piping is recommended to improve the condition, capacity, and reliability of the distribution system.

SECTION 3: WATER DEMAND ANALYSIS

This section discusses the average and peak demands in the KID system both for customer use and fire flow capacity.

3.1 Study Area

The study area for this report encompasses all residences, businesses, and water system customers within the Kinneloa Irrigation District's service area limits. All customers within the service area are equipped with water meters. The developed service area limits encompass approximately 460 acres and is shown in Figure 2-1.

3.2 Land Use and Population

Most of the land within the developed service area is exclusively single-family residences. Aside from landscape only accounts, the only non-residential customers are in the Eucalyptus pressure zone. Those non-residential customers include a church, an independent kindergarten through 8th grade school, a Los Angeles County Fire Department station and a commercial plant nursery. KID currently provides service to 591 metered customers including 24 landscape only services and four (4) non-residential domestic services. Per the Division of Drinking Water, the population served by KID is 1,953.

3.3 Existing Water Production and Demand

Historical water production was calculated based on well and tunnel production records. Historical water demand was calculated based on monthly reported sales for the calendar years 2014 through 2023. Demand analysis considers Average Day Demand (ADD), Maximum Day Demand (MDD) and Peak Hour Demand (PHD). Periodically, the District has sold water on a wholesale basis to the City of Pasadena; however, that demand has been excluded from this analysis. Annual retail customer demand has varied from 724-acre feet per year to 453-acre feet, the average annual retail demand over the study period was 603 acre-feet per year.

The State of California and the County of Los Angeles have differing methodologies for calculating MDD for purpose of storage capacity requirements. Figure 3-1 shows the monthly demand for the 10-year period ending December 2024 and calculations for MDD, ADD and MMDD using State, County and District methodologies.

FIGURE 3-1 . TEN (10) YEAR RETAIL DEMAND BY MONTH

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10 YR AVG
January	27,346	16,380	10,076	6,089	16,219	14,800	13,257	18,538	10,384	7,257	14,035
February	19,531	17,898	13,278	6,262	18,832	7,816	16,358	13,576	22,567	11,990	14,811
March	14,993	21,985	12,520	13,610	13,919	10,430	14,226	19,894	30,288	6,068	15,793
April	28,145	23,800	17,969	20,024	18,685	18,530	10,781	21,305	25,568	12,546	19,735
May	29,732	18,225	16,657	22,410	20,075	15,946	21,204	20,474	24,473	17,038	20,623
June	29,875	26,869	22,757	29,558	25,110	22,405	29,461	32,128	21,736	14,585	25,448
July	36,367	23,521	29,324	27,536	29,242	25,607	27,947	26,976	29,190	23,246	27,896
August	31,023	26,667	28,037	29,209	31,448	26,632	28,500	35,918	27,735	27,085	29,225
September	31,754	27,175	33,730	31,395	33,188	35,025	36,522	27,848	36,221	21,051	31,391
October	32,085	20,555	24,972	27,044	23,942	25,220	27,514	25,678	21,053	20,578	24,864
November	20,372	22,671	22,421	19,133	23,305	23,597	23,016	19,053	15,331	20,136	20,903
December	14,310	19,747	13,481	26,862	13,970	11,011	27,009	19,686	18,101	15,650	17,983
TOTAL CCF	315,533	265,493	245,222	259,132	267,935	237,019	275,795	281,074	282,647	197,230	262,708
TOTAL AF	724.36	609.49	562.95	594.89	615.09	544.12	633.14	645.26	648.87	452.78	603.09

*data taken from SWS Annual Reports, measured in CCF; Total of all sales EXCLUDING Deliveries to City of Pasadena

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	10 YR AVG
ADD (ccf)	864.5	727.4	671.8	710.0	734.1	649.4	755.6	770.1	774.4	540.4	719.7
ADD (gal)	646,627	544,078	502,536	531,043	549,083	485,727	565,191	576,009	579,233	404,186	538,371
MAX MONTH (ccf)	36,367	27,175	33,730	31,395	33,188	35,025	36,522	35,918	36,221	27,085	33,263
average daily (gal)	632,617	635,223	720,867	711,620	752,261	748,534	780,527	866,667	846,666	595,870	729,085
MIN MONTH (ccf)	14,310	16,380	10,076	6,089	13,919	7,816	10,781	13,576	10,384	6,068	10,940
average daily (gal)	356,796	408,408	251,223	151,819	347,047	194,879	268,806	338,495	258,908	151,295	272,768
Ratio to ADD	0.55	0.75	0.50	0.29	0.63	0.40	0.48	0.59	0.45	0.37	0.50
STATE REGULATORY REQUIREMENTS (gallons)											
MDD 1.5x	948,925	952,834	1,081,301	1,067,430	1,128,392	1,122,801	1,170,791	1,300,000	1,269,999	893,805	
PHD 1.5x	59,308	59,552	67,581	66,714	70,525	70,175	73,174	81,250	79,375	55,863	
COUNTY REGULATORY REQUIREMENTS (gallons)											
ADD	646,627	544,078	502,536	531,043	549,083	485,727	565,191	576,009	579,233	404,186	538,371
MDD (2x ADD)	1,293,253	1,088,156	1,005,073	1,062,086	1,098,166	971,453	1,130,382	1,152,018	1,158,466	808,373	1,076,743
DISTRICT CALCULATIONS											
MDD on eAR	1,071,884	997,084	902,088	1,029,891	1,060,664	862,444	936,496	1,015,036	899,096	915,350	969,003
Max Date on eAR	5/29/14	6/23/15	6/13/16	9/14/17	9/26/18	10/21/19	9/8/20	8/22/22	9/26/22	8/29/23	
Method	Production	Production	Production	Production	Production	Production	Production	Production	Subeca	Subeca	

California Waterworks Standards

California Waterworks Standards (California Code of Regulations, Title 22, Division 4, Chapter 16) require a water system to estimate MDD for the system as a whole and for each pressure zone within the system, *excluding fire flow*. To calculate MDD the system must identify the month with the highest water usage during at least the most recent ten years of operation, divide the total water usage during the maximum month by the number of days in that month and to calculate MDD multiply the average daily usage by a peaking factor that is a minimum of 1.5. The District reviewed monthly usage data as reported on the Small Water Systems Annual Report from January 2014 through December 2023. The month with the highest average daily flow identified was August 2021 with average daily flow of 866,667 gallons. The calculated MDD for compliance with California Waterworks Standards for water storage is 1,300,000 gallons.

Los Angeles County Standards

Los Angeles County Standards (Los Angeles County Code, Title 40 Utilities) require total storage capacity to meet fire-flow requirements and twice the average daily water flow (the MDD). The County code does not specify a time horizon for calculation average daily water flow. The average daily water flow for the period of January 2014 through December 2023 is 538,371 gallons. Twice that amount is 1,076,742 gallons. This figure will be represented as MDD for purposes of compliance with Los Angeles County storage standards.

Kinneloa Irrigation District Policy

Based on the data from years 2014 through 2023, the maximum day demand reported for each year has ranged from 862,444 gallons in 2019 to 1,071,884 gallons in 2014. The District will use the values determined per Los Angeles County methodology that average day demand is 528,371 gallons and maximum day demand is 1,076,742 gallons. Peak Hour Demand (PHD) will be assumed at 5 times ADD (or 2.5 times MDD). California Waterworks Standards require that PHD be calculated at least 2.25 times ADD.

During the analyzed period, the month for each year with the lowest demand was identified and the average daily demand over those 12 lowest demand months was 272,768 gallons per day, or 0.50 of ADD. These data points are summarized in Table 3-1.

Table 3-1. Summary of Existing Water Use

Criteria		Demand GPD	Demand GPM
Average Day Demand	ADD	538,371	374
Maximum Day Demand	MDD	1,076,742	748
Peak Hour Demand	PHD	2,691,855	1,869
Minimum Month Daily Demand	MMDD	272,768	189

Existing Water Demand by Pressure Zone

To estimate usage by zone a percentage allocation to each zone has been calculated based on consumption for calendar years 2021 and 2022 in each pressure zone. Following completion of the East-West Connector Pipeline project in 2017 the East Tank and West Tank zones effectively operate as a singular pressure zone and are evaluated as such. A summary of the ADD, MDD and MMDD for each zone is shown in Table 3-2.

Table 3-2. Summary of Existing Water Use by Pressure Zone

Pressure Zone	% of Total	ADD (gal)	MDD (gal)	MMDD (gal)
Eucalyptus Zone	7.25%	39,032	78,064	19,776
Brown/Glen Zone	11.93%	64,228	128,455	32,541
Vosburg Zone	26.33%	141,753	283,506	71,820
Holly/Sage Zone	30.57%	164,580	329,160	83,385
East/West Tank Zone	23.92%	128,778	257,557	65,246
TOTAL	**100.00%**	**538,371**	**1,076,742**	**272,768**

3.4 Future Development and Demands

The District is substantially built out, no significant development projects are planned which will increase system demand. Due to recent changes in State law (SB 9), construction of accessory dwelling units (ADU's) is anticipated which could increase system demand. Most of the District with lots suitable for ADUs is included in a Very Fire Hazard Severity Zone and a Hillside Management Area whereby current County regulations limit any new freestanding ADUs to 800 square feet and allow for one JADU. Additionally, newly constructed ADU's are typically built on existing irrigated landscape areas so some reduction in outdoor water demand should be expected. Future demands may come from construction of new Single-Family Residences, ADUs and Densification of existing residences for which a Junior ADU demand is used as a proxy.

New Single Family Residence Construction

The District has identified parcels in each zone that are currently vacant and may have a new single-family home constructed on them. The eligible parcels are largely infill parcels in existing neighborhoods whereby the homes are expected to be median water users, not new large multi-acre estates.

Accessory Dwelling Units (ADU)

An Accessory Dwelling Unit (ADU) is an additional or independent living facility required to provide provisions for living, sleeping, eating, cooking, and sanitation. It can be detached (separated from primary residence) or attached (sharing wall(s) with the primary residence). An existing space such as a garage, storage building, or an attached room can be re-purposed as an ADU. ADUs are subject to separate life, safety, and fire hazard regulations from the main dwelling.

It is assumed that 50% of properties that are eligible for a freestanding ADU will have one constructed. Demand from new, maximum 800-square foot ADU's is expected as similar to the average monthly consumption by the townhomes in the Dove Creek complex.

Junior Accessory Dwelling Units (JADU)

A Junior Accessory Dwelling Unit (JADU) is a separate living facility within an existing single or multi-family dwelling that has its own entrance and cooking facilities but is not necessarily required to have its own private bathroom. A sink may be installed but the sanitation facilities may be shared with the primary structure. Unlike ADUs, JADUs are considered part of the main structure and are not considered a separate unit for life, safety, and fire hazard regulations.

The Junior ADU is effectively densification of an existing residence with additional occupants. For purposes of planning for densification of existing properties, it is assumed that 100% of single-family homes will add a Junior ADU (JADU). The consumption forecast is 42 gallons per capita per day, which will be the California indoor standard for water use beginning in 2030. It is assumed that two (2) new people will occupy each JADU.

Assumed additional future demands per zone are shown on Table 3-4.

