

CRESCENTA VALLEY WATER DISTRICT

STAFF REPORT

Information Item No. 2
August 22, 2024

To: Engineering and Operations Committee
From: Carla Dillon, P.E. –Director of Engineering and Operations
Subject: Wastewater Master Plan

INFORMATION ITEM:

Final Project Presentation - Wastewater Master Plan, Project M-1037A – Discussion regarding the wastewater master plan and recommendations.

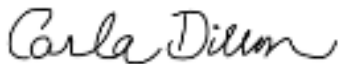
BACKGROUND:

The District contracted with Kennedy Jenks Consultants, Inc. in April 2022 to prepare a wastewater master plan. The project included information gathering, system assessment, flow modeling and calibration, flow projections, and recommendations.

DISCUSSION:

Kennedy Jenks Consultants, Inc. will present the process used for preparing the wastewater master plan and recommendations.

Submitted by:



Carla Dillon, P.E.
Director of Engineering & Operations

Attachments: Final Report

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July 2024

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Crescenta Valley Water District Wastewater Master Plan

FINAL



35 N. Lake Ave, Suite 550
Pasadena, CA 91101
626-568-4300

**Crescenta Valley Water
District
Wastewater Master Plan**

5 July 2024



Project M-1037

Prepared for

Crescenta Valley Water District
2700 Foothill Boulevard
La Crescenta, CA 91214

KJ Project No. 2244508

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Appendix F	CIP Project One Sheets
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List of Abbreviations

AACE	American Association of Cost Engineering
AC	Asset Condition
ADS	ADS Environmental Services
ADWF	Average Dry Weather Flow
AF	Acre-feet
AFY	Acre-feet per Year
AMBP	Asset Management Business Processes

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AMI	Area Median Income
APM	Asset Performance Management
APN	Assessor Parcel Number
ASCE	American Society of Civil Engineers
ASSFC	Amalgamated System Sewerage Facilities Charge
ASSSC	Amalgamated System Sewerage System Charge
ATS	Automatic Transfer Switch
BOD	Biological Oxygen Demand
BRVA	Business Risk and Vulnerability Assessment
BV	Business Vulnerability
CCTV	Closed-Circuit Television
CIP	Capital Improvement Program
CIPP	Cured-in-place piping
CMU	Concrete Masonry Unit
COF	Consequence of Failure
CVWD	Crescenta Valley Water District
d/D	Depth to Diameter
EMA	Enhanced Maintenance Area
FPS	Feet per Second
FRP	Fiberglass Reinforced Pipe
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
GPM	Gallons per Minute
GWTP	Glenwood Water Treatment Plant
HGL	Hydraulic Grade Line
HMP	Hazard Mitigation Plan
HP	Horsepower
HTP	Hyperion Treatment Plant
I&I	Inflow and Infiltration
IDM	Inch-Diameter Mile
KPI	Key Performance Indicator
kW	Kilowatt
LACSD	County Sanitation Districts of Los Angeles County
LAGWRP	Los Angeles-Glendale Water Reclamation Plant
LCF	La Cañada Flintridge
LCID	La Cañada Irrigation District
MCC	Motor Control Center
MFR	Multi-Family Residential

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MGD	Million Gallons per Day
MWD	Metropolitan Water District of Southern California
NFPA	National Fire Protection Association
NOAA	National Oceanic and Atmospheric Administration
O&M	Operation and Maintenance
OPCC	Opinion of Probable Construction Cost
PLC	Programmable Logic Controller
POR	Preferred Operating Range
PWWF	Peak Wet Weather Flow
R	Resiliency (ERP, AOP, SOP)
RDII	Rainfall-Derived Infiltration and Inflow
RES	Reliability Engineering Support
RHNA	State of California's Regional Housing Needs Assessment
RTK	Unit Hydrograph Methodology
SC	Safety Condition
SCADA	Supervisory Control and Data Acquisition
SCAG	Southern California Association of Governments
SFR	Single Family Residential
SS	Suspended Solids
SSA	Sewer Service Area
SSMP	Sewer System Management Plan
SSO	Sanitary Sewer Overflows
T	Training
TDH	Total Design Head
TSS	Total Suspended Solids
UPS	Uninterrupted Power Supply
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
VCP	Vitrified Clay Pipe
VFD	Variable Frequency Drive
WaPUG	Wastewater Planning Users Group
WDR	General Waste Discharge Requirements
WEF	Water Environment Federation
WEM	Work Execution Management
WSA	Water Service Area
WTP	Water Treatment Plant
WWMP	Wastewater Master Plan
WWTP	Wastewater Treatment Plant

Executive Summary

The Crescenta Valley Water District (CVWD) has developed the 2023 Wastewater Master Plan (WWMP) to continue their mission to “provide quality wastewater services to the Crescenta Valley community in an economically responsible manner” (CVWD, 2024). The main goal of this WWMP is to provide CVWD with a roadmap of key projects and improvements to current practices that will improve the safety and reliability of the collection system to continue to serve Crescenta Valley for many years to come. The Capital Improvement Program developed as part of this WWMP is meant to be a living document, with the flexibility to adjust the timing and priority of key system improvements based on changing risk factors and the evolving needs of CVWD. This is the first WWMP that has been completed for CVWD’s collection system since its inception in the 1980’s.

Background

Crescenta Valley Water District (CVWD) is located in the La Crescenta-Montrose unincorporated area of Los Angeles County (LA County), nestled between the foothills of the San Gabriel Mountains, between the San Fernando and San Gabriel Valleys. CVWD provides water distribution and sewage collection within its boundaries to the communities of La Crescenta, Montrose, Verdugo City, and City of Glendale as well as a small portion of the City of La Cañada-Flintridge.

The CVWD WWMP has been prepared to evaluate CVWD's sewer system for existing and future sewer flow conditions. The objectives of this WWMP include the following:

- 1) Identify existing collection system deficiencies through discussions with O&M and Engineering Staff, condition assessments, and hydraulic modeling/flow data collection
- 2) Quantify impacts to the collection system as a result of future growth/densification, and identify potential future collection system deficiencies
- 3) Develop list of CIP projects prioritized by risk and develop project costs
- 4) Develop implementation strategy for potential near-term and long-term CIP projects

Existing System Description

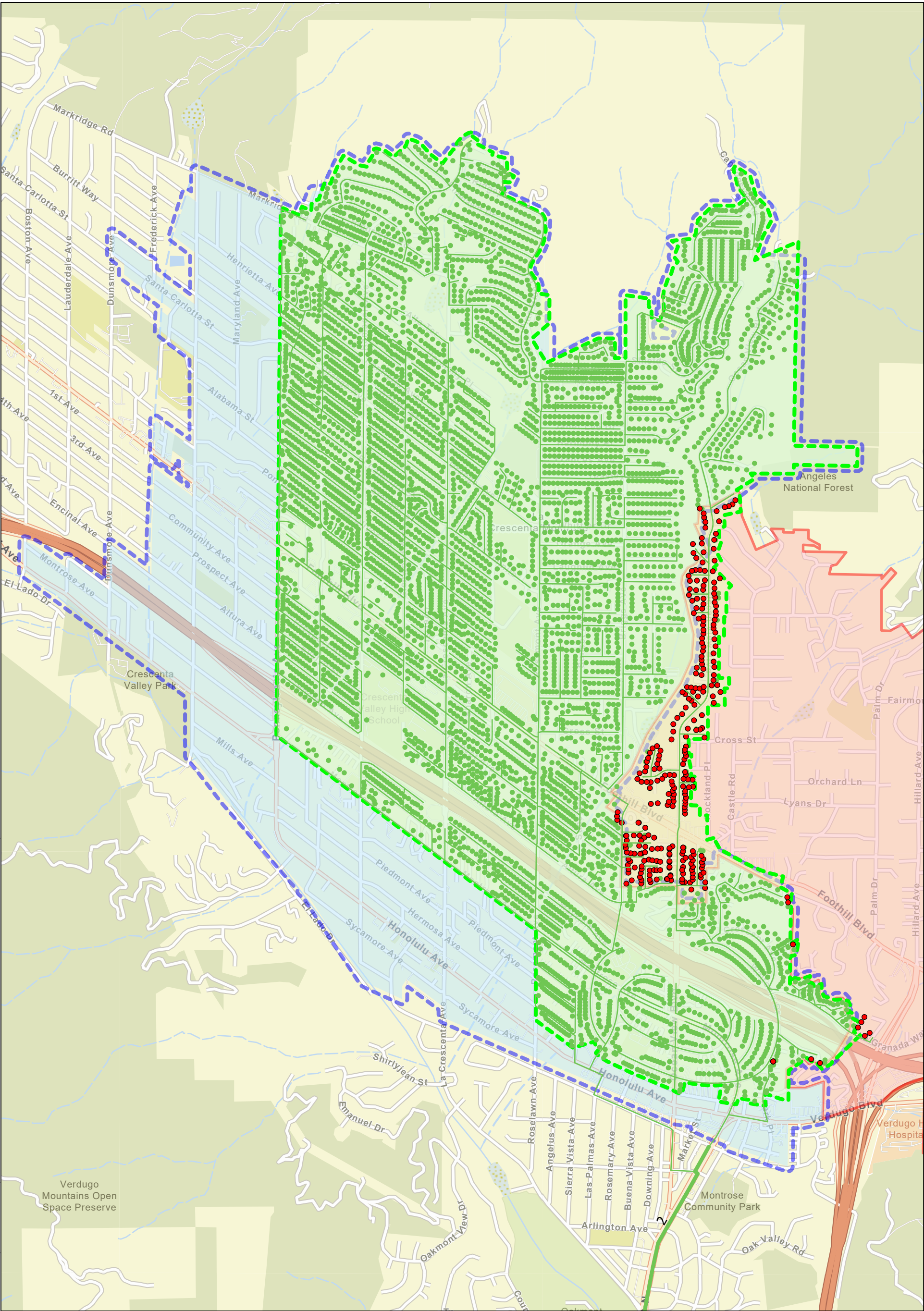
With a service area of approximately 4 square miles which serve a population of approximately 33,000 people, CVWD covers various elevations of terrain varying from 1,200 feet to nearly 3,000 feet above sea level (Pacific Institute, 2024). CVWD currently provides water service to approximately 8,800 accounts. As Figure ES-1 shows, CVWD's sewer service area (SSA) is not the same as the water service area (WSA). Compared to WSA, CVWD's SSA serves approximately two-thirds the number of customers and population, including approximately 6,000 accounts and a population of around 22,000.

CVWD's collection system has an average flow of 1.54 million gallons per day and includes 68 miles of pipeline, one lift station, and two flow monitoring stations. The collection system is primarily constructed of 8-inch vitrified clay pipe (VCP) installed in the 1980's. For the purposes of this WWMP, the SSA was subdivided into 10 sewersheds, primarily defined by major confluence points in the system where significant flows discharge into the trunk sewer lines. An overview of the sewer system is provided in Figure ES-2. This figure shows the locations of the flow meters that were installed for the 3-month data collection period. This figure also shows the locations of CVWD's enhanced maintenance areas (EMAs), which are areas in CVWD's SSA that require more regular maintenance/cleaning due to a variety of factors such as shallow slopes prone to debris buildup/blockages, or areas with historical SSO events. Table ES-1 documents the locations of these EMAs.

Table ES-1: Enhanced Maintenance Areas

EMA #	Location
1	Pine Glen Rd / Pineridge Dr
2	La Crescenta & Orange
3	Foothill & Briggs (76 Station)
4	Foothill between Sunset/Briggs, North Side
5	2000 Hilldale Dr
6	Waltonia between Hilldale and Montrose
7	Canalda and Ocean View flush tank
8	Prospect Ave between Sunset and Rosemont
9	Community between Ramsdell & Glenwood
10	Mountain Pine & Timberlake

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Legend

LCID Sewer Customers

CVWD Sewer Customer

Sewer Gravity Mains

Sewer Service Area

Water Service Area

La Canada Irrigation District

Notes:

1. LCID Customers are sewer only customers

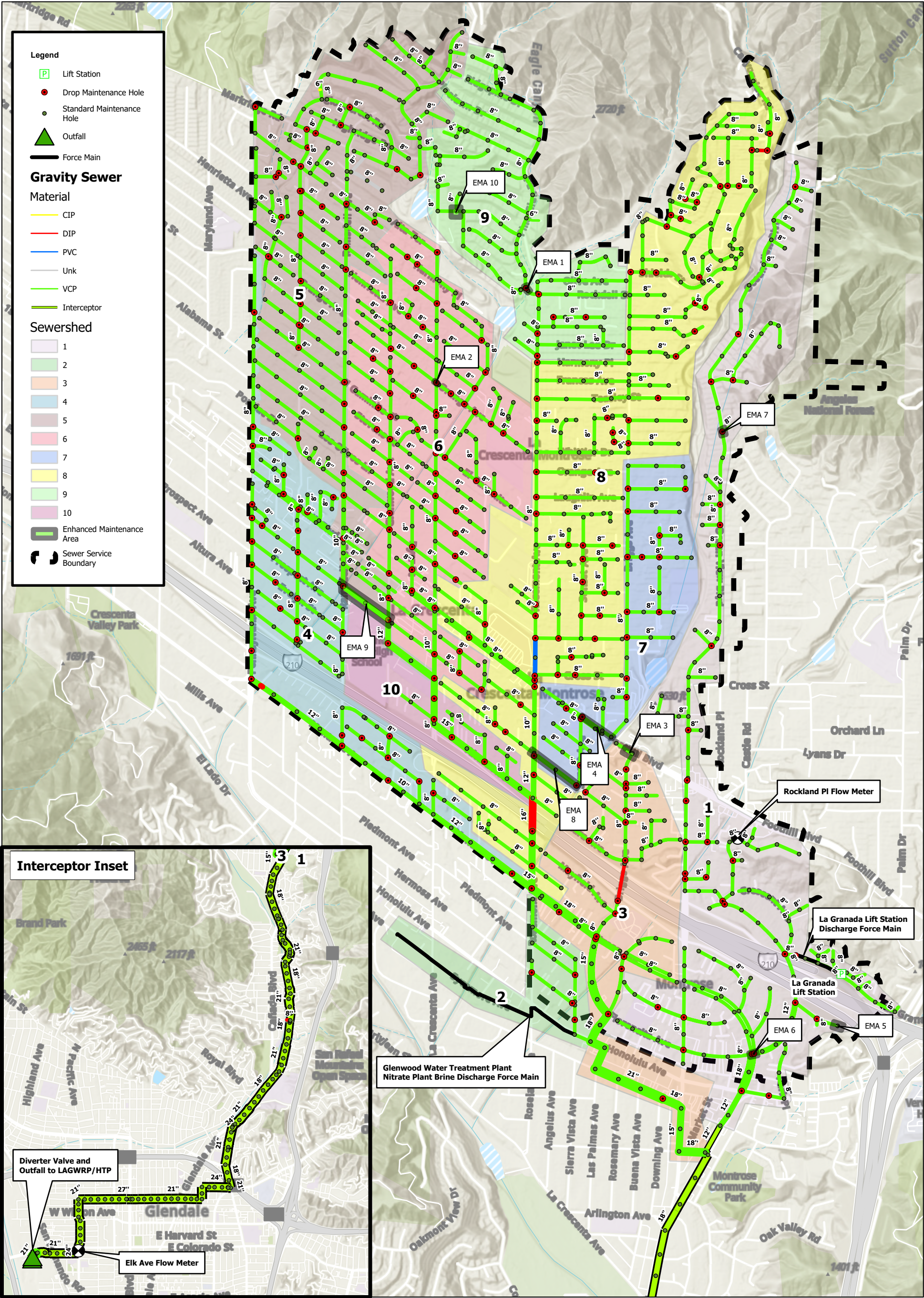


Kennedy Jenks

Crescenta Valley Water District
Wastewater Master Plan

Service Area Overview

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Figure ES-1



Notes:

1. Gravity Sewer symbol thickness varies by pipe diameter

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Crescenta Valley Water District
Wastewater Master Plan

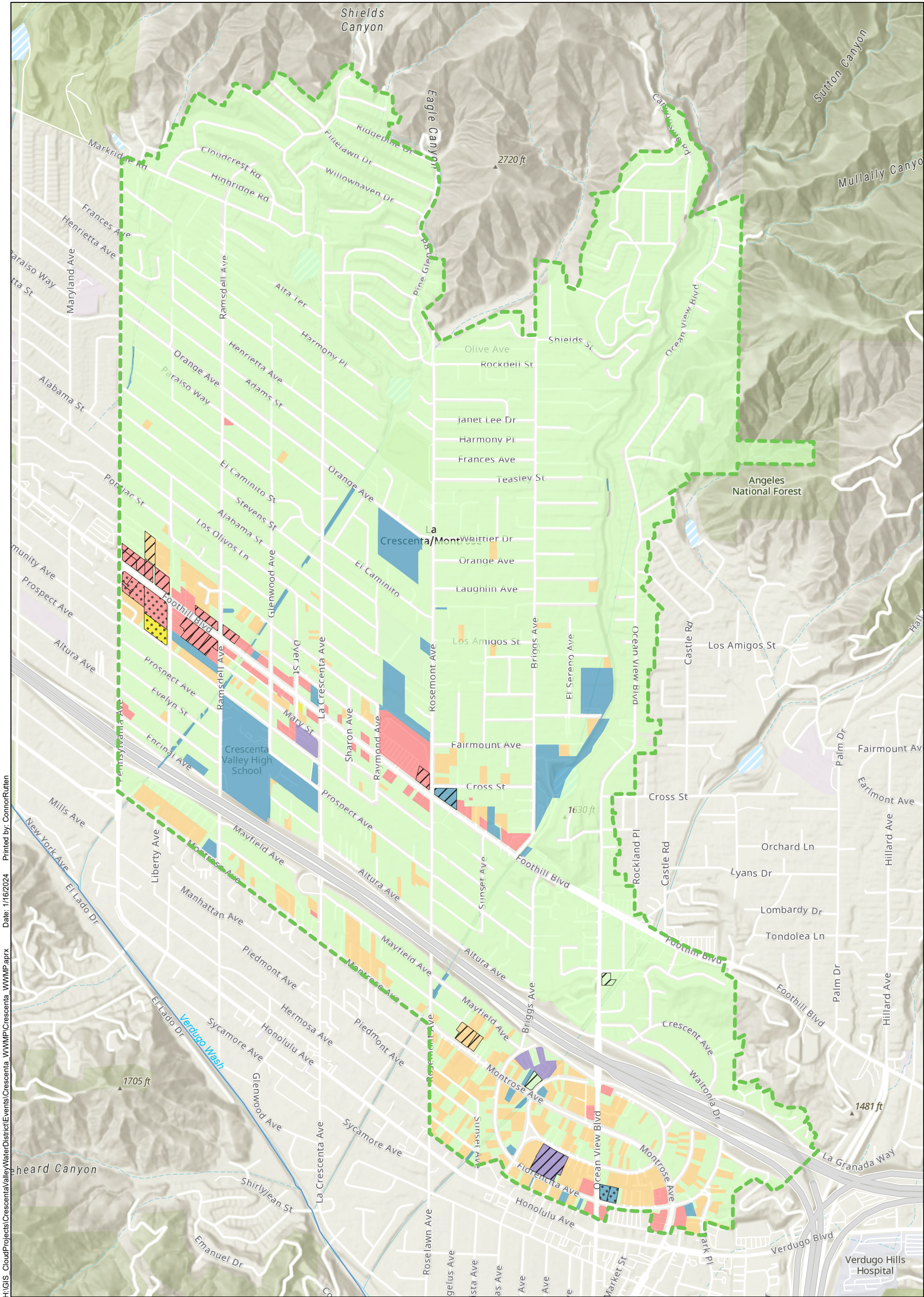
**Wastewater Collection
System Overview**

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Figure ES-2

CVWD's service area is primarily made up of residential and some light commercial accounts, and is largely built out with limited room for additional growth without significant densification. The 2020 Urban Water Management Plan estimated CVWD's WSA population to be around 32,500 in 2020, and is expected to be 35,100 by 2045 with an average annual growth rate of only 0.3%.

Due to the State of California's (State) ongoing effort to provide more affordable housing for its growing population, the State created the Regional Housing Needs Assessment (RHNA) to evaluate where and when additional housing is needed. LA County has identified some parcels within CVWD's service area that could be candidates for rezoning/densification. These parcels are primarily along the main commercial corridors on Foothill Blvd and Honolulu Ave.

CVWD's service area land use and parcels identified for densification are shown in Figure ES-3.



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Legend

LA County Parcels

Land Use Type

SFR

MFR

Commercial

Industrial

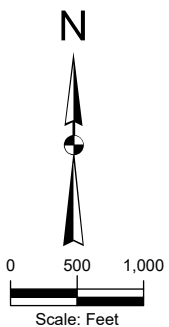
Gov/Institutional

School

Los Angeles County Housing Element (2021-2029) - Rezoning

Los Angeles County Housing Element (2021-2029) - Sites Inventory

Sewer Service Area



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Crescenta Valley Water District
Wastewater Master Plan

**Sewer Service Area
Land Use and Housing
Element Parcels**

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Figure ES-3

CVWD does not own or operate their own wastewater treatment plant (WWTP), and therefore relies on an ongoing agreement with the City of Los Angeles (City of LA) to receive and treat their wastewater. CVWD is one of the 24 Contracting Agencies that participate in the City of LA's Treatment & Disposal of Wastewater Agreement (Agreement). Currently, almost all of CVWD's wastewater is conveyed to the Los Angeles-Glendale Water Reclamation Plant (LAGWRP). Less than 1% of CVWD's wastewater is conveyed directly to Hyperion Treatment Plant (HTP), which occurs while CVWD is backwashing their ion exchange system at their GWTP, producing a highly concentrated brine that LAGWRP is not able to receive and treat.

The City of LA charges CVWD based on the distance of CVWD's outfall to either LAGWRP or HTP (depending on where the flow is treated), as well as the quantity and strength of the sewage being treated. The final unit that the treatment fee is based on is calculated in "MGD-Miles". From 2010 to 2020, the unit cost to treat 1 MG of flow rose on average by 8% each year. In 2020, it cost CVWD roughly \$2,500 for every 1 MG of flow sent to the City of LA. If these trends continue at the same rate of growth, the unit cost for treating 1 MG of flow in 2030 will be \$5,826. By contrast CVWD's base wastewater (WW) rate has grown by 5.4% per year on average from 2010 to 2023. Therefore, the cost of treatment is outpacing the rate at which WW rates are being adjusted. CVWD may consider performing another cost of service study using the CIP cost information included in this WWMP to ensure that CVWD has enough revenue to offset rising treatment costs. Figure ES-4 shows the historical and projected trend of the City of LA Agreement costs.

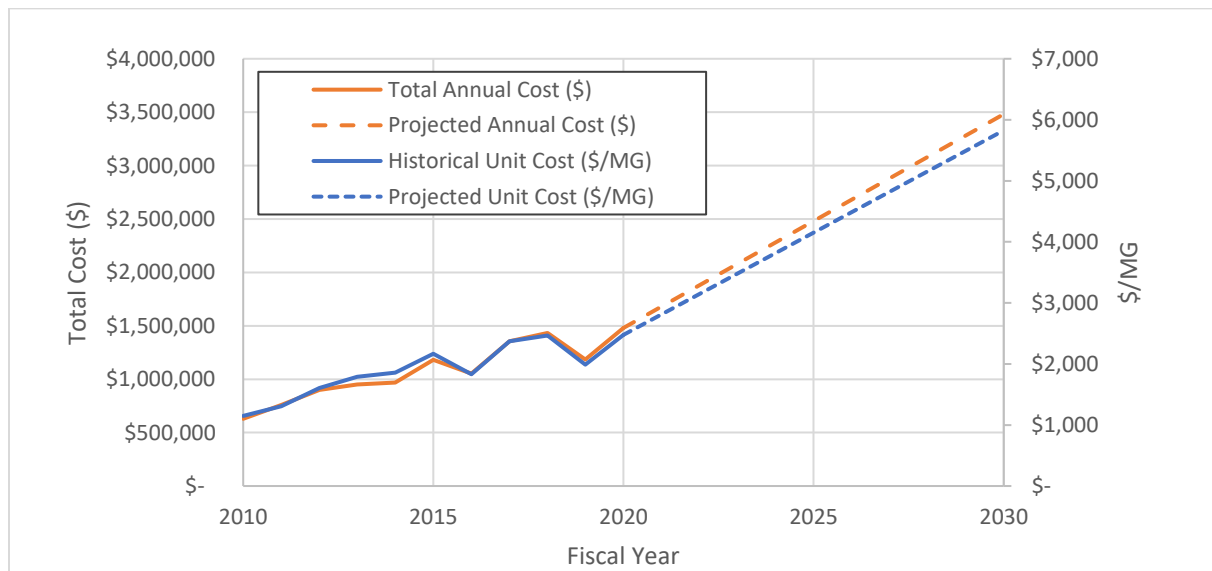


Figure ES-4: Historical and Projected Trend of City of LA Agreement Costs

Existing and Future Sewer Flow Analysis

Historical water demand and sewer flow data was used to evaluate sewer demands at the individual customer level. Future sewer flow projections were developed using a combination of population and water demand projections as well as housing data/predictions from the Housing Element. Sewer flows are not directly metered at each individual customer and must be estimated based on the customer's corresponding water demand. Because CVWD's WSA and SSA serve different populations, the water billing data required additional analysis to determine what portion of water customers were located within the SSA. Figure ES-5 shows the relative relationships between the WSA Billed Water Demand, SSA Billed Water Demand, and SSA Sewer Demand. Table ES-2 provides a summary of the water demand geolocated within the WSA versus in the SSA.

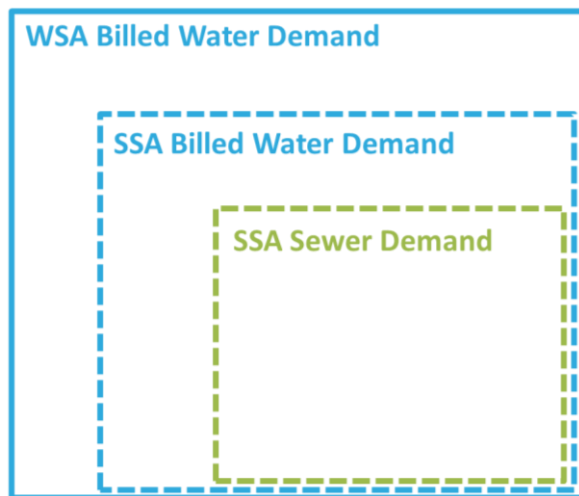


Figure ES-5: Relationship between Water and Sewer Demands

Table ES-2: WSA versus SSA Water and Sewer Demands Reduction Factor

WSA Billed Water Demand (2019- 2021, AFY)	SSA Billed Water Demand (2019- 2021, AFY)	SSA Reduction Factor (-)
3,656	2,533	0.693

To calculate the sewer demand for each individual customer, sewer return flow ratios were developed for each water customer usage type. The sewer return flow ratio represents what portion of the water demand being consumed by a water customer is then returned to the collection system as waste. On a systemwide basis, the return flow ratio has steadily increased over time, as the system water demands have significantly decreased while wastewater flows have remained relatively constant. Figure ES-6 documents the trend of the systemwide return flow ratio between 1996 to 2020. While water demands have steadily decreased over time, wastewater flows have remained relatively constant, resulting in higher return flow ratios.

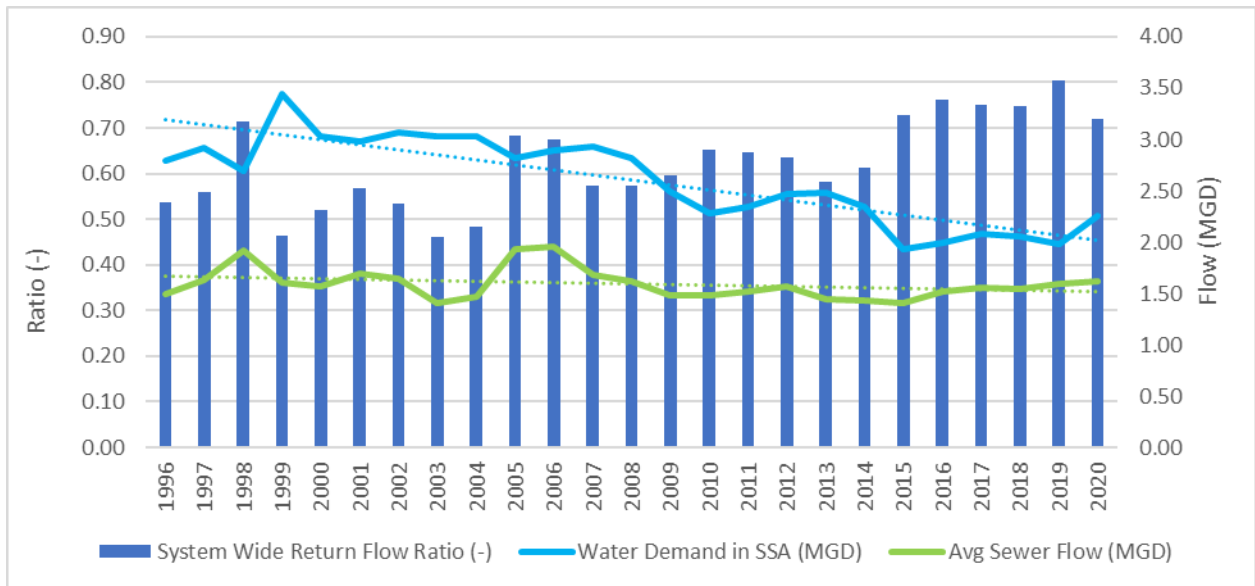


Figure ES-6: Systemwide Return Flow Ratio

In general, customers with less green space who primarily use water indoors, such as MFR customers, will have higher return flow ratios. Customers that use water for irrigation and fire protection will have no return flow, as the water is fully consumed and does not return to the sewer collection system. Several other Southern California WWMP efforts were surveyed to identify typical return flow ratios for the usage types in CVWD's system. Table ES-3 provides the return flow ratios used for this WWMP. Due to the high percentage of single family residential (SFR) demand in the SSA, the SFR return flow ratio had the largest impact on the sewer demand calculations.

Table ES-3: Return Flow Ratios by Usage Type

Usage Type	Return Flow Ratio
Commercial	80%
Fire	0%
Institutional	60%
Irrigation	0%
MFR	80%
School	50%
SFR	60.6%

Table ES-4 provides the summary of the calculated sewer flows by demand category.

Table ES-4: SSA Billed Water Demand by Usage Type

Usage Type	2019 - 2021 Average Annual Water Demand in SSA (GPM)	Return Flow Ratio	2019 - 2021 Average Annual Sewer Demand in SSA (GPM)	% Total Sewer Demand
Commercial	42	80%	33	3.0%
Fire	0.45	0%	0	0.0%
Institutional	8	60%	5	0.4%
Irrigation	33	0%	0	0.0%
MFR	355	80%	284	25.1%
School	36	50%	18	1.6%
SFR	1,196	60.6%	725	64.3%
LCF Metered Flow ¹	-	-	63	5.6%
Total	1,670 (2.41 MGD)		1,128 (1.62 MGD)	100%

Notes:

1. Composition of metered La Cañada Flintridge (LCF) Flow Unknown.

The sewer flow projections developed in this WWMP maintained alignment with population and water demand projections developed as part of the 2020 UWMP, and took into account the Housing Element parcel densification that is anticipated within the next decade. The resulting sewer flow projections actually show a net decrease in sewer flows by 2045, using the average sewer flow from 2019-2021 as the initial benchmark. Figure ES-7 and Table ES-5 summarize the sewer flow projections out to 2045.