Table 3-3. Summary of Future Water Demands by Zone

		NEW ADU's (50%)			NEW JADU's (100%)			POTENTIAL SFR's			
Eligible		QTY	Unit Demand	Subtotal	QTY	Unit Demand	Subtotal	QTY	Unit Demand	Subtotal	***TOTAL***
Accounts	Pressure Zone		*4 CCF/MO*	ADU	2 people at 42 GPCD		JADU		20 CCF/MO	SFR	***GPD***
			GPD	GPD		*GPD*	GPD		GPD	GPD	
2	Eucalyptus Zone	2	99.73	199	2	84.00	168	-	150.00	-	***367***
69	Brown/Glen Zone	35	99.73	3,441	69	84.00	5,796	2	500.00	1,000	***10,237***
184	Vosburg Zone	92	99.73	9,175	184	84.00	15,456	2	500.00	1,000	***25,631***
184	Holly/Sage Zone	92	99.73	9,175	184	84.00	15,456	8	500.00	4,000	***28,631***
79	East/West Tank Zone	40	99.73	3,939	79	84.00	6,636	10	500.00	5,000	***15,575***
518	**SUBTOTALS**	**260**	**99.73**	**25,931**	**518**	**84.00**	**43,512**	**22**	**500.00**	**11,000**	***80,443***
										AF/YEAR	***90.11***

It is estimated that future water demand will increase to 693-acre feet per year, assuming no reduction in current outdoor water use associated with construction of ADU's. Table 3-4 provides a summary of estimated future system demands by pressure zone.

Table 3-2. Summary of Future Water Use by Pressure Zone

Pressure Zone	% of Total	ADD (gal)	MDD (gal)	MMDD (gal)
Eucalyptus Zone	7.25%	39,399	89,728	20,094
Brown/Glen Zone	11.93%	74,464	147,649	37,977
Vosburg Zone	26.33%	167,385	325,867	85,366
Holly/Sage Zone	30.57%	193,211	378,343	98,538
East/West Tank Zone	23.92%	144,354	296,040	73,620
TOTAL	**100.00%**	**618,814**	**1,237,627**	**315,595**

SECTION 4: WATER SUPPLY ANALYSIS

This section discusses KID's existing water supplies, their long-term reliability, and potential future sources of water supply.

4.1 Water Supply Sources Overview

KID's existing water supplies consist of groundwater pumped from the Raymond Basin and groundwater produced from our groundwater tunnels. The District may receive water from Pasadena Water and Power on an emergency basis. The District is a member of the Foothill Municipal District and is entitled to receive imported water from the Metropolitan Water District but has no physical means of receiving that water presently.

4.2 Groundwater – Raymond Basin

The Raymond Basin, adjudicated in 1944, *City of Pasadena v City of Alhambra et al.* was the first basin wide adjudication of groundwater rights in California. The Raymond Basin Management Board was appointed Watermaster in 1984. The Raymond Basin is divided into the Pasadena, Santa Anita and Monk Hill subareas. The KID has decreed rights to 516 AFY in the Pasadena subarea; however, due to declining levels in the basin in January 2008 a self-imposed pumping reduction of 30% was implemented resulting in the current annual baseline production right reduced to 361.2 AFY. The KID may supplement its annual production right by conducting spreading operations where parties may receive credit for spreading of canyon surface water diversions into designated spreading grounds. The KID may further supplement its annual production right by leasing rights from another member agency that has rights in the Pasadena subarea

Since the 2008 pumping reductions were implemented, groundwater levels in the Raymond Basin have been relatively stable and have risen following the back-to-back wet water years of 2022-2023 and 2023-2024. With average annual demand of 603 AFY, supplementing pumping rights by conducting spreading operations and producing tunnel water directly to the system is critical to maintain future water supply reliability.

Refer to Appendix A, Production and Sales Report for Watermaster Year 2023-2024, for further details on groundwater production from the Raymond Basin.

4.3 Groundwater – Tunnels

KID operates several groundwater tunnels. Tunnels with water that meets regulatory requirements may be diverted directly to the system for direct potable use following precautionary disinfection while tunnels that do not meet regulatory water quality standards are diverted directly to spreading. Spreading operations are discussed in Section 4.3.

4.4 Spreading Operations

In the early 1970s, new drinking water quality regulations rendered the direct use of most surface water supplies in the Raymond Basin unacceptable for use as sources of potable water without additional treatment. As a result, the Raymond Basin Advisory Board developed a methodology by which parties with surface "diversion rights" could divert these surface water to spreading basins or natural stream channels leading to spreading basins and receive additional pumping credits (recapture credits) in lieu of constructing treatment facilities. These recapture credits are in addition to adjudicated groundwater extraction rights. The original spreading methodology was established in 1973 and revised in 1994 which is the standard in practice today. KID has certain surface water rights and often diverts groundwater from its tunnels sources to spreading. The general methodology is that KID will receive a recapture credit of 80% of any water spread in District owned facilities or property. For District water which is diverted to a Los Angeles County Public Works Department facility for percolation into the ground, the District will receive a recapture credit of 80% of the water delivered to the spreading basin that is not discharged from the spreading basin due to overflow.

4.5 Imported Water

KID is a member agency of the Foothill Municipal Water District (FMWD). FMWD operates as one of the 26 member agencies of the Metropolitan Water District of Southern California (MWD). MWD was originally formed in 1928 to build the Colorado River Aqueduct and bring water from the Colorado River to Southern California. MWD later contracted with the state to help bring Northern Sierra water south through the State Water Project. Once State Project and Colorado River water reach Southern California, it is distributed across MWD's region.

KID is a member agency of FMWD; however, given that there are no physical pipelines or interconnections to access any of FMWD's, MWD's or another FMWD member's system the KID has never received water through its membership in FWMD. The KID pays an annual fee to FMWD as a share of its administrative expenses. KID customers are assessed an ad valorem tax based on their assessed property value for inclusion in the MWD service area and pay an MWD Standby charge on their property tax bill.

For KID to access imported MWD water there would need to be a direct connection constructed to MWD facilities that would include new transmission pipeline construction as well as new reservoir construction, or modification of existing reservoirs, by KID to provide storage facilities that meet MWD requirements. FMWD's existing storage facilities do not have storage capacity dedicated or available for KID. Connecting to the nearest FMWD facility would require approximately four (4) miles of transmission pipeline construction. If KID pursues a physical connection for importing MWD water, a direct connect to the MWD facilities is likely the most economically and technically feasible scenario.

4.6 Pasadena Water and Power Interconnections

KID maintains multiple interconnections with neighboring Pasadena Water and Power (PWP) to provide water on an emergency basis to each other as required. The interconnection agreement outlines the mechanism for reimbursement of the delivering agency by receiving an equivalent amount of water in return, or financial reimbursement as specified by the agreement. There is a separate agreement for wholesale delivery of water by KID to PWP at an agreed upon price, no wholesale water deliveries were made for the most recent water year of July 2023-June 2024. The interconnection locations are shown on Figure 2-2 and summarized in Table 2-3.

Pasadena Water and Power is a member of the Metropolitan Water District. KID is a member of the Foothill Municipal Water District which is a member of the Metropolitan Water District. As KID has multiple interconnections with PWP, in lieu of constructing new facilities to receive water delivered from FMWD, it is possible that arrangements could be made for KID to receive MWD water through one of the existing PWP connections.

4.7 Water Supply Long-Term Reliability

The current net annual average retail sales for KID are 603-acre feet per year. Assuming a 10% water loss factor, the KID must produce 663-acre feet per year on average to meet current retail demand. The current annual baseline production rights for pumping water from the Raymond Basin is 361.2-acre feet, to meet customer demand the District must supplement its baseline rights through tunnel production to system, tunnel diversion to spreading and potentially leasing pumping rights.

It is estimated that at least 65% of water use is for non-indoor essential use. Using the minimum month daily demand as a proxy for the essential needs of District customers, the annual demand for essential customer use is presently 305-acre feet per year. Assuming a 10% water loss factor the District must produce 335-acre feet per year to meet this essential demand, this is less than the current annual baseline production right. Provided that pumping rights are not reduced further by action of the Raymond Basin Management Board the long-term reliability of meeting the District's essential needs is secure. Non-essential customer demand, primarily for outdoor irrigation use, requires supplementing baseline pumping rights. It is imperative that KID continue to invest in maintaining its tunnels to provide direct to system potable water or to increase annual pumping rights via spreading. Appendix A, the Production and Sales Report for Watermaster Year 2023-2024, includes further information on this subject.

SECTION 5: WATER STORAGE ANALYSIS

This section discusses the analysis and associated recommendations regarding potable water storage volumes in KID's water distribution system for meeting potable service requirements as well as fire flow demands.

5.1 Existing Water Storage Facilities

As discussed in Section 2, KID has ten (10) potable water storage tanks to store treated water for use in the distribution system. In total, KID currently has 3,985,000 gallons of potable water storage volume. A summary of total storage by pressure zone is summarized in Table 5-1. The Wilcox Reservoir is not represented in this table as it is a forebay to the distribution system and does not service any pressure zone directly. The Wilcox Reservoir acts as a production reserve that contains at least one day of average day demand that can be delivered to the system if groundwater production wells are out of service in case of an emergency.

Table 5-1. Potable Water Storage by Pressure Zone

Pressure Zone	Capacity (gallons)
Eucalyptus Zone	185,000
Brown-Glen	250,000
Vosburg Zone	1,250,000
Holly-Sage Zone	525,000
East-West Tank Zone	650,000
TOTAL	*2,860,000*

KID has manually operated valves that may be operated to transfer water from the Vosburg Zone to the Brown-Glen Zone, the East-West Tank Zone to the Holly-Sage Zone and the Holly-Sage Zone to the Eucalyptus Zone.

5.2 Fire Storage Analysis

The quantity of water which needs to be provided to a public fire hydrant in the event of a fire is determined by the Los Angeles County Code of Ordinances, Title 32 Fire Code, Appendix B. The minimum fire flow depends on the type of building occupancy, size of the building and construction type of the building. All zones except for the Eucalyptus Zone are included in the Very High Fire Hazard Severity area as designed by Los Angeles County. Per Appendix B of the Fire

Code "the minimum-fire flow for one- and two-family dwellings . . . located in a fire hazard zone shall not be less than 1,250 gallons per minute for a 1-hour duration at 20 psi."

The Kinneloa Irrigation District intends to provide storage above this minimum requirement to accommodate a home up to 3,600 sf be built in Type V construction with no automatic sprinkler system. Table B105.1(2) in Appendix B of the Fire Code requires 1,500 gpm of fire flow for 2 hours to accommodate this level of construction, that equates to 180,000 gallons of storage available for fire flow. The residences in the Eucalyptus Pressure Zone are outside of a fire hazard zone so the fire flow requirement for a home up to 3,600 square feet, Type V construction with no automatic sprinkler system is 1,000 gpm for 1 hour which equates to 60,000 gallons of storage for fire flow.

5.3 Total Storage Analysis

Determining the recommended volume of water storage is a balance between multiple factors. Industry standards and fire protection requirements provide multiple methods for estimating minimum water storage volume required for a potable water system. For KID, a conservative estimate of storage requirements was used to provide operational flexibility and system reliability.

KID policy shall be to have storage available to meet one day of maximum demand, an operational reserve of 30% of maximum day demand, one full day of average demand and fire flow demand for each pressure zone.

Storage at Existing Demand Levels

Table 5-2 includes a summary by pressure zone of available storage and capacity required at current demand levels per District policy.

Table 5-2. Storage Capacify by Zone based on Current Demand

KID TOTAL STORAGE CAPACITY REQUIRED (excluding future demand)

24 HOURS	MAX DAY DEMAND PLUS FIRE FLOW	Total Services	Maximum Day Demand MDD gallons	Reserve Operational 30% of MDD gallons	Reserve Emergency 1x ADD gallons	Demand Fire-Flow gallons	Storage Goal incl Fire-Flow and reserves gallons	Existing Capacity gallons	Surplus or (Shortfall) gallons
7.25%	Eucalyptus Zone	61	78,062	23,419	39,031	60,000	200,512	185,000	(15,512)
11.93%	Brown/Glen Zone	69	128,485	38,545	64,242	180,000	411,273	250,000	(161,273)
26.33%	Vosburg Zone	187	283,500	85,050	141,750	180,000	690,300	1,250,000	559,700
30.57%	Holly/Sage Zone	195	329,186	98,756	164,593	180,000	772,535	525,000	(247,535)
23.92%	East/West Tank Zone	79	257,509	77,253	128,755	180,000	643,517	650,000	6,483
	SUBTOTALS	**591**	**1,076,743**	**323,023**	**538,371**	**780,000**	**2,718,137**	**2,860,000**	**141,863**

As no reservoir improvements are contemplated in this plan, other system improvements must be implemented so that the shortfall in each zone can be mitigated. Based on Table 5-2 at current demand levels, although some zones are deficient on meeting storage requirements, the system overall has sufficient capacity. The shortfalls in various zones are intended to be mitigated by projects included in the 10-year capital improvement plan.

Storage at Future Demand Levels

Table 5-3 includes a summary by pressure zone of available storage and capacity required per District policy assuming growth in demand per the assumptions discussed in Section 3.4.

Table 5-3. Storage Capacify by Zone based on Future Demand

24 HOURS	MAX DAY DEMAND	Total	Maximum Day	Reserve	Reserve	Demand	Storage Goal	Existing	Surplus or
	PLUS FIRE FLOW	Services	Demand	Operational	Emergency	Fire-Flow	incl Fire-Flow	Capacity	(Shortfall)
			MDD	30% of MDD	1x ADD		and reserves		
			gallons	gallons	gallons	gallons	gallons	gallons	gallons
7.25%	Eucalyptus Zone	61	89,726	26,918	39,399	60,000	216,043	185,000	(31,043)
11.93%	Brown/Glen Zone	69	147,683	44,305	74,479	180,000	446,467	250,000	(196,467)
26.33%	Vosburg Zone	187	325,860	97,758	167,381	180,000	771,000	1,250,000	479,000
30.57%	Holly/Sage Zone	195	378,373	113,512	193,225	180,000	865,109	525,000	(340,109)
23.92%	East/West Tank Zone	79	295,986	88,796	144,330	180,000	709,112	650,000	(59,112)
	SUBTOTALS	**591**	**1,237,628**	**371,288**	**618,814**	**780,000**	**3,007,730**	**2,860,000**	**(147,730)**

In the future demand scenario, there is a deficit in aggregate for water storage across all pressure zones. To meet storage requirements based on the future demand scenario, Wilcox Reservoir must be maintained and the booster pumps operational to deliver water into the distribution system.

Domestic Water Storage

An analysis was also conducted to determine the days of domestic system demand stored in each zone for MDD, ADD and MMDD. Table 5-4 summarizes this data.

Table 5-4. Days of Water Storage for Domestic Demand only, by Pressure Zone

Existing Demand

Pressure Zone	Capacity (gallons)	MDD	MDD Days	ADD	ADD Days	MMDD	MMDD Days
Eucalyptus Zone	185,000	78,062	2.37	39,031	4.74	19,516	9.48
Brown-Glen	250,000	128,484	1.95	64,242	3.89	32,121	7.78
Vosburg Zone	1,250,000	283,500	4.41	141,750	8.82	70,875	17.64
Holly-Sage Zone	525,000	329,186	1.59	164,593	3.19	82,297	6.38
East-West Tank Zone	650,000	257,510	2.52	128,755	5.05	64,378	10.10
TOTAL	*2,860,000*	1,076,742	2.66	538,371	5.31	269,186	10.62

Future Demand

Pressure Zone	Capacity (gallons)	MDD	MDD Days	ADD	ADD Days	MMDD	MMDD Days
Eucalyptus Zone	185,000	89,726	2.06	39,399	4.70	19,700	9.39
Brown-Glen	250,000	147,683	1.69	74,479	3.36	37,240	6.71
Vosburg Zone	1,250,000	325,860	3.84	167,381	7.47	83,691	14.94
Holly-Sage Zone	525,000	378,373	1.39	193,225	2.72	96,613	5.43
East-West Tank Zone	650,000	295,986	2.20	144,330	4.50	72,165	9.01
TOTAL	*2,860,000*	1,237,628	2.31	618,814	4.62	309,407	9.24

SECTION 6: FIRE PREPAREDNESS POLICY

The Kinneloa Irrigation District adopted a Fire Preparedness Policy prepared by ASL Consulting Engineers in February 1997 that was subsequently updated by KID staff in January 2018. That policy is voided by the adoption of this plan.

The Los Angeles County Fire Department, as the Local Responsibility Agency (LRA) has classified certain portions of the District into Fire Hazard Severity Zones (FHSZ). Fire Hazard Severity Zones fall into one of the following classifications: Moderate, High, or Very High. The California laws that require Fire Hazard Severity Zones include California Public Resource Code 4201-4204, California Code of Regulations Title 14, Section 1280 and California Government Code 51175-89. Nearly all the District service area is designated as a Very High Fire Hazard Severity Zone. The only portions of the District that are not included in a Fire Hazard Severity Zone are the Dove Creek Townhome complex, the Los Angeles County Fire Department Station and the commercial plant nursery properties which are served from the Eucalyptus pressure zone. Figure 6-1 shows the location of the Fire Hazard Severity Zone in relation to the District Boundaries.

The flow and volume of water which needs to be provided in the event of a fire flow demand is determined by Appendix B of the 2022 California Fire Code. The requirement impacts sizing of reservoirs so that storage capacity is available for the fire flow event and distribution system piping has the capacity to deliver the required flow. Fire preparedness goals are as follows:

Distribution Piping

The goal of this plan will be to improve the distribution piping network to increase delivery capability to all fire hydrants and customer services. The policy of the District shall be that each hydrant that serves properties outside of a Fire Hazard Severity Zone shall be capable of delivering 1,000 gpm for 60-minutes with a residual pressure of 20 psi. Any hydrant that serves properties inside a Fire Hazard Severity Zone shall be capable of delivering 1,500 gpm for 120-minutes with a residual pressure of 20 psi. The District does not have a hydraulic model to identify which areas of the distribution system likely do not have capacity to meet the fire flow requirements. The District does have an inventory and location of pipeline material and sizing, it is assumed that all distribution system piping of 4" diameter or smaller will not deliver sufficient flow to meet fire flow demands.

Senate Bill 552 (SB 552) was passed and signed by Governor Gavin Newsom in September 2021. SB 552 requires small water suppliers (defined as those with fewer than 3,000 connections and serve fewer than 3,000 acre-feet) to "No later than January 1, 2032, have source system capacity, treatment system capacity if necessary, and distribution system capacity to meet fire flow requirements." The 10-year CIP as part of this plan includes various distribution system projects to be implemented by that deadline so that minimum fire flow of 1,250 gpm can be delivered via the pipeline infrastructure.

Reservoir Storage

The storage goal is to provide storage and sustain pressure in each zone to satisfy a single, fire flow event in each zone in addition to customer demand. The Eucalyptus zone serves properties outside of the FHSZ and will require fire flow storage sufficient to deliver 1,000 gpm for 1-hour, a total of 60,000 gallons. All other zones serve properties within the FHSZ and will require fire flow storage sufficient to deliver 1,500 gpm for 2-hours, a total of 180,000 gallons.

Customer demand during the fire flow event is assumed to be the Peak Hour Demand (PHD) for a 2-hour duration. Peak Hour Demand is defined by the California Code of Regulations as “the amount of water utilized by consumers during the highest hour of use during the maximum day.” According to the California Code of Regulations, “To calculate the PHD, determine the average hourly flow during MDD and multiply by a peaking factor that is a minimum of 1.5.” The District will consider Peak Hour Demand as 3 times the average hourly flow during the MDD, thereby doubling the minimum regulatory requirement.

In addition to Fire Flow Demand (FFD) and 2-hours of PHD, the District’s storage will be sized to accommodate one additional full day of Average Daily Demand (ADD). Table 6.1 shows the Storage Required to meet the Districts Fire Preparedness goals. All zones except for the Brown-Glen zone presently have sufficient storage in both Existing and Future Demand scenarios.

Table 6-1. Storage Required for Fire Preparedness, all figures are in gallons

Existing Demand

Pressure Zone	PHD x2	Fire Flow Demand	ADD	Storage Goal	Capacity (gallons)	Variance
Eucalyptus Zone	19,516	60,000	39,032	118,548	185,000	66,452
Brown-Glen	32,114	180,000	64,228	276,341	250,000	(26,341)
Vosburg Zone	70,877	180,000	141,753	392,630	1,250,000	857,370
Holly-Sage Zone	82,290	180,000	164,580	426,870	525,000	98,130
East-West Tank Zone	64,389	180,000	128,778	373,168	650,000	276,832
TOTAL	*269,186*	*780,000*	*538,371*	*1,587,557*	*2,860,000*	*1,272,444*

Future Demand

Pressure Zone	PHD x2	Fire Flow Demand	ADD	Storage Goal	Capacity (gallons)	Variance
Eucalyptus Zone	22,432	60,000	39,399	121,831	185,000	63,169
Brown-Glen	36,921	180,000	74,464	291,385	250,000	(41,385)
Vosburg Zone	81,465	180,000	167,385	428,850	1,250,000	821,150
Holly-Sage Zone	94,593	180,000	193,211	467,805	525,000	57,195
East-West Tank Zone	73,997	180,000	144,354	398,350	650,000	251,650
TOTAL	*309,407*	*780,000*	*618,814*	*1,708,221*	*2,860,000*	*1,151,779*

Pumping Capacity

The Fire Preparedness goal for pumping capacity is to ensure reliable, efficient and sufficient capacity of the District's pumping facilities to the following standards:

1. Pumping capacity for each booster station will be sufficient to replenish Maximum Day Demand (MDD) to all zones the pumping facility serves, during the Southern California Edison (SCE) off-peak demand rate period of 19 hours per day.

2. Pumping capacity for each booster station will be sufficient to replenish Maximum Day Demand (MDD) and Fire Flow Demand (FFD) to all zones the pumping facility serves, during a 24-hour period.

3. Pumping Facilities shall have at least one standby pump at each location.

4. Pumping facilities shall have backup generators onsite, connected to the station with an Automatic Transfer Switch to facilitate uninterrupted power to the pump station. Fuel shall be stored onsite at each facility so that at least 48-hours of uninterrupted pumping time is available via generator supplied power.