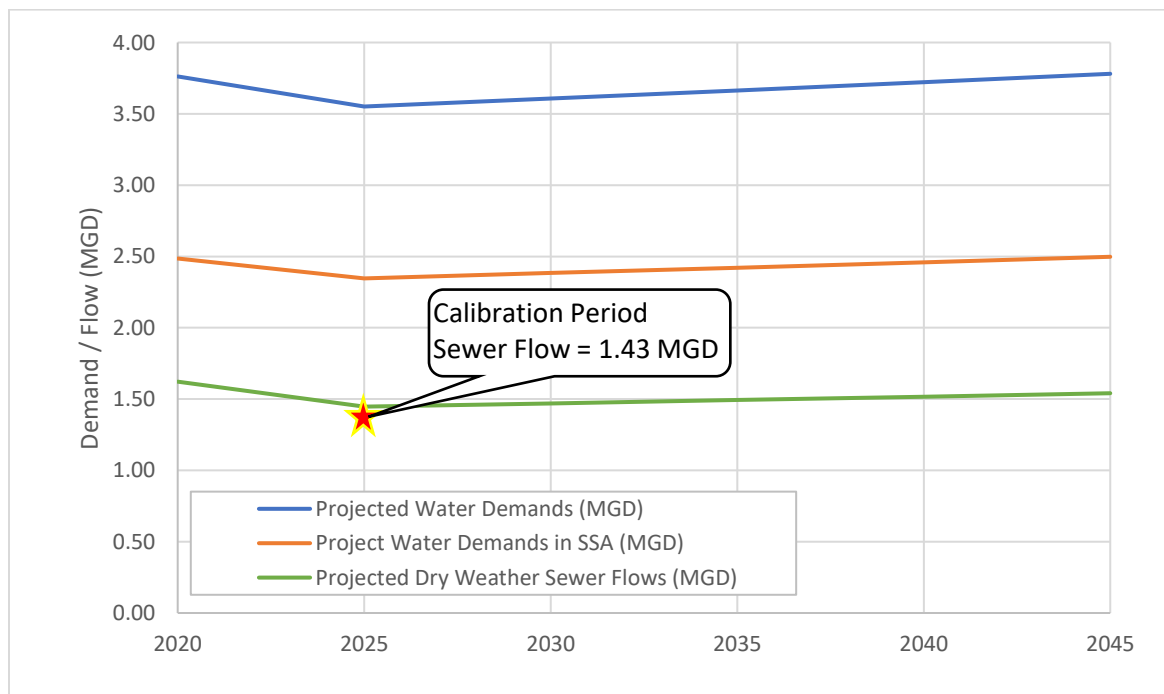


Figure ES-7: UWMP Demand Projections and Projected Sewer Flows

Table ES-5: 2020 UWMP Demand Projections and Sewer Flow Projections

Year	Population	Per Capita Water Demand (GPCD)	Projected Water Demands (MGD) ¹	Project Water Demands in SSA (MGD) ²	Projected Sewer Flows (MGD)
2020	32,462	115.9	3.76	2.49	1.62
2025	32,974	107.7	3.55	2.35	1.45
2030	33,494	107.7	3.61	2.38	1.47
2035	34,022	107.7	3.66	2.42	1.49
2040	34,558	107.7	3.72	2.46	1.52
2045	35,103	107.7	3.78	2.50	1.54

Notes:

1. 2020 Water Demand based on actual total billing data for the year 2020. The 5-year average system demand from 2015-2020 was 3.45 MGD. Because demand projections use the 5-year average as the starting point, the UWMP shows a dip in projected demands between 2020 and 2025 before continuing to climb to 2045.
2. The WSA to SSA reduction factor of 0.6606 was used to convert projected WSA water demands SSA water demands.

Sewer System Model Development

A key element of understanding the capacity of CVWD's collection system under existing and future sewer flows involved the development of the collection system hydraulic model. Innovyze's InfoSWMM software was used to develop the hydraulic model. The development of the hydraulic model involved several steps including importing CVWD's existing GIS sewer geodatabase, reviewing model connectivity, calculating/assigning existing and future flows to the model, and calibrating the model using flow meter data. Figure ES-2 provided the locations of the temporary flow meters installed to collect real time dry weather and wet weather flow data.

The calibration and validation process were based on flow data collected between December 2022 and March 2023. For calibration, data from eight out of the eleven temporary flow meters was used, in addition to the Elk Ave permanent Flow Meter, located just north of the intersection of S Pacific Ave and W Elk Ave. The selected dry weather period spanned from January 23 to January 29, 2023, covering both weekdays and weekends. The dry weather peak flow and volume calibration criteria obtained from the Wastewater Planning Users Group (WaPUG) required at least 80% agreement between measured and model-predicted hydrographs. Overall, 89% of events met the calibration criteria for both dry weather peak flow and volume.

The calibration storm event occurred on January 9, 2023, simulating a 2-year, 24-hour design storm. The storm on February 24, 2023, equivalent to a 25-year, 24-hour design storm, was selected for validation. The wet weather calibration and validation criteria required at least 60% agreement between measured and model-predicted hydrographs. Notably, 71% of wet weather peak flow and 100% of wet weather volume met the calibration criteria. During validation, 44% of wet weather peak flow and 67% of wet weather volume were met. Although validation didn't meet peak flow criteria, the predicted flows were higher than the observed flows, meaning the model results are conservative and a reasonable match between measured and modeled values. Therefore, this calibration and validation are considered acceptable.

Consequently, this model effectively assesses CVWD’s sanitary sewer system capacity and informs infrastructure improvements that will be documented in the CIP.

Figure ES-8 and Figure ES-9 provide snapshots of the Elk Ave Flow Meter calibration results, showing the agreement between the modeled and observed flow data under both dry weather flow (DWF) and wet weather flow (WWF) conditions.

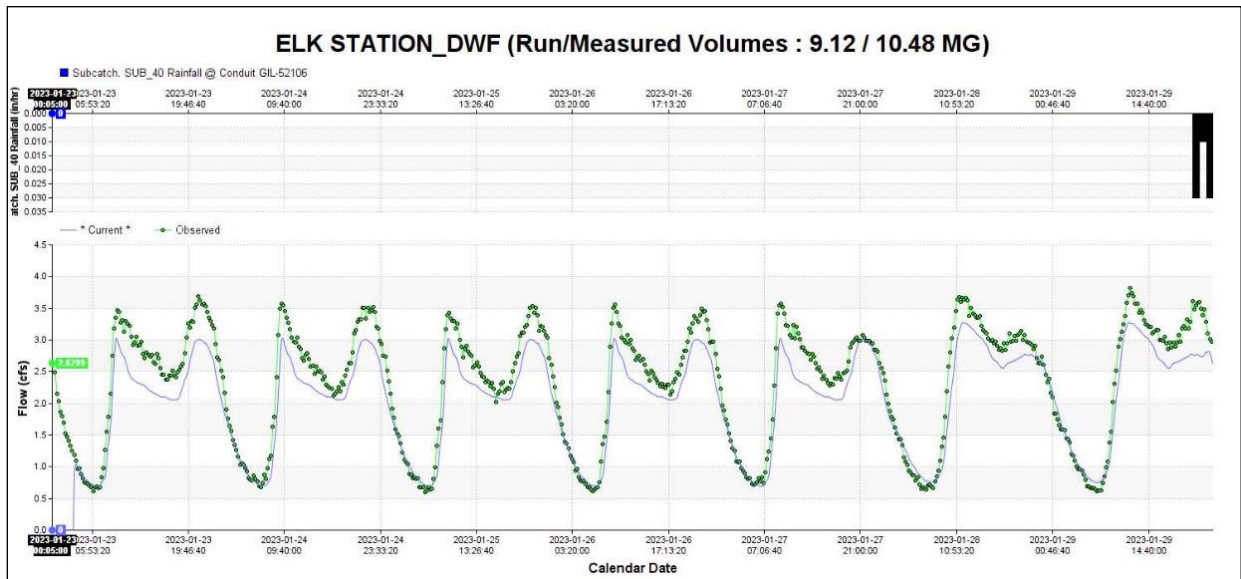


Figure ES-8: Elk Ave Flow Meter Observed versus Modeled DWF Flows

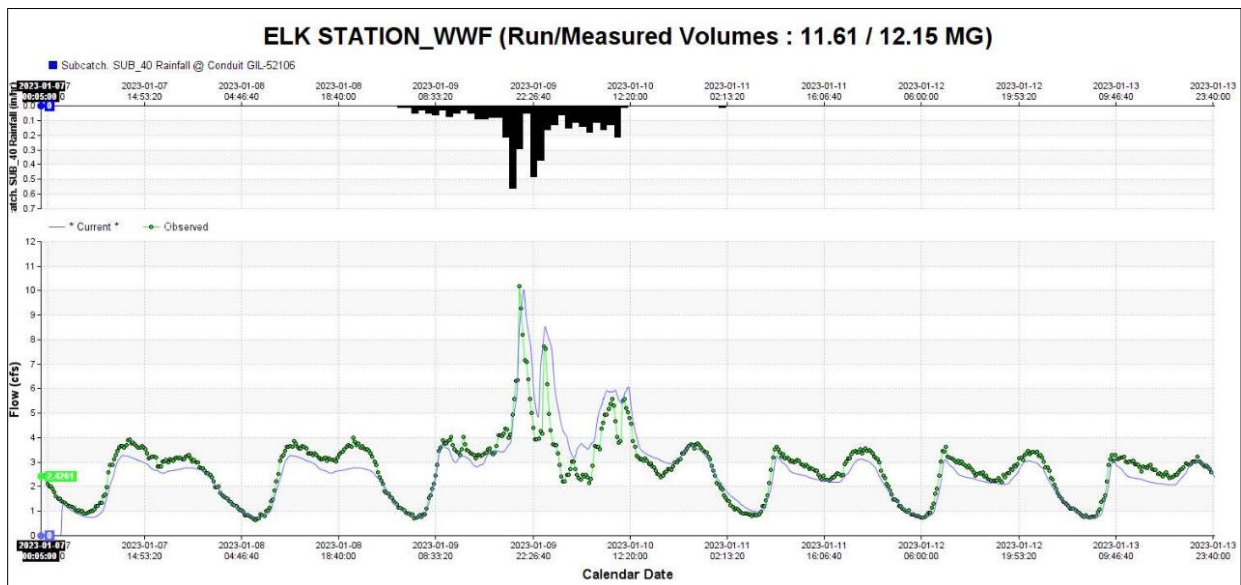


Figure ES-9: Elk Ave Flow Meter Observed versus Modeled WWF Flows

Collection System Evaluation

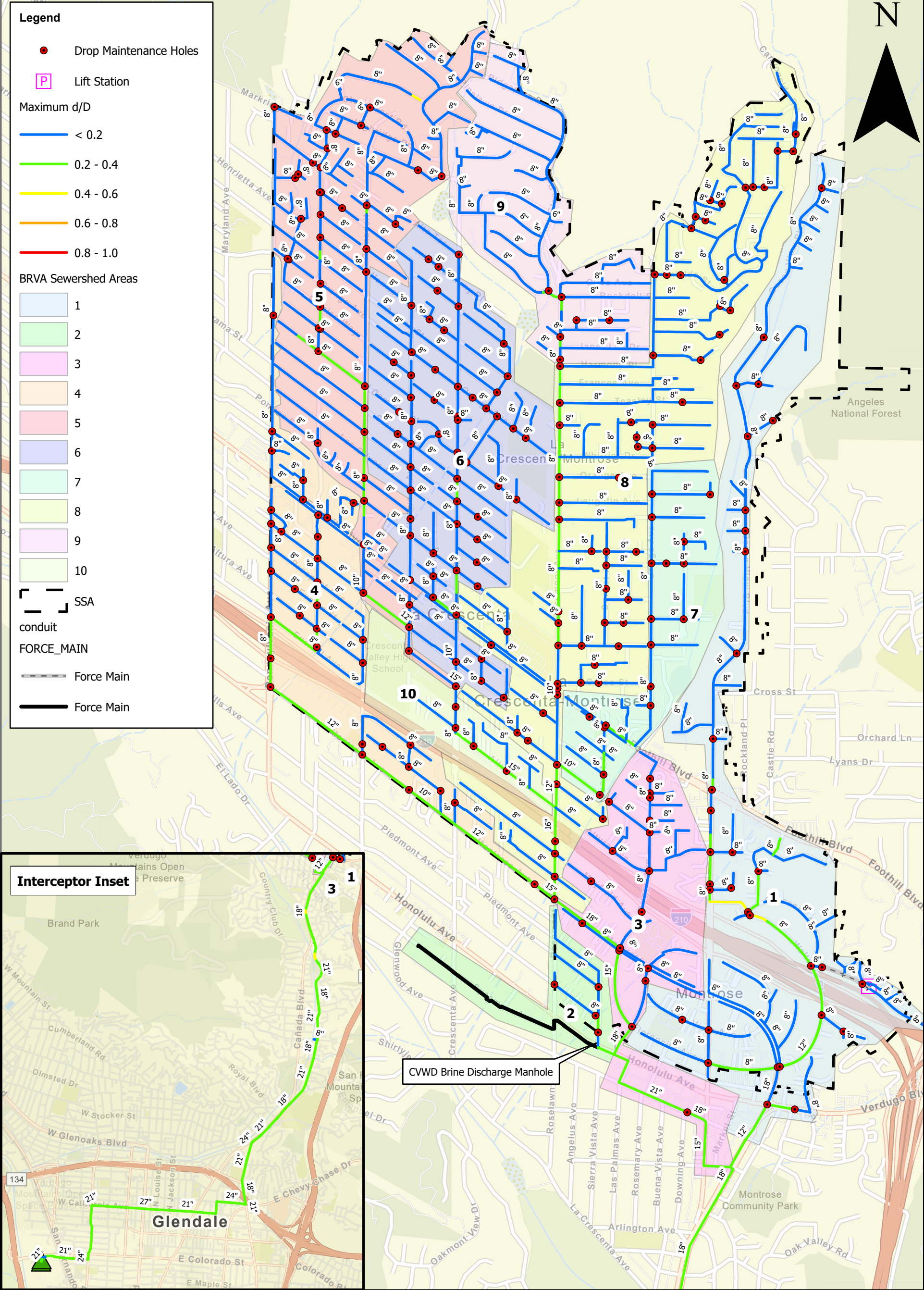
Several analyses were completed as part of the collection system evaluation, including the Hydraulic Model Capacity Evaluation, the La Granada Lift Station Condition Assessment, and the Business Risk and Vulnerability Assessment. These analyses were an amalgamation of several months of data collection, workshops, and field investigations to provide the most comprehensive understanding and evaluation of the collection system's performance.

Hydraulic Model Capacity Evaluation

One of the key performance indicators (KPIs) of a sewer collection system, is limiting the occurrence of sanitary sewer overflows (SSOs). This objective hinges on the ability of each pipe within the collection system to convey to accumulated upstream sewer flows without exceeding the pipe flowing full. As soon as a gravity sewer pipe turns from gravity to pressurized flow, known as surcharging, the risk an SSO drastically increases.

Flow depth has long been a key design parameter in sewer design, exemplified by the flow depth-to-diameter (d/D) ratio. This ratio, integral to sewer design guidelines, is calculated as d/D , where 'd' represents the flow depth in inches, and 'D' is the sewer diameter in inches. Gravity sewers are typically designed with some reserve capacity, the degree of which can vary based on various design recommendations. For instance, the American Society of Civil Engineers (ASCE) and the Water Environment Federation (WEF) recommend that sewers up to 15 inches in diameter maintain dry weather d/D ratios below 50%, and larger sewers keep these ratios under 75%. Sewers are not intended to operate under surcharge conditions, hence wet weather d/D ratios should ideally remain below 100%.

Specific design criteria from the SSMP dictate that the d/D ratio should be less than 60% under ADWF and below 80% under PWWF. These standards are necessary to ensure the sewer system's effectiveness to reliably convey raw sewage through pipeline infrastructure. A focal area of concern is Waltonia Drive, influenced by shallow slopes (0.0036 – 0.0043) and a concentrated number of upstream customers. Here, the d/D ratios are measured to be between 0.52 - 0.55 under DWF and 0.67 – 0.71 under WWF in Sewershed 1. Figure ES-10 and Figure ES-11 show the results of the existing DWF and WWF d/D capacity analyses. Due to the projected sewer flows being less than existing sewer flows, the capacity evaluation results for the future flow scenarios are identical to the existing flow capacity results.

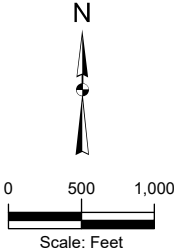


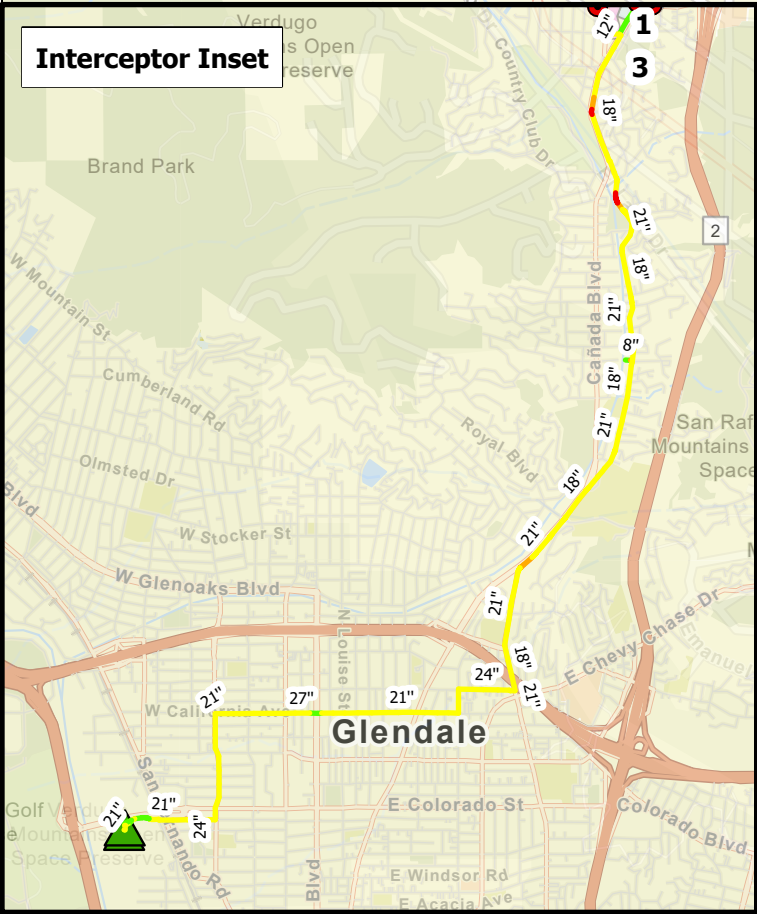
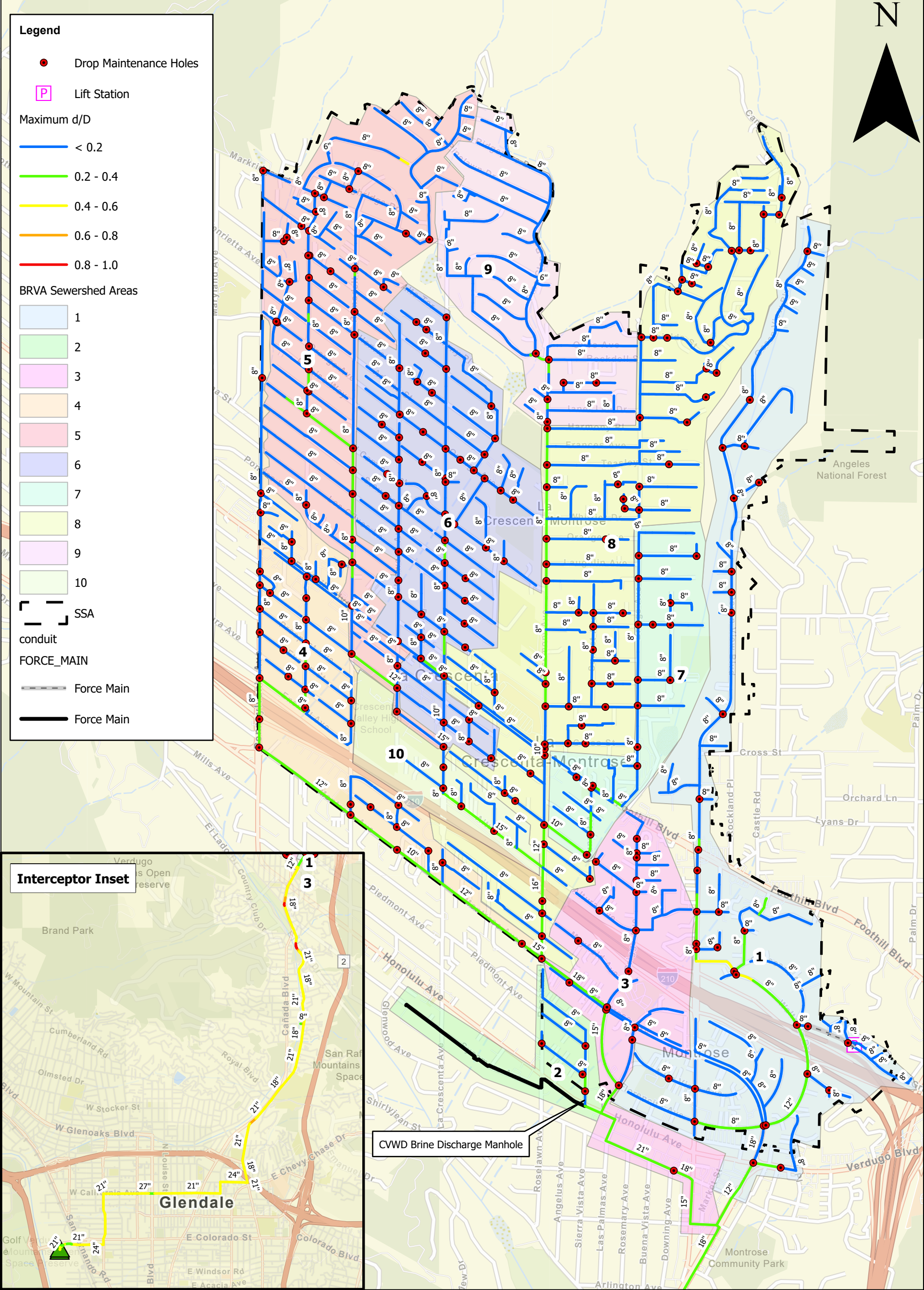
Notes:

K Kennedy Jenks
Crescenta Valley Water District
Wastewater Master Plan

System Overview
Existing ADFW d/D

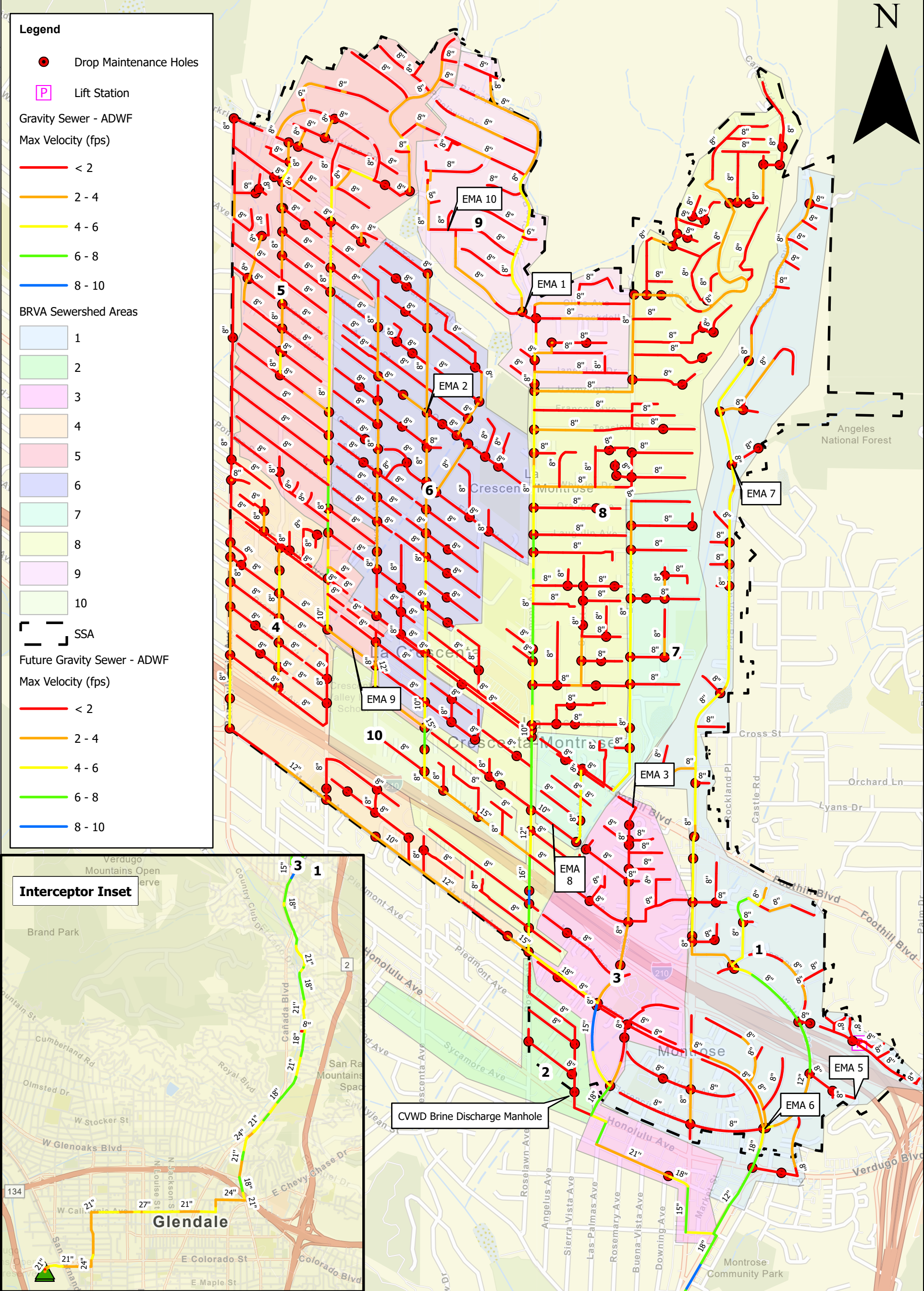
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Figure ES-10





The other main KPI for collection systems is the range of sewer flow velocities. Pipe velocity is driven by pipe diameter, pipe slope, and sewer flow rates. Pipe velocities should be high enough to prevent debris and solids from settling and collecting at the bottom of the pipe, but low enough to avoid significant flow turbulence/hydraulic jumps, which releases more corrosive gasses that could lead to maintenance hole corrosion and/or odor complaint issues. The calibrated hydraulic model was used to evaluate system pipe velocities to identify any potential areas not achieving CVWD's design velocity criteria. According to the SSMP, sewer mains must uphold a minimum velocity of 2.5 feet per second (fps) and a maximum of 10 fps, adhering to a minimum pipe slope of 2%.

The primary goal under Average Dry Weather Flow (ADWF) conditions is to maintain a minimum velocity to achieve effective scouring. Scour velocity is crucial in addressing issues related to impacts of Fats, Oils, and Greases (FOGs) as well as sanitary products, such as baby wipes. The typical industry standard for minimum sewer velocity is 2 fps. Even using this less conservative minimum velocity criterion, the hydraulic evaluations reveal that under ADWF, 93% of collectors and 26% of trunk sewers did not meet the 2-fps criterion. One possible contribution to this issue could be the water conservation efforts that have taken place over the last decade, resulting in lower sewer flows. With the collaboration of CVWD, the O&M staff indicated that no odor complaints have been made in the SSA. Odor complaints are typical in areas with low sewer pipe velocities. Consequently, there's no need for extraordinary measures beyond regular maintenance to maintain system efficiency and reliability. This approach ensures both the effectiveness of wastewater management and the longevity of the sewer infrastructure. Figure ES-12 shows the results of the analysis.



I&I Analysis

I&I refers to the entry of groundwater (infiltration) and stormwater (inflow) into a sewer system. When a collection system is compelled to handle a greater flow than it was designed for, I&I can result in pipeline surcharging and downstream impacts to pumping and/or wastewater treatment facilities. This increased effluent not only poses challenges for wastewater treatment facilities but also escalates costs since the stormwater and groundwater mix with sewage and the entire volume must be processed at the treatment plant.

I&I can constitute a significant portion of annual flow to treatment plants, reaching up to 45% in some cases. This excess burden can overwhelm the collection system, leading to several adverse consequences.

- Uncontrolled SSOs: I&I can exceed the capacity of pipelines, pumping stations, or treatment plants, causing raw sewage to overflow and pollute the environment.
- Pipe Failures: Excess flow due to I&I can stress and damage pipes, increasing the risk of leaks and breaks.
- Soil Subsidence and Sinkholes: I&I can undermine the supporting soil around pipes, potentially leading to ground collapse and sinkholes.

These issues highlight the importance of addressing I&I effectively to safeguard public health, environmental quality, and infrastructure integrity.

Calculating I&I involves flow monitoring, where wastewater flow in the system is measured over time and compared with a baseline flow estimate. These measurements are crucial for determining the extent of I&I in the sewer system. Flow monitoring not only aids in identifying and prioritizing areas for further inspection but also serves as a basis for visual inspection methods to assess the severity of I&I in a given area.

Inflow is usually recognized graphically by large-magnitude, short-duration spikes immediately following a rain event. Infiltration is often recognized graphically by a gradual increase in flow after a wet-weather event. The increased flow typically sustains for a period after rainfall has stopped and then gradually drops off as soils become less saturated and as groundwater levels recede to normal levels.

Figure ES-13 provides a visualization from a portion of flow meter data for FM01. The storm event used for I&I analysis was February 24th storm which was the same as validation period. The wet weather flow hydrograph was overlayed with the measured dry weather flow hydrograph of the days prior to the storm. The difference between the two-time series is equal to the volume of I&I entering the collection system. The total I&I volume is an indicator of combined inflow and infiltration which was calculated for all sewersheds based on available flow meter data to identify which sewersheds have the highest portion of I&I.

After analyzing the scattergraphs from different flow meters, the flow returns to ADWF levels right after the conclusion of the observed storm event, indicating the absence of groundwater infiltration.

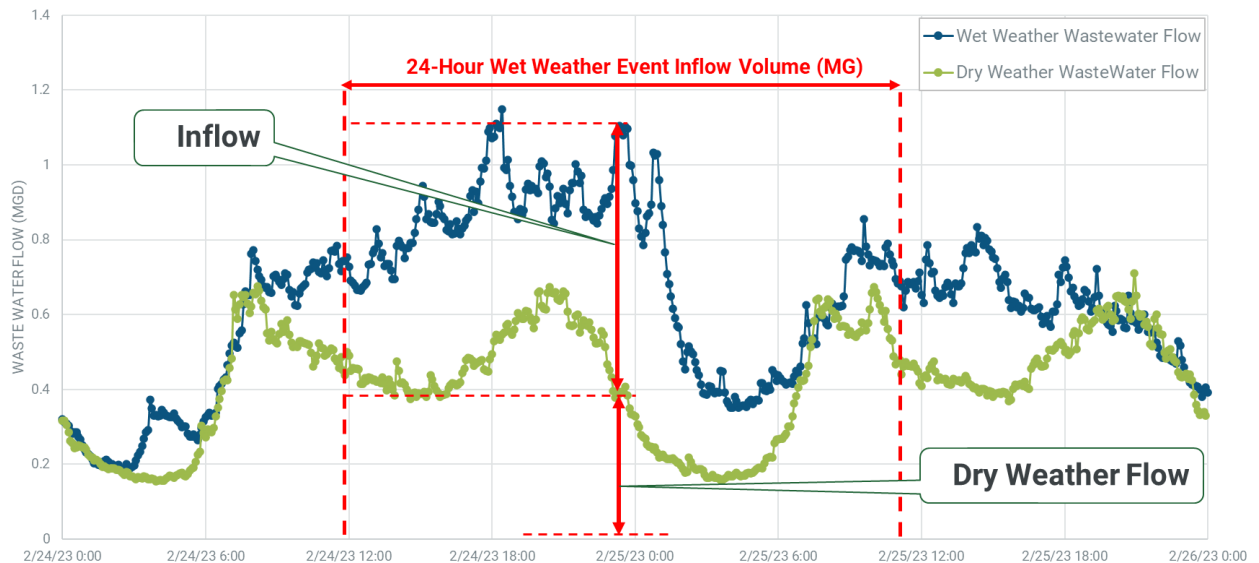


Figure ES-13: Overlay of Wet and Dry Weather Events for FM01

Table ES-6 summarizes the calculations and rankings for the sewersheds based on highest I&I rate, in units of gallons per day, per inch-diameter mile (gpd/idm).

Table ES-6 - I&I Analysis – February 2023, 24-Hour Storm

Ranking*	Sewershed	Inch- Diameter Mile (idm)	Design Storm Total Inflow Rate (Gpd/idm)
1	Sewershed 2+3	49	8,247
2	Sewershed 1	71	3,474
3	Sewershed 7	25	2,922
4	Sewershed 6+10	86	2,320
5	Sewershed 9	36	1,448
6	Sewershed 5	86	1,354
7	Sewershed 4	53	720
8	Sewershed 8	107	597

Based on the I&I analysis, Sewersheds 1, 2, and 3 make up only 22% of the collection system's piping by length but contribute 55% of the total I&I present in the collection system. Therefore, focusing on reducing I&I for this portion of the system will yield the greatest return on the invested time and resources.