Table 6-2 shows the daily refill demand for each zone at both Existing and Future Demand Levels

Table 6-2. Refill Demand by Zone, Fire Flow and Maximum Day Demand

Existing Demand

Pressure Zone	Max Day Demand	Fire Flow Demand	Refill Demand
Eucalyptus Zone	78,064	60,000	138,064
Brown-Glen	128,455	180,000	308,455
Vosburg Zone	283,506	180,000	463,506
Holly-Sage Zone	329,160	180,000	509,160
East-West Tank Zone	257,557	180,000	437,557
TOTAL	*1,076,742*	*780,000*	*1,856,742*

Future Demand

Pressure Zone	Max Day Demand	Fire Flow Demand	Refill Demand
Eucalyptus Zone	89,726	60,000	149,726
Brown-Glen	147,683	180,000	327,683
Vosburg Zone	325,860	180,000	505,860
Holly-Sage Zone	378,373	180,000	558,373
East-West Tank Zone	295,986	180,000	475,986
TOTAL	*1,237,628*	*780,000*	*2,017,628*

Table 6-3 shows the refill demand on each booster station in GPD to refill all zones that it serves either directly or indirectly. Demand is shown in Normal System Operations (MDD refill only) and Emergency System Operations (MDD plus FFD refill) for both Existing and Future Demand scenarios. In Emergency System Operations pumps will be allowed to run 24-hours per day and not be constrained by the SCE off-peak pricing window. Capacity and condition of existing pump stations is identified in Section 7-4

Table 6-3. Refill Demand on Pump Stations, Fire Flow and Maximum Day Demand

NORMAL SYSTEM OPERATIONS - NO FIRE FLOW EVENT

Existing Demand

Sage Boosters	50% East/West	128,778
Vosburg Boosters	50% East/West	128,778
Glen Booster	Vosburg Zone + Vosburg Boosters - Holly Transfer	341,485
Wilcox Boosters	Brown/Glen Zone + Glen Booster	469,940
Holly Transfer Valve	to Vosburg Reservoir	70,800
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster	528,738
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	606,802

Future Demand

Sage Boosters	50% East/West	147,993
Vosburg Boosters	50% East/West	147,993
Glen Booster	Vosburg Zone + Vosburg Boosters - Holly Transfer	403,053
Wilcox Boosters	Brown/Glen Zone + Glen Booster	550,736
Holly Transfer Valve	to Vosburg Reservoir	70,800
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster	597,166
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	686,892

EMERGENCY SYSTEM OPERATIONS - FIRE FLOW EVENT EACH ZONE

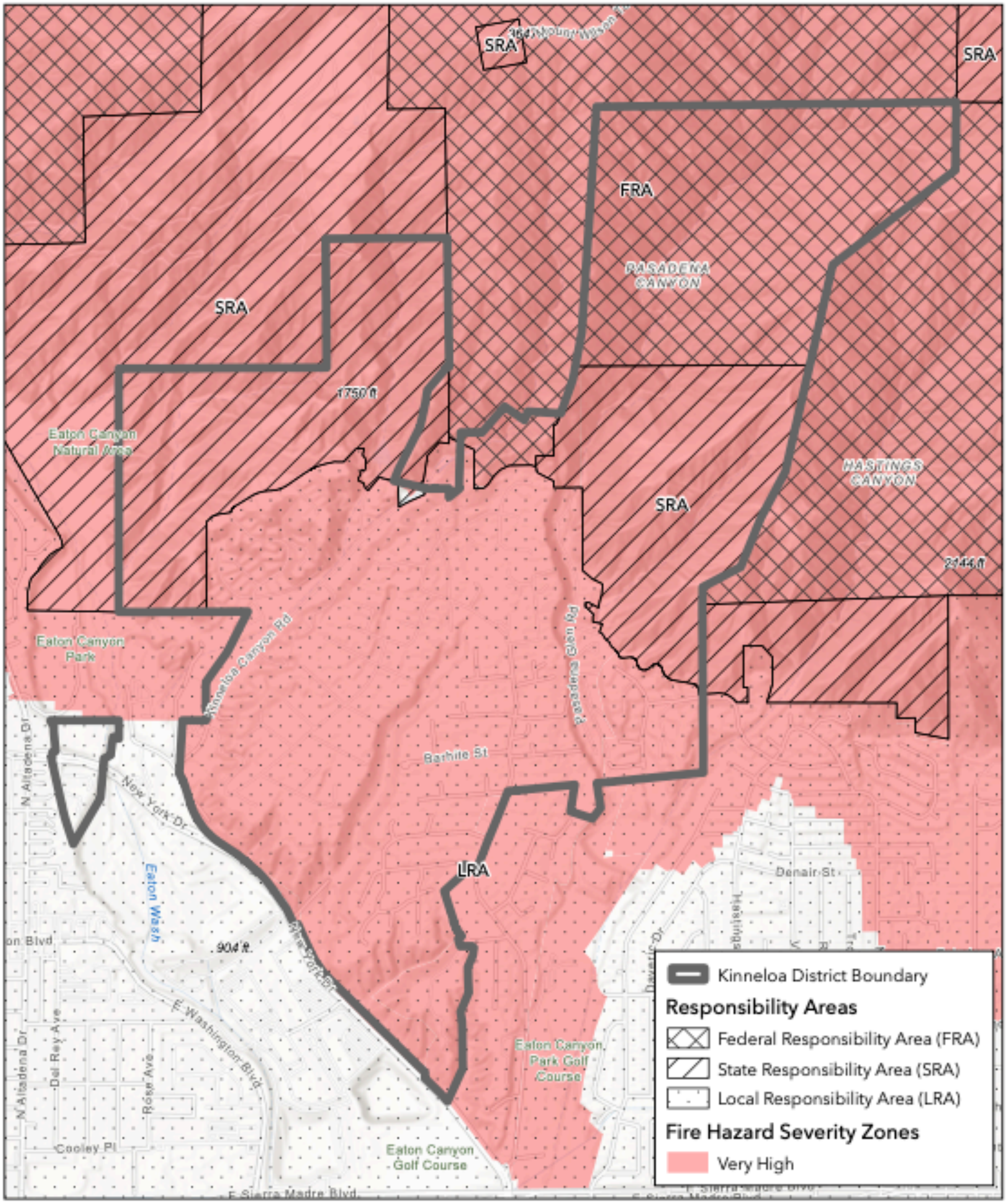
Existing Demand

Sage Boosters	50% East/West	218,778
Vosburg Boosters	50% East/West	218,778
Glen Booster	Vosburg Zone + Vosburg Boosters - Holly Transfer	434,485
Wilcox Boosters	Brown/Glen Zone + Glen Booster	742,940
Holly Transfer Valve	to Vosburg Reservoir	247,800
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster	975,738
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	1,113,802

Future Demand

Sage Boosters	50% East/West	237,993
Vosburg Boosters	50% East/West	237,993
Glen Booster	Vosburg Zone + Vosburg Boosters - Holly Transfer	496,053
Wilcox Boosters	Brown/Glen Zone + Glen Booster	823,736
Holly Transfer Valve	to Vosburg Reservoir	247,800
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster	1,044,166
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	1,193,892

FIGURE 6-1 FIRE HAZARD SEVERITY ZONE BOUNDARIES



Kinneloa Irrigation District

Fire Hazard Severity & Responsibility Areas

SECTION 7: CONDITION AND INFRASTRUCTURE ASSESSMENT

This section discusses the results of a condition assessment of various components of the District's water supply, treatment, storage and distribution system. KID works proactively to maintain existing facilities; however, aging infrastructure is challenging to keep in operable condition and larger scale projects are essential to maintain a satisfactory level of operation.

7.1 Water Production Facilities – Groundwater Well Assessment

K-3 Well

The K-3 well was originally drilled in 1965 and equipped with a 50-hp motor for production at 400 gpm. In 1989, to accommodate additional demand from new development, the well was redeveloped and equipped with a 125-hp motor to produce 800 gpm. In 2005 due to pump failure, a complete overhaul was performed, and a new pump and motor were installed. Well production is down from the 800-gpm design capacity due to declining basin water levels and aging pump and motor equipment. District management recommends a new pump and motor be installed based on age of each. Additionally, the current pump is oil lubricated, it is recommended to replace this with a water lubricated pump for operational efficiency and to eliminate the need to add degreaser to steel tank washouts in the future. The K-3 Well pump vault also contains a variable frequency drive (VFD), an electrical cabinet air conditioner to keep the VFD cool and a vault exhaust system. The well pump vault is subject to extremely high temperatures which can be damaging to the pump control equipment. The existing exhaust fan was installed in 1989, an evaluation of the existing ventilation system including options for adding additional cooling and ventilation measures is underway.

Wilcox Well

The Wilcox Well was originally drilled in 1924 to a depth of 350 feet. Due to declining water levels and other issues with the well in 1975 the production was down to 350 gpm. In 1976 due to well casing failure the well was redeveloped by being drilled down to 581 feet and a new casing installed along with a 100-hp pump motor installed, well production was 550 gpm, static water level was 381 feet. In 2000 the pump and motor were rebuilt, production was 550 gpm. Due to declining water levels and the aging pump and motor the production has decreased significantly down to a low of 225 gpm in 2022. Current production is approximately 260 gpm due to partial recovery in basin water levels at 441 feet to water.

7.2 Water Production Facilities – Groundwater Tunnels Assessment

In his book “The Mountains of California,” John Muir, who visited the area around Eaton Canyon wrote “*People mine for irrigating water along the foothills as for gold*.” The groundwater tunnels that deliver water to the District were dug specifically to extract groundwater. Many such tunnels were dug in the foothills of Pasadena and Altadena starting in the 1880’s, before gasoline and electrically powered pumps were available. Tunnels were no more expensive than wells, had a greater chance of reaching water and did not require windmills to pump the water out of the ground. A horizontal shaft, or “drift,” was dug until a water source was reached, usually at the point where a local fault was pushing the groundwater up. Once the water “vein” was hit, water would travel along the floor of the tunnel to be collected at a bulkhead and piped to its destination.

KID operates several groundwater tunnels that produce potable water directly to the system or are diverted to spreading grounds for groundwater recharge purposes. Table 7-1 shows the status of the five (5) tunnels that are currently operational for producing potable water or diversions for spreading.

Table 7-1. Tunnel Production History for WYE June 2005 through June 2024 and Current Status

	Annual Production (Acre-Feet)				
Tunnel Name	**Mean**	**High**	**Low**	**Pumping Cost Offset ($/AF)**	**Status as of Report Date**
Eucalyptus Tunnel	44.2	55.7	37.4	$ 175	Offline - bacteriological
High-Low Pressure Tunnels	72.4	171.9	33.5	$ 380	Offline - fluoride content and bacteriological
House Tunnel	18.3	40.5	10.2	$ 380	Offline - fluoride content and bacteriological
Delores Tunnel	61.3	223.3	2.3	$ 620	Online
Far Mesa Tunnel	41.6	68.2	28.5	$ 415	Offline - fluoride content

Each tunnel is described further as follows:

Eucalyptus Tunnel

The Eucalyptus Tunnel was hand dug in the early 1900s a short distance up Eucalyptus Canyon. The entire tunnel and transmission pipeline was buried as part of the Kinclair Estates development. The most recent improvements made to the tunnel system were done in the early 1960’s when a masonry and concrete access shaft was constructed. The tunnel itself is approximately 350 feet deep behind the tunnel portal. There is approximately 400 lineal feet of cement lined steel pipe and approximately 400 lineal feet of AC pipe underground that delivers to the Eucalyptus Reservoir site where it may be chlorinated for delivery into the system or diverted to spreading. The development of the Kinclair Ridge tract in the early 2000’s added potential contamination sources from the newly installed residential septic systems. KID received a lump sum payment in 2002 to compensate it for the potential future need to treat the tunnel water should contamination occur. As of April 2023, the tunnel is offline, and diverted to spreading, due to repeated total coliform positive water samples. The Eucalyptus Tunnel is a reliable and moderate producer; however, given that it enters the system at the lowest elevation it is the least valuable to the system in terms of pumping cost offset.

House Tunnel

The House Tunnel is in a canyon that terminates at the Los Angeles County Department of Public Works (LADPW) Kinneloa-East Debris Basin. This canyon has informally been referred to as House Tunnel Canyon. This tunnel was originally built to transport water to the lake on the site of the Lockhart Estate which is how it got its name as the “house” tunnel. At its current configuration, the House Tunnel is delivered to the Holly Tanks site where it is metered and can be disinfected and produced into Holly Tank-East or diverted to spreading. The House Tunnel transmission pipeline crosses the canyon overhead several times before it leaves the canyon and is highly susceptible to damage from landslides and fires. A large portion of the tunnel transmission pipeline was damaged by landslides following rainfall in 2004-2005. In 2006, FEMA and CalOES funds were secured to rebuild and harden the canyon transmission piping and anchors. Further damage occurred in the rainstorms of 2023-2024. Following this, KID installed new HDPE piping on canyon bottom to avoid the constant threat of damage to the aerial sections. The House Tunnel is a reliable low to moderate producer but has some of the highest fluoride levels of all the tunnels. The tunnel is currently offline due to high fluoride levels and repeated positive total coliform water samples. District management intends to not treat this tunnel for fluoride but instead intends to convert it to a standby source which would allow it to be used only for short-term emergencies of five consecutive days or less, and for less than a total of fifteen calendar days a year. If further damage to the transmission pipeline occurs KID staff would likely recommend moving the metering location to the tunnel portal so that it could be diverted permanently to spreading, and not invest in further pipeline rehabilitation.