La Granada Lift Station Condition Assessment

An in-person condition assessment of the La Granada Lift Station was conducted in July 2023 to identify any risks, deficiencies, and to provide improvement recommendations. A summary of the findings for each facet of the lift station is documented in the following subsections. See Appendix D for more detailed notes and photographs from the condition assessment. The summary of findings/recommendations are provided below by category.

The main issue for the entire lift station is that it does not currently comply with NFPA 820 code. The opening from the wet well is in the same room as all of the lift station electrical equipment, presenting an explosion hazard. The building is currently classified as a Class 1 Division 1 (C1D1) space. Ventilation could be added to the lift station so that it was “continuously ventilated at 12 changes per hour” to make the space Division 2 (C1D2); however, C1D2 spaces still require significant changes to the electrical equipment. The State of California Department of Industrial Relations (DIR) also has additional directives for electrical equipment in C1D2 spaces, such as requiring de-energizing the entire facility in the event that the ventilation system fails for any reason (DIR, 2021). This would require the lift station to stop conveying sewage entirely, which would require bypass pumping during the period when the lift station was not operational.

Given the current lift station configuration and the direct opening from the wet well to the pump/electrical room, there is no way to make the lift station building an “unclassified” space (not in the presence of any potentially flammable gasses).

Building Recommendations:

- Abandon interior building wet well and install wet well on the outside of the building (Figure ES-14)
- Provide proper ventilation to meet NFPA 820 requirements. Consider installing louvers or an exhaust fan for proper ventilation in the PS building.
- Assess and reinforce wood-framed roof for seismic stability.
- Evaluate the feasibility of replacing the wood-framed roof.

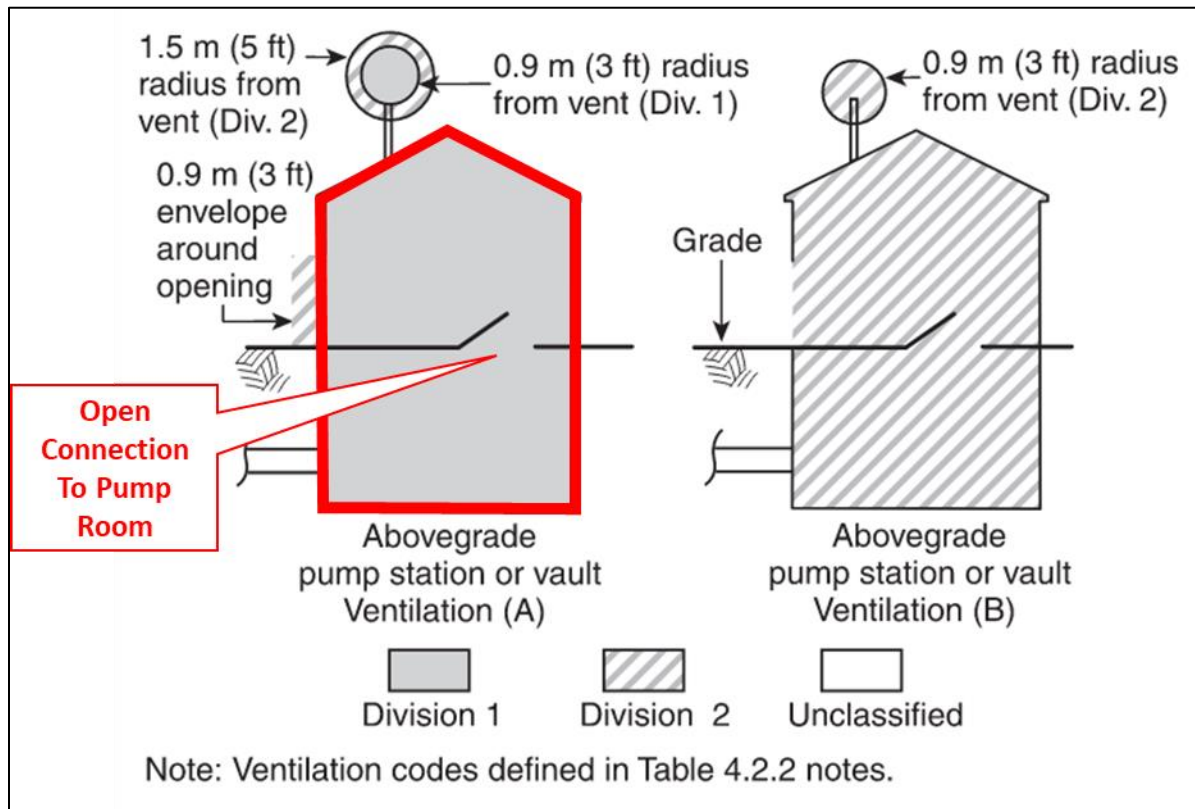


Figure ES-14: NFPA 820 Figure A.4.2(e) Above grade Wastewater Pumping Station Not Physically Separated from Wet Well; Illustration of Table 4.2.2, Row 17 (NFPA, 2023)

Three main tests were performed to evaluate pump condition and performance; a motor vibration test, pump drawdown test, and pump starts per hour analysis. The vibration test indicated that the motors/belt drives needed to be realigned to limit vibration. The pump drawdown test indicated that the pumps are operating at a lower flow rate than intended. Figure ES-15 shows the range of potential system curves overlayed with the pump manufacturer curve as well as the preferred operation range (POR). The figure shows that the pumps are operating outside of the POR and that the original design point was right on the edge of the POR, making the current AllPrime suction lift pumps not an ideal choice for this lift station's system curve.

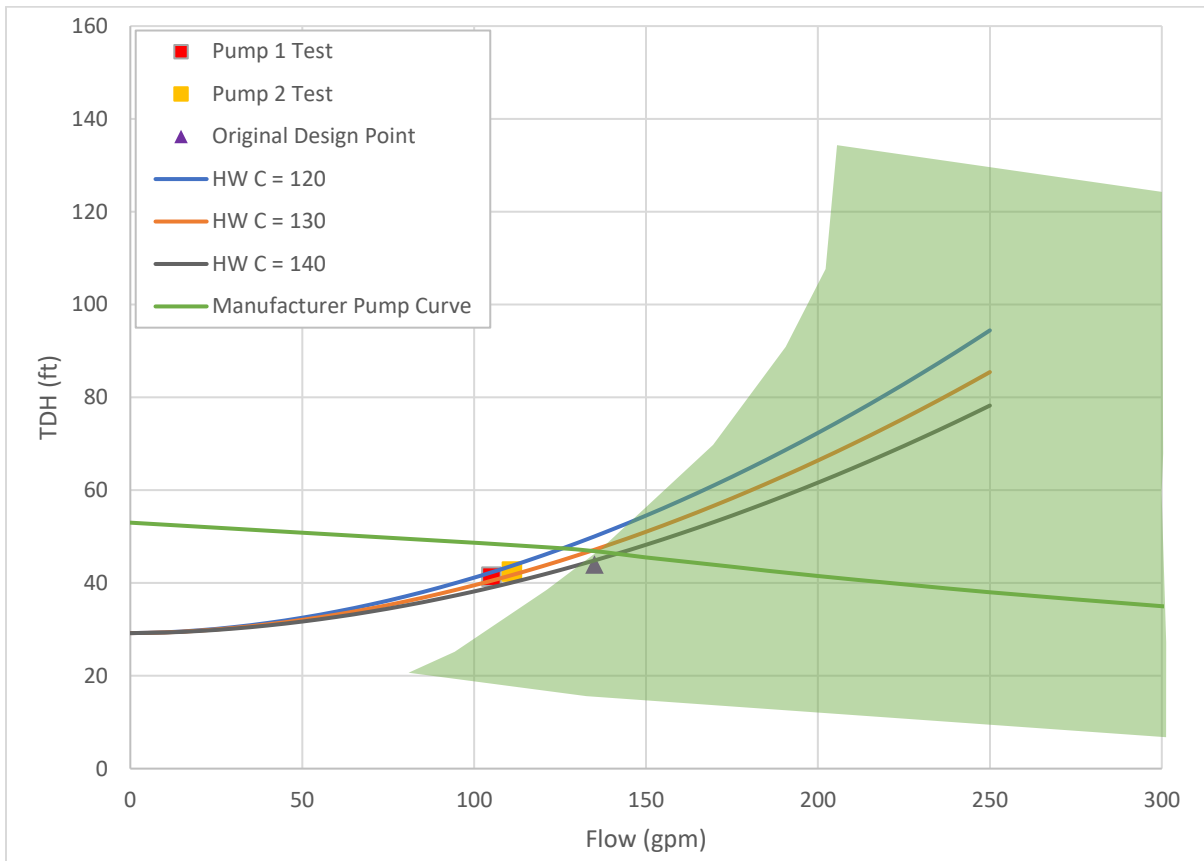


Figure ES-15: Pump and System Curve

Pump Recommendations:

- Regularly monitor motor vibration levels and rebalance the motor plate/belt drives if needed.
- Perform a more detailed evaluation of the pumps, including additional performance testing and analysis of the vibration data.
- Investigate the cause of the decrease in pump flow capacity.
 - Inspect pump components for wear/damage.
 - Install sanitary seal suction and discharge pressure gauges to measure pump TDH.
 - Eliminate the local high point on the discharge header or install a sewage air release valve at the top of the discharge header to prevent air entrainment in the force main.
- Contact pump manufacturer for potential alternative pump model/impeller sizes that intercept the system curve within the pump's POR
- Consider metering the wet well influent sewer line during a wet weather period to understand peak influent flow and potentially revise the chosen design flow rate of 135 gpm.

Electrical, Instrumentation & Controls Recommendations:

- Conduct a deeper inspection to determine precise condition of the bus bars, circuit breakers, wiring, relays, switches, etc. There may be significant signs of corrosion due the minimal separation of the wet well and electrical gear.
- Replace obsolete MCC starter components.
- Update MCC internal wiring for a single-phase to 3-phase converter.
- Explore options for replacing the compressor for the wet well bubbler. Or options for level indicator transmitters such as radar, ultrasonic, guided wave, or submersible pressure transducers.
- Address pressure gauge issues on both the discharge and suction sides.
- Consider upgrading pump motors and using Variable Frequency Drives (VFDs) for better control.
- Improve the monitoring and calibration of the wet well level measurement system.
- Examine the feasibility of updating the MCC for single-phase power.
- Evaluate the SCADA hookup and modem connection for proper functionality.

Generator Recommendations:

- Increase generator exercising frequency to prevent wet stacking and fuel degradation. With a total runtime at full speed of 38 hours, the generator would need to be run for roughly 45 minutes every week to turn over the entire fuel tank within a year.
- Decrease fuel input to allow new diesel to cycle through the tank. With the currently runtime schedule of 15 minutes per week (13 hours per year), the fuel tank only needs roughly 46 gallons of fuel so that all of the generator fuel is consumed within one year.
- Define a required level of service (LOS) for the generator, determining how many hours of continuous runtime are needed from the generator given a power outage emergency and accounting for the typical amount of time it takes to restore power to the area.

Business Risk and Vulnerability Assessment

The BRVA provides CVWD with a framework for prioritizing inspections and CIP projects based on risk while aligning the assessment with CVWD's corporate mission. The components of risk include both the existing condition of the asset as well as the consequence of failure of the asset. The BRVA brought all departments of CVWD, including Operations, Engineering, and Finance into the same room to encourage cross talk between departments and to understand how each department perceived and risk tolerance for system-level assets. The BRVA also helped CVWD understand the business practices in place to control and/or mitigate risk in the event of a failure of a portion of the collection system, as well as any improvements that may need to be made.

The BRVA approach followed the timeline shown below in Figure ES-16.

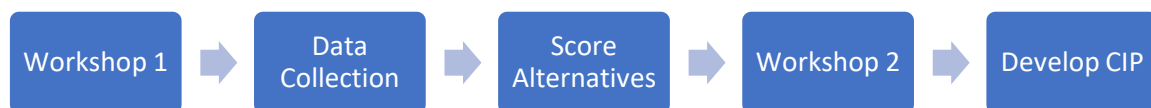


Figure ES-16: BRVA Timeline

Workshop 1

Kennedy Jenks held an all-day workshop attended by all departments of CVWD. The first goal of the workshop was to develop a risk matrix that fit CVWD's business goals and corporate mission statement. The objective of the matrix is to eliminate subjectivity from the failure analysis and confirm group consensus on the consequences of the system failures. The consequence of failure is an aggregated value composed of five major categories:

- Health and Safety for the Public and Employees
- Impact on Environment or Regulatory Compliance
- Quality of Service
- Public Image
- Financial Impact

Each of these categories during the workshop was scored on a scale of 1 to 5. Additionally, the Quality of Service criterion, meaning how many customers does an asset impact, was informed by the results of the calibrated hydraulic model. Assets conveying relatively more flow received higher Quality of Service scores, and vice versa. The 5x5 matrix shown in Figure ES-17 has the condition score of the asset on the vertical axis and the consequence of failure (COF) on the horizontal axis. The definitions for each COF category are specific to CVWD.

Corporate Risk Matrix Wastewater Master Plan										
Crescenta Valley Water District July 2022										
System Condition	Very Poor, Full Replacement	5						5	X < 1 Yr	Likelihood of Failure
	Poor Condition, Rehab. or Replacement	4						4	1 < X <5 Yrs	
	Fair Condition, Major CM	3						3	5< X <10 Yrs	
	Fair Condition, Minor CM	2						2	10< X < 20 Yrs	
	Good Condition, No Action	1						1	X > 20 Yrs	
		1	2	3	4	5				
Consequence of Failure										
Safety	No injury, and no anticipated future impacts	Minor to moderate injury – contusions & lacerations w/out lost time, first aid applied		Moderate injury/lost time or restricted duty	Major serious health issues (acute & chronic) & long-term injuries – disabling		Fatalities	Safety		
Environmental and Regulatory Impact	No negative impacts on environment, public health or regulatory compliance	No negative impacts on environment or public health; minor compliance issues (i.e., minor NPDES violation, exceed WQ standard triggering effluent limit; SSS WDR Category 3 spill; RW spill < 1,000 gals; minor Title 22 violation; Notice to Comply)		Minor negative impact to the environment and/or public health; compliance issues (i.e. repeated or major NPDES violation; SSS WDR Category 2 spill or Category 1 spill < 1000 gals; recycled water spill > 100,000 gals; minor Notice of Violation)	Moderate negative impact to the environment and/or public health; major permit violation (i.e. NPDES ACL > \$10,000; SSS WDR Category 1 spill > 1,000 gals & < 100,000 gals; recycled water spill > 500,000 & < 1M gals; Title 22 major violation; major Notice of Violation)		Significant negative impact to the environment and/or public health; major permit violation (i.e. Significant NPDES Enforcement Order; SSS WDR Category 1 spill > 100K gals; recycled water spill > 1M gals; potential for Title 22 permit revocation; any violation resolved through the Courts)		Environmental and Regulatory Impact	
Quality of Service and Delivery	No impacts on service delivery or customers	Impact limited to individual customers		Moderate localized impact to groups of customers; short-term service disruption	Sub-basin impacts with potential long-term service disruption		Service area-wide impacts; Long-term service outages		Quality of Service and Delivery	
Public Image	No to minimal Impact; odor complaint, or complaint to staff, with staff acknowledgement, action and response	Some significant social media and no local media coverage; phone call response handled by staff		Social media activity and maybe minor local media coverage; Board may receive complaints to be responded to by staff	Local media coverage with Board of Directors involved in response; potential long-term impact to community trust in District		Lead story in regional/national or industry short and long-term coverage; significant impact to community trust in the District		Public Image	
Fiscal Impact	0 < \$5K	\$5K < X < \$25K		\$25k < X < \$50K	\$50k<x<\$250k		> \$250k		Fiscal Impact	

Figure ES-17: CVWD Risk Matrix (See Appendix E for Full Size / High Resolution Table)

The second goal of the workshop was to interview staff about the collection system assets/asset regions to understand asset condition and business practices in place for each asset. Because there are over 65 miles of gravity sewer pipe, the collection system was divided into 10 regional sewersheds based on major confluence points (see Figure ES-2 for the numbered sewersheds). Additionally, each of the EMAs were analyzed as part of the BRVA. The BRVA discussion divided the collection system into the following components:

- Outfall / Diverter Valve
- Sewer Interceptor
 - The Interceptor was divided into two segments. Segment 1 is from the outfall at LAGWRP up to Hillside Drive. Segment 2 is from Hillside Drive up to Sunview Drive.
- La Granada Lift Station / Force Main
- Sewersheds 1 - 10
- EMAs 1 – 10

In addition to scoring the COF for each asset within the collection system, the business practices in place for each asset were also evaluated. Business practices are used to prevent and/or mitigate a failure event. The better the business practices are, the easier it will be for CVWD to recover from a failure event. Table ES-7 provides the business practices that were scored on a scale from 1 to 5 for each asset. These scorings were then used to calculate the total “Business Vulnerability” (BV) score for each asset.

Table ES-7: CVWD Business Element Definition

CVWD Business Practices	Definition
Work Execution Management (WEM)	How well work orders are issued, processed, and documented.
Asset Condition	What is the current condition of the asset based on O&M inspections.
Training Program	How effective is the O&M training program relative to testing the competencies needed for sustaining assets.
Site Safety Condition	How safety is the work environment when operating and/or maintaining the asset.
Resiliency	Are emergency response plans, abnormal operating procedures, and standard operating procedures well documented.
Reliability Engineering Support	How well does engineering monitor Key Performance Indicators (KPIs), conduct root cause analysis, conduct failure and risk analysis, implement resiliency strategies, and practice continuous improvement to gain system efficiencies.
Asset Performance Management Practices	Available sensors/technology to measure and document the condition of assets.
Asset Management Business (AMB) Processes	CIP in place and regularly updated

Data Collection

After Workshop 1, additional data was collected to verify the condition of some of the assets discussed. This included the La Granada Lift Station condition assessment as well as verifying pipe and maintenance hole inverts/configurations for key areas of the collection system with record drawings. The work done with the calibrated collection system hydraulic model also revealed asset condition information not previously available to CVWD, and informed the asset scores as well.

Score Alternatives

The total risk score was calculated by multiplying the weighted COF score with the weighted BV score. The lowest (least risk) score possible is a 1, while the highest (most risk) score is 25. Both of the COF and BV scores were composite scores calculated based on the weighting determined during the first workshop. Category weightings were assigned based on CVWD’s priorities and business goals.

Workshop 2

With the scorings and field data collected, the departments of CVWD and Kennedy Jenks reconvened for a second time to review the risk scores of the assets and discuss potential conceptual-level CIP projects. The risk matrix shown in Figure ES-17 was populated with the calculated COF and asset condition data to visualize the prioritization of the one-time risk mitigation opportunities that may transform into CIP projects. The total risk score profile for all assets was also provided to understand which assets carried the greatest risk, despite potentially not resulting in a CIP project based on the current condition of the asset.

Workshop 2 also yielded additional information on potential vulnerabilities within the collection system based on the discussion of the proposed CIP projects and results of the I&I analysis. This information was also considered in the final development of the CIP.

Develop CIP List

The findings of the BRVA were used to develop a prioritized CIP plan, outlining project costs and timelines driven by the asset condition and the risk/consequence of failure score. The key findings for each asset category discussed during the BRVA process are broken down into the following subsections.

Interceptor

The gravity sewer interceptor, stretching over 6 miles from Sunview Dr/Verdugo Blvd to the outfall at LAGWRP, serves as the backbone of CVWD's wastewater collection system. This unlined VCP pipe, dating back 40 years, represents a critical single point of failure. As the sole conduit for conveying wastewater across the service area, its failure would eliminate CVWD's entire sewage conveyance capacity.

While the interceptor's physical age raises concerns, discussions with staff revealed a further vulnerability: a lack of well-defined emergency procedures in case of a break. Crucial aspects included the following:

- Bypass pumping vendor coordination: Securing reliable and readily available pumping resources is essential for mitigating sewage overflows during an outage.
- Designated bypass laydown areas: Identifying temporary storage locations for bypass equipment ensures immediate deployment in case of an emergency.
- Coordination with nearby agencies: Streamlining communication and collaboration with relevant authorities can expedite response and minimize environmental impact.

The criticality of the interceptor demands immediate attention. Thus, CVWD should consider prioritizing:

- Conducting a comprehensive condition assessment: This in-depth evaluation will reveal the extent of deterioration and prioritize repair needs.

- Developing a robust emergency response plan: Establishing clear protocols for rapid response, resource allocation, and interagency coordination minimizes potential damage and ensures swift restoration of service.
- Exploring long-term rehabilitation or replacement options: Depending on the assessment results, investing in rehabilitation, or even replacing the aging pipeline can safeguard CVWD's wastewater conveyance system for decades to come.

The Diverter Valve at the outfall of the interceptor currently does not have site security (fencing/adequate lighting) and does not have a backup uninterruptible power system (UPS). If the diverter valve were to fail due to loss of power, it would fail in the last position. The Diverter Valve is normally open, conveying flow to LAGWRP. However, during the three-hour period from 12:00 AM to 3:00 AM, the diverter valve must close to convey concentrated brine directly to HTP. If a power failure was to occur at 11:30 PM, prior for brine to be discharged, the valve would fail in the “open” position, and potentially allow concentrated brine into LAGWRP's treatment facilities. Under this possible failure scenario, this will likely result in a regulatory fine against CVWD.

Finally, a private lateral connects to the interceptor at Hillside Drive that currently does not have any backflow prevention in place. Therefore, if a portion of the downstream interceptor (Segment 1) failed, this could result in a significant SSO event at Hillside Drive, and cause significant fiscal, environmental, and public image issues for CVWD.

Highway Crossings

CVWD has two key locations where gravity sewer pipe crosses above Highway 210 before continuing south. These elevated highway crossings have DIP gravity sewer pipe and are enclosed in a casing within the bridge crossing structure. These Hwy 210 crossings are located at Rosemont Ave and Briggs Ave. There is currently no CCTV or inspection history of the crossing gravity sewer pipe and/or casing pipe, and therefore the condition of these assets is unknown. CVWD recently experienced a water main break in August 2023 at the Rosemont / Hwy 210 crossing which caused significant impacts to traffic and made local news.

La Granada Lift Station

The La Granada Lift Station poses a current safety issue to CVWD operations staff, as the interior of the pump station building is classified as a Class 1 Div 1 space and is a potential explosion hazard with electrical equipment exposed to flammable gases and explosive environment.

EMAs

Each EMA was evaluated during the BRVA process, however EMA 1, located at the intersection of Pine Glen Rd and Pineridge Dr, was the key focus of discussion. Due to the “switchback” configuration of the gravity sewer in the area, this portion of gravity sewer is prone to maintenance hole blockages due to the several 90-degree turns the sewage must make before continuing downstream. This EMA is the location of a historical SSO.

Hillside Sewer Access

There are two maintenance hole locations in the northern portion of CVWD's SSA that are steep and difficult for CVWD operations staff to access and maintain. These locations are near the intersection of Dorothy St / Goss Canyon Ave and on Starfall Dr / Ridgeline Dr. Maintenance

hole blockages could result in SSOs that would travel into nearby wildlife areas that could result in fines for CVWD.

CVWD Programmatic Issues

CVWD currently does not have a digitized work order database or method for tracking/documenting work completed or condition assessment data, but are currently working on this improvement.

Figure ES-19 provides the total risk score profile from highest to lowest for the evaluated assets. The highest scoring areas included the interceptor and its components as well as the Hwy 210 crossings.

Figure ES-19 shows the system O&M safety condition scoreboard by project. Most notably, the La Granada Lift Station is rated a 5 due to the immediate safety threat it poses to O&M staff.

Figure ES-20 shows the combined COF and asset condition score, showing the driving factors for how the projects were prioritized and scheduled.

Figure ES-21 shows the risk matrix with the asset COF versus asset condition. Figure ES-22 shows the risk matrix with the O&M safety score on the horizontal axis instead to highlight the necessity of the La Granada Lift Station project. Additional risk profiles are available in Appendix E.

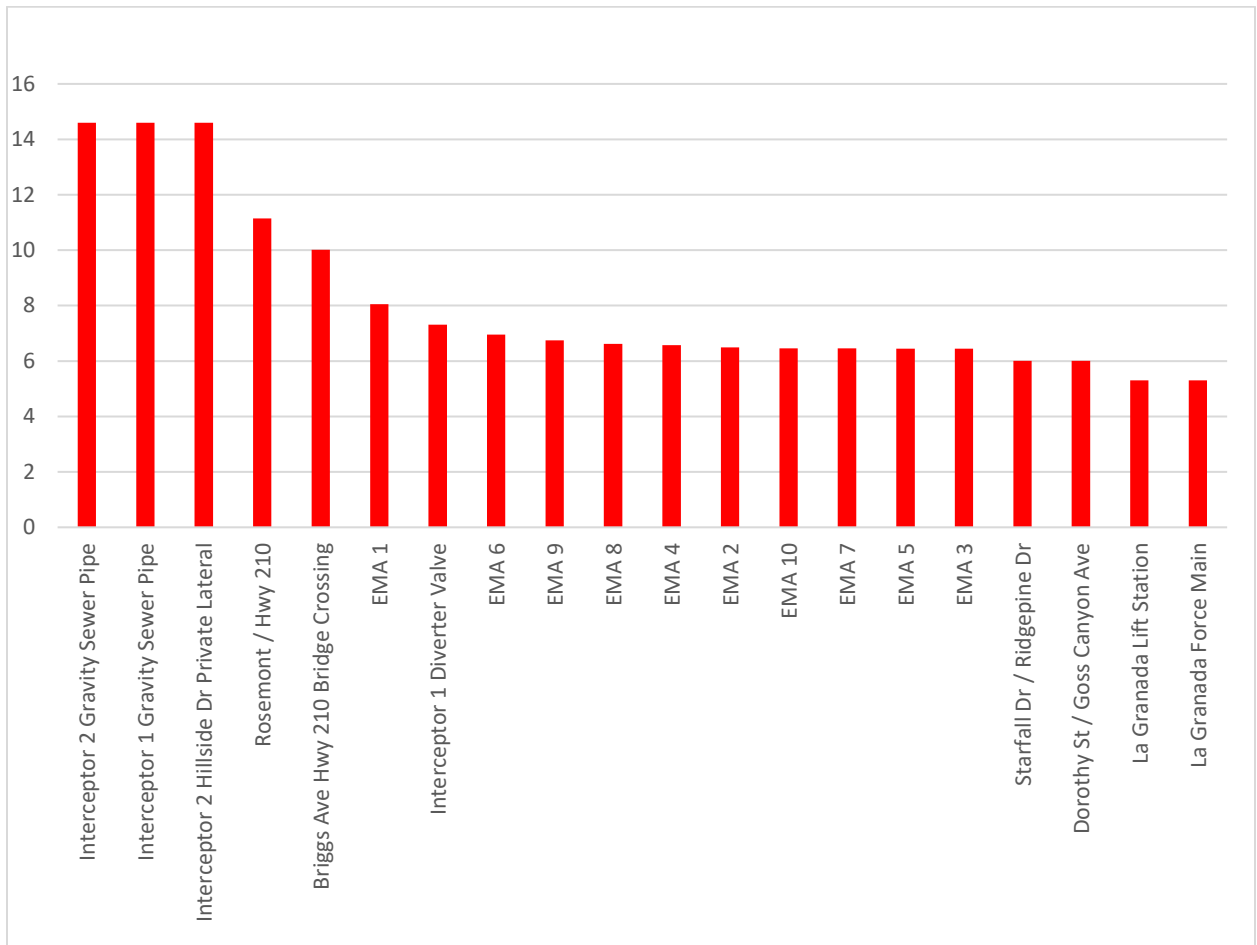


Figure ES-18: System Level Risk Scoreboard

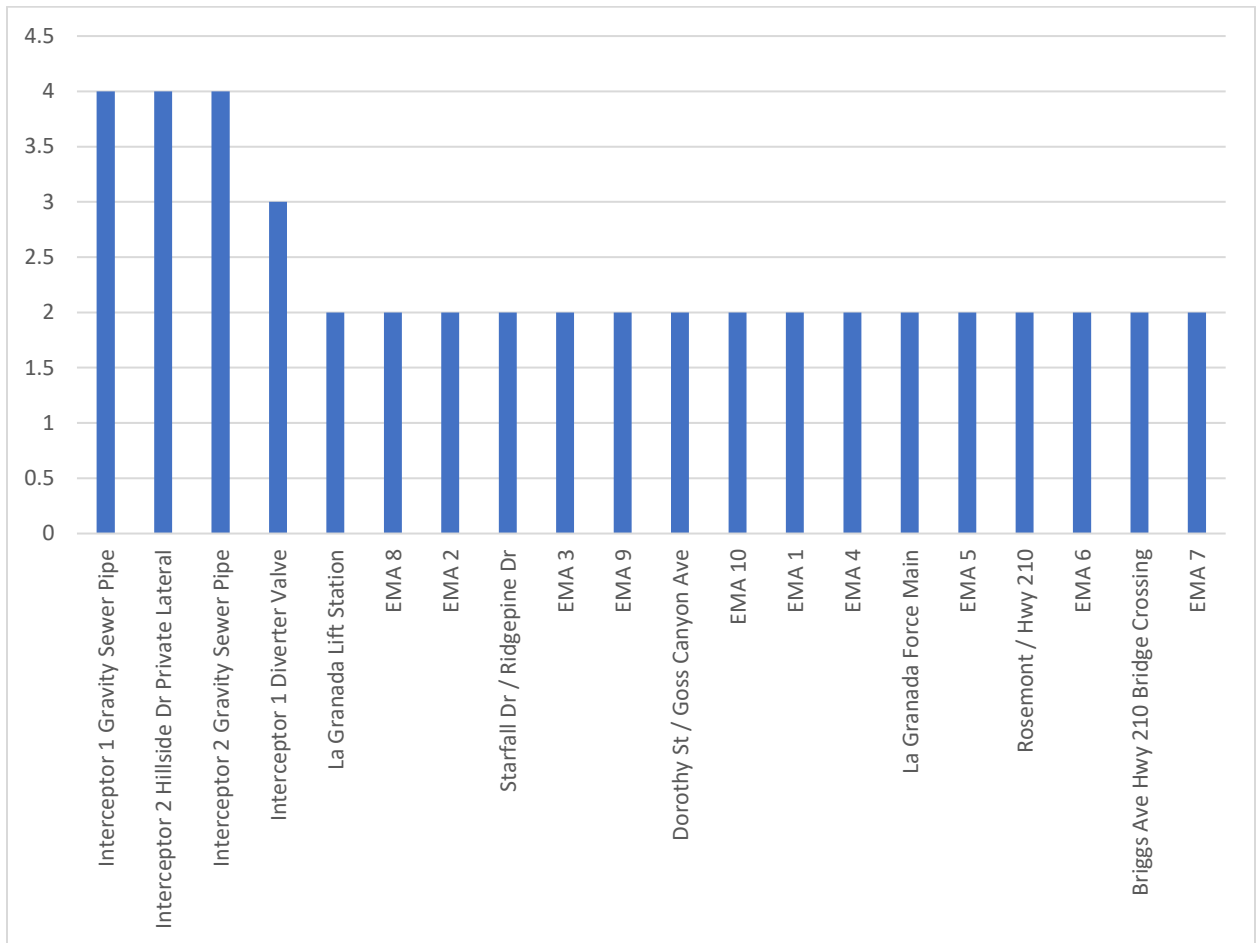


Figure ES-19: System Safety Condition Scoreboard

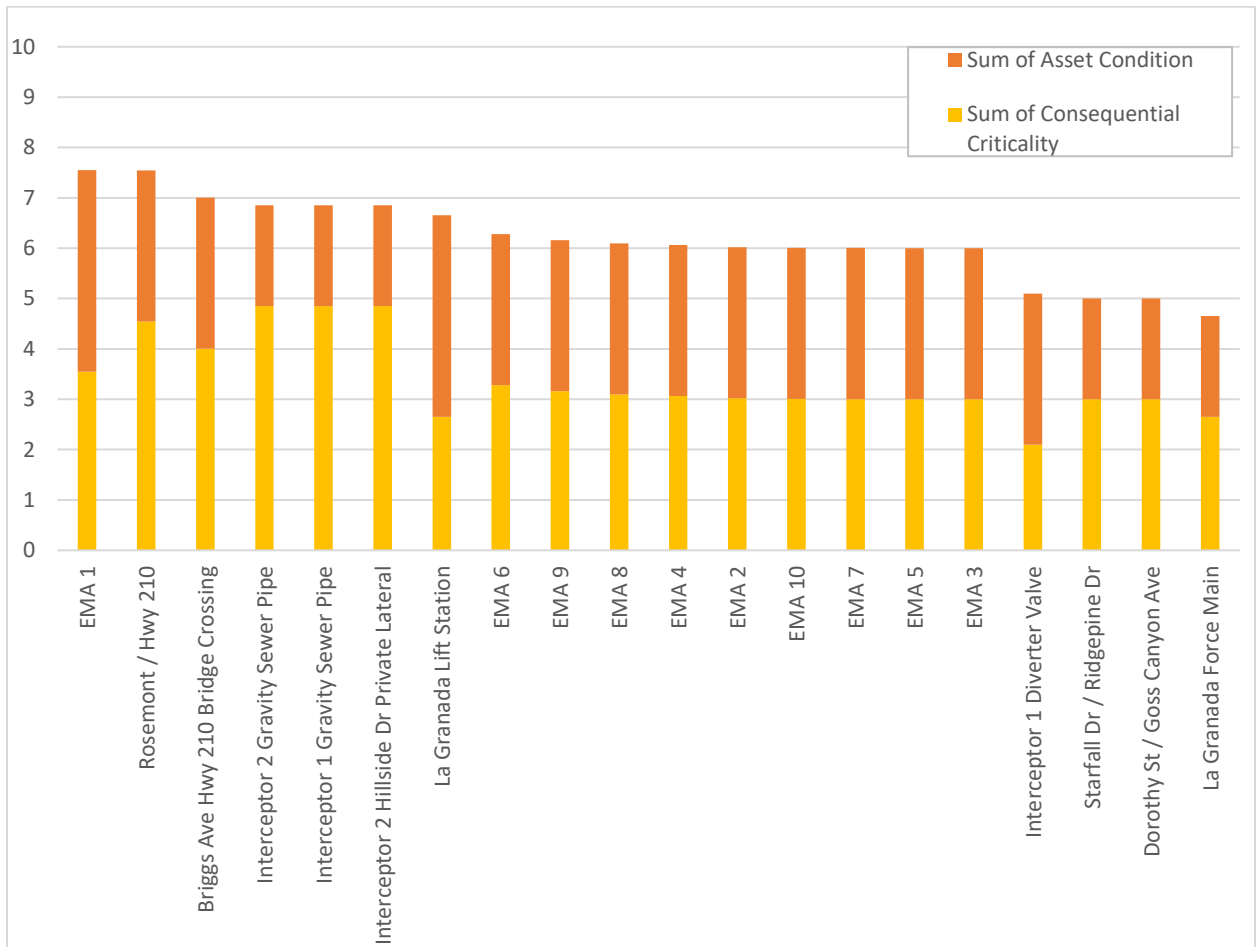


Figure ES-20: Consequence of Failure and Asset Condition Combined Scoreboard

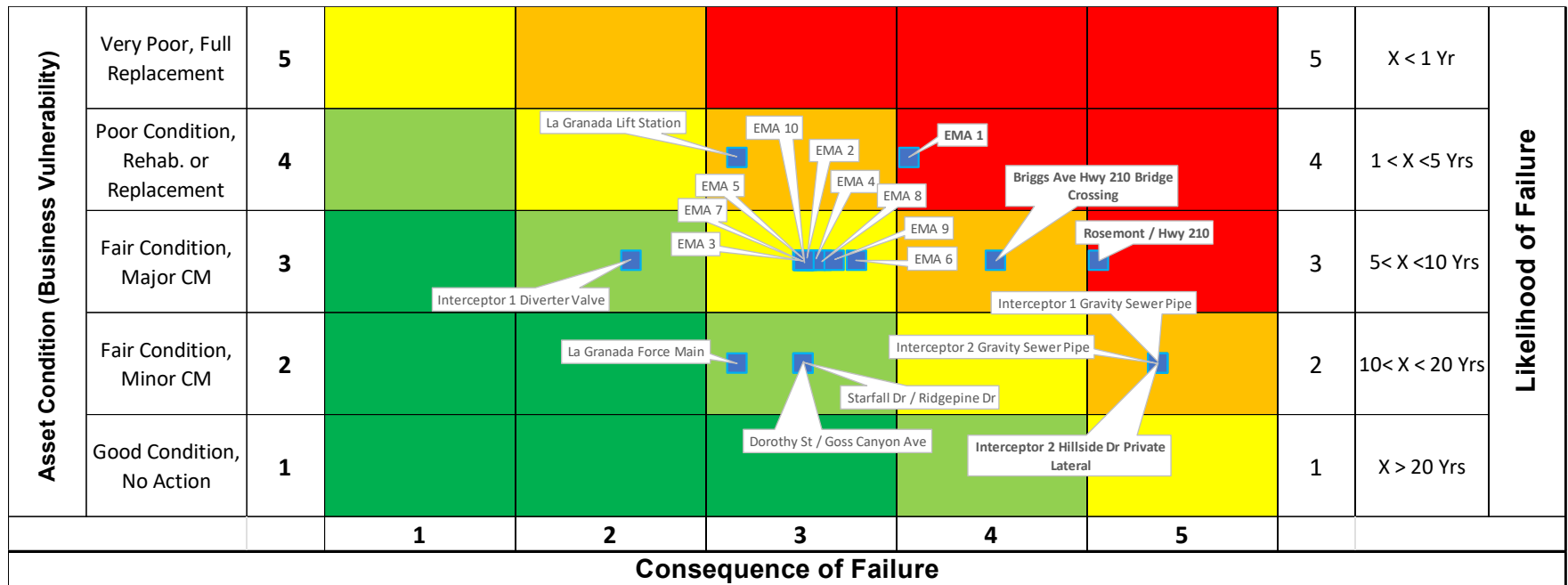


Figure ES-21: Risk Matrix Using Weighted COF

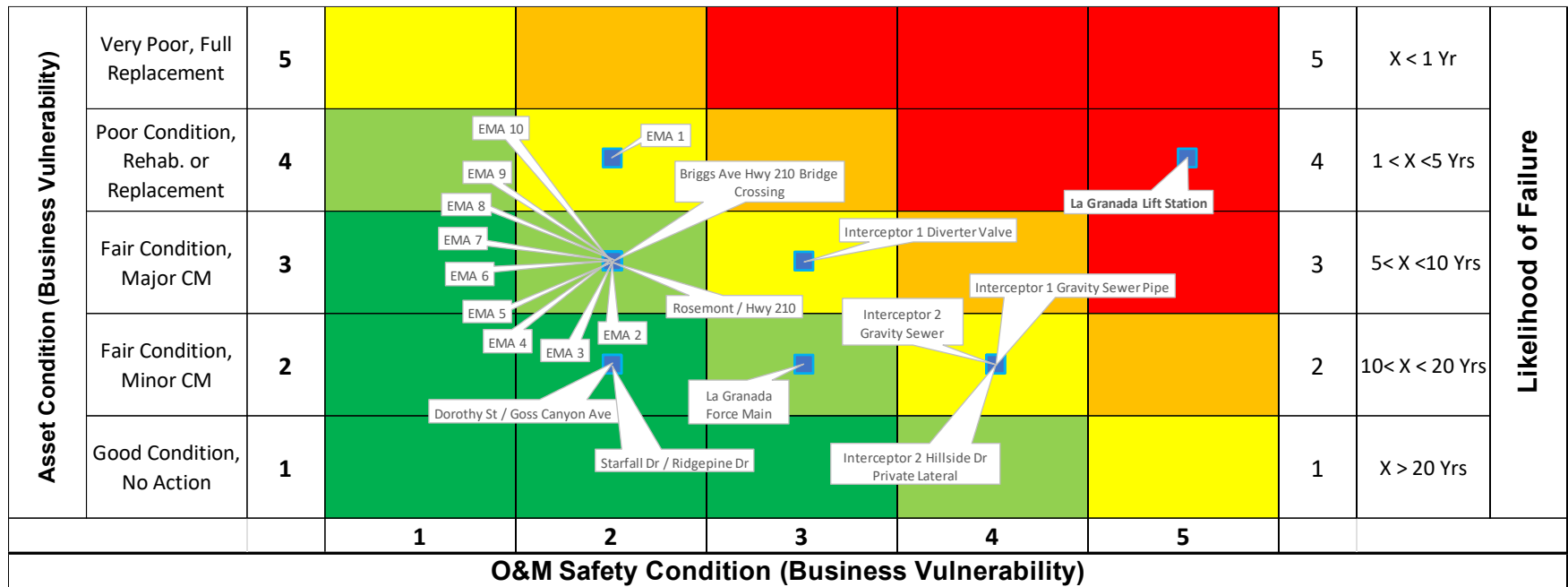


Figure ES-22: Risk Matrix Using O&M Safety Condition

Recommendations

Using the results of the BRVA process, the prioritization of the potential CIP projects was developed and is shown in Table ES-8. Projects with a “short” timeline should be completed as soon as possible, within the next 1 to 3 years. Projects with a “medium” timeline should be completed within 3-5 years. Projects with a “long” timeline should be completed within 5-10 years. Detailed 1-Page Project Summaries are also included in Appendix F. Figure ES-23 provides an overview of the proposed projects.

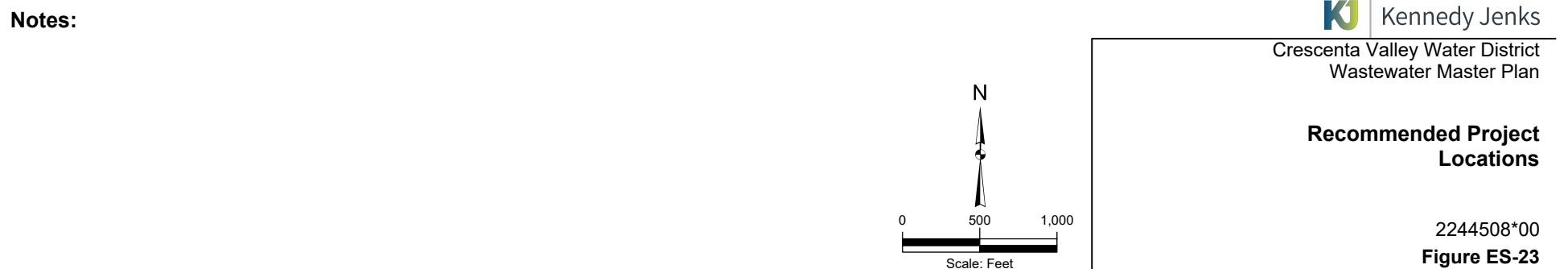
Table ES-8: Recommended Infrastructure Project Prioritization

Timeline	Project	Justification
Short	Rosemont / Hwy 210 Crossing Inspection / Rehabilitation	Unknown Condition / Big safety, financial, and regulatory risks
	Pine Glen Rd / Pineridge Dr (EMA 1)	Historical SSO, Consistent problem for Ops, safety, financial, and regulatory risks
	La Granada Lift Station Improvements	Safety issue for Ops team, current code violation
Medium	Briggs / Hwy 210 Crossing	Unknown Condition, safety, financial, and regulatory risks (serves fewer customers than Rosemont)
	Hillside Dr Private Lateral	High safety and financial risk, relatively low effort to fix
Long	Diverter Valve	Low COF – minimal regulatory/financial/safety impacts
	Dorothy St / Goss Canyon Ave Sewer Access	Low COF - minimal regulatory/financial/safety impacts
	Starfall Dr / Ridgepine Dr Sewer Access	Low COF - minimal regulatory/financial/safety impacts

Additional non-infrastructure recommendations related to best business practices are listed below. These recommendations can be completed in-house and would be completed based on availability of operations staff.

1. **SmartCover Maintenance Hole Lid Installation** – The primary purpose of SmartCovers are to monitor depth of flow within maintenance holes to alert CVWD of potential blockages/breaks in the collection system. Abnormally low flows could indicate and upstream blockage/break, while abnormally high flows would indicate a downstream blockage. The secondary benefit of the SmartCovers is that they provide additional calibration data for the hydraulic model. CVWD staff plans to install 5 SmartCovers in 2024 and 5 more in 2025. Based on discussions with CVWD staff, the following locations were selected for the 2024 SmartCovers (also shown in Figure ES-23):

- a. Waltonia Dr, MH# 3D76 – This is the location with the highest modeled d/D ratio for the collection system, largely due to the shallow slope of the gravity sewer pipe.
 - b. Sunview Dr / N Verdugo Blvd, MH#@ 3E68 – This is the beginning of the interceptor and a major confluence point on CVWD's system.
 - c. Hillside Dr along Interceptor, MH# 39108 (no VT Number) – This is the middle of the interceptor and provides CVWD with valuable information on the status of the interceptor.
 - d. Pineridge Dr / Pine Glen Rd, MH# 2B12 – This is a historical SSO location and should be monitored given it is a high-risk EMA.
 - e. Foothill Blvd / Briggs Ave, MH# 3D7 – This is a very shallow segment of sewer pipe and is also a classified EMA prone to blockages and debris buildup.
 - f. Two future recommendations for 2025 SmartCover placements are Oceanview Blvd / Barton Rd (MH# 3D68) and Foothill Blvd / Cloud Rd (MH# 1C15). Based on input from operations, these areas are prone to blockages/debris buildup due to the flow received from upstream customers.
2. **Improved Emergency Response Training for Interceptor break** – CVWD currently has a plan outlined for how to address high flow SSO's along the interceptor, but the plan does not address more severe conditions such as a break on the interceptor requiring immediate action. The SSMP should address on-call bypass pumping vendors, identify bypass pumping laydown areas for the interceptor alignment, and provide emergency contacts for local entities that may be impacted such as the City of Glendale.
 3. **Improved Communication with ADS to identify Elk St Flow Meter Failure** – CVWD should discuss with ADS how they could be notified of a meter failure at Elk St, as this has implications for how CVWD reports flows to the City of LA, and also removes a key indicator for CVWD for understanding how the interceptor is performing.
 4. **Develop monitoring method for Canalda tank discharge (EMA 7)** – Canalda tank current discharges unmetered flow to CVWD's SSA. CVWD should attempt to quantify the discharge flow on a more granular scale (GPM) to understand the impacts to collection system capacity.
 5. **Targeted flow monitoring for Sewersheds 1, 2, 3** – Based on the I&I analysis performed, CVWD should consider continuing temporary flow metering during wet weather months in sewersheds 1, 2, and 3 to pinpoint sources of inflow. While smoke testing entire sewersheds is not feasible or cost effective, isolating I&I to one street or sewer alignment could then be followed with targeted smoke testing to identify stormwater cross connections and other areas of leakage.
 6. **Develop Digitized Asset Condition / Work Order Database** – creating a digitized database of work order history and asset condition assessments is crucial to allowing CVWD to effectively maintain the collection system long after key staff and operators have left, taking institutional knowledge with them. It also provides the ability to plot the condition of assets overtime and observe which assets are degrading faster than others, and which need to be prioritized for rehabilitation/repair/replacement. This database will inform CVWD's future cured-in-place piping (CIPP) lining schedule.



Capital Improvement Program Development

The Capital Improvement Program (CIP) was developed based on the collection system evaluation outcomes and provides an actionable plan regarding the implementation of the proposed projects. This section outlines the development of the Capital and O&M costs, and provides potential CIP plan implementation schedules for the identified projects. This section also provides additional programmatic recommendations beyond the proposed CIP Plan for CVWD's consideration. Table ES-9 shows the identified projects, their descriptions, and their justification based on the results of the BRVA.

Table ES-9: CVWD CIP Projects

Proj. ID	Project Name	Project Description	Justification
Infrastructure Projects			
I-1	Granada Pump Station Improvements	Site safety and pump system improvements to the Granada Pump Station: entails a new wet well, new gravity sewer influent line, and building, piping, electrical, and site modifications.	Asset condition is poor and is an existing safety issue for operations staff. Regulatory issue with NFPA 820.
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	Improvements to prevent historical debris collection and SSO events: abandonment/demolition of existing sewer lines, new installation of reversed flow sewer line, drop maintenance hole, and chimney lateral.	Asset in poor condition and was a historical SSO site (regulatory issue). Financial risk if surrounding homes are damaged.
I-3	Rosemont / Hwy 210 Crossing Retrofit	Seismic retrofit of highway bridge crossing: retrofit each end of bridge pipe with seismically rated sewer fitting. Option for full bridge sewer line and casing pipe replacement.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
I-4	Briggs / Hwy 210 Crossing Retrofit	Seismic retrofit of highway bridge crossing: retrofit each end of bridge pipe with seismically rated sewer fitting. Option for full bridge sewer line and casing pipe replacement.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
I-5	Hillside Dr Private Lateral Backflow Preventer	Backflow prevention: Installation of duckbill backflow preventer on private lateral off interceptor.	Public safety risk and major financial risk. Relatively low effort to address for large gain
I-6	Dorothy / Goss Canyon Access Road	Improve maintenance hole access: obtainment of easement, construction of access road.	Operations staff safety issue, fiscal liability if backup occurs and damages nearby homes
I-7	Starfall / Ridgeline Access Road	Improve maintenance hole access: obtainment of easement, construction of access road.	Operations staff safety issue, fiscal liability if backup occurs and damages nearby homes
I-8	Diverter Valve Upgrades	Security improvements: installation of UPS, site lighting, perimeter fence.	Safety concern for both public and operations staff due to lack of security
Non-Infrastructure Projects			
N-1	Rosemont, Briggs Crossings Condition Assessment	Thoroughly inspect sewer lines and casings crossing Rosemont and Briggs bridges. Would entail consultant CCTV inspection of sewer and void between pipe and casing. One-time.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
N-2	Smart Cover Installation	Maintenance hole monitoring and alarms through smart maintenance hole cover systems. 4 covers to stay in position, 6 covers to alternate locations. Ongoing, indefinite.	Low-cost method of evaluating system performance and identifying potential areas with frequent blockages/flow issues
N-3	Interceptor Items	Improved Emergency Response Training for Interceptor break (annual, indefinite). Improved Communication with ADS to identify Elk Ave Flow Meter Failure (one-time).	Improve training and resiliency to handle interceptor break, improve ability to know when flow meter is in a failed state
N-4	EMA 7 Monitoring	Monitoring of Canalda tank discharge. 3 months of monitoring; one-time.	Unknown asset condition, receiving unknown quantities of discharge flow
N-5	SS 1,2,3 Monitoring	Targeted flow monitoring for sewersheds 1, 2, 3. 3 months of monitoring per year for 5 years.	Narrow down areas with large I&I contributions for targeted pipe rehabilitation/lining projects
N-6	Work Order Database	Develop work order database with pipe and maintenance hole condition ratings data. One-time.	Improves APM practices by being able to visualize and prioritize pipeline replacement projects based on condition assessment data

Capital Costs

An Opinion of Probable Construction Cost (OPCC) was developed for each of the CIP projects at a Class 5 level, which represents Concept Screening level detail with an estimated accuracy range between -30% to +50, in accordance with the AACE standard cost estimating guidelines. The following assumptions and inclusions were made in the preparation of each of the cost estimates:

- Projects will be publicly bid projects.
- Prevailing wage requirements will apply.
- Assume there will be at least 3 qualified bids submitted.
- Assume all excess excavated material is hauled and disposed of.
- Assume all demolished material will be hauled and disposed of including a dump fee.
- Costs are rounded to nearest \$1,000 and are in 2024 dollars.

The estimates do not include the following:

- Hazardous materials (lead paint, asbestos, PCBs, etc.) removal or disposal is not included.
- Soil remediation, testing, removal, or disposal.

The Class 5 OPCCs and associated present worth costs for each of the CIP projects are shown in Table ES-10. See Appendix G for a detailed cost estimate breakdown.

Table ES-10: Capital Cost Assumptions

Item	Assumption
Taxes	10.25%
Mobilization/Demobilization/Permits	10%
Contractor Overhead & Profit	15%
Bonds and Insurance	2.5%
Escalation to mid-point of Construction	6%
Estimate Contingency	30%
Engineering ¹	15% / 25%
Construction Management ¹	15% / 25%

Notes:

1. Projects with Subtotal costs (before soft costs) under \$1 Million assumes 25% increase, Projects with Subtotal costs above \$1 Million assumes 15% increase.

O&M Costs

For the infrastructure CIP projects, there is assumed to be no increase in maintenance requirements or cost beyond CVWD's existing regular maintenance activities and existing O&M budget, respectively.

For the non-infrastructure CIP projects, the annual O&M costs are shown in Table ES-11.

Table ES-11: Non-Infrastructure CIP Project O&M Costs

Proj. ID	Project Name	Annual O&M Cost
N-1	Rosemont, Briggs Crossings Condition Assessment	N/A
N-2	Smart Cover Installation	\$10,000
N-3	Interceptor Items	\$3,000
N-4	EMA 7 Monitoring	N/A
N-5	SS 1,2,3 Monitoring	\$12,000
N-6	Work Order Database	N/A

CIP Project Schedule

Based on the CIP project and assuming an annual CIP budget of \$500,000, there are two alternative CIP Plans based on the scopes of Projects I-3 and I-4 depending on the findings of the bridge crossing inspections. CIP Plan A reflects the best-case scenario where all that is needed to fix the bridge crossings are seismic joint installations. CIP Plan B reflects the worst-case scenario, assuming that full replacement of the bridge crossing casing and gravity sewer pipe require replacement. All dollar amounts displayed in the CIP Plans are in 2024 dollars.

CIP Plan A

CIP Plan A would consist of all listed projects, with Projects I-3 and I-4 being seismic retrofits only. Under Plan A, all project capital costs will be committed with the \$500,000 annual budget within 5 years. CIP Plan A is displayed in Table ES-12.

CIP Plan B

CIP Plan B would consist of all listed projects, with Projects I-3 and I-4 including seismic retrofits and full replacements of sewer line and casing pipe. Under Plan B, all project capital costs can be committed with the \$500,000 annual budget within 10 years. CIP Plan B is displayed in Table ES-13.

Table ES-12: CIP Plan A Schedule

Proj ID	Infrastructure Projects	Asset Condition	Total Risk Score	Year									
				1	2	3	4	5	6	7	8	9	10
I-1	Granada Pump Station Improvements	4.0	8.5	\$209,000									
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	4.0	8.2		\$221,000								
I-3	Rosemont / Hwy 210 Crossing Retrofit ¹	2.0	14.6		\$181,000								
I-4	Briggs / Hwy 210 Crossing Retrofit ¹	2.0	6.0			\$203,000							
I-5	Hillside Dr Private Lateral Backflow Preventer	2.0	6.0		\$35,000								
I-6	Dorothy / Goss Canyon Access Road	3.0	11.4			\$90,000							
I-7	Starfall / Ridgepine Access Road	3.0	10.0			\$107,000							
I-8	Diverter Valve Upgrades	3.0	7.3			\$41,000							
Non-Infrastructure Projects													
N-1	Rosemont, Briggs Crossings Cond. Assessment	-	-	\$231,000									
N-2	Smart Cover Installation ²	-	-	\$34,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
N-3	Interceptor Items ²	-	-	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
N-4	EMA 7 Monitoring	-	-		\$4,000								
N-5	SS 1,2,3 Monitoring	-	-	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000					
N-6	Work Order Database	-	-	\$8,000									
Project Total				\$497,000	\$466,000	\$466,000	\$25,000	\$25,000	\$13,000	\$13,000	\$13,000	\$13,000	\$13,000
CIP Budget				\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000

Notes:

- 1. Bridge crossing projects consist of seismic retrofits only.
- 2. Smart Cover Installation and Interceptor Items are ongoing and indefinite. They will continue to have O&M costs beyond this 10-year schedule.

Table ES-13: CIP Plan B Schedule

Proj ID	Infrastructure Projects	Asset Condition	Total Risk Score	Year									
				1	2	3	4	5	6	7	8	9	10
I-1	Granada Pump Station Improvements	4.0	8.5	\$209,000									
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	4.0	8.2		\$221,000								
I-3	Rosemont / Hwy 210 Crossing Retrofit ¹	3.0	11.4		\$250,000	\$475,000	\$475,000	\$411,000					
I-4	Briggs / Hwy 210 Crossing Retrofit ¹	3.0	10.0						\$487,000	\$487,000	\$487,000	\$441,000	
I-5	Hillside Dr Private Lateral Backflow Preventer	2.0	14.6					\$35,000					
I-6	Dorothy / Goss Canyon Access Road	2.0	6.0										\$90,000
I-7	Starfall / Ridgepine Access Road	2.0	6.0										\$107,000
I-8	Diverter Valve Upgrades	3.0	7.3									\$41,000	
Non-Infrastructure Projects													
N-1	Rosemont, Briggs Crossings Cond. Assessment	-	-	\$231,000									
N-2	Smart Cover Installation ²	-	-	\$34,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
N-3	Interceptor Items ²	-	-	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
N-4	EMA 7 Monitoring	-	-		\$4,000								
N-5	SS 1,2,3 Monitoring	-	-	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000					
N-6	Work Order Database	-	-	\$8,000									
Project Total				\$497,000	\$500,000	\$500,000	\$500,000	\$471,000	\$500,000	\$500,000	\$500,000	\$495,000	\$210,000
CIP Budget				\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000

Notes:

- 1. Bridge crossing projects consist of seismic retrofits only.
- 2. Smart Cover Installation and Interceptor Items are ongoing and indefinite. They will continue to have O&M costs beyond this 5-year schedule.

Recommended SSMP Updates

Based on the findings of this WWMP, the following changes are recommended for the next round of updates for the SSMP:

1. Update Section 5 – Design and Performance Provisions to include language recommending/requiring that the developer utilizes the new collection system hydraulic model to evaluate if the proposed development sewer flows will have any impacts on the downstream gravity sewer pipes. This will protect CVWD from approving a development flow that the existing collection system cannot accommodate within the required capacity criteria and will provide justification for CVWD to have the developer share in the costs of any required infrastructure improvements (likely upsizing the downstream gravity sewer) to accommodate the new development. If new sewer pipe is being constructed, this will also help evaluate whether or not the design criteria laid out in the SSMP will be met by the proposed sewer configuration.
2. Update Section 4.3.4 Enhanced Maintenance Areas (EMAs). Remove language specifying that sewers constructed outside of CVWD's design parameters (flat sewers) should be classified as an EMA. Due to the nature of the collection system and the decrease in sewer flows due to conservation, A majority of the collection system does not meet the minimum velocity design criterion of 2.5 fps laid out in the SSMP. Therefore, a majority of the collection system would be classified as an EMA, making difficult to distinguish which areas operations staff should focus on regularly maintaining. EMA classification should largely be based on input from operations staff during maintenance activities as well as collected condition assessment data.
3. Update the Lift Station Maintenance & Inspection Checklist to analyze the number of starts per hour per sewer lift station pump. Each pump should be starting no more than 6 times per hour to avoid the motor from overheating.

Section 1: Introduction

1.1 Background

Crescenta Valley Water District (CVWD) is located along the foothills of San Gabriel and Verdugo Mountains between the San Fernando and San Gabriel Valleys in Los Angeles County (See Figure 1-2). CVWD provides water distribution and sewage collection to the unincorporated communities of La Crescenta as well as parts of the cities of La Cañada Flintridge and Glendale. CVWD serves an area of about four-square miles and ranges in elevation from 1,200 feet to almost 3,000 feet above sea level.

The customer base is primarily residential with some light commercial accounts. CVWD currently provides water service to approximately 8,800 accounts, representing a population of approximately 33,000. As Figure 2-9 shows, CVWD's sewer service area (SSA) is a fraction of the size of the water service area (WSA). Compared to WSA, CVWD's SSA serves roughly two-thirds the number of customers and population, including roughly 6,500 accounts and a population of approximately 22,000.

CVWD's water supply over the last five years have been comprised of approximately half imported water and half local groundwater supply. CVWD pumps groundwater from the Verdugo Basin, which is highly dependent on replenishment from local rainfall. With periodic droughts over the last 15 years, CVWD has needed to supplement its water supply with about 50% imported water. CVWD purchases imported water from the Metropolitan Water District of Southern California (MWD), which is wheeled through Foothill Municipal Water District.

Figure 1-1 shows the trend of CVWD's water production and average annual wastewater flows from 1996 to 2022. As the trendlines show, water production (and in turn system demands) have steadily decreased due to water conservation efforts as a result of statewide mandates for water consumption reduction in response to extended periods of drought. These reductions in water demand, largely accomplished due to changing landscaping practices, installation of low flow water fixtures, and consumer behavioral changes, have persisted even after the end of the drought periods and after the mandates for reduction in water consumption were lifted. This is also evident in the historical trend of wastewater flows for CVWD, dropping from an average daily flow rate of 1.7 MGD in 1996 to 1.5 MGD in 2022. Pairing these recent demand reductions with the fact that CVWD's SSA is largely built out and is anticipating minimal future development/densification (see Section 2.2.1), future average annual sewer flows are not expected to increase, and instead will likely decrease as water conservation efforts continue. This WWMP therefore focuses less on constructing new infrastructure to accommodate future sewer flows and more on improving the operations/maintenance of the existing wastewater collection system assets.

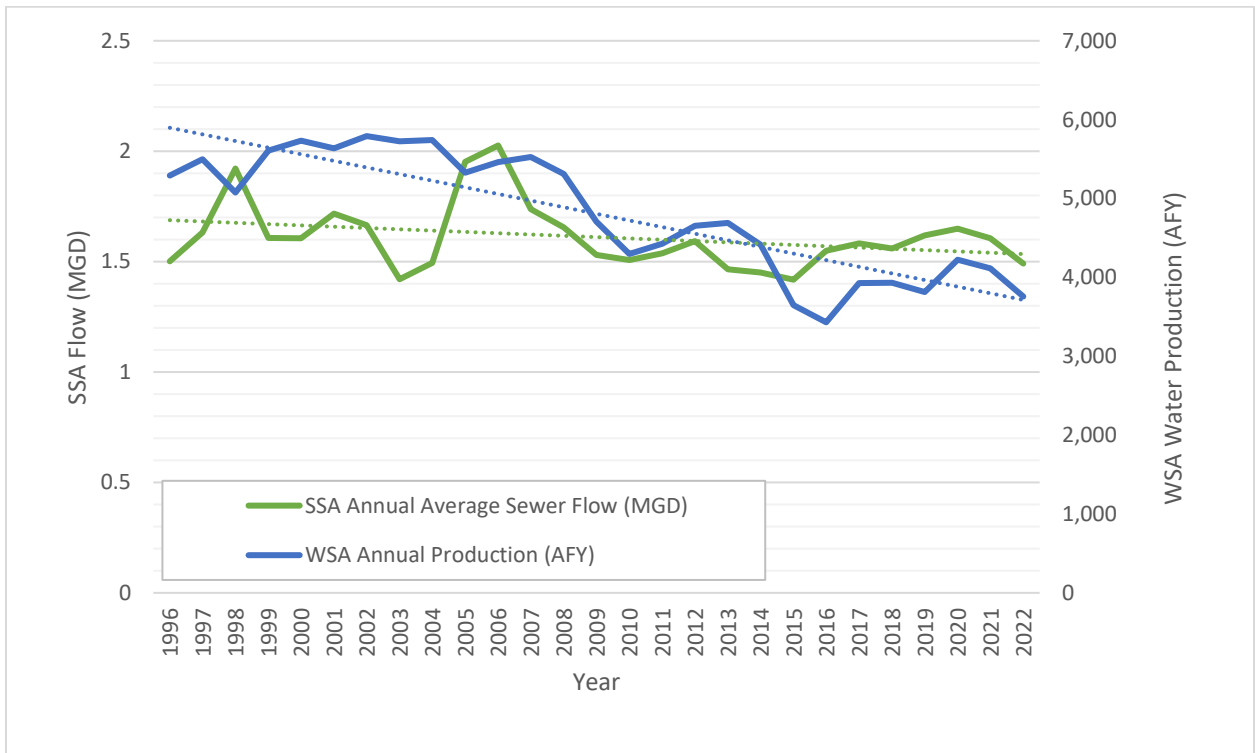


Figure 1-1: CVWD Historical Annual Water Production and Sewer Flows



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Crescenta Valley Water District
Wastewater Master Plan

CVWD Vicinity Map

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Figure 1-2

1.2 Previous Work

This section documents the previous work and plans that CVWD has completed to operate, maintain, and plan for the future of the wastewater collection system, and how this WWMP intersects with these existing documents.