High-Low Pressure Tunnels

The High-Low Pressure Tunnels are in a canyon that terminates at the Los Angeles County Department of Public Works (LADPW) Kinneloa-West Debris Basin. This canyon has informally been referred to as Kinneloa Canyon. After severe winter storms in 2005 the High-Pressure and Low-Pressure Tunnel pipelines were reconstructed with funding assistance from FEMA and CalOES. The High-Low Tunnel transmission pipelines cross the canyon overhead several times before it leaves the canyon and is highly susceptible to damage from landslides and fires.

There are two (2) High-Pressure Tunnels that are combined into a single transmission line at a higher elevation collection box. There are two (2) Low-Pressure Tunnels that are combined at a lower elevation. From the High-Pressure Tunnels collection box, raw water is transmitted via a 4” hose to a combiner/eductor where it is further combined with water from Low-Pressure Tunnel 2 for delivery to the Holly Tanks site for disinfection. Low-Pressure Tunnel 1 is currently not producing and access for rehabilitation is severely limited. Low-Pressure Tunnel 2 is producing at a low volume but is repeatedly testing positive for total coliform. District staff investigated the condition of Low-Pressure Tunnel 2 at the portal and found the sanitary seal compromised. Due to vegetation growth and land movement, access to the tunnel to perform rehabilitation work is not economically or practically feasible. District staff intends to make modifications at the combiner/eductor so that the Low-Pressure tunnels are metered at that location and spread into canyon bottom.

District staff intends to pursue approval of fluoride treatment so that the High-Pressure Tunnels may continue to be produced into the system. Historically, the High-Pressure Tunnels have been treated at the Holly Tanks site and delivered into Holly Tank East; however, pipeline infrastructure exists that would allow it to be treated and delivered to West Tank instead which would be an operationally superior fluoride blending strategy. Given the high elevation of the High-Pressure Tunnels they are the most economically valuable in terms of pumping cost offset, they have also been reliable and steady producing tunnels over many years which would likely justify investment in their treatment to be used in the potable water system.

Far Mesa Tunnel

The Far Mesa Tunnel is the combination of two separate tunnels that are joined together in the watershed before being transmitted via gravity to the Glen Reservoir. The tunnels were likely originally constructed in the late 1800's. There are notes in the District files indicating that the tunnels were partially rehabilitated in 1917. Access to the tunnels is on private property that has had various developments plans contemplated in recent years. The Far Mesa Tunnel has high levels of fluoride and is currently offline pending approval of a fluoride blending treatment plan by DDW.

Delores Tunnel

The Delores Tunnel was originally dug around 1915 by the Vosburg Water Company. It is reported to be more than 500' deep. The Delores Tunnel delivers to the Vosburg Reservoir site. The Delores Tunnel pipeline from the tunnel portal to the terminus of Pasadena Glen Canyon was reconstructed in 2001 with various repairs performed since then. A visual inspection of the pipeline in the canyon was conducted in December 2023. Much of the pipeline is hose spanning the canyon overhead, there are several large trees that pose hazards to this transmission line. The Delores Tunnel has fluoride levels that vary from slightly below to slightly above the MCL. KID has presented a fluoride blending treatment plan to DDW for approval so that this source may remain in use in the potable water system. This tunnel is one of the most economically valuable in terms of pumping cost offset; however, its production can vary widely as indicated by historical mean, high and low annual production values in Table 7-1.

Long Tunnel (Inactive, Spreading Only)

The Long Tunnel historically delivered water to the Glen Reservoir. Many years ago, this tunnel became contaminated by septic tanks of residences in the vicinity. The Long Tunnel is currently an inactive source and is diverted to spreading only.

Tent Tunnel (Inactive, Spreading Only)

The Tent Tunnel historically delivered water to the Glen Reservoir. Many years ago, this tunnel became contaminated by septic tanks of residences in the vicinity. The Tent Tunnel could be considered for partial rehabilitation so that flow could resume to be diverted for spreading purposes.

7.3 Water Storage Facilities

The KID has 5 steel water tanks and 5 concrete reservoirs to store potable water for use in the distribution system. The concrete reservoirs are in fair to poor condition, the capital improvement plan includes various projects to bring the concrete reservoirs into good condition. Each facility is described in greater detail, along with a photo of the facility in Section 2.5. Condition assessment and recommendation of all storage facilities is as follows:

Steel Tanks

The steel water tanks are generally in good condition, an asset management agreement is in place with USG Water Solutions, a private company that completes all inspections and routine maintenance as required. The contract with USG requires them to furnish specialized services including engineering and inspection services needed to maintain and repair the tanks during the term of the contract. USG will clean and repaint the interior and/or exterior of the tank at such time as complete recoating is needed. The need for interior coating is to be determined by the thickness of the existing liner and its protective condition. The need for exterior painting is to be determined by the appearance and protective condition of the existing coating. The tanks shall be inspected annually. The tanks shall be completely drained and cleaned biannually.

Interior condition assessments are completed whenever the take interior is washed out. Tank interiors are washed out with high pressure potable water, chemically cleaned with NSF approved chemicals to remove visible staining and invisible biofilm, then disinfected according to AWWA C652-Method 2 and made ready for service. If minor interior coating repairs are necessary, they will be performed at time of washout, if interior coating requires extensive renovation, it will be noted in the condition assessment report and scheduled for the following year. All tanks are currently in good condition. It is recommended by management that KID continue the contractual arrangement with USG to maintain all steel tanks in good condition.

Table 7-2 indicates the most recent year that each service was performed. The services are generally performed in the first quarter of the calendar year.

Table 7-2. Condition of Steel Water Storage Tanks

Facility Name	Capacity (gallons)	Year Built	Recent Interior Washout	Recent Interior Recoat	Recent Exterior Recoat
Sage Tank	225,000	2003	2024	2016	2015
Holly Tank East	150,000	1956	2024	2018	2023
Holly Tank West	150,000	1959	2023	2003	2023
West Tank	500,000	2003	2024	2016	2013
East Tank	150,000	1958	2022	2006	2016

Concrete Reservoirs

The concrete reservoirs are generally in fair to poor condition. Maintenance of the concrete reservoirs has been neglected in recent years. The American Water Works Association (AWWA) recommends that potable water storage tanks are inspected and cleaned at least every three (3) years. Concrete reservoirs are inspected and cleaned while full by a diving contractor. The inspections completed qualify as a "Comprehensive Facility Inspection" as defined by the AWWA and recognized by the EPA. Diving contractors adhere to the AWWA standards for inspecting and repairing water tanks, AWWA D101-53. All dive personnel and equipment are fully disinfected according to AWWA Standard C652-19 before entering potable water facilities. All Confined Space operations conducted follow all applicable OSHA, AWWA, and ADCI standards, procedures and regulations. All repair products are NSF-61 approved for use in potable water facilities.

Table 7-3 indicates the year of construction for each facility, date of most recent dive inspection/cleaning and a condition assessment designated by KID management following review of the most recent dive inspection and current exterior condition assessment.

Table 7-3. Condition of Concrete Water Storage Reservoirs

Facility Name	Capacity (gallons)	Year Built	Condition	Recent Inspection/ Cleaning	Liner Install Date	Roof Rebuild Date
Eucalyptus Reservoir	185,000	1960/1989	Fair	2017	none	1989
Wilcox Reservoir	1,125,000	1924	Fair	2019	1992	1990
Brown Reservoir	125,000	1924	Fair	2024	none	2000
Glen Reservoir	125,000	1924	Poor	2024	none	2001
Vosburg Reservoir	1,250,000	1924/1958	Fair	2024	none	1997

The 10-year CIP includes several projects to upgrade the condition of the concrete reservoirs. The most immediate need is a rehab of the Glen Reservoir to include a liner, an entirely new roof structure and other various repairs. Allowances for other facilities are included in the CIP; however, without a recent inspection available for the Eucalyptus and Wilcox Reservoirs the extent of necessary repairs is unknown currently.

7.4 Water Pumping Facilities

Pumping facilities include well and booster pumps, pump enclosures, electrical systems and backup power generation. Well and booster pumps are inspected annually during a preventative maintenance service performed by General Pump Company, the most recent service for which this condition assessment is based on was performed in March 2024. Portable Diesel backup generators at various pumping sites are serviced annually by Generator Services, the most recent date of the annual preventative maintenance for which this condition assessment is based on was performed in March 2024. The Automatic Transfer Switches (ATS) are all manufactured by ASCO, a system wide preventative maintenance service has not been part of regular District operations, in March 2024 an ASCO representative visited and inspected all the ATS's throughout the District. Electrical systems at each pumping facilities were evaluated by Jose Cortes, PE of Building Solutions Group in early 2024, a comprehensive condition assessment was prepared on July 3, 2024. Table 7-4 includes a snapshot condition assessment of the pumping equipment at each facility.

Table 7-4. General Condition of Pumping Facilities and Equipment

Facility Name	Enclosure Condition	Pumps Condition	Electrical System Condition	ATS Condition	Backup Generators Condition
Sage Boosters	Fair	Good	Good	Good	Good
Vosburg Boosters	Good	Good	Good	Good	Good
Glen Booster	Poor	Poor	Poor	Good	Good
Wilcox Boosters	Poor	Poor	Poor	Good	Fair
Eucalyptus Boosters	Fair	Fair	Good	Good	Fair
K3 Well	Fair	Fair	Fair	n/a	n/a
Wilcox Well	Poor	Poor	Poor	n/a	n/a

Booster pumps are serviced annually by General Pump Company, booster pump efficiency tests are conducted bi-annually by Pump Check. District management has developed a priority replacement schedule for each booster pump based on efficiency, age and system demands. Table 7-5 shows age of booster pumps, condition and replacement priority.

Table 7-5. Booster Pump Evaluation and Upgrade Priority

Facility Name	Enclosure Condition	Effective Pump Age	Effective Motor Age	Condition	Upgrade Priority
K3 Well Pump	P&M New 1989, Overhauled 2005	19	19	Fair	High
Wilcox Well Pump	P&M New 1979, Overhauled 2000	24	24	Poor	High
Eucalyptus Booster 1	P&M Rebuilt 2010	14	14	Poor	High
Eucalyptus Booster 2	P&M Rebuilt 2012	12	12	Good	Medium
Eucalyptus Booster 3	P&M New 2023	1	1	Good	Low
Sage Booster 1	P&M New 2002 (Original)	12	12	Good	Medium
Sage Booster 2	New Pump 2002, New Motor 2018	12	12	Good	Medium
Wilcox Reservoir Booster 1/75hp	P&M Rebuilt 2010	14	14	Good	High
Wilcox Reservoir Booster 2/50hp	P&M Rebuilt 1984, Original 1966	40	40	Poor	High
Glen Reservoir Booster 1	P&M Rebuilt 2010, new motor 2019	14	5	Good	Medium
Vosburg Reservoir Booster 1	P&M New 2016 (Original)	8	8	Good	Low
Vosburg Reservoir Booster 2	P&M New 2016 (Original)	8	8	Good	Low
Vosburg Reservoir Booster 3	P&M New 2016 (Original)	8	8	Good	Low

Booster pump station capacity requirements are defined in Section 6. Table 7-6 indicates the required and available pumping capacity at each booster pump facility to meet the refill demand under normal system operations. Table 7-7 indicates the required and available pumping capacity at each booster pump facility to meet the refill demand under emergency system operations.

The critical needs of the pumping system are:

1. The Glen Booster station does not have a standby pump and requires a standby solution.
2. The Wilcox Booster station requires a standby pump at the same production capacity as the duty pump. That is currently not the case, and the standby pump may only produce at 50% of the duty pump capacity due to size and age.
3. The K-3 Well pump does not have a readily available emergency backup power source.
4. The Eucalyptus Booster station requires 2 duty pumps. One of the booster pumps onsite is aged and capacity does not meet required demand of the station.