1.2.1 2019 Sewer System Management Plan

The purpose of CVWD's Sewer System Management Plan (SSMP) is to "support [CVWD's] Operations and Maintenance program and goals by providing high-level, consolidated guidelines and procedures for all aspects of CVWD's sewer system management" (Crescenta Valley Water District, 2019). First developed in 2009, the SSMP is revised, updated, and/or amended every 2 years to improve on CVWD's best practices. The goals listed for the SSMP include:

- Improve the reliability of collection system infrastructure
- Provide adequate system capacity for existing and future customers
- Minimize system leaks to reduce infiltration, inflow, and exfiltration
- Minimize the number and severity of sanitary sewer overflows (SSOs)
- Improve the response time to SSOs
- Ensure staff is well-trained to address potential wastewater system issues promptly.

The SSMP outlines several crucial programs for Operations & Maintenance (O&M) staff, including both short term, day to day programs as well as long-term planning programs. Both the Overflow Emergency Response Plan and Fats, Oils & Grease (FOG) Control Program provide O&M staff with daily tools and proper procedures for responding to sanitary sewer overflows (SSOs), and contact information for key individuals crucial to removing FOG from the collection system.

For long-term project planning, the System Evaluation and Capacity Assurance Plan (SECAP) is used to identify any capacity deficiencies that could arise from future development. The SECAP has methods for determining Inflow and Infiltration (I&I), Average Dry Weather Flow (ADWF), Peak Wet Weather Flow (PWWF), performing a capacity analysis, and defining a project for the Capital Improvement Program (CIP). This WWMP is meant to augment and refine both the standard day to day operating procedures listed in the SSMP, as well as the long term SECAP used to identify future CIP projects. This WWMP provides some recommended updates to the SSMP's design guidelines in Section 6.4.2.

1.2.1.1 Enhanced Maintenance Areas

To help identify potential CIP projects within this WWMP, CVWD's Enhanced Maintenance Areas (EMA) program was used to create an initial list of areas within the collection system causing the most problems for O&M staff. A portion of the collection system is classified as an EMA for several reasons, including customer complaints due to odor, historical locations for SSOs, lines in close proximity to trees prone to root intrusion, and shallow sewer lines more prone to accumulations of debris and blockages. EMAs are more regularly cleaned and inspected compared to the rest of the collection system to ensure they do not develop into

larger issues and/or SSOs. Table 1-1 provides a list of the current EMAs. The locations of these EMAs are shown in Figure 2-1. More detailed location information for each EMA is provided in Appendix A.

Table 1-1: Enhanced Maintenance Areas

EMA #	Location
1	Pine Glen Rd / Pineridge Dr
2	La Crescenta & Orange
3	Foothill & Briggs (76 Station)
4	Foothill between Sunset/Briggs, North Side
5	2000 Hilldale Dr
6	Waltonia between Hilldale and Montrose
7	Canalda and Ocean View flush tank
8	Prospect Ave between Sunset and Rosemont
9	Community between Ramsdell & Glenwood
10	Mountain Pine & Timberlake

1.2.1.2 Design Standards

This WWMP also utilizes specific design guidelines and standards per CVWD's SSMP governing the sizing, slope, material, connections, and construction of sewer mains within CVWD. The following standards were utilized to evaluate existing collection system capacity and to define future CIP projects:

Existing Infrastructure standards:

- Gravity sewer pipe depth to diameter (d/D) ratio should not exceed 60% under ADWF flow conditions (see Section 5.1.1.1)
- Gravity sewer pipe d/D ratio should not exceed 80% under PWWF flow conditions (see Section 5.1.1.1)

Future Infrastructure standards:

- New sewer pipe must be sized to maintain velocities between 2.5 and 10 feet per second, with a minimum slope of 2% (Section 6.1)
- New sewer pipe material shall be Vitrified Clay Pipe (VCP) (Section 6.2.1)

1.2.2 Hazard Mitigation Plan

CVWD's local Hazard Mitigation Plan (HMP) was developed in 2021. The purpose of the HMP is to reduce the risk to vital assets that provide CVWD's customers with crucial water and sewer services by mitigating potential hazards that threaten CVWD infrastructure.

The HMP quantifies the portion of CVWD's assets that are exposed to damage from earthquakes, landslides, flooding, and wildfire, and also quantifies the probability of these types of natural disasters occurring within CVWD's service area. The HMP also provides a list of potential actions/projects that can be completed to mitigate the risks of these natural disasters for both the water and sewer collection systems. The final CIP list (see Section 6.3) resulting from this WWMP can be aligned with the proposed projects in the HMP to both support project funding and justification. The HMP should be used to provide justification for certain CIP projects that mitigate CVWD's risk/vulnerability to the effects of natural disasters.

1.3 Objectives

The main objectives of this WWMP are:

- 1) Identify existing collection system deficiencies through discussions with O&M and Engineering Staff, condition assessments, and hydraulic modeling/flow data collection
- 2) Quantify impacts to the collection system as a result of future growth/densification, and identify potential future collection system deficiencies
- 3) Develop list of CIP projects prioritized by risk and develop project costs
- 4) Develop implementation strategy for potential near-term and long-term CIP projects

1.4 Report Organization

This Master Plan is organized into the following sections:

- **Section 1: Introduction** Background information on the Crescenta Valley Water District, previous reports on the sewer system, and discussions of the Master Plan's objectives.
- **Section 2: Existing System Description** describes the boundaries, geography, land use, population, and existing sewer system considered within the study.
- **Section 3: Existing and Future Sewer Flows Analysis** describes the existing and future sewer flows that are calculated for the sewer system.
- **Section 4: Sewer System Model Development** describes the sewer collection system hydraulic model development, and wet weather/dry weather flow calibration.
- **Section 5: Collection System Evaluation** describes the hydraulic model capacity evaluations, condition assessment evaluations, and the business risk and vulnerability assessment (BRVA) conducted for the sewer collection system.
- **Section 6: Capital Improvement Program** describes the proposed Capital Improvement Program (CIP) for the sewer system. This section also provides future recommendations beyond the CIP

Section 2: Existing System Description

This section describes the components of CVWD's existing wastewater collection system and service area.

2.1 Collection System Components

2.1.1 Gravity Sewer

CVWD's existing wastewater collection system is comprised of approximately 68 miles of gravity sewer mains, and over 1,200 maintenance holes. Due to the large variations in elevation across the service area, there are over 270 drop maintenance holes within CVWD's service area. The SSMP necessitates a drop maintenance hole wherever the incoming gravity sewer enters the receiving maintenance hole more than 30 inches above the invert of the maintenance hole. The gravity pipe throughout the system ranges in size from 4-inch to 27-inch diameter, with 83% of the gravity pipe being 8-inch or smaller. CVWD's most crucial element of the collection system is the gravity sewer interceptor, composed of 6.6 miles of VCP pipe ranging from 18 to 27 inches. The interceptor conveys all of the system sewer flows from the SSA to the collection system outfall located in the City of Glendale. Figure 2-1 shows the alignment of the interceptor as well as pipe material and diameter information. Figure 2-2 shows the collection system color coded by pipe age.

The distributions of gravity sewer pipe length by diameter, material, and year of installation are shown in the tables below. The collection system is mostly composed of 8-inch VCP installed in the 1980's.

Table 2-1: Sewer Pipe Size and Length Distribution

Diameter (in)	Length (mi)	Percentage
4	0.14	0.21%
6	0.04	0.06%
8	56.07	82.90%
10	1.14	1.68%
12	1.25	1.84%
15	1.23	1.82%
16	0.09	0.13%
18	3.14	4.64%
21	4.09	6.04%
24	0.41	0.61%
27	0.04	0.06%

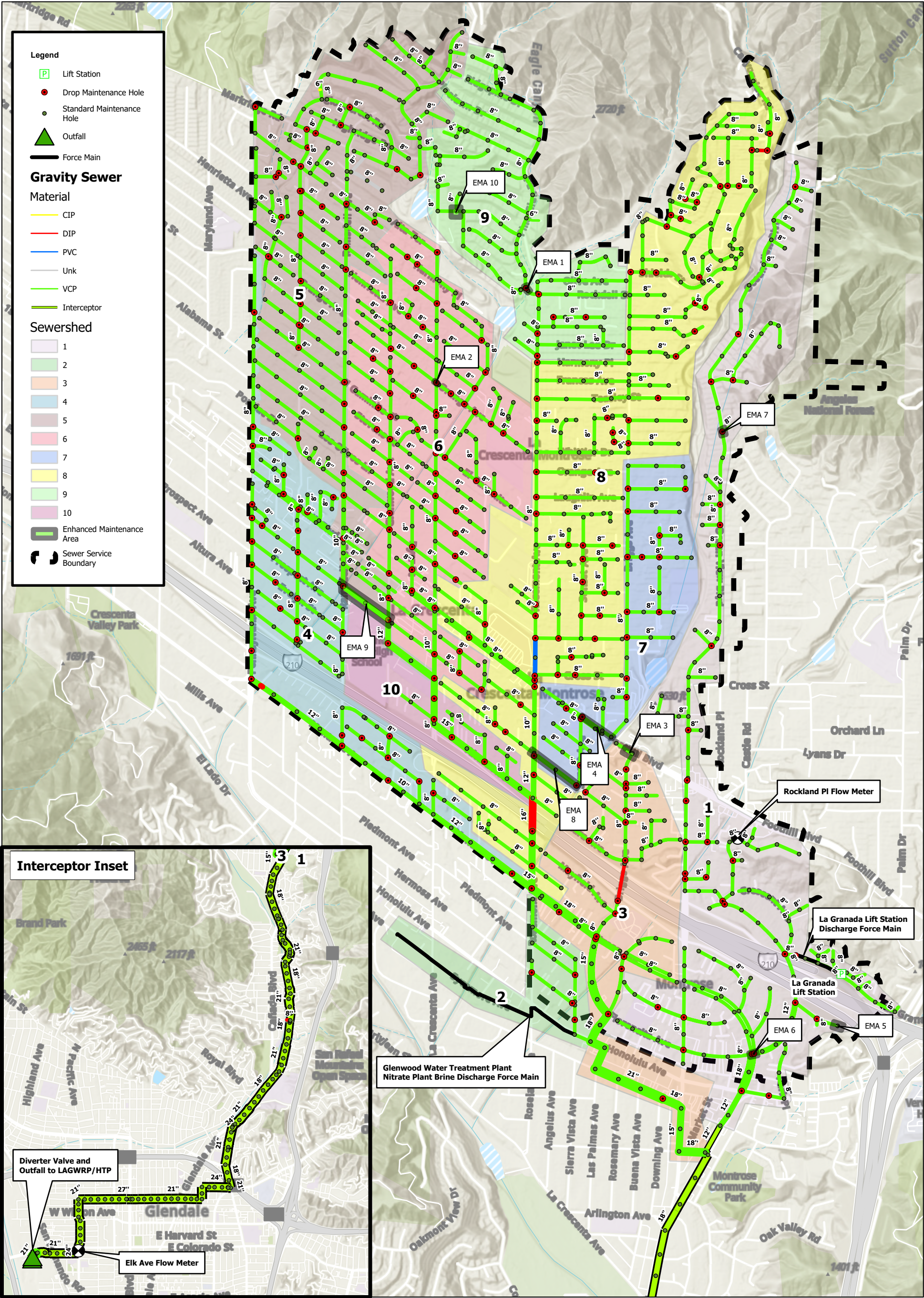
Table 2-2: Sewer Pipe Material and Length Distribution

Material	Length (mi)	Percentage
VCP	67.04	99.13%
PVC	0.133	0.20%
DIP	0.289	0.43%
CIP	0.004	0.01%
Unknown	0.164	0.24%

Table 2-3: Sewer Pipe Age – Year Installed by Length

Year Installed (Decades)	Linear Footage (ft)	Percentage
Unknown	21	1.14%
1950s	6	0.31%
1960s	135	5.61%
1970s	22	0.83%
1980s	1449	91.63%
1990s	4	0.15%
2000s	12	0.32%

The collection system was organized into 10 “sewersheds” based on key confluence points to help organize the subsequent analyses and CIP project identification. These sewersheds are shown in Figure 2-1. See Section 4.1.2 for additional information on how the sewersheds were utilized to choose flow meter data collection locations.



Notes:

1. Gravity Sewer symbol thickness varies by pipe diameter

2.1.2 La Granada Lift Station

CVWD owns and operates one single lift station, the La Granada Lift Station built circa 1980. The lift station serves approximately 45 single family residences. Figure 2-3 shows the location of the lift station, just north of Hwy 210 along La Granada Way. The lift station discharges to a 4-inch force main that conveys flow west roughly 1,350 ft to a discharge maintenance hole near the intersection of La Granada Way and Waltonia Dr.

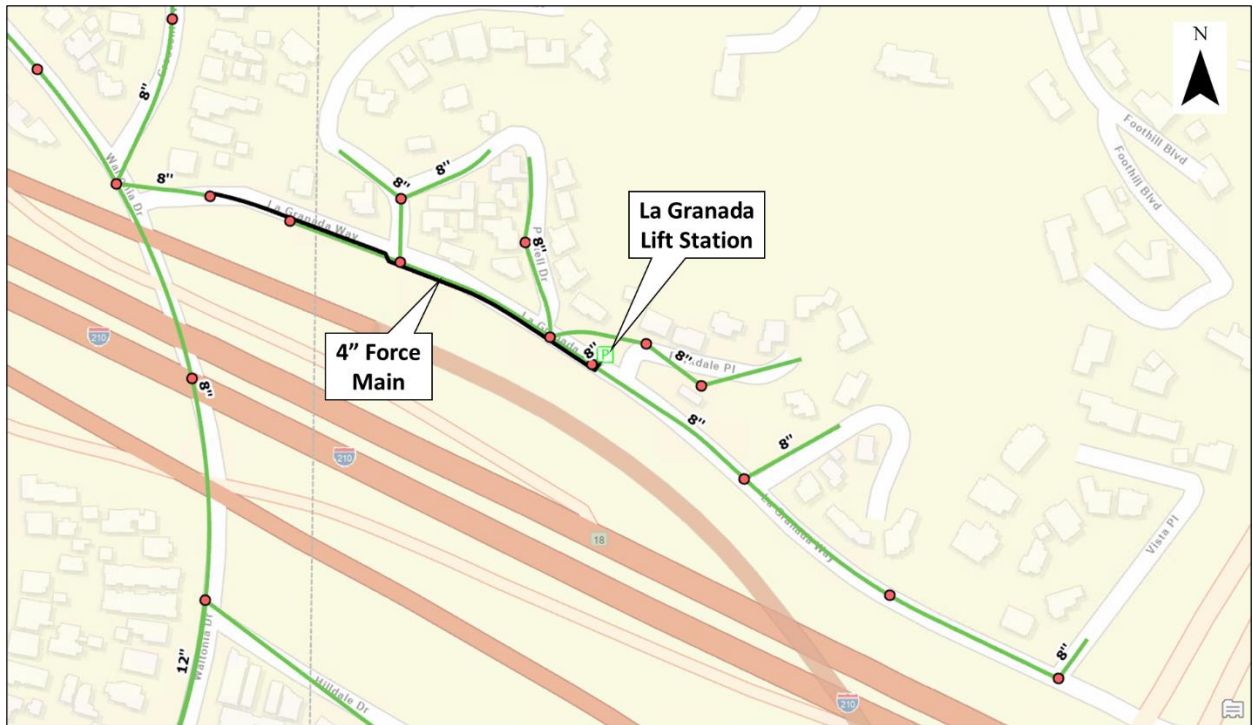


Figure 2-3: La Granada Lift Station Vicinity Map 1

A condition assessment was completed as part of this WWMP to identify any risks, deficiencies, and to provide improvement recommendations, more details can be found in Section 5.2 of this WWMP. Figure 2-4 shows the lift station building that sits on the median between La Granada Way and Parkdale Pl. The building houses the wet well access, electrical equipment, and the above-grade pump skid. The influent maintenance hole and gravity sewer enter the lift station's wet well from the south. The 4-inch force main exits the lift station building on the south side of the building as well before turning west along La Granada Way. A force main replacement project just outside of the lift station was completed in 2017 and found that the 4-inch force main was in good condition.

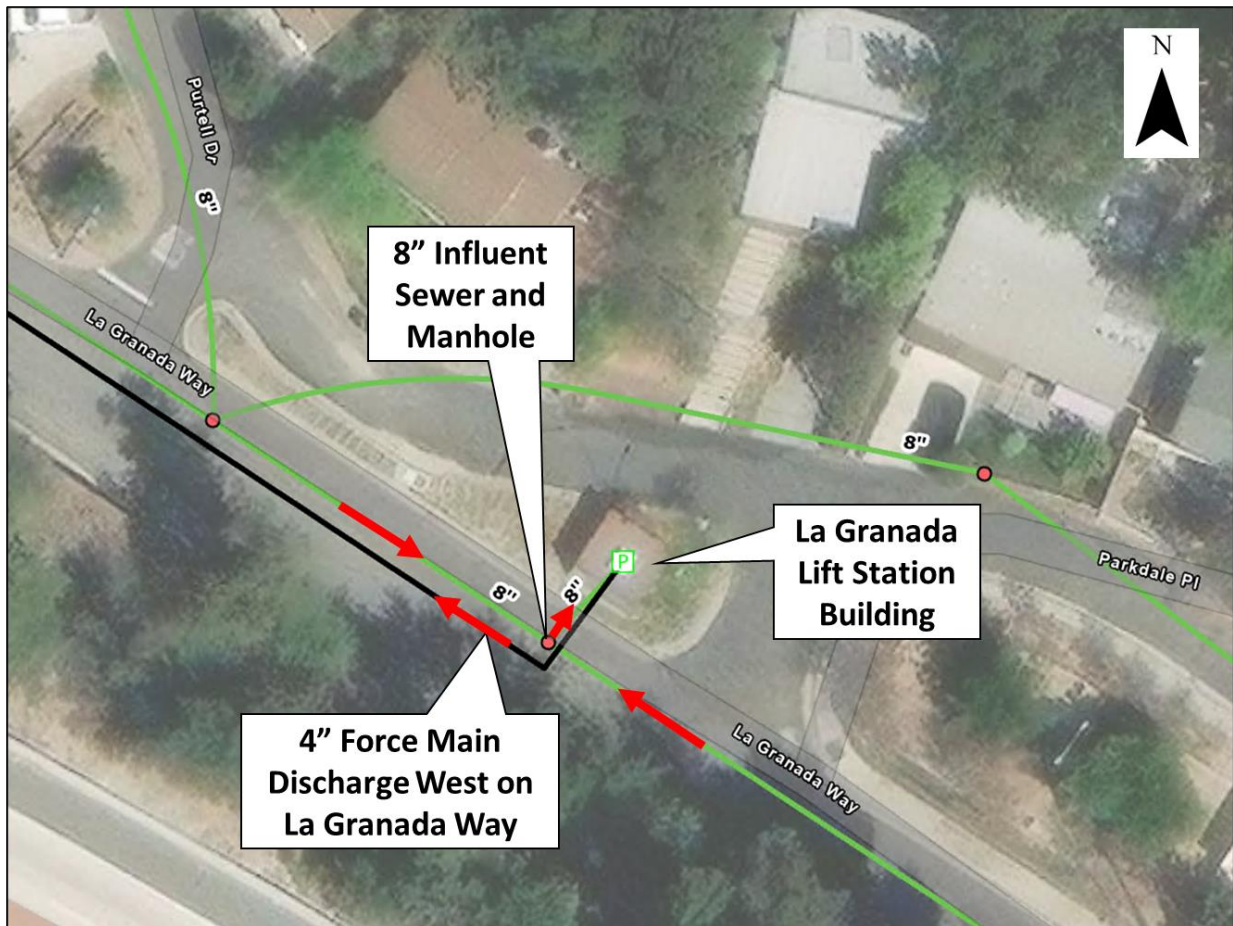


Figure 2-4: La Granada Lift Station Vicinity Map 2

2.1.2.1 Lift Station Construction

The lift station building is a 14 ft x 16 ft concrete masonry unit (CMU) building with a wood frame roof. The roof has a built-in skylight hatch to remove/replace pumps, motors, or other internal lift station components. The building has a single man door for access as well as a privacy fence around the entire site to reduce visual impact to the neighboring community. The lift station building encloses all the electrical equipment, pump, and motors, as well as the access to the lift station wet well. The circular wet well is 11 ft deep and 5 ft in diameter.

2.1.2.2 Electrical

The lift station electrical service is 200 Amps of 120/208 Volt, single phase power. This service provides ample capacity to run both 5 HP pumps and miscellaneous electrical continuously. The lift station is equipped with a motor control center (MCC), control panel, and programmable logic controller (PLC).

2.1.2.3 Backup Generator

In 2023, a permanent backup diesel generator and automatic transfer switch (ATS) were installed on site, improving the reliability of the pump station in the event of a power failure. The generator is a 35 kW generator designed to run both 5 HP pumps simultaneously in addition to miscellaneous electrical load. The generator fuel tank holds up to 132 gallons of diesel fuel, and is typically cycled for 15 minutes per week.

2.1.2.4 Controls

The PLC allows operators to change the wet well operating setpoints on site, as well as the lead/lag assignment of each pump. The lift station is continuously monitored through SCADA via radio telemetry, monitoring the following elements in real time:

- Power status (detecting power failures).
- Wet well status (monitoring high well conditions).
- Entry alarm (activated on the Remote Terminal Unit).
- Pump status (monitoring pump on/off cycles).

The telemetry system signals are monitored at the Glenwood Operations Facility. Based on a site visit performed in July of 2023, the lift station currently has the following wet well operating setpoints and alarms setpoints:

Table 2-4: Pump Control Setpoints

Wet Well Controls	Level (ft)	HGL (ft) ¹
Lead Pump Start	3.80	1,290.00
Lag Pump Start	4.00	1,290.20
Lead Pump Stop	2.60	1,288.80
Lag Pump Stop	2.60	1,288.80

Notes:

1. Relative to surveyed bottom of wet well elevation 1,286.20 (NGVD 29)

Table 2-5: Wet Well Alarm Setpoints

Alarm Controls	Level (ft)	HGL (ft) ¹
Wet Well Level High High Alarm	6.0	1292.20
Wet Well Level High Alarm	5.5	1291.70
Wet Well Level Low Alarm	0.5	1286.70
Wet Well Level Low Low Alarm	0.3	1286.50
Wet Well Level Invalid Alarm	0.0	1286.20

Notes:

1. Relative to surveyed bottom of wet well elevation 1,286.20 (NGVD 29)

The “lead pump start” level is currently set just above the elevation equal to the invert of the influent gravity sewer pipe (1,289.85 ft). Because the upstream maintenance hole invert is only slightly higher in elevation (1,290.00) and is also less than 30 ft away from the lift station, a

rising wet well level can rapidly result in surcharging of the upstream sewer line and maintenance hole. Because of this, the lift station is configured so that both pumps can operate simultaneously in the event of an extremely large inflow event. The “lag pump start” is only 0.20 ft above the “lead pump start” to address this concern. Both the electrical service and backup generator are sized to accommodate both pumps operating simultaneously. While infrequent, there are times during the winter months when both pumps may be operating simultaneously.

2.1.2.5 Suction Lift Pumps

The lift station is a suction lift duplex station, with each pump equipped with a 5 horsepower (HP) motor and 4-inch suction and discharge piping. The suction lift pumps are AllPrime Model S-4, self-priming centrifugal pumps. The pump system was updated in 2021, this included new belt motors and other updates to the lift station.

The design point for each suction lift pump was originally set at 135 GPM @ 44 ft total dynamic head (TDH). Figure shows the pump curve for the suction lift pumps currently installed. Because the pump curve is relatively flat and the selected operating point is already on the edge of the preferred operating range (POR), a small increase in required TDH will push the operating point of the pumps rapidly towards their shutoff head (also known as “dead head”) conditions. Therefore, running both pumps simultaneously would likely yield only a small increase in overall lift station capacity. No flow data with both pumps running is currently available to verify the capacity of the lift station with both pumps active. See Section 5.2.2 for additional analysis of the capacity of the lift station

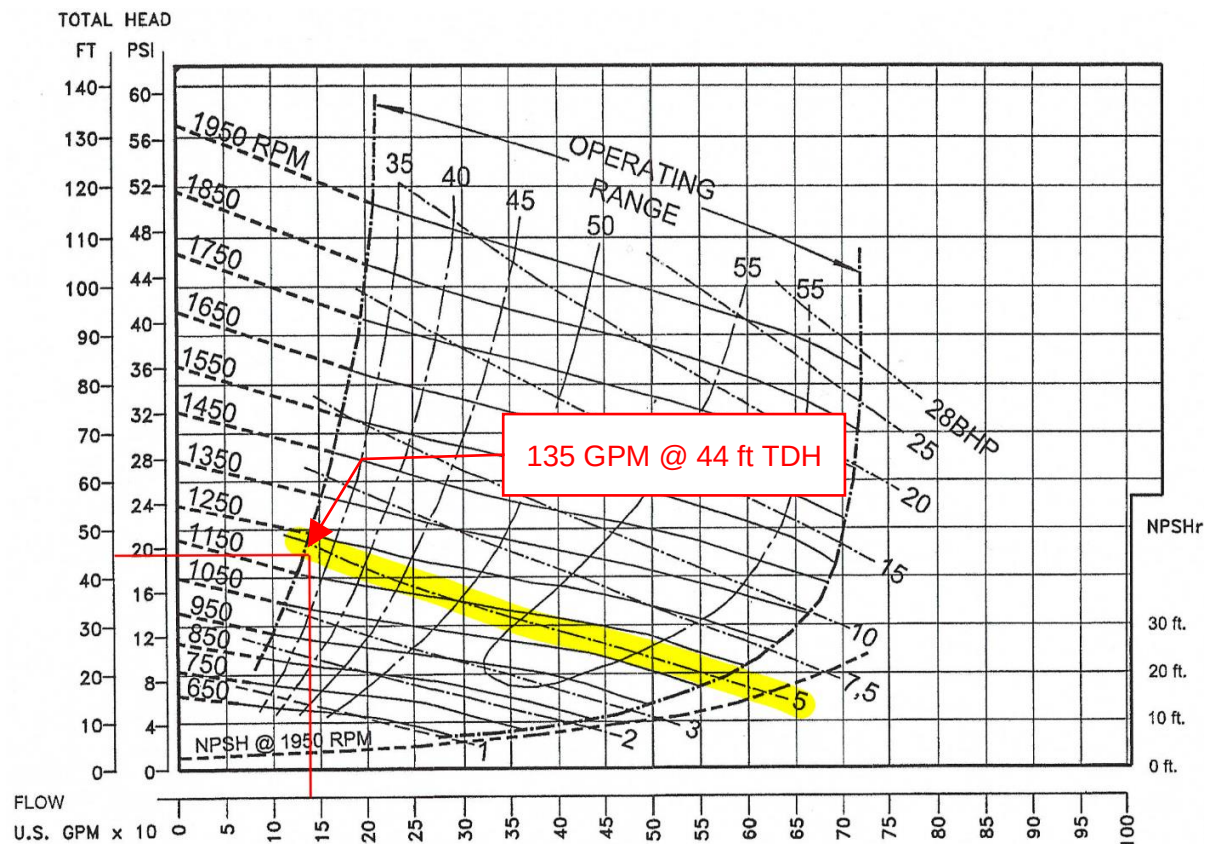


Figure 2-5: AllPrime Model S-4 Pump Curve with Design Point of 135 GPM @ 44' TDH

2.1.3 Glenwood Nitrate Treatment Facility Brine Force Main

Figure 2-1 shows the location of the Glenwood Water Treatment Plant (GWTP) Backwash Force Main, located in Sewershed 3 and discharging to the collection system at Honolulu Ave. This 6-inch fiberglass reinforced pipe (FRP) force main conveys concentrated brine backwash from the GWTP to the collection system during the backwash cycle of the ion-exchange tanks located at GWTP. The GWTP has not been in operation since 2019. This process typically occurs for three hours from 12 AM – 3 AM when sewer flows are lowest, as CVWD is required to send this concentrated flow directly to Hyperion Treatment Plant (HTP) and bypass the Los Angeles-Glendale Water Reclamation Plant (LAGWRP). Section 2.5 provides additional detail regarding the arrangement with LAGWRP and HTP.

2.1.4 Outfall Diverter Valve

In order to control whether flow is conveyed to LAGWRP or the HTP, CVWD owns and operates a 21-inch diverter valve located at the outfall of CVWDs interceptor. The valve is typically in the “open” position, conveying flow to LAGWRP, and is “closed” when CVWD is running the backwash cycle at the GWTP. Figure 2-6 shows the location of the diverter valve along Colorado Blvd.

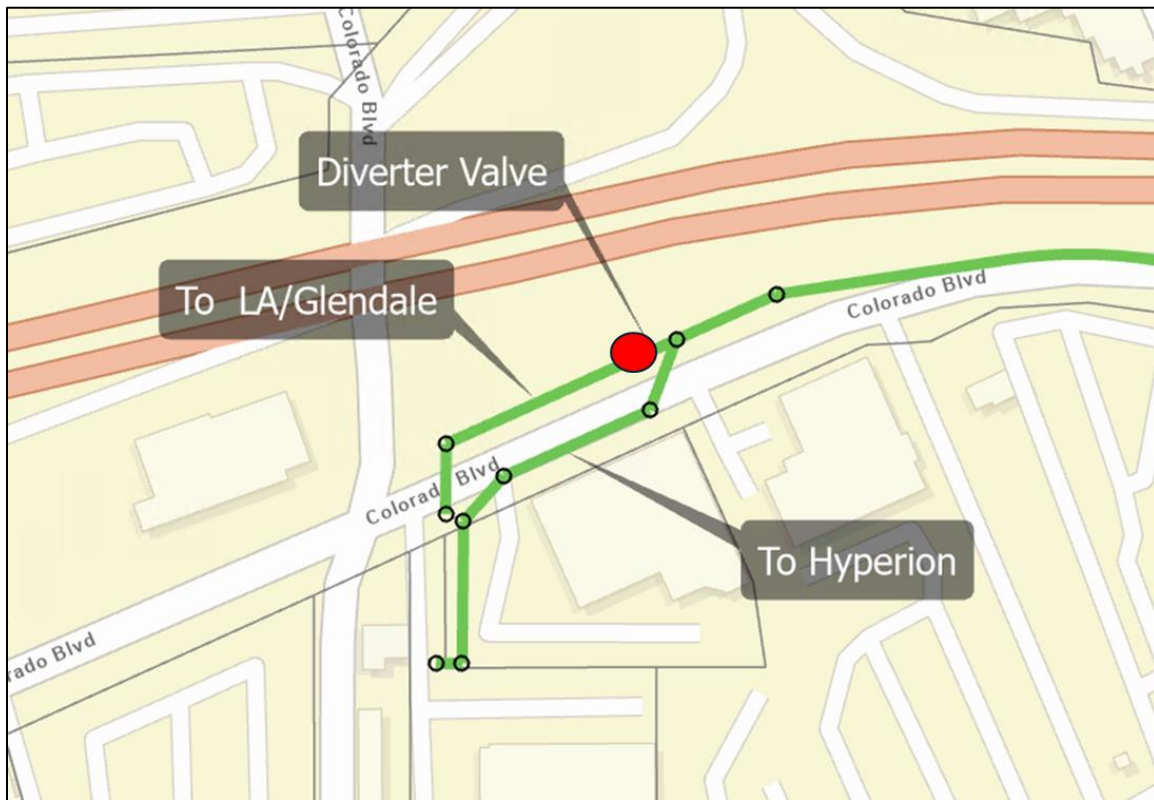


Figure 2-6: Diverter Valve Configuration

2.1.5 Flow Meters

CVWD partners with ADS Environmental Services (ADS) to operate and maintain two flow meter locations in the SSA. The first is the Elk Ave Flow Meter (see Figure 2-1) located near the outfall of CVWD's interceptor. This flow meter is essential for monitoring both the quantity and the strength of the sewer flows for the entirety of the SSA. The Elk Ave Flow Meter is crucial to CVWD's operations, as it is used for reporting sewer flow and strength to the City of LA (see Section 2.5), and is the only permanent flow meter within CVWD's system.

The second flow meter location is on Rockland Pl, which is used to quantify the flow coming from La Cañada Flintridge (LCF) just to the east of CVWD's SSA. LCF discharges a portion of their system's wastewater flow to CVWD due to the topography of the area and to avoid constructing a sewer lift station. CVWD then conveys this flow by gravity to LAGWRP. Figure 2-1 provides a high level overview of the location of the meter, and Figure 2-7 shows a closer image of which maintenance hole the flow meter is located in.



Figure 2-7: Rockland PI Flow Meter Location

2.2 Land Use

Based on LA County parcel zoning data, CVWD's service area contains the following land use types:

- Single Family Residential (SFR)
- Multi-Family Residential (MFR)
- Commercial
- Industrial
- Government/Institutional
- School

The predominant land use in CVWD's service area is residential (SFR and MFR), complemented by two commercial/business corridors along Foothill Boulevard and Honolulu

Ave. Figure 2-8 shows the land use types within CVWD's SSA based on LA County parcel data. Based on current LA County parcel zoning data, there are just two parcels defined as "Industrial" use (meat processing and self-storage), and no agricultural water users within CVWD. Institutional users are confined to schools, churches, parks, and freeway landscaping.

2.2.1 LA County Housing Element

The State of California's Regional Housing Needs Assessment (RHNA) continually updates the housing needs for different regions of the State to address the ongoing housing shortage and exponentially rising cost of living. The State then relies on local government agencies to develop plans to meet the housing goals set. LA County is a member of the Southern California Association of Governments (SCAG), which has developed their own RHNA Allocation Plan. LA County has been working on their portion of the RHNA Allocation Plan, titled the "Housing Element 2021-2029" (Housing Element). Table 2-6 shows the number of additional units based on affordability that Unincorporated LA County must accommodate by 2029. CVWD is located in unincorporated LA County; therefore, LA County is the regional planning authority.

Table 2-6: RHNA Required Units for Unincorporated LA County

Affordability	Extremely Low/Very Low (< 50% AMI¹)	Lower (50-80% AMI)	Moderate (80-120% AMI)	Above Moderate (>120% AMI)	Total
Required Units	25,648	13,691	14,180	36,533	90,052

Notes:

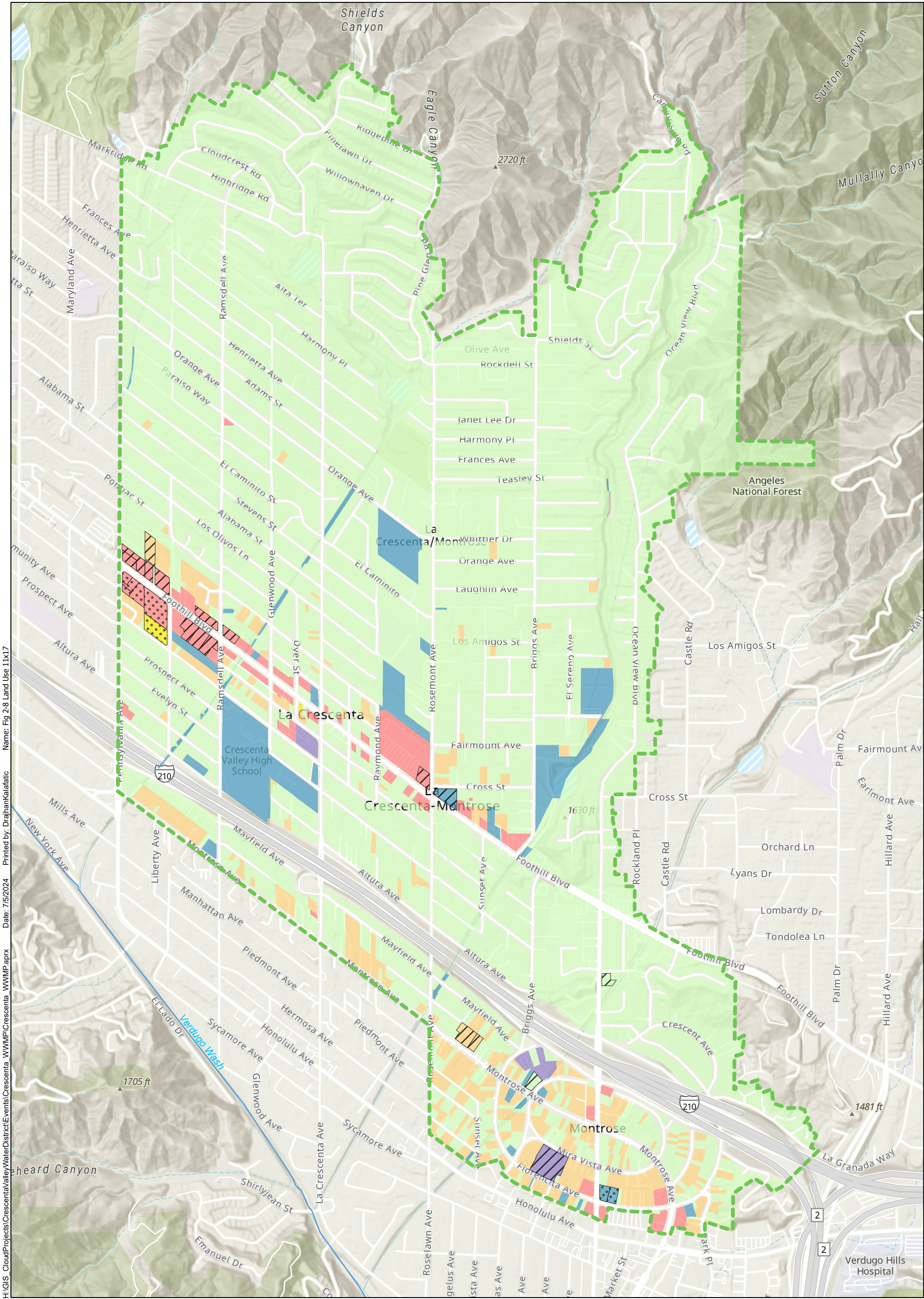
1. AMI = Area Median Income

Since the previous RHNA cycle was completed for 2014-2021, the target number of additional units has drastically risen from roughly 30,000 homes to 90,000 homes in Unincorporated LA County as Table 2-6 shows. LA County has worked to identify parcels in Unincorporated LA that are already zoned for residential use and also meet other criteria, such as being located outside of an environmentally sensitive area. Currently, there are not enough sites that are already zoned for residential use to meet the number of required units. Therefore, additional sites needed to be identified for rezoning by the year 2024 that could potentially be redeveloped into multi-family housing. These sites would ideally be located near transit corridors, amenities, and services. Three main factors were considered when evaluating whether a parcel might be redeveloped by 2029:

1. Age of Existing Buildings: Property owners and developers are more likely to redevelop the site if the existing buildings are relatively older. 20 years was the threshold for existing non-residential buildings, and 50 years was the threshold for existing residential buildings;
2. Land Value vs. Improvement Value: If the land is more valuable than the existing improvement, the property owner is more likely to redevelop the site with a more intense use, such as multi-family housing development; and

3. Contamination: Sites that are or have been contaminated (e.g. gas stations) often require a lot of money and time for clean-up. These sites are unlikely to be suitable for housing development in the near future.

A portion of these sites identified for redevelopment and/or rezoning are located within CVWD's service area, mainly along the two commercialized corridors of Foothill Blvd and Honolulu Ave. Figure 2-8 identifies the locations of these parcels. Appendix A contains additional information on the identified parcels.



H:\GIS_Cloud\Projects\CrescentaValleyWaterDistrict\Events\Crescenta_WWMP\Crescenta_WWMP.aprx Date: 7/5/2024 Printed by: DrajhanKalafatic Name: Fig 2-8 Land Use 11x17

Legend

LA County Parcels

Land Use Type

SFR

MFR

Commercial

Industrial

Gov/Institutional

School

Los Angeles County Housing Element (2021-2029) - Rezoning

Los Angeles County Housing Element (2021-2029) - Sites Inventory

Sewer Service Area

U.S. Rivers and Streams

LA County Boundary

KJ

Kennedy Jenks

Crescenta Valley Water District

Wastewater Master Plan

Sewer Service Area

Land Use and Housing

Element Parcels

2244508*00

Figure 2-8

2.3 Service Area

CVWD provides water and sewer services to its customers; however, CVWD's water service area (WSA) and sewer service area (SSA) do not have identical boundaries. Figure 2-9 shows the WSA and SSA as well as the sewer customer locations. The WSA is roughly 4 square miles while the SSA is approximately 3.1 square miles. The WSA almost envelops the entire SSA, except for two small subset of customers located in the La Cañada Irrigation District (LCID) and La Cañada Flintridge (LCF) that CVWD serves with sewer service only (see Section 3.2).

The sewer customer locations were geolocated based on three years of complete water billing data between 2019 and 2021 (the latest dataset available at the time the project was initiated), using a combination of assessor parcel number (APN) information and address information. The total number of accounts and totalized demand geolocated within the SSA equated to 69% of WSA demands. The average billed water demand for the WSA was 3.27 MGD, while the average billed water demand for the SSA 2.26 MGD. Table 2-7 and Table 2-8 document the demand for the water customers served by CVWD by account type for both the WSA and SSA.

Table 2-7: WSA 2019 -2021 Average Annual Demand

Usage Type	2019 - 2021 Average Annual Demand (GPM)	# Active Accounts (2020)
Commercial	95	356
Fire ¹	0.4	117
Institutional	41	52
Irrigation	125	84
MFR	506	700
School	39	20
SFR	1,462	7,492
Total (GPM)	2,268	
Total (MGD)	3.27	8,826

Notes:

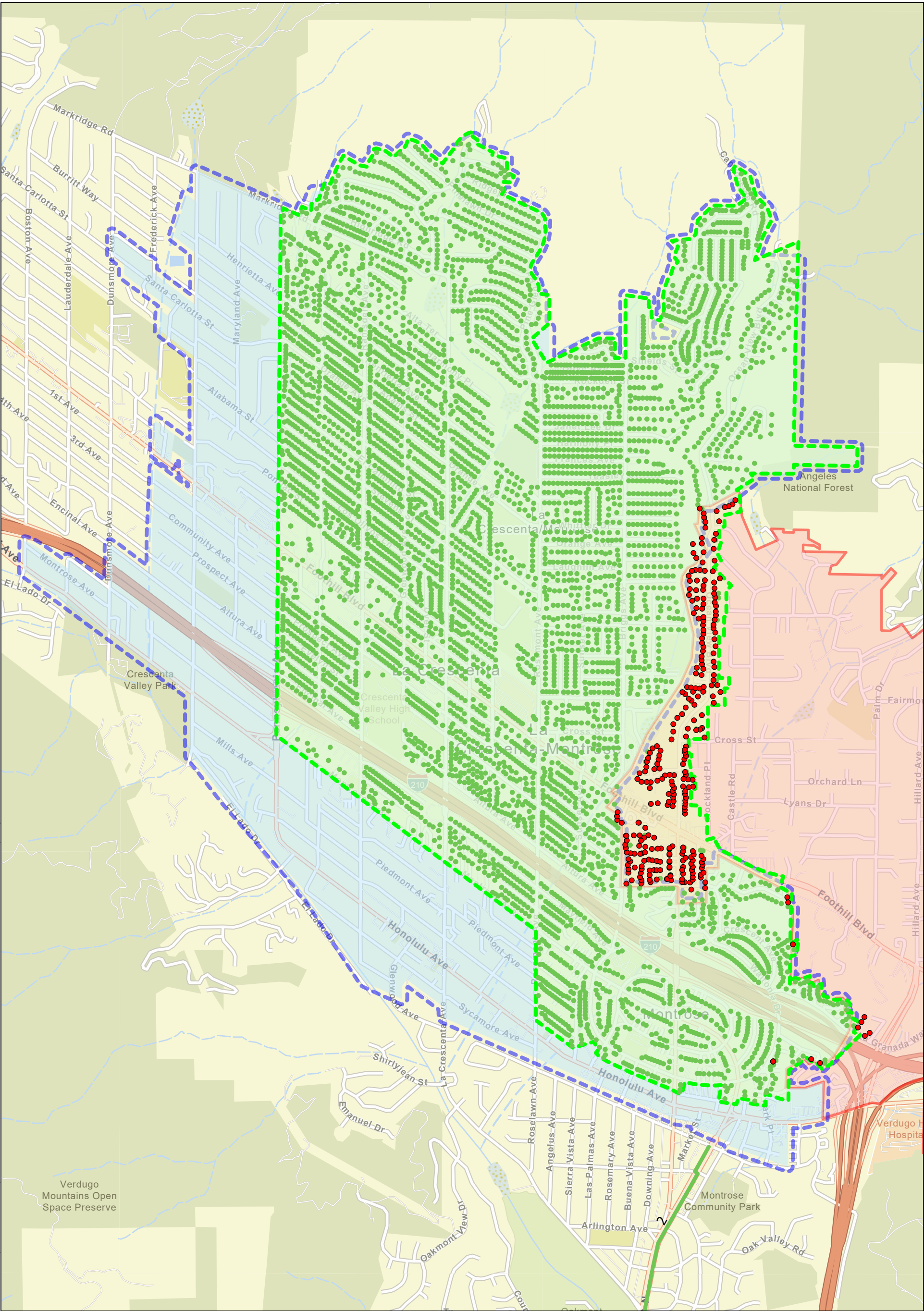
1. The "Fire" Usage Type is used to document water consumption used for firefighting and is metered through temporary flow meters.

Table 2-8: SSA 2019 -2021 Average Annual Demand

Usage Type	2019 - 2021 Average Annual Demand (GPM)	# Active Accounts (2020)
Commercial	42	126
Fire ¹	0.4	56
Institutional	8	22
Irrigation	33	49
MFR	343	497
School	36	15
SFR	1,109	5,338
Total (GPM)	1,572	
Total (MGD)	2.26	6,106

Notes:

1. The "Fire" Usage Type is used to document water consumption used for firefighting and is metered through temporary flow meters.

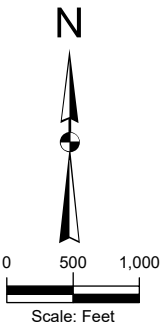


Legend

- LCID Sewer Customers
- CVWD Sewer Customer
- Sewer Service Area
- Water Service Area
- La Canada Irrigation District

Notes:

1. LCID Customers are sewer only customers



2.4 Population

The anticipated population growth within CVWD's service area is projected to increase by 8% over the next 25 years, translating to an average annual growth rate of 0.3%. **Table 2-9** provides details on the current population and the projected figures for the next quarter-century.

Table 2-9: 2020 UWMP Population – Current and Projected

Year	2020	2025	2030	2035	2040	2045
Service Population	32,462	32,974	33,494	34,022	34,558	35,103

Per the Urban Water Management Plan (UWMP) developed in 2020, the service area populations for CVWD were determined through the utilization of the DWR Population Tool ("WUE"). This tool incorporates service boundaries, US Census data, and the number of residential service connections. By leveraging past US Census data and the count of service connections, the tool calculates population by deriving persons per connection. This method enables the determination of the current service population by applying the persons per connection to the current count of service connections. Additionally, projections for the future service population can be made based on the average growth factor.

2.5 City of Los Angeles Wastewater Treatment & Disposal Agreement

CVWD does not own or operate their own wastewater treatment plant (WWTP), and therefore relies on an ongoing agreement (to be renewed in 2030) with the City of Los Angeles (City of LA) to receive and treat their wastewater. CVWD is one of the 24 Contracting Agencies that participate in the City of LA's Treatment & Disposal of Wastewater Agreement (Agreement). Almost all of CVWD's wastewater is conveyed to the Los Angeles-Glendale Water Reclamation Plant (LAGWRP). Less than 1% of CVWD's wastewater is conveyed directly to Hyperion Treatment Plant (HTP), which occurs while CVWD is backwashing their ion exchange system at their GWTP, producing a highly concentrated brine that LAGWRP is not able to receive and treat.

The City of LA charges CVWD based on the distance of CVWD's outfall to either LAGWRP or HTP (depending on where the flow is treated), as well as the quantity and strength of the sewage being treated. The final unit that the treatment fee is based on is calculated in "MGD-Miles". The equation representing the MGD-Miles calculation is as follows:

$$CVWD_{MGD-MILES} = [(DIST_{HTP}) \times (Q_{CVWD-HTP} + Q_{SLUDGE} + Q_{BRINE})] + (DIST_{LAG} \times Q_{CVWD-LAG})$$

Where:

$DIST_{HTP}$ represents the distance of CVWD's outfall to HTP, in miles;

$Q_{CVWD-HTP}$ represents the untreated wastewater flow conveyed to HTP, in MGD;

Q_{SLUDGE} represents the sludge flow generated by the treatment of CVWD flow at LAGWRP;

Q_{BRINE} represents the brine flow that bypasses LAGWRP and is conveyed directly to HTP;
 DIST_{LAG} represents the distance of CVWD's outfall to LAGWRP; and
 $Q_{\text{CVWD-LAG}}$ represents the untreated wastewater flow conveyed to LAGWRP.

A sample calculation using flow data from FY 2019 is shown below:

$$CVWD_{\text{MGD-MILES}} = [(27.3 \text{ Miles}) \times (0.39 \text{ MGD} + 0.05 \text{ MGD} + 0.01 \text{ MGD})] + (6.3 \text{ Miles} \times 1.04 \text{ MGD}) = 18.8 \text{ MGD} - \text{Miles}$$

Figure 2-10 provides a visualization of the relationship between the calculated flows.

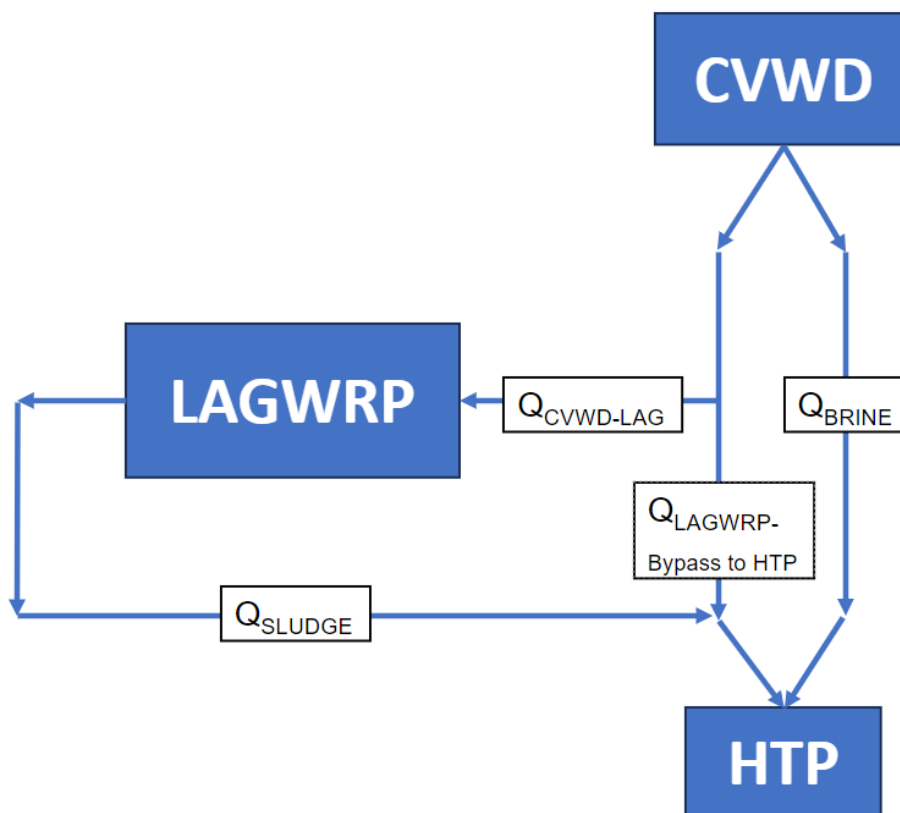


Figure 2-10: Flow Schematic of City of LA Agreement

While CVWD has no operational costs associated with a WWTP, the cost of sending wastewater to the City of LA for treatment is steadily increasing, and is outpacing CVWD's ability to offset the increasing costs by increasing customer wastewater rates. Figure 2-11

provides the total annual cost to CVWD as well as the annual unit cost, normalized by the total annual flow treated in a given year (in MG).

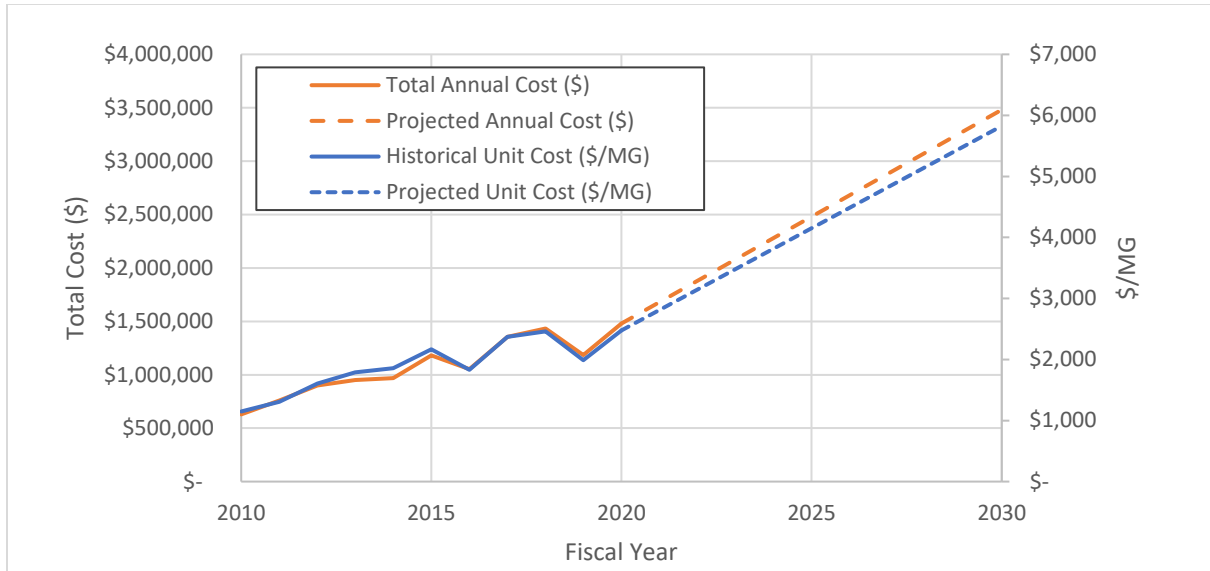


Figure 2-11: Historical and Projected Trend of City of LA Agreement Costs

From 2010 to 2020, the unit cost to treat 1 MG of flow rose on average by 8% each year. In 2020, it cost CVWD roughly \$2,500 for every 1 MG of flow sent to the City of LA. If these trends continue at the same rate of growth, the unit cost for treating 1 MG of flow in 2030 will be \$5,826. By contrast CVWD's base wastewater (WW) rate has grown by 5.4% per year on average from 2010 to 2023. Therefore, the cost of treatment is outpacing the rate at which WW rates are being adjusted. Figure 2-12 compares the rate of change for these two values. CVWD may consider performing another cost of service study using the CIP cost information included in this WWMP to ensure that CVWD has enough revenue to offset rising treatment costs.

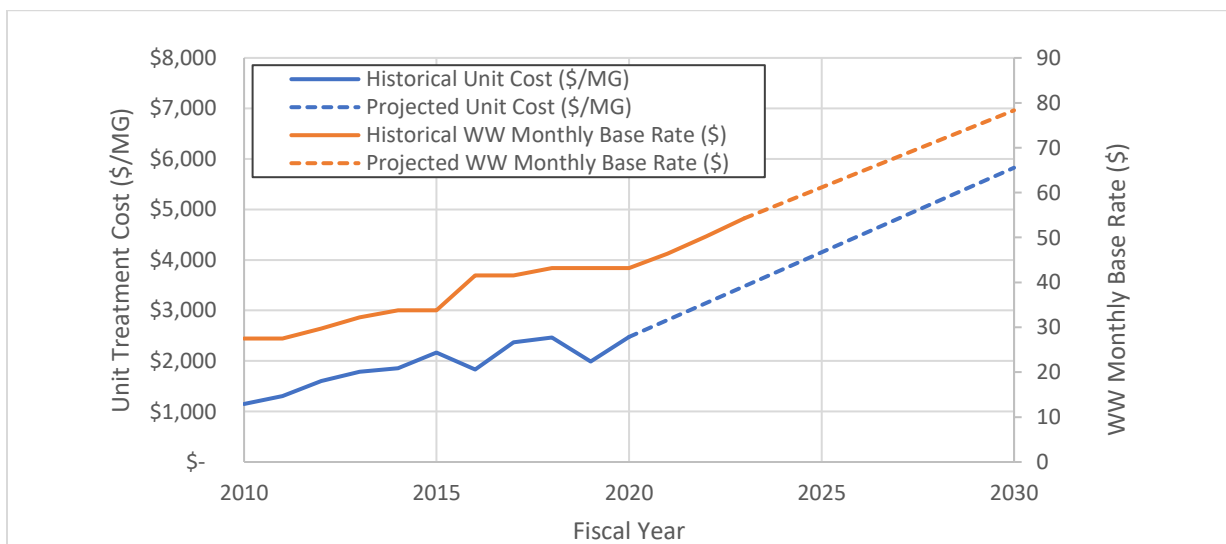


Figure 2-12: Historical and Projected Unit Treatment Costs vs WW Monthly Base Rates

Section 3: Existing and Future Sewer Flow Analysis

This section analyzes historical and existing sewer flows at both the system level and at the individual customer level, and explains what data was used to develop future sewer flow projections. This section sets the foundation for evaluating the capacity of the existing collection system under present day and future sewer flow conditions.

3.1 Historical Wastewater Flow and Strength

CVWD currently meters and measures the strength of wastewater flow at two locations in the collection system. The first location is Elk Ave, which measures the flow and strength of wastewater for the entire CVWD SSA. The second is at the Rockland PI flow meter, which meters flow from LCF. Table 3-1 provides a summary of the average flow, biological oxygen demand (BOD), and suspended solids (SS) for both meter locations from January 2010 to March 2023. BOD and SS are used to quantify the strength of the sewage when reporting to the City of LA. Typical residential wastewater has a BOD between 100 to 400 mg/L, and an SS of 100 – 400 mg/L. CVWD's wastewater falls within these normally observed ranges.

Table 3-1: Wastewater Strength and Flow

Flow Meter	Average Flow (MGD)	BOD ¹ (mg/L)	SS ² (mg/L)
Elk Ave	1.52	131	197
Rockland PI	0.106	193	194

Notes:

1. BOD = Biological Oxygen Demand
2. SS = Suspended Solids
3. Data period from Jan 2010 to Mar 2023

Figure 3-1 shows wastewater flows and strength from 2000 to March 2023. Since 2010, sewer flows have remained relatively constant on an annual average basis. Both BOD and SS fluctuate between 50 to 400 mg/L.

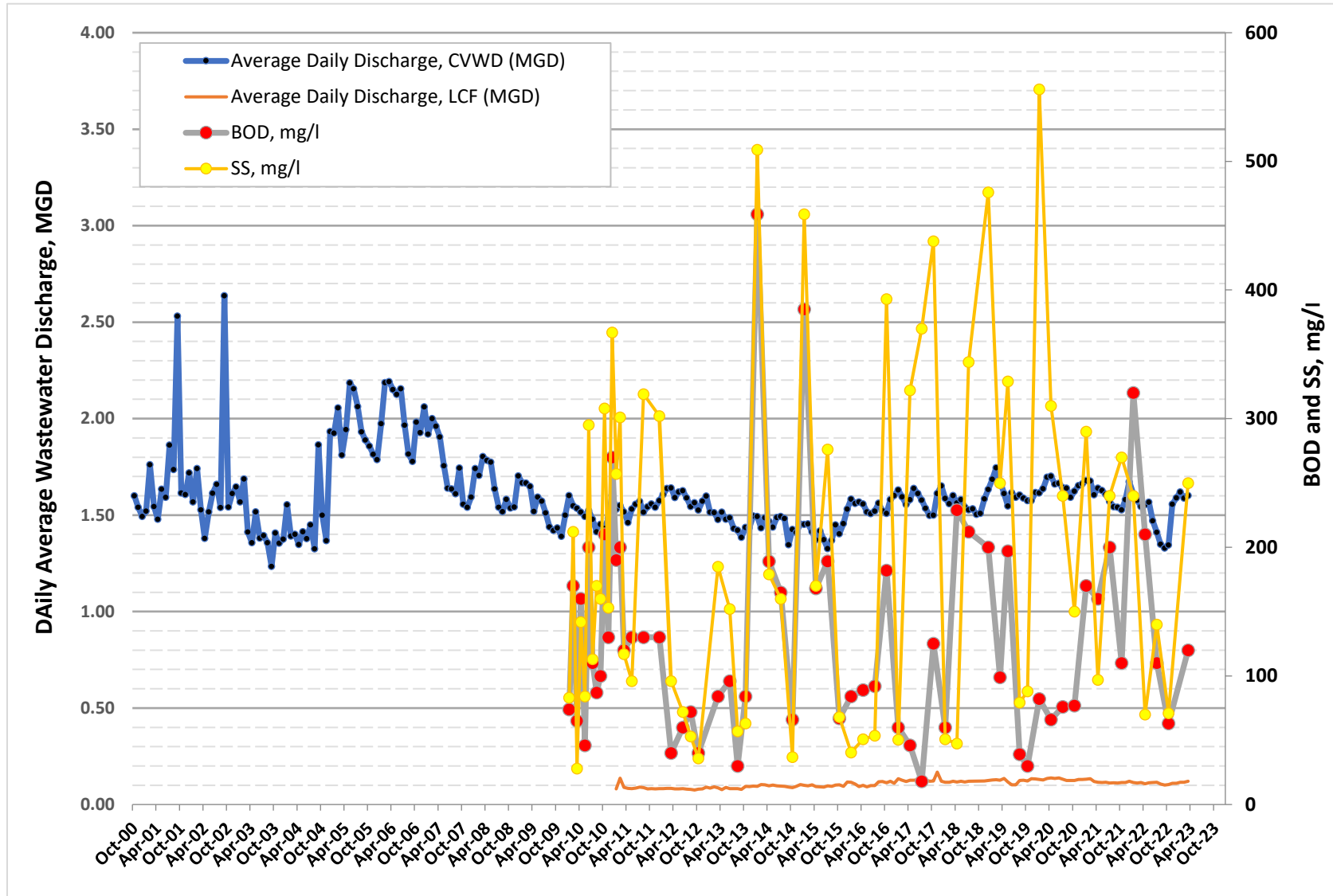


Figure 3-1: Historical SSA Wastewater Flow and Strength (Oct 2000 – Mar 2023)

3.2 Existing Customer Wastewater Demands

Sewer flows are not directly metered at each individual customer and must be estimated based on the customer's corresponding water demand. Because CVWD's WSA and SSA serve different populations, the water billing data required additional analysis to determine what portion of water customers were located within the SSA. As Section 2.3 describes, there is also a subset of LCID customers that are served by the sewer collection system but not served by CVWD's water distribution system. Figure 3-2 shows the relationship between the WSA Billed Water Demand, SSA Billed Water Demand, and SSA Sewer Demand.

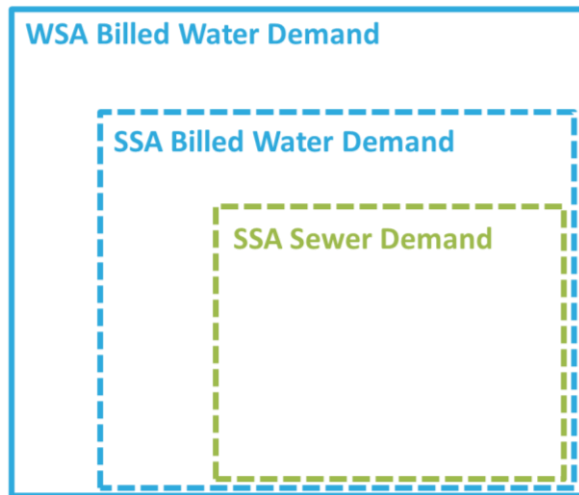


Figure 3-2: Relationship between Water and Sewer Demands

The WSA Billed Water Demand was calculated based on three years of complete water billing data from 2019 to 2021. Figure 3-3 shows the monthly billed water demand for the WSA. System demands peak in August/September and are lowest in February/March. Table 3-2 provides a summary of the WSA water billing data by year.