Table 7-6. Refill Pumping Demand, by Booster Station, Normal System Operations (MDD Only) in Existing Demand Scenario

Pumping Facility	Facilities Served	Refill Demand (GPD)	Pumping Configuration	Duty Pump(s) GPM	Pumping Hours/Day	Pumping Capacity GPD	Variance to Demand GPD	Variance to Demand GPM
Sage Boosters	50% East/West	128,778	1 duty / 1 standby	375	19.0	427,500	298,722	262
Vosburg Boosters	50% East/West	128,778	1 duty / 2 standby	325	19.0	370,500	241,722	212
Glen Booster	Vosburg Zone + Vosburg Boosters - Holly Transfer	341,485	1 duty / 0 standby	395	19.0	450,300	108,815	95
Wilcox Boosters	Brown/Glen Zone + Glen Booster	469,940	1 duty / 1 standby	495	19.0	564,300	94,360	83
Holly Transfer Valve	to Vosburg Reservoir	70,800	n/a	295	4.0	70,800	-	-
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster + Holly Transfer	528,738	2 duty /1 standby	725	19.0	826,500	297,762	261
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	606,802	1 duty / 0 standby	725	19.0	826,500	219,698	193

Table 7-7. Refill Pumping Demand, by Booster Station, Emergency System Operations (MDD+FFD) in Existing Demand Scenario

Pumping Facility	Facilities Served	Refill Demand (GPD)	Pumping Configuration	Duty Pump(s) GPM	Pumping Hours/Day	Pumping Capacity GPD	Variance to Demand GPD	Variance to Demand GPM
Sage Boosters	50% East/West	218,778	1 duty / 1 standby	375	24.0	540,000	321,222	223
Vosburg Boosters	50% East/West	218,778	1 duty / 2 standby	325	24.0	468,000	249,222	173
Glen Booster	Vosburg Zone* + Vosburg Boosters - Holly Transfer	365,285	1 duty / 0 standby	395	24.0	568,800	203,515	141
Wilcox Boosters	Brown/Glen Zone + Glen Booster	673,740	1 duty / 1 standby	495	24.0	712,800	39,060	27
Holly Transfer Valve	to Vosburg Reservoir	-	n/a	295	-	-	-	-
Eucalyptus Boosters	Holly/Sage Zone + Sage Booster + Holly Transfer	727,938	2 duty /1 standby	725	24.0	1,044,000	316,062	219
K3 Well	Eucalyptus Zone Demand + Eucalyptus Booster	866,002	1 duty / 0 standby	725	24.0	1,044,000	177,998	124

** Given the size of Vosburg Reservoir and its function as a storage reserve, assuming a level of 80% full before the demand event it would still have 317,716 gallons remaining in the reservoir; therefore, refill demand from the Glen Booster has been reduced by such amount in the MDD+FFD scenario.*

7.5 Water Treatment Facilities

At high-volume production facilities the District operates Clortec® on-site sodium hypochlorite generators that generate low-strength (0.8%) sodium hypochlorite from salt via electrochlorination via a brine cell design. Salt is dissolved in water to form a saturated brine solution. Proportioning pumps then dilute the mixture to a 3% concentration and feed the solution through the brine cell. Electrolysis takes place as a low voltage DC current is passed across electrodes. The resulting 0.8% hypochlorite is stored in a day-tank and delivered to the injection point by a metering pump. The product is stored in a day tank where concentrations remain constant and ready for use as needed. As the tank level drops, the system automatically starts and replenishes its supply of hypochlorite. District staff needs to monitor daily to ensure the cell is clean, the salt tank has sufficient salt, and the electrical system is operating correctly.

Table 7-8 indicates the age of the Clortec generator and brine cell at the applicable facilities. This system is no longer manufactured and although some replacement components are available, the electronic controls and programming is no longer supported.

Table 7-8. Clortec Inventory and Age

Facility Name	Clortec Installed	Clortec Age	Brine Cell Replaced	Brine Cell Age	Upgrade Priority
K-3 Well	1997	27	2012	12	High
Wilcox Well	2002	22	2002	22	Medium
Delores Tunnel	2006	18	2006	18	Low
Hi-Lo and House Tunnels	2007	17	2007	17	Low

At facilities that do not have onsite sodium hypochlorite generators, HASA Multi-Chlor ®, a 12.5% sodium hypochlorite solution, is purchased and is mixed with potable water in the day tank at the treatment facility to achieve the desired concentration and then delivered to the injection point by a metering pump. Replacement low volume metering pumps and other system components are generally readily available and inexpensive.

7.6 Pipeline and Appurtenances

7.6.1 Pipeline

Appendix B provides an inventory of pipeline by material and size throughout the District.

The American Water Works Association (AWWA) published a report titled "Buried No Longer: Confronting America's Water Infrastructure Challenge." That report analyzed many water systems across the country and gave recommendations on estimated useful life for various pipeline material types. Water systems were differentiated across four system size categories, the category applicable to KID is "Very Small Systems" which serve fewer than 3,300 people. Furthermore, the country was divided into four regions that roughly share certain similarities, the KID is in the West region. The report used historical data on the production and use of seven major types of pipes with 14 total variations to estimate what kinds of pipe were installed in water systems in particular fields, that data was validated by checking with a sample of water utilities. The report also differentiated between Long Service Life (LSL) for installations resulting from some combination of benign ground conditions and evolved laying practices. Alternatively, Short Service Life (SSL) indicates a relatively short service life for the material resulting from some combination of harsh ground conditions and early laying practices.

Table 7-9 indicates the LSL and SSL for pipe material types found in the KID system for systems in the "West Very Small" category.

Table 7-9. Average Estimated Service Lives by Pipe Materials (average years of service)

Pipe Material	DI (LSL)	DI (SSL)	AC (LSL)	AC (SSL)	PVC	STEEL
West, Very Small	110	60	105	65	70	95

Table 7-10 indicates the age range of each pipe material class in the District and a replacement timeframe. Although the AWWA report notes that 95 years is the anticipated useful life for Steel pipe, all steel pipe in the KID is unlined and small diameter. Due to our groundwater quality these pipes are susceptible to heavy corrosion and restriction of flow. It is recommended that all steel pipe 4" and smaller be replaced as soon as possible to meet fire flow demands and all other steel pipe be replaced soon thereafter.

Table 7-10. Pipeline Replacement Timeframes based on AWWA Recommendation

Pipe Material	Installation Dates	Age in Years	Anticipated Lifespan (years)	Replacement Timeframe
Steel (unlined)	through 1958	greater than 65	95	2025-2034
Asbestos Cement (AC)	1960-1975	49-64	65-105	2025-2080
C-900 (PVC)	1975-2003	21-49	70	2035-2073
Ductile Iron (DI)	1992-present	less than 32	60-110	2077+

7.6.2 Hydrants

Appendix B provides an inventory of hydrants by pressure zone and hydrant size. Any hydrant of 4" x 2.5" will not meet current fire flow requirements. Additionally, although most hydrants are of the new standard 6"x4"x2.5" size, they are attached to mains that will not provide adequate fire flow.

Hydrant fire flow tests are often performed at the request of District customers pursuing home construction or improvement projects. The District has identified many hydrants that do not provide the current minimum required fire flow. The 10-year CIP includes various pipeline projects that will also include new fire hydrants that meet current requirements.

7.6.3 Isolation Valves

The AWWA recommends that every valve should be operated through a full close and open cycle on a regular schedule to clear the operating stem and wedge guides of naturally occurring encrustation or other debris. General industry standard is that every valve should be exercised annually or at least every two years. In 2014 the District completed a system wide valve exercising and condition assessment, all valve locations were recorded via GPS and an identifier assigned to each valve. Until 2023 valves were only exercised due to system needs for repairs and shutdowns. A comprehensive system-wide valve exercising is underway currently, approximately 50% of the system valves will be exercised in 2024 and each year going forward.

Appendix B provides an inventory of valves by type, size and installation date. Most of the standard gate valves are associated with older steel mainline and are likely not performing satisfactorily. Butterfly valves are mostly associated with PVC mainline installations that occurred between 1975 and 1989. Since the early 1990's when Ductile Iron Pipe has been the District standard material choice, resilient wedge gate valves have been installed.

7.6.4 Hydraulic Control Valves

The District has 21 hydraulic control valves in use in the system, all are manufactured by Cla-Val. Most of the hydraulic control valves are pump control valves, there is one altitude valve in the system, one electronically controlled transfer valve and several ancillary bypass valves at pumping facilities. Cla-Val's global headquarters is locally in Costa Mesa. KID utilizes the Cla-Val factory service team to provide preventative maintenance on all the valves in the system. Cla-Val recommends that a service and rubber replacement be completed every 3 years, a rehab at 5 years and a rebuild at 10 years. KID has each valve on a 4-year service schedule and recommended maintenance is performed at that time.

7.6.5 Actuator Control Valves

KID has ten (10) electric motor actuator operated control valves in the system, these are all at reservoir or tank inlet/outlets. The actuator is a separate component mounted to an existing butterfly or gate valve. All actuators are manufactured by Flo-Loc and were installed between 2006 and 2010. The actuator at Vosburg Reservoir has failed in early 2023 and has not been repaired. Two (2) of the valves are operated throughout the day to maintain tank levels, eight (8) of the valves are programmed to operate only in a seismic event and close to a preset level to avoid rapid draining of a tank. Flo-Loc no longer manufactures or provides replacement parts for the actuators. The 10-year CIP includes an allowance to replace all actuator-controlled valves. Instead of replacing all 10 valves with motor actuator assemblies the District will replace 7 of the valves as needed with Cla-Val hydraulic control valves due to economy of installation and service. Three (3) of the valves will be replaced with an actuator manufactured by others as the sites are not well suited for a hydraulic control valve.

7.6.6 Customer Metering

The customer metering system consists of water meters and register/reporting devices. In 2022 and 2023 the District replaced its register and meter reading system with a "smart" metering system by Subeca.

The KID historically has had no formal meter audit or replacement program in place, meters are replaced only when they have obviously failed by notification of the customer or by District staff observing a dramatic drop-off in reported consumption. The District has 606 meters in its system, although some of these are for inactive accounts, District facilities or interconnections with PWP. KID has no meter testing program in place nor the resources available to economically perform programmatic meter testing.

Most studies that have been performed by the water industry have concluded that residential meters should be replaced after 15-20 years. At this age the accuracy would have diminished to the point that the cost of meter replacement is less than loss of revenues with continued use of the old meter. Aside from loss of revenue, the lack of accurate consumption data can distort the view of actual system demands and makes it difficult to make informed planning decisions. Many larger urban water agencies in California have policies whereby ¾" meters are replaced at a maximum of 20 years and 1" meters replaced every 15 years. Although not applicable to KID as we are not regulated by the California Public Utilities Commission, for agencies that are regulated by the CPUC domestic water service meters must be replaced every 10-20 years depending on meter size. The EPA and SWRCB advise that the life expectancy of a service meter is 15-20 years.

An inventory of all meters was completed in September of 2023 indicating that the mean age of KID's meters at that time was 21.2 years with 57% of the meters being over 20 years old, 23% over 30 years old and 2% over 40 years old. Since that inventory was taken, 76 of the oldest and/or highest consumption meters have been replace bringing the mean age of KID's meters down to 18.6 years.

Table 7-11 indicates the age distribution of District meters at time of initial inventory in September of 2023 and age distribution as of August 2024.