Table 3-2: WSA Billed Demand Summary

Year	Unique Active Meters	Annual Demand (AFY)	Average Demand (MGD)
2019	8,856	3,363	3.00
2020	8,758	3,816	3.41
2021	8,837	3,790	3.38
2019-2021 Average	-	3,656	3.26

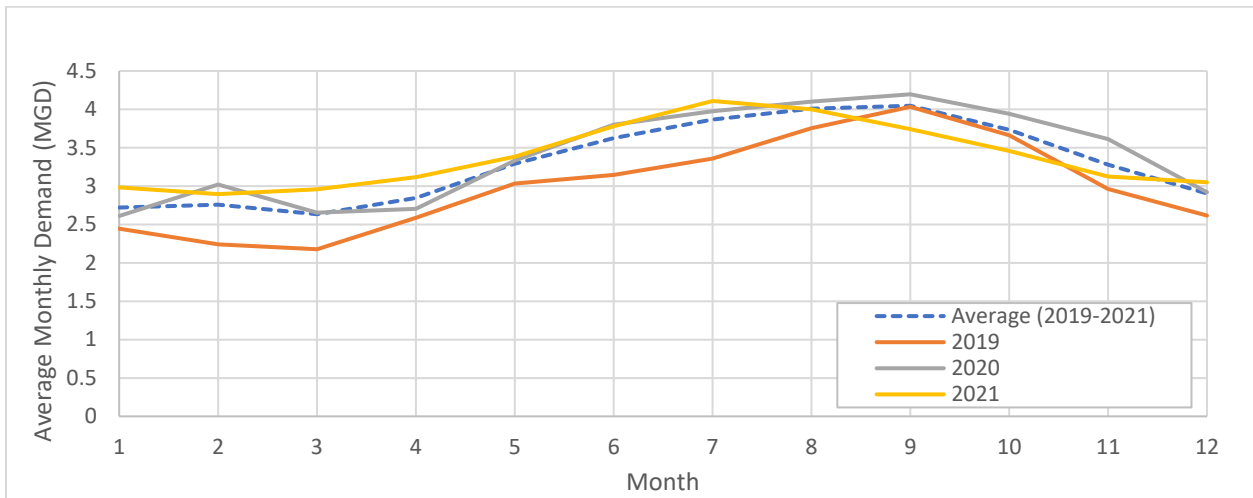


Figure 3-3: 2019-2021 Average Monthly Billed Water Demand

The next step to converting billed water demand to sewer demands is understanding what portion of the billed water demand is located inside of the SSA. As Figure 2-9 shows, the water billing customer data was geolocated based on APN/address information within GIS. By doing a spatial intersect between the SSA boundary and the water billing data, a subset of the water customers located within the SSA were identified. The total demand for these customers was calculated and is shown in Table 3-3, along with the calculated “SSA Reduction Factor” used to convert WSA billed water demand to SSA billed water demand.

Table 3-3: WSA versus SSA Water and Sewer Demands

WSA Billed Water Demand (2019-2021, AFY)	SSA Billed Water Demand (2019-2021, AFY)	SSA Reduction Factor (-)
3,656	2,533	0.693

To account for the sewer-only LCID customers, water billing data for the LCID accounts was obtained for the same time period (2019 – 2021), totaling 168 AFY of demand. The LCID sewer demands were comprised of both single family and multi-family residential accounts. Table 3-4 shows the SSA billed water demand by usage type, incorporating both CVWD water billing data and LCID sewer only customer billing data. The water billing data contained meter usage types that were used to corroborate the LA County parcel land use data. The “Fire” Usage Type is used to document water consumption used for firefighting and is metered through temporary flow meters.

Table 3-4: SSA Billed Water Demand by Usage Type

Usage Type	2019 - 2021 Average Annual Demand (GPM)	% Total Water Demand	# Accounts (2020)
Commercial	42	2.5%	126
Fire ¹	0.45	0.03%	56

Usage Type	2019 - 2021 Average Annual Demand (GPM)	% Total Water Demand	# Accounts (2020)
Institutional	8	0.5%	22
Irrigation	33	2.0%	49
MFR	355	21.2%	509
School	36	2.2%	15
SFR	1,196	71.6%	5,608
Total	1,670 (2.41 MGD)	100%	6,385

72% of the water demand in the SSA is composed of SFR customers, and 93% of the total SSA demand is composed of residential customers (SFR and MFR), indicative of the customer composition of CVWD's customers in the SSA.

3.2.1 Return Flow Ratio Calculations

Finally, to calculate the sewer demand for each customer, sewer return flow ratios were developed for each water customer usage type. The sewer return flow ratio represents what portion of the water demand being consumed by a water customer is then returned to the collection system as waste. On a systemwide basis, the return flow ratio has steadily increased over time, as the system water demands have significantly decreased while wastewater flows have remained relatively constant. Figure 3-4 documents the trend of the systemwide return flow ratio between 1996 to 2020.

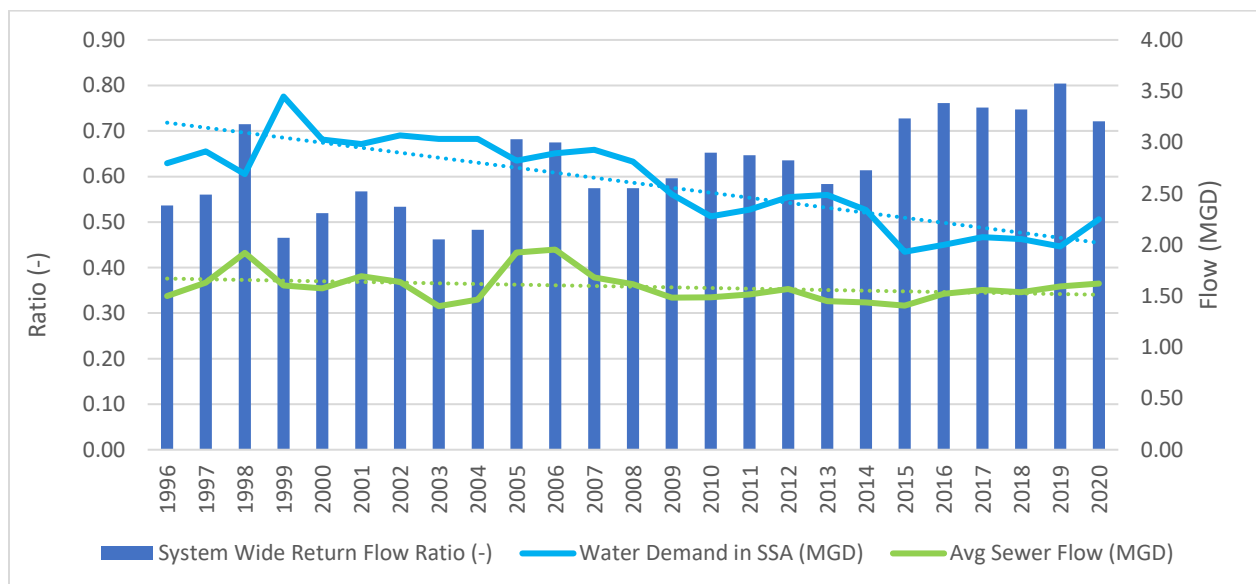


Figure 3-4: Systemwide Return Flow Ratio

The systemwide return flow ratio can be directly calculated using the flow meter data from the Elk Ave flow meter and the water billing data. However, calculating the return flow ratio for specific usage types that are not directly metered is not as straightforward. In general, customers with less green space who primarily use water indoors, such as MFR customers, will have higher return flow ratios. Customers that use water for irrigation and fire protection will have no return flow, as the water is fully consumed and does not return to the sewer collection system.

Return flow ratios can be estimated by dividing winter water demands (when outdoor usage is assumed to be minimal or zero) by the annual average demands; however, this is not an accurate method in Southern California where landscape irrigation may not follow a seasonal fluctuation as it would in other parts of the state, leading to artificially high return flow ratios. Therefore, several other Southern California WWMP efforts were surveyed to identify typical return flow ratios for the usage types in CVWD's system.

The total calculated sewer flow for the SSA needed to equal the average metered sewer flow at the Elk Ave flow meter of 1.625 MGD (2019-2021 average). Because 72% of the SSA demands are SFR customers, the SFR return flow ratio had the most impact on the total SSA sewer demand calculation. The SFR return flow ratio was iterated until the sum of all calculated SSA sewer demands equaled the measured average flow at the Elk Ave flow meter. Table 3-5 shows the chosen return flow ratios for each usage type based on other WWMP projects in the region and past project experience. Table 3-6 provides an overview of the calculation of sewer demand by usage type using the defined return flow ratios.

Table 3-5: Return Flow Ratios by Usage Type

Usage Type	Return Flow Ratio
Commercial	80%
Fire	0%
Institutional	60%
Irrigation	0%
MFR	80%
School	50%
SFR	60.6%

Table 3-6: SSA Billed Water Demand by Usage Type

Usage Type	2019 - 2021 Average Annual Water Demand in SSA (GPM)	Return Flow Ratio	2019 - 2021 Average Annual Sewer Demand in SSA (GPM)	% Total Sewer Demand
Commercial	42	80%	33	3.0%
Fire	0.45	0%	0	0.0%
Institutional	8	60%	5	0.4%
Irrigation	33	0%	0	0.0%
MFR	355	80%	284	25.1%
School	36	50%	18	1.6%
SFR	1,196	60.6%	725	64.3%
LCF Metered Flow ¹	-	-	63	5.6%
Total	1,670 (2.41 MGD)		1,128 (1.62 MGD)	100%

Notes:

1. Composition of metered LCF Flow Unknown.

Figure 3-5 shows a visual comparison of the monthly SSA water demand versus the Elk Ave metered sewer flow, as well as the calculated average SSA sewer flow of 1.62 MGD.

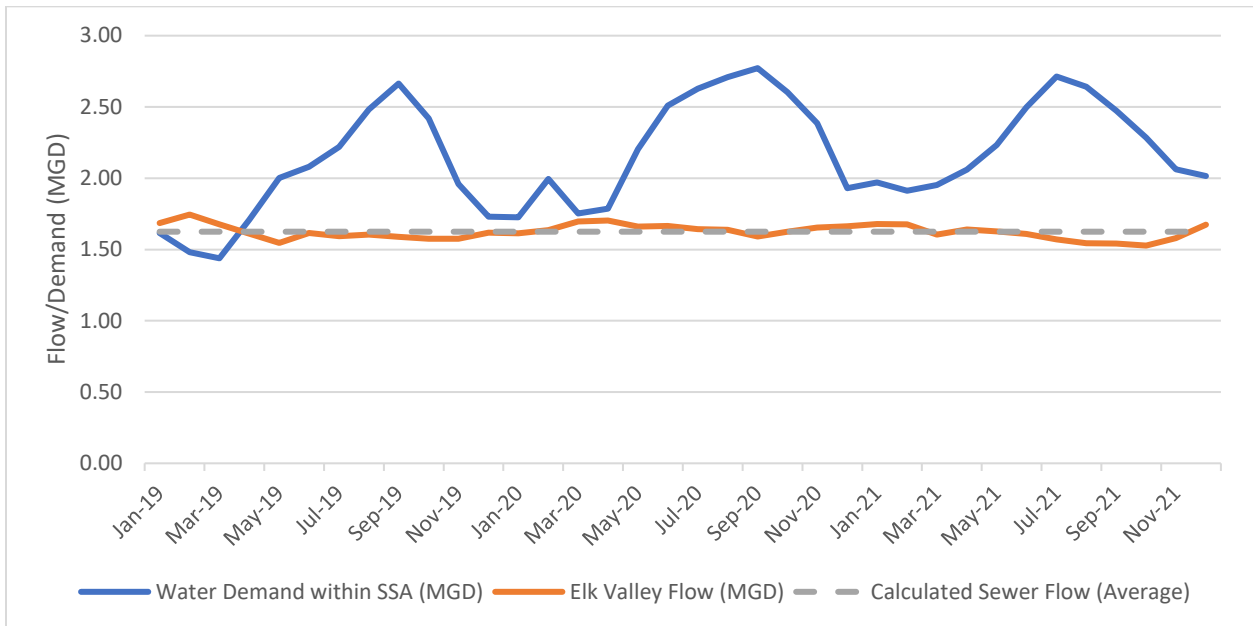


Figure 3-5: SSA Water Demand versus Metered Sewer Flow

As future flow metering efforts are completed within the different sewershed areas (see Section 6.1), it is possible to re-calculate the return flow ratio if upstream customers are all a single usage type, SFR being the most important.

3.3 Sewer Flow Projections

This section describes the various sources of data used to develop the future sewer flow projections, incorporating data from the UWMP and the 6th Cycle Housing Element.

3.3.1 UWMP Demand Projections

In order to align this WWMP with the UWMP, water demand projections from the UWMP were used as the basis for calculating the future sewer flows for CVWD's SSA. UWMP demand projections used a design demand per person of 107.7 gallons per capita per day (GPCD) based on the past five-year average and projected population growth. Per capita consumption rates are expected to remain under 107.7 GPCD and trend further below that rate as a result of ongoing water conservation efforts (SA Associates, 2021). Therefore, by holding the GPCD constant through 2045 for the sewer flow projections, the projections are considered to be conservative. Sewer flow projections should be revisited after the next UWMP cycle to refine the sewer flow projections.

Table 3-7 shows the UWMP demand projections alongside the calculated sewer flow projections. Figure 3-6 provides a visual representation of the projected water and sewer flows. The projected sewer flows utilize the WSA to SSA reduction factor as well as the return flow

ratios developed in Section 3.1, as the UWMP breaks down the projected water demands by usage category.

Table 3-7: 2020 UWMP Demand Projections and Sewer Flow Projections

Year	Population	Per Capita Water Demand (GPCD)	Projected Water Demands (MGD) ¹	Project Water Demands in SSA (MGD) ²	Projected Sewer Flows (MGD) ³
2020	32,462	115.9	3.76	2.49	1.62
2025	32,974	107.7	3.55	2.35	1.45
2030	33,494	107.7	3.61	2.38	1.47
2035	34,022	107.7	3.66	2.42	1.49
2040	34,558	107.7	3.72	2.46	1.52
2045	35,103	107.7	3.78	2.50	1.54

Notes:

1. 2020 Water Demand based on actual total billing data for the year 2020. The 5-year average system demand from 2015-2020 was 3.45 MGD. Because demand projections use the 5-year average as the starting point, the UWMP shows a dip in projected demands between 2020 and 2025 before continuing to climb to 2045.
2. The WSA to SSA reduction factor of 0.6606 was used to convert projected WSA water demands SSA water demands. See Section 3.1 for more details.
3. See Section 3.2.1 for return flow ratios used.

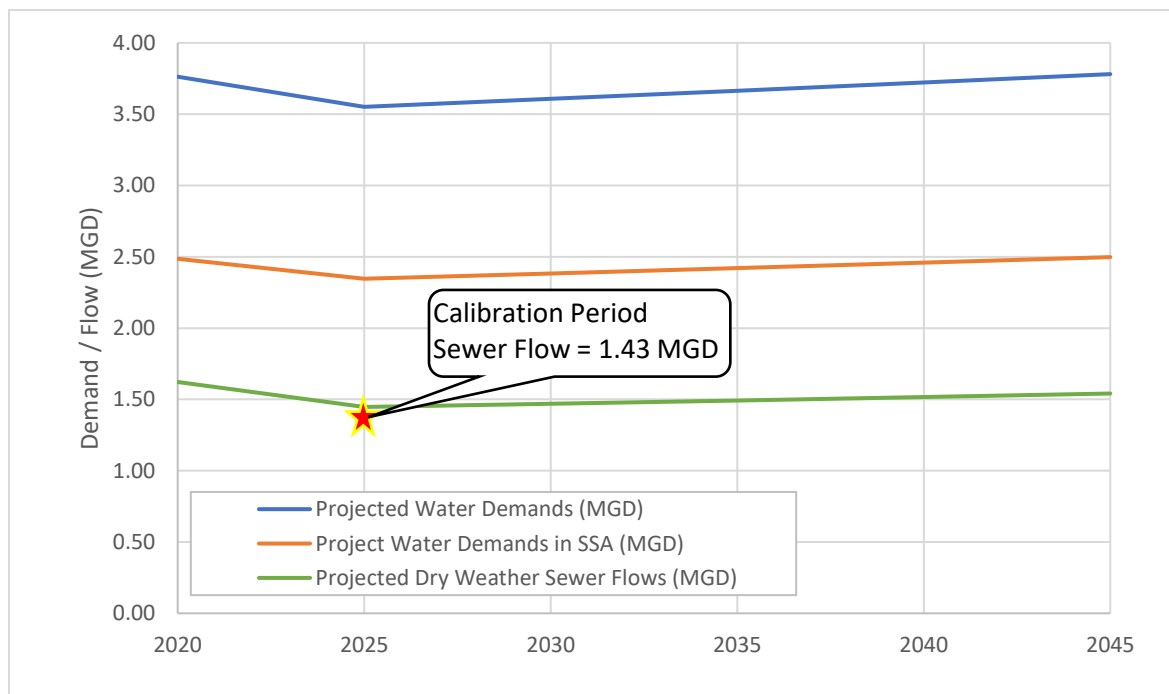


Figure 3-6: UWMP Demand Projections and Projected Sewer Flows

For reference, the average dry weather sewer flow recorded at Elk Ave flow meter was 1.43 MGD in January of 2023. See Section 4.2.3.2 for additional information.

3.3.2 Future Sewer Flow Distribution

As discussed in Section 2.2.1, LA County has identified specific parcels within CVWD's SSA that are candidates for densification and/or rezoning. While the UWMP only projects future water demands at a service area level, LA County's Housing Element provides a method for identifying where the additional projected sewer flows may occur within the SSA. The distribution of future sewer flows is important in order to understand the potential impacts to CVWD's collection system capacity. Figure 2-8 shows the locations of the identified Housing Element parcels, and Appendix A includes specific information on identified parcels. The Housing Element not only identifies the locations of the parcels but also calculates the anticipated additional population that would be supported by the densification and newly developed housing units. With an estimated population, the UWMP target GPCD of 107.7 can be applied to calculate the approximate additional water demand within CVWD's SSA. Furthermore, the usage type for the target parcels will be MFR based on the goals of the Housing Element to densify and develop more affordable housing. Therefore, the return flow ratio for MFR customers of 80% can be used to calculate the corresponding sewer flows associated with the Housing Element parcels. Table 3-8 summarizes the calculation of the total projected additional sewer demand that will occur within the SSA.

Table 3-8: LAC 2021-2029 Potential Growth

Parameter	Value	Units
Potential Rezoned Parcels	8	parcels
Rezoning total capacity	1,046	persons
Potential Sites Inventory (already properly zoned)	17	parcels
Sites Inventory capacity	452	persons
Total Anticipated Sites Inventory Population	1,498	persons
UWMP Target GPCD	107.7	gpcd
Total Water Demand based on target UWMP GPCD	161,335	gpd
Total Water Demand in SSA based on target UWMP GPCD	112.0	GPM
MFR Return Flow Ratio	80%	-
Projected Sewer Demand	129,068	gpd
Projected Sewer Demand	90	GPM

The total additional projected sewer demand is 90 GPM. Using the UWMP projections, the anticipated increase in sewer flows from 2025 to 2045 is only 0.09 MGD or 62.5 GPM. However, as the UWMP states, the ongoing water conservation efforts will likely result in further decreases in water consumption. Therefore, the difference between the projected 90 GPM based on the Housing Element and the 62.5 GPM projected by the UWMP can be contributed to future conservation efforts. Section 4.1.2.2 explains how this was accounted for in the hydraulic model.

Section 4: Sewer System Model Development

A key element of understanding the capacity of CVWD's collection system under existing and future sewer flows involved the development of the collection system hydraulic model. Innovyze's InfoSWMM software was used to develop the hydraulic model. The development of the hydraulic model involved several steps including importing CVWD's existing GIS sewer geodatabase, reviewing model connectivity, calculating/assigning existing and future flows to the model, and calibrating the model using flow meter data. This section provides an overview of the hydraulic model development, calibration and validation process, in addition to the comprehensive capacity analysis and modeling results.

4.1 Hydraulic Model Development

The wastewater collection system model was developed in Innovyze InfoSWMM Version 15.0. The hydraulic model horizontal datum is based on the California Zone 5 State Plane Coordinate System (NAD83). The model uses Manning's equation to calculate friction losses throughout the system with a Manning's roughness coefficient of 0.013.

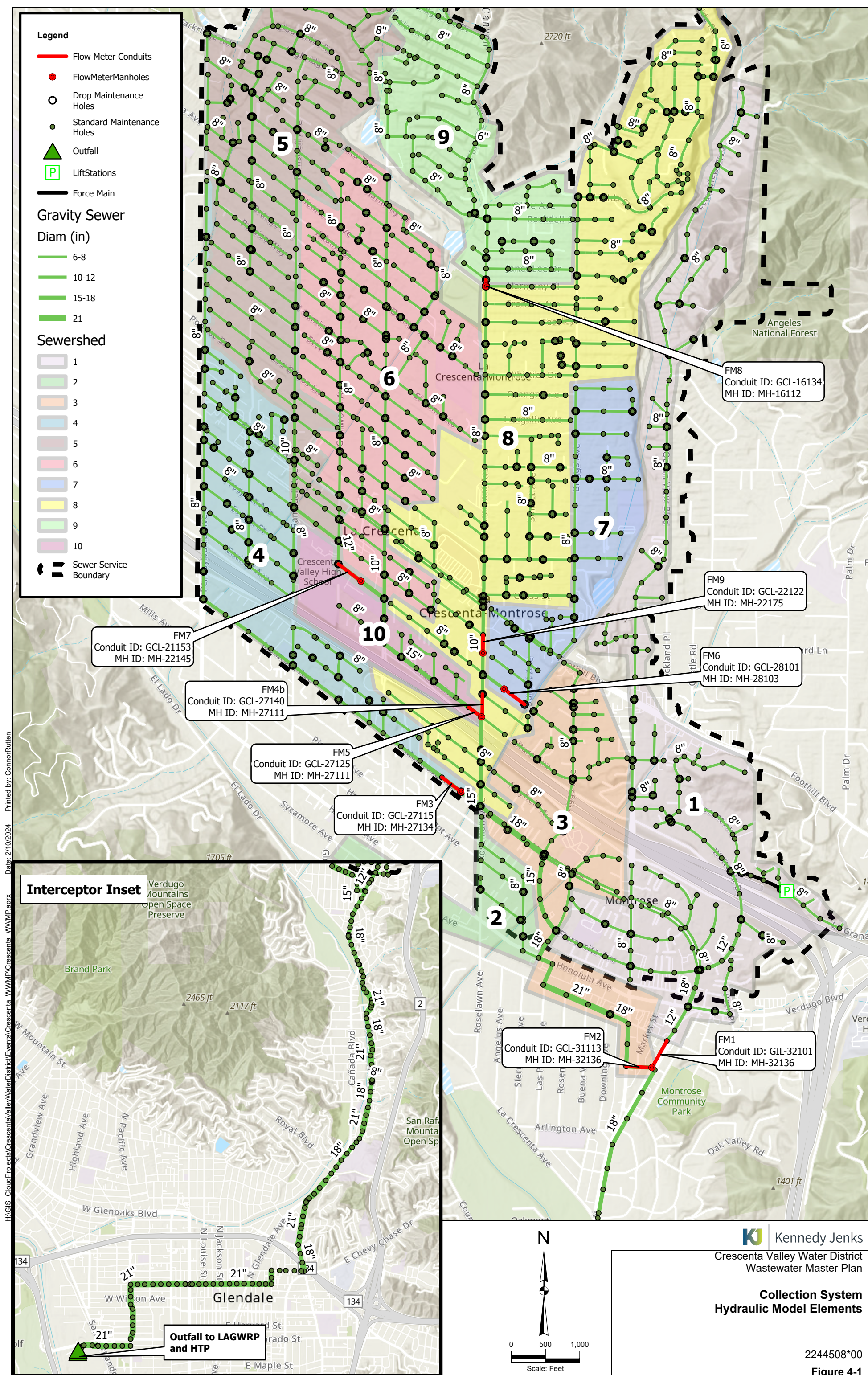
The modeled network includes all active gravity sewer pipes 8 inches or larger, maintenance holes, and the La Granada Lift Station and force main. The model also captures the cleanouts and fittings included in CVWD's GIS sewer geodatabase.

4.1.1 Model Approach and Update

The hydraulic model was constructed based on the data included in CVWD's GIS sewer geodatabase along with CVWD's sewer record drawings. The following approach was taken where information, such as diameters and inverts, were not available for conduits:

- When inverts were missing in intermediate gravity sections where upstream and downstream information was known, the inverts were interpolated using the known inverts as well as the length of the conduit with missing invert information.
- When only downstream inverts were available, the upstream inverts were calculated using the known downstream invert, the length of the conduit, and an assumed constant slope.
- When connectivity information was completely missing, appropriate assumptions were made based on engineering judgement and consultation with CVWD staff to build the network.
- For maintenance holes for which information was unknown, a rim elevation was taken from Google Earth and verified using the latest topographic data available from United States Geological Survey (USGS).

Figure 4-1 shows the collection system hydraulic model elements, sewershed boundaries, and the locations of the flow meters described in Section 4.1.3.



4.1.2 Sewer Demand Allocation

This section explains the methods used to allocate both the existing and future sewer demands to the hydraulic model.

4.1.2.1 Existing Sewer Demand Allocation

As Section 3.1 states, the water billing data was geolocated within GIS based on parcel number and address information. After calculating the average annual sewer demand for each customer, a tabular join was performed between the tabulated sewer demands and the geolocated customers. InfoSWMM's demand allocation manager was then used to load the hydraulic model with the calculated sewer demands, using the "nearest pipe" allocation method as shown in Figure 4-2. The sewer demand is attributed to the next downstream maintenance hole.



Figure 4-2: Model Demand Allocation Method

4.1.2.2 Future Sewer Demand Allocation

Section 3.3 explains the anticipated increase in sewer demands as well as the anticipated reduction in sewer flows due to ongoing water conservation efforts. The future sewer demands of 90 GPM that is associated with the Housing Element parcels were first allocated in the

hydraulic model using the same allocation method mentioned above. Locations of these parcels is shown in Figure 2-8.

Since the projected Housing Element sewer demands are higher than the overall anticipated demand increase documented in the UWMP, the existing sewer demands were uniformly reduced by 87% global multiplier until the total SSA ADWF was equal to the projected 2045 sewer flow of 1.54 MGD. This global reduction represents the increase in water consumption efforts over the next 20 years.

4.1.3 Flow Meter Data Collection

CVWD worked with the on-call flow metering contractor, ADS, to compile a list of suggested locations for the installation of temporary flow meters. After considering available resources, site constraints, and field/traffic conditions, temporary flow meters were subsequently installed at the locations described below. Table 4-1 lists the meter names with their corresponding Conduit ID and Operational Period. Figure 4-1 provides the flow meter locations and their corresponding sewersheds.

The sewer system study, initially set for a 90-day period from December 1 to March 1, was extended due to persistent flow imbalances at site FM04. Efforts to address the issue included installing three additional locations, including FM04a upstream of FM04. Despite these measured, the flow imbalance problem persisted. Continuing attempts to address the issue, CVWD added an installation at site FM09, six maintenance holes further upstream of FM04, with reasonable flow balance.

ADS extended the study's end period by 14 days due to lack of reliable data. Subsequently, CVWD amended the agreement, relocating FM09 to a new location referred to as FM04b, capturing the northern flow in the same maintenance hole as FM05. This relocation occurred during the courtesy extended period.

The monitoring periods for these locations are as follows:

- FM04a: January 18, 2023 – March 15, 2023
- FM04b: March 3, 2023 – March 15, 2023
- FM09: February 8, 2023 – March 3, 2023 (relocated to FM04b at CVWD's request)

Further investigation revealed that the flow readings at sites FM04 and FM04A were likely erroneous due to the configuration of the maintenance hole the meters were installed in. In both cases, the maintenance holes were drop maintenance holes, with a secondary opening towards the top of the maintenance hole that allowed some flow during wet weather events to bypass the meter entirely. Therefore, the data collected by these flow meters was not used for calibration.

In the sewer system overview, the system was divided into 10 sewersheds, each assigned a flow meter. The calibration period for all meters ran from December 1st to March 15th, excluding FM04B and FM09. FM09 operated until 3/3/23, replaced by FM04b, which remained active until 3/15/23; both of which are situated within sewer shed 8. Since no data was available for FM04B calibration period, it was not used for calibration.

FM03 had significant flow and depth changes which occurred after the ADS crew relocated the sensor from the pipe inlet to the pipe outlet on February 7th. Based on discussions with ADS staff, data from February 7th onward was considered more reliable and was used for calibration.

Appendix C contains the flow metering report developed by ADS which provides greater detail regarding the flow meter data and flow meter locations.

Table 4-1: List of Flow Meters

Meter Name	Upstream Meters	Sewershed Number	Modelled Conduit ID	Location (Street name)	Operational Period
FM01	None	1	MHS-32101	3501 N Verdugo Rd, Glendale, CA 91208	12/01/2022 to 03/15/2023
FM02	FM03, FM04b, FM05	3+2	MHS-32101	3501 N Verdugo Rd, Glendale, CA 91208	12/01/2022 to 03/15/2023
FM03	None	4	MHD-27109	2623 Montrose Ave, Montrose, CA 91020	02/07/2022 to 03/15/2023
FM04	None	-	N/A	2600 Mayfield Ave, La Crescenta-Montrose, CA 91214	12/01/2022 to 03/15/2023
FM04a	None	-	N/A	4211 Rosemont Ave, La Crescenta-Montrose, CA 91214	12/01/2022 to 03/15/2023
FM04b	FM06, FM09	8	MHS-27115	2601 Altura Ave, La Crescenta-Montrose, CA 91214	03/03/2023 to 03/15/2023
FM05	FM07	10+6	MHS-27115	2601 Altura Ave, La Crescenta-Montrose, CA 91214	12/01/2022 to 03/15/2023
FM06	None	7	MHS-28117	2533 Prospect Ave, Montrose, CA 91020	12/01/2022 to 03/15/2023
FM07	None	5	MHS-22154	2831 Prospect Ave, La Crescenta-Montrose, CA 91214	12/01/2022 to 03/15/2023
FM08	FM08	9	MHD-16134	Rosemont Ave & Harmony Pl La Crescenta-Montrose, CA 91214	12/01/2022 to 03/15/2023
FM09	None	8	MHS-22131	4428 Rosemont Ave, Montrose, CA 91020	02/08/2023 to 03/03/2023

Notes:

1. Flow meters FM04 and FM04a highlighted in red were not used for the model calibration.

4.2 Hydraulic Model Calibration

Model calibration is an iterative process involving the adjustment of model parameters until the predicted outcomes closely align with the data recorded by flow meters. When the simulated hydrographs generated by the model closely match the historical measured conditions in the collection system, the model is considered calibrated, indicating that it is an accurate representation of the real collection system. The model is calibrated and then validated using two independent sets of historical data to ensure that the calibrated model is robust and is not just calibrated for one specific subset of data. This ensures that the model can be used for predicting multiple outcomes when provided different historical precipitation events and/or demand patterns. Additional demands can then be added on top of the calibrated model to reliably predicting the impacts of future sewer flow conditions.

Calibration was carried out for the 8 temporary flow meter locations in addition to the Elk Ave permanent flow meter. The calibration adjustments made during this process are tailored to address specific conditions, focusing on both dry weather flow (DWF) and wet weather flow (WWF) conditions. Adjustments for DWF ensure the model accurately reflects the system's behavior under average and low-flow conditions. Simultaneously, adjustments for WWF are implemented to capture the system's response during periods of increased flow, such as during rainfall events. By fine-tuning the model through calibration, it becomes a more dependable tool for predicting the consequences of various scenarios in the future.

4.2.1 Calibration Criteria

When evaluating calibration results, it is important to establish the level of acceptable tolerance between actual and measured data. Best practice model calibration criteria, obtained from the Wastewater Planning Users Group's (WaPUG) Code of Practice for Hydraulic Modelling of Sewers, were adopted for this calibration.

For dry weather flow the criteria was applied to one dry weather period lasting for seven consecutive days. In addition, a meter was called calibrated if the observed and model-predicted hydrographs meet the recommended criteria listed below for at least 80% of the qualified events observed during the flow monitoring program:

- The timing of the peaks and troughs should be within 1 hour.
- The peak flow rate should be in the range -10%.
- The volume of flow should be in the range of -10%. Care should be taken to exclude periods of missing or inaccurate data.

For wet weather events, a meter was called calibrated and validated if the observed and model-predicted hydrographs meet the recommended criteria listed below for at least 60% of the qualified events observed during the flow monitoring program.

- The timing of the peaks and troughs should be similar having regard to the duration of the event.

- The peak flow rates at each significant peak should be in the range + 25%, - 15% and should be generally similar throughout the event.
- The volume of flow should be in the range +20% to -10%. Care should be taken to exclude periods of missing or inaccurate data.