Table 7-11. Customer Meter Inventory by Age

Meter Age	Count as of 9/19/23	% of Total	Count as of 8/23/24	% of Total
over 40 years	13	2%	0	0%
30-40 years	129	21%	82	14%
20-30 years	203	33%	187	31%
15-20 years	84	14%	84	14%
10-15 years	124	20%	124	20%
less than 10 years	53	9%	129	21%
TOTAL	606	100%	606	100%

7.7 Telemetry/SCADA

KID operates and utilizes an extensive SCADA system, which consists of Remote Telemetry Units (RTU) and Human Machine Interfaces (HMI) to allow operators to remotely monitor and operate nearly 100% of system functions. Instrumentation is the most basic element of a SCADA system. KID has instrumentation that measures pump flows, tank levels, chlorine residuals and many other types of data. Instrumentation is connected to a remote terminal unit (RTU) which converts the signals from the equipment into a data stream that is communicated to a central location via radio network, where a data concentrator collects the data and feeds it to the operator terminal.

7.7.1 Remote Telemetry Unit (RTU) Assessment

All facilities have a Remote Telemetry Unit (RTU) that monitors and controls the equipment at that site. All RTU's are currently SCADA Pack 32 model which reached its End of Commercialization date as of June 30, 2023, meaning they are no longer available for purchase. As of June 30, 2028, after-sales support will end. The manufacturer, and our SCADA integrator, are recommending we transition to SCADAPack 474. Over the first two years of the CIP the District will replace all existing SCADAPack 32's with SCADAPack 474.

7.7.2 Human Machine Interface Assessment

HMI/SCADA collects data from RTU's and other control devices such as flow meters and pump controllers. This data is presented to an operator using a Human Machine Interface (HMI). The HMI allows the operator to see what is going on in the system in real time, including custom mimic displays, alarms, trends, etc., to make decisions to adjust any system controls or settings. The District utilizes software by Aveva under an annual license as well as an operator alarm system called Win-911 by Sage Designs. Both services are currently available and supported, the District intends to continue use of both services.

7.7.3 Radios

All facilities with RTU's communicate via the District's radio network that consists of various types of antennae and a Trio model radio by Schneider Electric. The Trio operates in the license-free 900Mhz and 2.4 Ghz band. All radios were installed in 2018, this model is still sold and supported by the manufacturer.

7.7.4 Pressure Transducers

Tank levels are monitored at each facility and reported back to the SCADA system. Onsite tank levels are measured by pressure transducers. The District has "drop in" transducers at concrete reservoir facilities manufactured by Keller and has installed Ashcroft or Foxboro pressure transducers at steel tank sites. District staff maintains a small stock of replacement transducers to ensure that tank levels can be reliably monitored.

SECTION 8: RECOMMENDED CAPITAL IMPROVEMENT PROJECTS

Capital improvement projects were developed based on the results of the condition assessment and other evaluations performed in preparation of this Report. The projects were divided into several categories including:

General (G-X): General projects include planning projects, fleet upgrades, administrative system upgrades and projects which do not fit into the other categories.

Storage (ST-X): Storage projects include modifications, upgrades and improvements to system storage facilities.

Pumping (P-X): Pumping projects include work associated with upgrades to existing pump stations.

Treatment (T-X): Treatment projects include upgrades to existing disinfection facilities and construction of new fluoride blending facilities.

Spreading (SP-X): Spreading projects include work associated with maintaining existing spreading infrastructure and maximizing spreading production.

Distribution (D-X): Distribution projects include work to improve the potable water distribution system, not including pump stations.

Appendix C includes a Capital Project Implementation Schedule.

8.1 General Projects

Project G-1: Main Office Solar and Batter Storage Project

Drivers: System Resiliency, Emergency Responsiveness, Reduce Operating Costs

The District office was built in 1975 at the "Hidden Valley" site that was contemplated to be a future reservoir site. The office has not been renovated or refreshed since then with many deficiencies. Original floor covering is peeling or damaged in many spots creating trip hazards. The roof was replaced within the last 15-years but was poorly detailed so that there is ongoing roof leaking and ceiling damage in any rain event. This project includes an interior refresh of the office to include new floor and wall covering, new energy efficient light and plumbing fixtures, replacing doors with ACA compliant hardware and replacing the kitchenette with an ADA compliant configuration. This project also includes installation of a solar panel system and backup battery. The backup battery system will be designed to provide 5 days of power needs with a total outage and loss of solar production. Following this project, it is expected that the electricity bill is reduced 90% annually and we would avoid the need to maintain a diesel generator onsite and the ongoing expense of replacing individual Uninterruptable Power Supply's to each desktop PC. This project is proposed to be implemented in year 1 of the CIP. Moving the District office to solar powered is a first step toward having our energy supply consist of 100% renewable and zero-carbon sources by December 31, 2035, as required by SB 1020.

Project G-2: Physical Site Security Improvements

Drivers: System Resiliency, Emergency Responsiveness

This project is proposed to be completed over 3 years with high priority facilities addressed first. Physical site security deficiencies at each facility will be addressed and may include addition of security cameras, replacement of existing facility fencing and other related improvements.

Project G-3: Fire and Water Wise Landscape Improvements

Drivers: Reduce Operating Costs, Fire Preparedness, Customer Outreach/Education

This project is a low priority project. This would include replacement of all site landscaping at the District Office, the Eucalyptus Reservoir, the Brown Reservoir and the Wilcox Reservoir. Current plantings are non-native, invasive and water intensive. This project would follow Water Wise landscaping standards and include plant types recommended by the Los Angeles County Fire Department. Aside from reducing operational costs to water and maintain existing landscapes these gardens would serve as demonstration gardens to District residents considering similar improvements. There may be grant funding opportunities for this project.

Project G-4: Roofing on Booster Stations and Chlorine Rooms

Drivers: System Resiliency, Protection of Existing Assets

All roofs are past their useful life and failing in some instances. Over several years all roofing on Booster Stations and freestanding Chlorine rooms will be replaced.

Project G-5: SCADA RTU Upgrade

Drivers: System Resiliency, Cybersecurity, System Operational Efficiency

All facilities have a Remote Telemetry Unit (RTU) that monitors and controls the equipment at that site. All RTU's are currently SCADA Pack 32 model which reached its End of Commercialization date as of June 30, 2023, meaning they are no longer available for purchase. As of June 30, 2028, after-sales support will end. The manufacturer, and our SCADA integrator, are recommending we transition to SCADAPack 474. Over two years the District will replace all existing SCADAPack 32's with SCADAPack 474.

Project G-6: Solar Power/Battery Systems at Pumping Sites

Drivers: System Resiliency, Emergency Responsiveness, Reduction in Operating Costs

Presently pumping facilities have onsite diesel backup generators that turn on in the event of a utility power outage. Even when not required for pumping these generators must run to facilitate other small demand equipment to function such as area lighting and communications. Installation of small solar panel systems and backup batteries will ensure these facilities are able to communicate in even of a power outage without having to rely on the backup generator to run. This also avoids the unnecessary expense, noise and environmental impact of running the diesel generators for small equipment power needs.

Project G-7: SCADA Radio Upgrades

Drivers: System Resiliency, Cybersecurity, System Operational Efficiency

Each site with an RTU has a separate radio unit to communicate with the SCADA system. The current radios were installed in 2018 and are still being manufactured; however, it is anticipated that a District wide SCADA radio replacement will be necessary within the timeframe of this CIP.

Project G-8: District Storage Facilities

Drivers: Emergency Responsiveness, Protection of Existing Assets

The District has no dedicated storage facility but uses and abandon below-grade reservoir at the Vosburg site for its primary storage. This storage area is not secure, safe for personnel or efficient. This project includes over the course of three years constructing small, secure storage units. To recapture the Kinneloa Estates HOA storage shed behind the District office it is proposed that a replacement storage shed be constructed for them next to the Eucalyptus Booster Station and that the HOA move there and the District recaptures the storage shed at the office. It is proposed that high-value material be stored in a new storage shed constructed on the Sage Tank site as this facility is behind multiple secured entry points and can be video monitored easily. Finally, its recommended that the existing Vosburg storage be abandoned, and a small supplemental storage facility be built at that site.

Project G-9: Driveway Paving/Improvements

Drivers: Protection of Existing Assets, Emergency Responsiveness

Existing paving and site drainage at several sites is failing which may cause damaged to District vehicles, District facilities and possibly prevent access in time of emergency. This project will make driveway and drainage improvements at the Wilcox Well, Wilcox Reservoir and Holly Tanks sites.

8.2 Storage Projects

Project ST-1: Vosburg Reservoir

Drivers: Protection of Existing Assets, Health & Safety

The Vosburg Reservoir was cleaned and inspected by a diving contractor in April 2024. There were minor sanitary deficiencies noted on perimeter screening that have been addressed. It is anticipated that following the next inspection the entire exterior cladding and screening system should be fully removed and replaced to maintain a sanitary environment.

Project ST-2: Glen Reservoir

Drivers: Protection of Existing Assets, Health & Safety

The Glen Reservoir was cleaned and inspected by a diving contractor in April 2024. The reservoir has many sanitary deficiencies due to a failing roof structure causing rainwater and organic matter intrusion. Additionally, the concrete reservoir itself is cracked and leaking in many areas. This is an urgently needed project. This project will include complete tear-off of the existing roofing and roof structure with complete replacement. The project will include installation of a CSPE liner inside the reservoir to prevent further water loss from increasing structural damage. This project will also include site improvements to the site paving and drainage.

Project ST-3: Brown Reservoir

Drivers: Protection of Existing Assets, Health & Safety

The Brown Reservoir was cleaned and inspected by a diving contractor in April 2024. There were minor sanitary deficiencies noted on perimeter screening that have been addressed. This reservoir is the same age and construction type of the Glen Reservoir so it is anticipated that a new roof and liner installation will be required within the timeframe of this CIP.

Project ST-4: Eucalyptus Reservoir

Drivers: Protection of Existing Assets, Health & Safety

The Eucalyptus Reservoir will be cleaned and inspected by a diving contractor in early 2025. This project is an allowance to correct anticipated minor deficiencies that may be noted during that inspection.

Project ST-5: Wilcox Reservoir

Drivers: Protection of Existing Assets, Health & Safety

The Wilcox Reservoir will be cleaned and inspected by a diving contractor in early 2025. This project is an allowance to correct anticipated minor deficiencies that may be noted during that inspection.

Project ST-6: East Tank Erosion Control

Drivers: Protection of Existing Assets, Natural Hazard Mitigation

The East Tank site was restored using FEMA funds in 2023 when a large amount of earth was removed from around the tank. To prevent the tank from becoming partially buried in the future this project will install gabion type baskets around the tank to prevent ongoing hillside erosion from burying the tanks.

8.3 Pumping Projects

Project P-1: K-3 Well Pump Rehab

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

The K-3 Well Pump and Motor is due for refurbishment. This project will also upgrade the pump from oil to water lubricated for operational efficiencies. This project will also include removal of abandoned electrical components in the vault and upgrade to the vault exhaust system to maintain lower temperatures to protect vault equipment.

Project P-2: Wilcox Well Pump and Motor Upgrade

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

The Wilcox Well Motor requires replacement. The onsite electrical system is also in need of urgent replacement. This project will upgrade the pump motor, replace the existing electrical main gear and motor control center and include purchasing of a backup generator to be stationed at the Wilcox Well but capable of powering the K-3 Well if necessary.

Project P-3: Eucalyptus Booster Pump #1 Remove and Replacement

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

This unit is overdue for a replacement. The Eucalyptus Station operates with 2 duty pumps and 1 standby pump so having all 3 pumps in good operational condition is necessary.

Project P-4: Wilcox Reservoir Booster System Project

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

This project will follow the dive inspection scheduled for early 2025 so that the pump stand rehab needs can be evaluated and planned for. This project will include necessary rehab/painting of the pump stand, complete replacement of the original 50hp Booster, rehab of the 75hp Booster, replacement of existing electrical MCC and main switchgear. The project will also include replacement of the pumping line from the booster station to the connect at Villa Knolls Road. This project will require engineering support for pipeline, pumping and electrical scope. The engineering study will evaluate potential for this station to pump directly to Vosburg Reservoir as an alternate to Glen Reservoir.

Project P-5: Glen Booster Resiliency

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

There is a single booster pump at the Glen site with no ability to add a standby pump. To build resiliency a spare set of pump bowls will be purchased and stored in the District. If there is a failure on this pump it is expected that it could be returned to service within 3 days provided the parts are on hand. Additionally, this pump and motor will be due for an overhaul by year 3 of the CIP.

Project P-6: Generator Fleet Replacement

Drivers: System Resiliency, Emergency Preparedness, Reduction of Operating Expenses

With the exception of the K-3 Well and Wilcox Well, all pumping facilities have a portable diesel backup generator onsite and dedicated to the facility. The generators were all purchased used in fair condition, they are currently between 18-26 years old and in fair condition. It is expected that all generators must be replaced during the timeline of this CIP.

8.4 Treatment Projects

Project T-1: Fluoride Blending Stations for Far Mesa and Delores Tunnels

Drivers: Supply enhancement, System Resiliency

This project includes various piping, valving and telemetry to accomplish source water blending as submitted to DDW as part of a blending treatment permit. This project will complete the blending stations for the Delores Tunnel at Vosburg Reservoir and the Far Mesa Tunnel at Glen Reservoir only.

Project T-2: Fluoride Blending Stations for Hi Pressure Tunnel at West Tank

Drivers: Supply enhancement, System Resiliency

This project includes various piping, valving and telemetry to accomplish source water blending of the High-Pressure Tunnel to the West Tank. This proposal has not been presented to DDW and is anticipated to occur 1 year following DDW approval of blending at Delores and Far Mesa Tunnels so that the District has that data available to support this request. The distribution piping is in place. This project will include piping and valve at Sage Tank and West Tank to accomplish chlorine disinfection of the source water from the treatment facility at Sage Tank and have that disinfected water enter the system at West Tank for fluoride blending. This project is not yet designed.

Project T-3: K3 Chlorination and Controls System Upgrade

Drivers: System Resiliency, Reduction in Operating Expenses

The onsite sodium hypochlorite generator at K3 is functional but beyond its service life. Technical support from the original manufacture is not available. This project will be done simultaneously with project P-1 and will include installation of a new sodium hypochlorite generation system, water softener, chlorine pumps and controls upgrade.

8.5 Tunnel Supply/Spreading Projects

Project SP-1: Delores Tunnel Resiliency

Drivers: System Resiliency, Source Protection

If the investment is made to blend the Delores Tunnel water for fluoride, then the protection of the tunnel and pipeline in the Pasadena Glen Canyon must also be done. This includes removal of several hazard trees that could easily fall and catastrophically damage the tunnel line along with various pipeline hardening efforts in the canyon after the source leaves the groundwater tunnel.

Project SP-2: Far Mesa Tunnel Resiliency

Drivers: System Resiliency, Source Protection

If the investment is made to blend the Far Mesa Tunnel water for fluoride, then the protection of the tunnel and pipeline must also be done. This project includes securing and constructing a tunnel access structure on the vacant private property at Ranch Top Road as well as installation of pipeline shield where root intrusion is causing ongoing operational issues.

Project SP-3: High Pressure Tunnel Resiliency

Drivers: System Resiliency, Source Protection

If the investment is made to blend the High-Pressure Tunnel water for fluoride, then the protection of the pipeline in Kinneloa Canyon must also be done. There are several locations where pipeline anchors are at or near failure and reconstruction is required along with selective replacement of hose with HDPE where damage is likely.

8.6 Distribution Systems Projects – Valves and Hydrants

Project D-1: Hydraulic Control Valve Project

Drivers: Emergency Preparedness, System Operations Efficiency

This project includes field retrofit of existing hydraulic control bypass valves at Sage Tank and the Eucalyptus Reservoir. The existing manually operated bypass valve at Sage Tank will be retrofitted for automatic control so that West Tank water may drop into the Holly-Sage Zone if necessary. The existing manually operated bypass valve at the Eucalyptus Reservoir will be retrofitted to allow for automatic control so that Holly-Sage zone water may drop into the Eucalyptus Reservoir if necessary. Finally, the existing abandoned Holly Booster Pumps which were intended to be removed following completion of the Vosburg Booster Station project in 2015 will be removed and a new automatic hydraulic control valve will be installed to allow for East Tank water to drop into the Holly-Sage zone if necessary.

Project D-2: Motorized Valve Actuators

Drivers: Emergency Preparedness, System Operations Efficiency

At various locations the District has motorized valve actuators to control reservoir inlets/outlets and to operate as part of a Seismic Sensing Closing System to restrict flow out of a reservoir in case of a seismic event that may have damaged distribution system pipeline. It is anticipated that all actuators will need to be replaced during the timeline contemplated by this CIP.

Project D-3: Hydrant Head/Lateral Upgrades

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

At locations in the District where the mainline is believed to have capacity to support a 1,250-gpm fire flow but the hydrant head itself is undersized this project will replace the hydrant lateral and hydrant so that fire flow can be achieved. There are assumed to be 9 locations in the District where this is applicable.

Project D-4: Gate Valve Replacement Program

Drivers: System Reliability, Aging Infrastructure

Exclusive of aging gate valves that will be replaced as part of pipeline improvement projects there are assumed to be ten (10) locations where an aged, potentially failed, gate valve must be replaced.

8.7 Distribution Systems Projects – Pipeline

Project D-5: Brown-Glen Fire Flow Pipeline Project

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

The design of this project is complete and was worked on for several years. The primary goal of this project is to address unacceptable fire flow conditions at the south end of the Brown-Glen Zone. The project includes installation of a combination pressure reducing and pressure sustaining valve connecting Brown-Glen system to the Vosburg system. In the event of a fire flow or other large demand event this valve would open and put Vosburg system pressure and volume into the Brown-Glen system. There are pipeline improvements required down Sierra Madre Villa, along Villa Knolls and Edgecliff Lane. There is a second phase of this project that is partially designed which would extend south on Sierra Madre Villa to serve the Hartwood Point area, this

Hartwood Point extension is excluded from the scope of this Ten-Year CIP. The primary project is fully designed and effectively shovel ready, although several expired permits need to be renewed.

Project D-6: Villa Mesa and Villa Rica Fire Flow Project

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

The fire hydrant at Villa Mesa/Villa Rica has one of the lowest levels of available fire flow in the District due to small and deteriorated steel piping. This project will replace all existing 4" steel pipeline on Villa Rica with 8" DIP and replace the existing 2.5" steel main on Villa Rica with larger diameter DIP. The steel pipeline on these streets is likely heavily corroded, undersized and is original to the late 1950's construction of this tract. The project is not yet designed although a Request for Proposal for engineering services is ready to be issued upon approval of this CIP.

Project D-7: Lower Pasadena Glen Road Fire Flow Project

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

This project will replace approximately 780 lineal feet of existing 3" steel mainline with 8" DIP. The residences on this street are on Vosburg pressure but the fire hydrants are on Brown-Glen pressure via another main in the street. This project will remove the hydrants from Brown-Glen pressure as they do not meet current fire flow requirements. New hydrants will be installed that will be served from the new DIP mainline and Vosburg pressure. The project is not yet designed although a Request for Proposal for engineering services is ready to be issued upon approval of this CIP.

Project D-8: Mesaloa/Meyerloa/Clarmeya Fire Flow Project

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

These streets branch east and west off Kinneloa Mesa Road. In 2009 most of the old small diameter steel mains on the west side of Kinneloa Mesa Road were replaced with DIP. This project will replace all remaining, original, small diameter steel water mains on the east side of Kinneloa Mesa Road with DIP to facilitate fire flow demands and system reliability. The project is not yet designed although a Request for Proposal for engineering services is ready to be issued upon approval of this CIP.

Project D-9: Holly-Sage Loop Phase 1 and 2

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

This project includes Phase 1 which is currently designed and shovel ready as the "1850 Kinneloa Canyon Road" upgrade project. This project replaces small diameter mainline from near the Eucalyptus Reservoir down to the subject address and installs a new fire hydrant on Holly-Sage pressure. The existing hydrants on this street are on Eucalyptus Zone pressure and do not meet current fire flow requirements. Phase 2 of this project which is not currently designed would extend that Holly-Sage mainline past 1850 Kinneloa Canyon Road to the corner of Kinneloa Canyon Road and Kinneloa Mesa Road. A new fire hydrant would be installed at this corner so that the fire flow needs of the school and church at this location are met via a combination of an existing fire hydrant on Eucalyptus pressure and a new fire hydrant on Holly-Sage pressure. This would be a connection point to complete the desired Holly-Sage loop which is Project D-10 in this CIP plan.

Project D-10: Holly-Sage Loop Phase 3

Drivers: Fire Flow Provisions, System Reliability, Aging Infrastructure

Phase 3 would connect to the Holly-Sage main at the corner of Kinneloa Mesa Road and Kinneloa Canyon Road and extend up Kinneloa Mesa Road to join the existing dead end main at Kinneloa Mesa Road and Larmona Drive. This dead-end main is undesirable for maintaining consistent water quality and completes a looped system between the Sage and Holly Tanks. This completed loop in addition to improving water quality will improve system reliability in supplying the Holly-Sage zone.

Project D-11: Glen Reservoir Pumping Line/Drain Sump

Drivers: System Reliability, Aged Infrastructure

The pumping line into the Glen Reservoir is aging at risk of failure. Given the presence of multiple residences in the area a repair to this line would be highly invasive and expensive. Should the Glen Reservoir be desired to remain in service a new pumping line should be installed extending up Pasadena Glen Road and entering the reservoir from the West through the easement between 1830 and 1856 Pasadena Glen Road. The existing reservoir drain line location is not known so this same trench line would include a new drain line that would drain directly into the wash west of the reservoir on the opposite side of the road.

Project D-12: Brown Reservoir Pumping Line

Drivers: System Reliability, Aged Infrastructure

The pumping line into the Brown Reservoir is aging at risk of failure, especially the portion from the canyon bottom up to Vosburg Street. This project is conceptual at this point and assumes replacing approximately 1,200 lineal feet of 6” steel line.

Project D-13: East Fairpoint Street

Drivers: System Reliability, System Efficiency

This project would abandon ~900 lineal feet of aging 4” steel dead end main and connect six (6) existing residential services to the 8” DIP main that was installed in 2010. This project would also upgrade the PWP interconnection at Fairpoint from 2” to 4” which would allow more efficient delivery of water to PWP to the Calaveras zone in case of emergency or for returning water delivered from PWP to KID at Outpost-West. The 4” steel line is at risk of failure and should have been abandoned in 2010 when the new 8” DIP main was installed.

Project D-14: West Windover

Drivers: System Reliability, Aged Infrastructure

This project would replace ~280 feet of 4” steel mainline with new 4” or 6” DIP mainline for six (6) residential services. There are no fire hydrants on this line. The 4” steel line is significantly aged and at risk of failure.

Project D-15: Vosburg Street West of Sierra Madre Villa

Drivers: System Reliability, Aged Infrastructure

This project would replace ~400 feet of 1.5” steel service line in the shared driveway at the west end of Vosburg with new 4” DIP. Approximately 1200 feet of 1.5” steel line on the east and west side of Sierra Madre Villa would be abandoned.

Project D-16: North Villa Heights Road (Western Extension)

Drivers: System Reliability, Aged Infrastructure

This project would connect 7 residential services to an existing 12” DIP main that was installed as part of the East-West Pipeline Project. This would allow for approximately 240 feet of existing 4” AC main and 210 feet of existing 2” steel main to be abandoned as both lines are past their expected useful life and at risk of failure.

Project D-17: 1770-1790 Sierra Madre Villa Private Driveway

Drivers: System Reliability, Aged Infrastructure

This project would replace a deteriorating and aged, ~300 feet of 3” steel line with 4” DIP and reconnect five (5) residential services.