The above criteria are intended to guide the calibration process. There were instances where calibration couldn't meet the specified standards. Reasons for this included unusual conditions in the system, or meter malfunctions. In such cases where the criteria were not met, a thorough and reasonable explanation was provided. It is noted that achieving the above criteria is the goal of the calibration process and that good engineering judgement is also used to assess the overall quality of a calibration.

4.2.2 Rainfall Data Analysis

A total of 13 rainfall events had occurred during the monitoring period. A review of the meter data was performed to select appropriate storms for calibration purposes. The storm selected for calibration on 1/9/2023 is equivalent to 2-Yr, 24-hour design storm (as per NOAA Atlas 14 shown in Appendix C), the storm selected for validation on 2/24/2023 is equivalent to 25-Yr, 24-hour design storm (as per NOAA Atlas 14). Table 4-2 lists the rainfall statistics (event start/end times, duration) for rainfalls of at least 0.25 inches.

Table 4-2: Rainfall Event Summary

Number	Start Time	End Time	Duration (h)	Total Rainfall (in)
1	12/11/2022 0:00	12/11/2022 9:00	10	2.93
2	12/27/2022 14:00	12/27/2022 23:00	10	0.41
3	12/31/2022 0:00	1/1/2023 01:00	26	1.96
4	1/4/2023 10:00	1/4/2023 23:00	14	0.78
5	1/5/2023 01:00	1/5/2023 11:00	11	1.88
6	1/9/2023 03:00	1/10/2023 11:00	33	4.29
7	1/14/2023 09:00	1/14/2023 20:00	14	1.47
8	1/15/2023 16:00	1/16/2023 8:00	17	0.86
9	2/24/2023 0:00	2/25/2023 15:00	39	8.49
10	2/27/2023 9:00	2/28/2023 2:00	18	0.63
11	3/1/2023 0:00	3/1/2023 5:00	6	0.81
12	3/10/2023 3:00	3/10/2023 17:00	15	0.93
13	3/14/2023 9:00	3/15/2023 5:00	19	2.04

Notes:

1. Rainfall events highlighted in red were selected for the calibration and validation periods.

4.2.3 Dry Weather Flow Calibration

The initial step in determining the DWF component of the flow data involved identifying dry days and wet days. By examining the rainfall data graph, the DWF period was selected starting from

1/23/2023 to 1/29/2023 for all meters except for FM03 & FM09, therefore these meters were calibrated from 2/17/2023 to 2/22/2023. FM04b had no data available for that period so was not used for calibration and FM09 was used instead since they are both located within sewershed 8.

The DWF calibration began with the upstream meters and proceeded downstream. The DWF calibration was performed to achieve reasonable volume, flow pattern and depth comparisons with metered responses. Based on the flow meter data provided by ADS there were no signs of groundwater infiltration flows.

In summary, the model calibration process for dry weather periods is a systematic iteration carried out for each flow meter site, involving four key steps:

1. Run the model using initial diurnal flow patterns created from meter data.
2. Compare the simulated flow model results (model hydrographs) with the field-measured flow meter data (meter hydrographs).
3. Evaluate differences and investigate potential reasons for significant mismatches between model predictions and meter data.
4. Based on Step 3, adjust relevant parameters, rerun the model, and repeat Steps 2 through 4 until the model results closely align with the flow meter data.

4.2.3.1 Dry Weather Flow Diurnal Pattern

After the seven-day dry weather flow data was selected from January 1/23/2023 to 1/29/2023, a distinct difference in flow patterns was identified for many of the flow meters between Saturday and Sunday flow data and Mondays through Friday flow data. Therefore, an average weekday and weekend dry weather flow hydrograph was calculated.

The flow meter data received from ADS was utilized to generate flow patterns for each meter. These patterns were then divided by the corresponding Average Daily Dry-Weather Flow (ADDF) values, resulting in weekday and weekend diurnal pattern for each flow meter. These diurnal patterns are a series of 24 hourly unitless multipliers used to capture the variation in sewer flows that occurs throughout the day as a result of upstream customer water usage habits. The weekday diurnal patterns typically had two peaks, one between 7 and 8 AM, and one between 7 to 8 PM. The weekend diurnal pattern had more consistent usage throughout the day with a single peak near 10 AM.

These diurnal patterns were assigned to each node location based on the corresponding sewershed they were located in and adjusted as necessary during the calibration process to achieve better alignment with the metered flow. An example of dry-weather diurnal patterns generated from flow meter FM05 are represented in Figure 4-3. The blue curve is the weekday pattern, and the green curve is the weekend pattern.

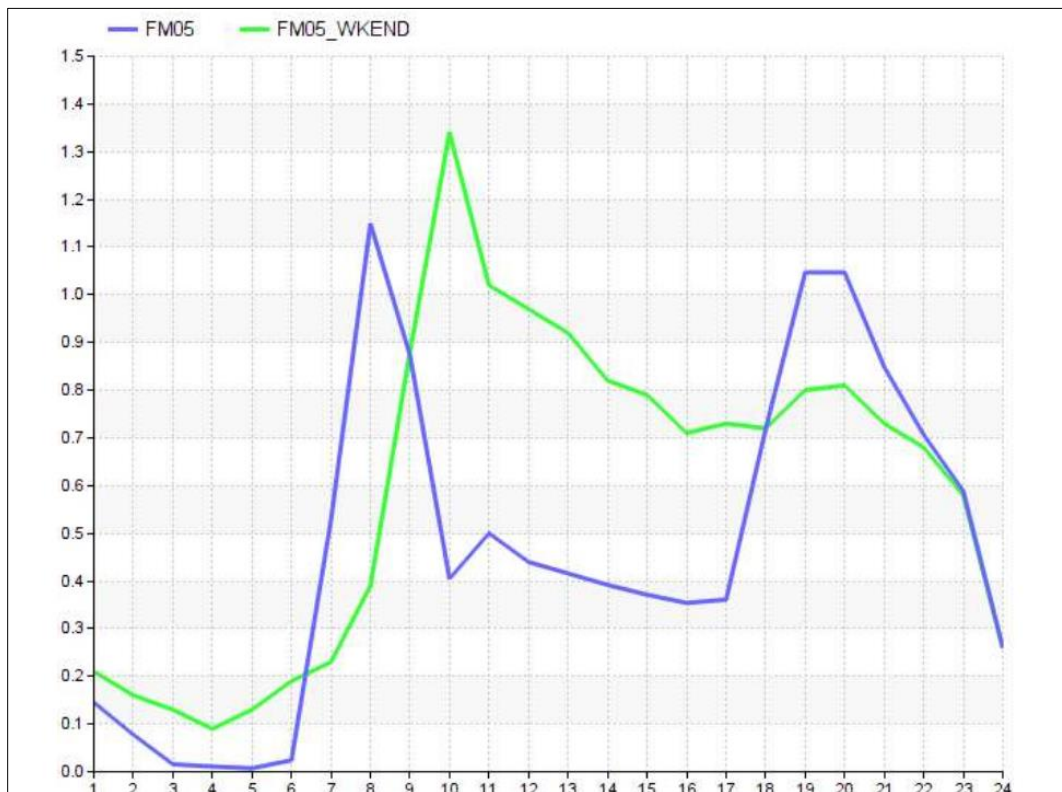


Figure 4-3: Sample DWF Diurnal Patterns

4.2.3.2 Dry Weather Flow Calibration Results

Dry weather flows predicted by the model were compared with field measured flow data for the 8 flow meters in addition to the Elk Ave permanent flow meter. The model results generally matched well with the measured data with respect to overall volume and peak flow.

FM06 experienced some outlier as mentioned later in Section 4.2.3.3. Therefore, the observed peak flow was recorded at the same time of peak flow recorded by all other meters during dry weather. FM03 & FM09 had no data available for January, instead period 2/17/2023 to 2/21/2023 was used for calibration for these meters.

Table 4-3 presents the summary of the results of the dry weather flow calibration. An example of the DWF Calibration results for the Elk Ave Station which is located at the most downstream end of the system at the interceptor is illustrated in Figure 1-1Figure 4-4 below.

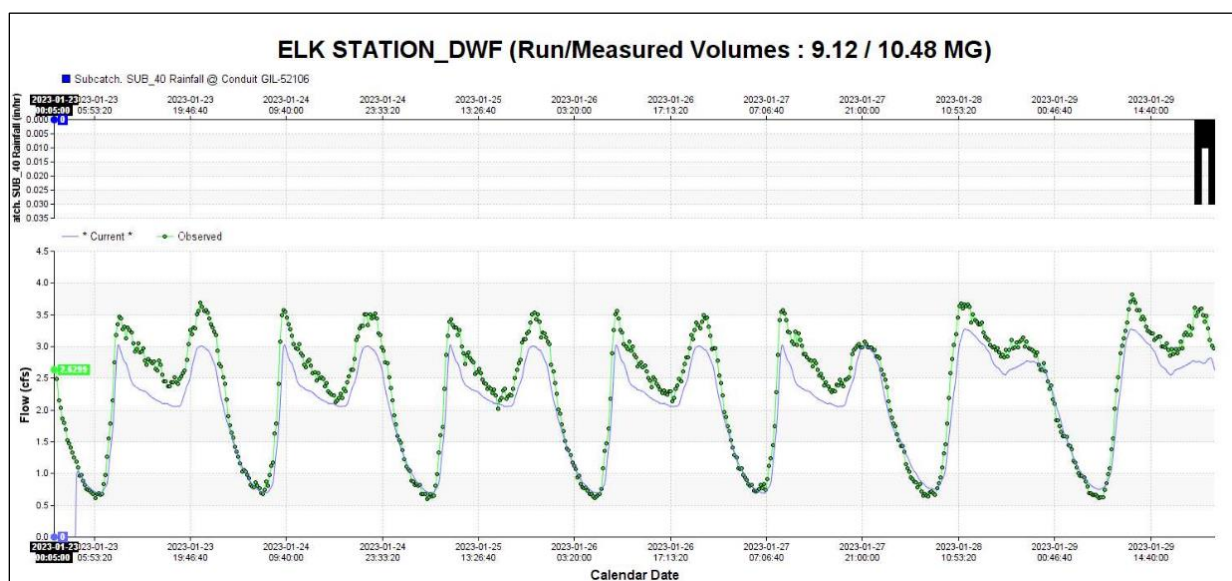


Figure 4-4: DWF Results for Elk Ave Flow Meter

Table 4-3: Dry Weather Flow Calibration Results (1/23/23 to 1/29/23)

Meter Name	Model Peak Flow (CFS)	Observed Peak Flow (CFS)	Peak Flow %Error	Model Run Volume (MG)	Observed Volume (MG)	Volume %Error
FM01	1.10	1.05	5%	3.11	3.09	1%
FM02	1.97	2.16	-9%	6.10	5.7	7%
FM03*	0.43	0.43	0%	1.34	1.32	2%
FM05	0.90	0.93	-3%	1.85	1.91	-3%
FM06	0.30	0.32	-6%	0.71	0.7	1%
FM07	0.46	0.51	-10%	1.24	1.24	0%
FM08	0.27	0.27	0%	0.73	0.71	3%
FM09*	0.56	0.54	4%	1.06	1.04	2%
ELK AVE	3.30	3.80	-13%	9.12	10.48	-13%
Summary of Number of Events that Meet Calibration Criteria (>= 80%)			89%	Summary of Number of Events that Meet Calibration Criteria (>= 80%)		

Overall, the model calibration results for the peak flow and volume for dry weather flow conditions aligned with the criteria outlined in Section 4.2.1. Peak flow criteria were met at 8 out of 9 sites, and event volume criteria were also met at 8 out of 9 sites, satisfying the 80% threshold based on qualified events observed during the flow monitoring period. The following describes the results for sites where the peak and volume criteria were not met:

- At Elk Ave Station, the model underpredicted both peak flow and the modelled event volume by 13%. Although this value exceeded the criteria, a review of the calibration curves identified a reasonable match between measured and modelled values. As a result, this calibration is considered acceptable.

In summary, both the modelled event volume & peak flow criteria's have been met for DWF calibration results. For a detailed visual representation of the calibration outcomes for each flow meter, refer to Appendix C, which contains meter-versus-model DWF plots.

4.2.3.3 Dry Weather Unreliable Data

During calibration, some meters had some outliers, where the measured data resulted in a high percentage difference of the peak flow. Therefore, volume was considered the most important characteristic to match. An example represented in Figure 4-5 of meter FM06 having a high percentage error due to outliers in the measured data.

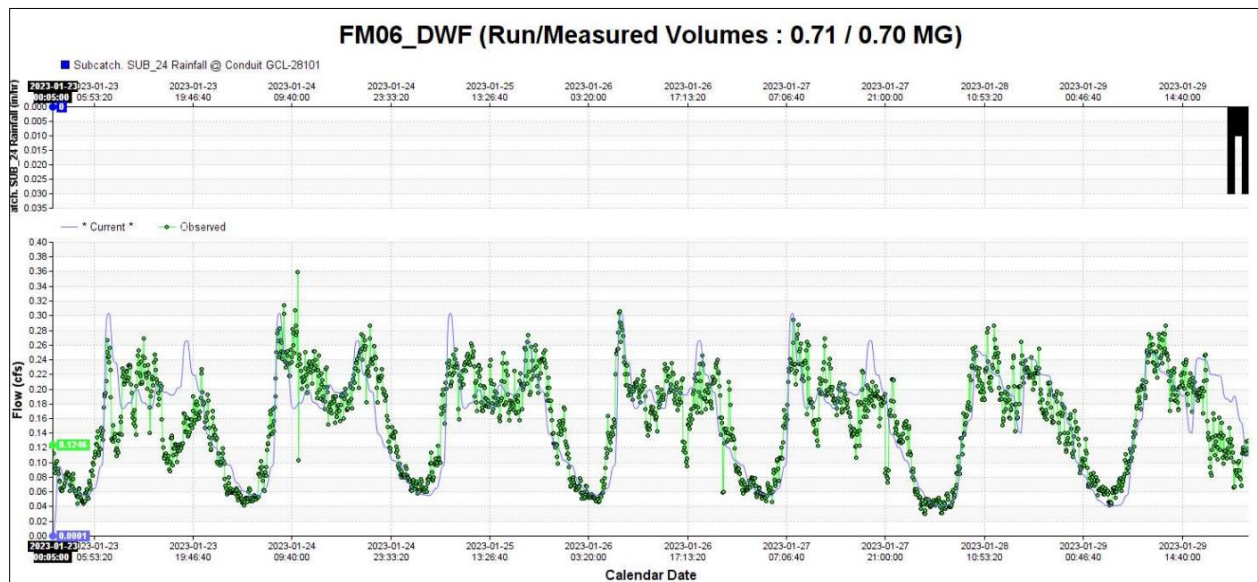


Figure 4-5: Outlier Results for Meter FM06

4.2.4 Wet Weather Flow Calibration

The calibrated dry weather model serves as the foundation for the wet weather calibration process. While the concept is similar to dry weather calibration, the objective here is to have a model that accurately represents the system's response to various rainfall events which was determined based on the highest depth of rainfall and the longest duration of rainfall. The selected rainfall event used for calibration was on 1/9/2023 which had a total rainfall depth of 4.29 inch with a peak intensity of 0.56 in/hr.

InfoSWMM employs the RTK unit hydrograph method to estimate Rainfall-Derived Infiltration and Inflow (RDII) flow into a sewer system. This method includes three hydrographs for short-term, intermediate-term, and long-term responses. Each hydrograph is defined by three parameters:

1. **R (Rainfall Fraction):** Represents the fraction of rainfall volume that enters the sewer system.

2. **T (Time to Peak):** Represents the time from the onset of rainfall to the peak of the Unit Hydrograph in hours.
3. **K (Recession Ratio):** Represents the ratio of time to recession of the Unit Hydrograph to the time to peak.

The RTK parameters measure short-term, medium-term, and long-term sewer flow responses to wet weather events. The calibration process involves adjusting these parameters for each sewershed (area upstream of the flow monitoring station) using a genetic algorithm. Iterating these parameters refines the model until the predicted RDII closely matches the measured RDII. The accuracy of RDII calibration improves with the inclusion of significant wet weather events during the flow monitoring period.

4.2.4.1 Wet Weather Calibration Results

For most of the sites, data was available for the wet weather calibration period except for FM03 & FM09. These meters were closely calibrated during the validation period. FM06 & FM08 experienced some outlier as mentioned later in Section 4.2.4.2. Therefore, the observed peak flow was recorded at the same time of peak flow recorded by all other meters during the peak storm event.

Table 4-4 presents the summary of the results of the wet weather flow calibration. An example of the WWF calibration results for the Elk Ave Station is illustrated in Figure 4-6 below.

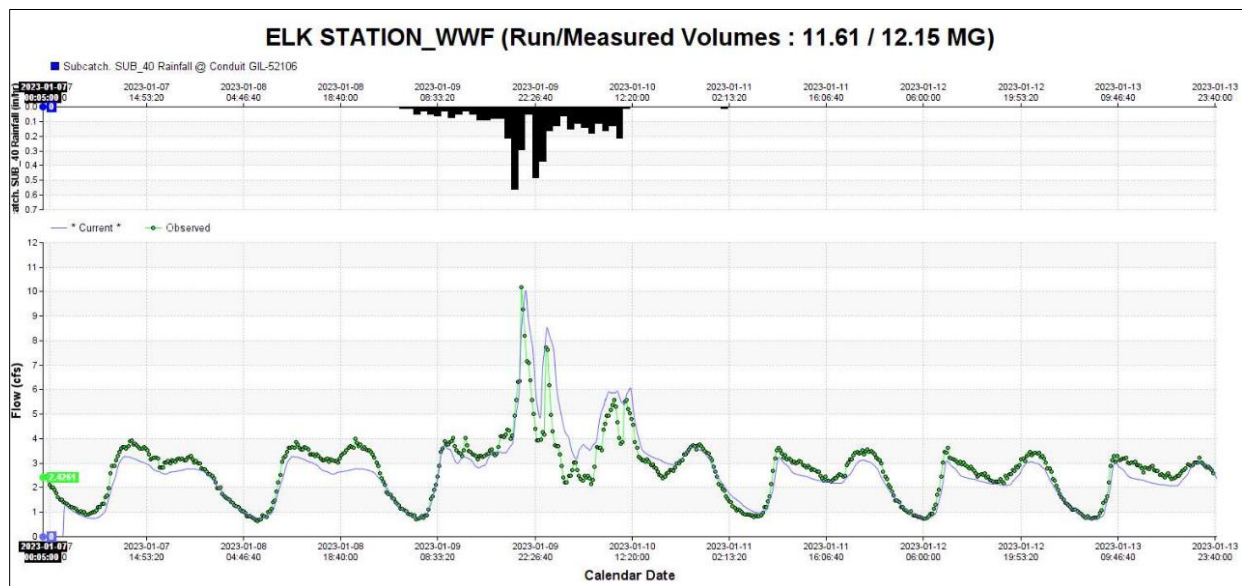


Figure 4-6: WWF Results for Elk Ave Station

Table 4-4: Wet Weather Flow Calibration Results (1/7/23 to 1/12/23)

Meter Name	Model Peak Flow (CFS)	Observed Peak Flow (CFS)	Peak Flow %Error	Model Run Volume (MG)	Observed Volume (MG)	Volume %Error
FM01	1.87	2.50	-25%	2.50	2.40	4%
FM02	7.37	6.94	6%	8.34	8.04	4%
FM05	2.80	3.34	-16%	2.44	2.36	3%
FM06	0.44	0.52	-15%	0.85	0.79	8%
FM07	0.93	1.03	-10%	1.66	1.72	-3%
FM08	0.37	0.41	-10%	0.78	0.78	0%
ELK AVE	9.16	10.16	-10%	11.61	12.15	-4%
Summary of Number of Events Meet Calibration Criteria ($\geq 60\%$)			71%	Summary of Number of Events that Meet Calibration Criteria ($\geq 60\%$)		
				100%		

In general, the model calibration results for wet weather flow conditions met the peak flow and volume calibration criteria outlined in Section 4.2.1. Peak flow criteria were met at 5 of 7 sites while event volume criteria were met for all 7 sites, satisfying the 60% threshold based on qualified events observed during the flow monitoring period. The following describes the results for sites where the peak criteria was not met:

- At FM-05, the modelled event volume was met while the peak flow criteria was 16% lower than measured value. Although this value does not meet the criteria, a review of the calibration curves identified a reasonable match between measured and modelled values. This calibration can be considered acceptable.
- At FM-01, the volume criteria were met with 4% error difference while the peak flow criteria were not met. It is noted that the model underpredicted peak flow by 25%, Although this value exceeded the criteria, a review of the calibration curves identified a reasonable match between measured and modelled values. This calibration can be considered acceptable.

Overall, both the modelled event volume & peak flow criteria's have been met for WWF calibration. A review of the continuous simulation calibration curves shows that the model reasonably predicts flows within the system at all sites. Based on detailed review of the calibration results, the model can be considered calibrated and suitable for model validation.

4.2.4.2 Wet Weather Unreliable Data

Figure 4-7 represents meter FM08 which resulted in having a high percentage error in the measured data of the peak flow. Looking into other storms of similar size we don't see those spikes; therefore, we have assumed it to be an outlier/unreliable data.

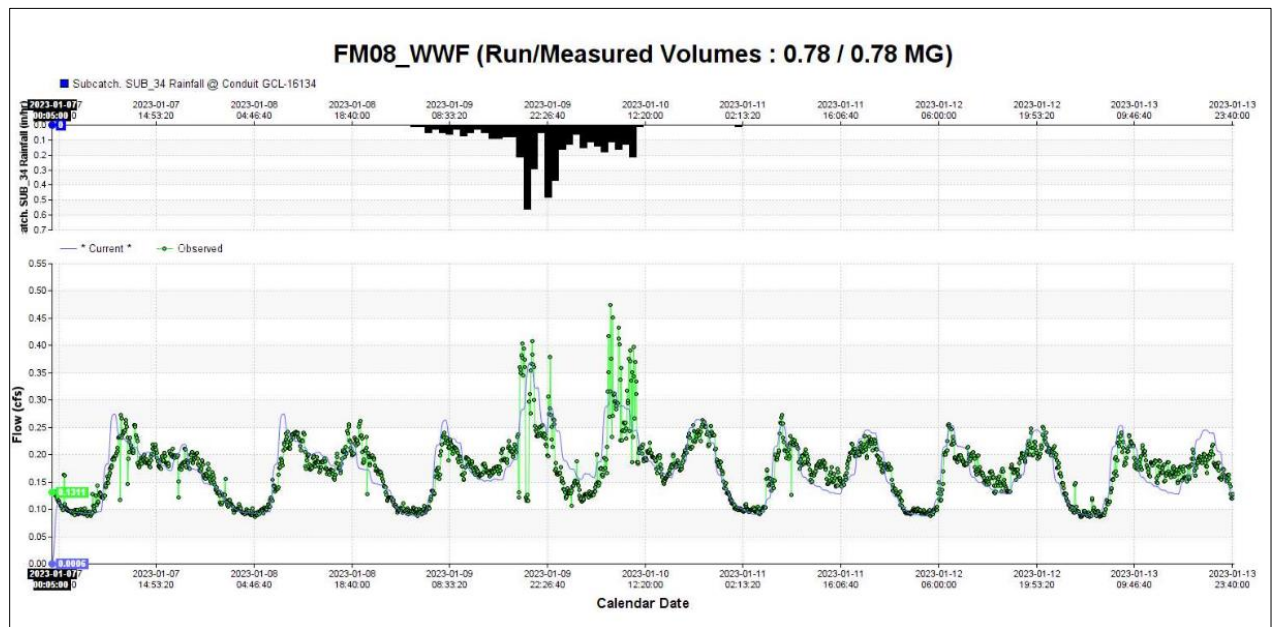


Figure 4-7: Outlier Results for Meter FM08

4.2.5 Model Validation

This section presents a summary of the model validation process. The objective of the model validation process was to test the model calibration with an independent set of rainfall and flow data, not used for calibration. Validation results are used to confirm that a model is well calibrated and suitable for use. A good validation can increase confidence in model results. It is important to note that model results generated for events larger than those considered in calibration and validation are subject to greater uncertainty.

For model validation, a comparison of the continuous simulation calibration results for all 9 sites with measured values was completed. Appendix C contains these comparison graphs.

4.2.5.1 Model Validation Results

Model validation was completed for the rainfall event that occurred on February 24, 2023. This event had a rainfall depth of 8.49 in and a peak intensity of 0.52 in/hr. It is noted that this event had a lower volume and peak intensity than that of the calibration event. Table 4-5 presents the model validation results. An example of the validation results for the ELK Ave Station is illustrated in Figure 4-8 below.

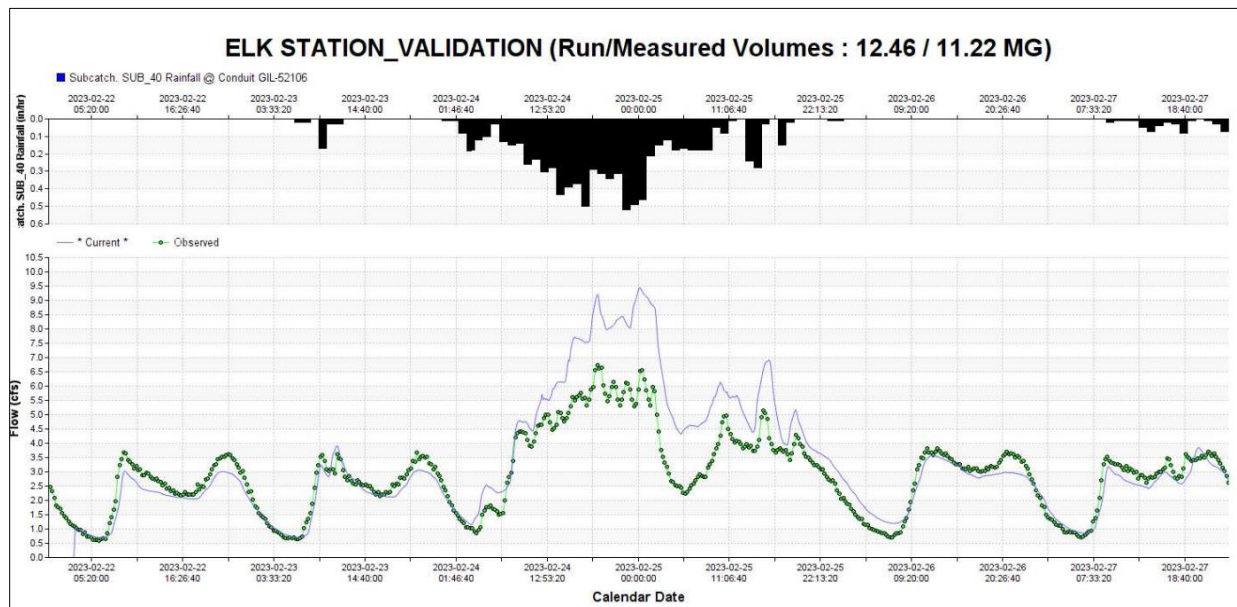


Figure 4-8: Validation Results for Elk Ave Station

Table 4-5: Model Validation Results (2/22/23 to 2/27/23)

Meter Name	Model Peak Flow (mgd)	Observed Peak Flow (mgd)	Peak Flow % Error	Model Run Volume (MG)	Observed Volume (MG)	Volume % Error
FM01	1.78	1.78	0%	3.28	3.02	9%
FM02	7.78	4.62	68%	9.29	7.51	24%
FM03	0.64	0.50	28%	1.38	1.23	12%
FM05	2.60	1.70	53%	3.06	2.52	21%
FM06	0.45	0.48	-6%	0.90	0.65	38%
FM07	0.88	0.65	35%	1.55	1.28	21%
FM09	1.03	1.05	-2%	1.72	1.56	10%
FM08	0.38	0.47	-19%	0.74	0.70	6%
ELK AVE	9.00	6.70	34%	12.46	11.22	11%
Summary of Number of Events Meet Calibration Criteria (>= 60%)			44%	Summary of Number of Events Meet Calibration Criteria (>= 60%)		
						67%

During validation, we assessed nine sites. Among these, peak flow validation criteria were met at 4 out of 9 sites, while event volume validation criteria were met at 6 out of 9 sites. Overall, the model's validation results for wet weather flow conditions aligned with the volume calibration criteria outlined in Section 4.2.1, satisfying the 60% threshold based on qualified events observed during the flow monitoring period. However, the peak flow criteria were not met. Despite this, a reasonable match was observed between measured and modeled values, making this validation acceptable.

FM06 & FM09 experienced some outlier as illustrated in Figure 4-9 below, therefore, the observed peak flow was recorded at the same time of peak flow recorded by all other meters during the peak storm event.

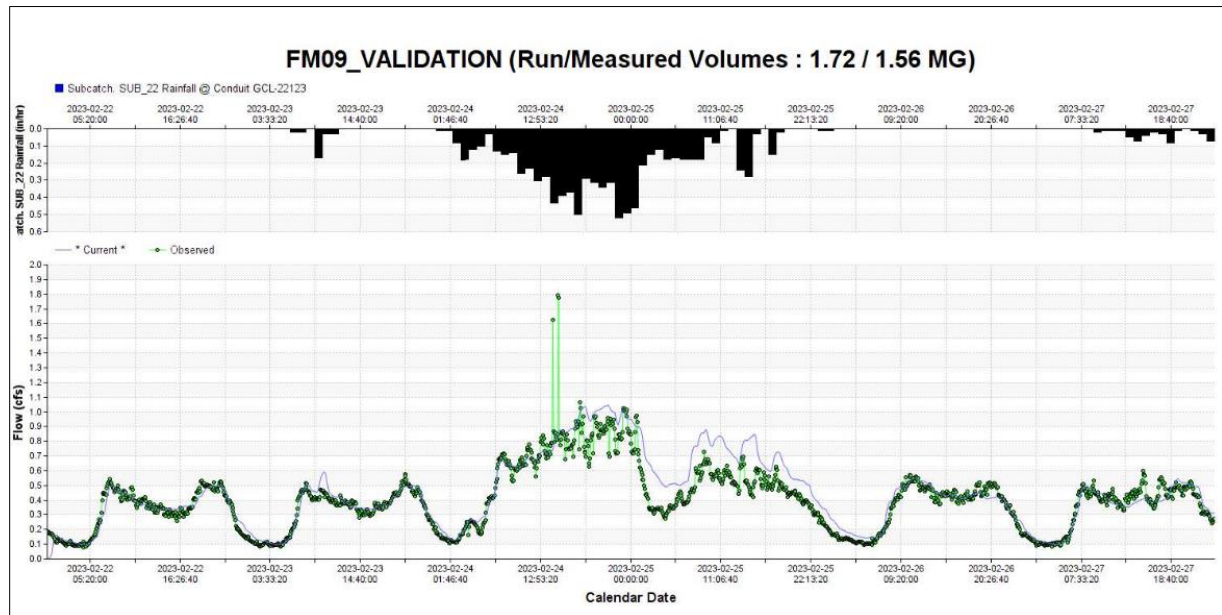


Figure 4-9: Validation Results for Meter FM09

As this model will be used to establish the capacity of the system under larger type rainfall events, a calibrated model that predicts responses to larger events is preferred. In addition, to be more conservative, it is preferable that the model overpredicts measured values instead of underpredicting the response. As a result, the validation is considered acceptable, and the model is suitable for use in planning level studies.

4.2.6 Summary

To summarize, the calibration and validation activities undertaken to create a model of the sanitary sewer system which will be used to assess the capacity of CVWD's sanitary sewer and provide CVWD with a basis for improvements in its sewer infrastructure management system, or development of a Capital Improvement Program. The calibration and validation process were based on flow data collected between December 2022 and March 2023. The model calibration was limited to the rainfall events that occurred during the four-months long monitoring period. It is expected that if CVWD collects additional flow data, the model calibration and validation will be reviewed, updated and revised as needed. This also applies to the physical network data (pipes invert, size, and ground level elevation) as well. Based on the model calibration and validation, the model is suitable for planning level studies.

Section 5: Collection System Evaluation

This section details the analyses completed to evaluate the performance and reliability of the sewer collection system. The analyses include the Hydraulic Model Capacity Evaluation, the La Granada Lift Station Condition Assessment, and the Business Risk and Vulnerability Assessment. These analyses were an amalgamation of several months of data collection, workshops, and field investigations to provide the most comprehensive understanding and evaluation of the collection system's performance.

5.1 Hydraulic Model Capacity Evaluation

This section explains the capacity analyses performed using the calibrated sewer system model as well as the hydraulic model findings.

5.1.1 Existing Flow Conditions

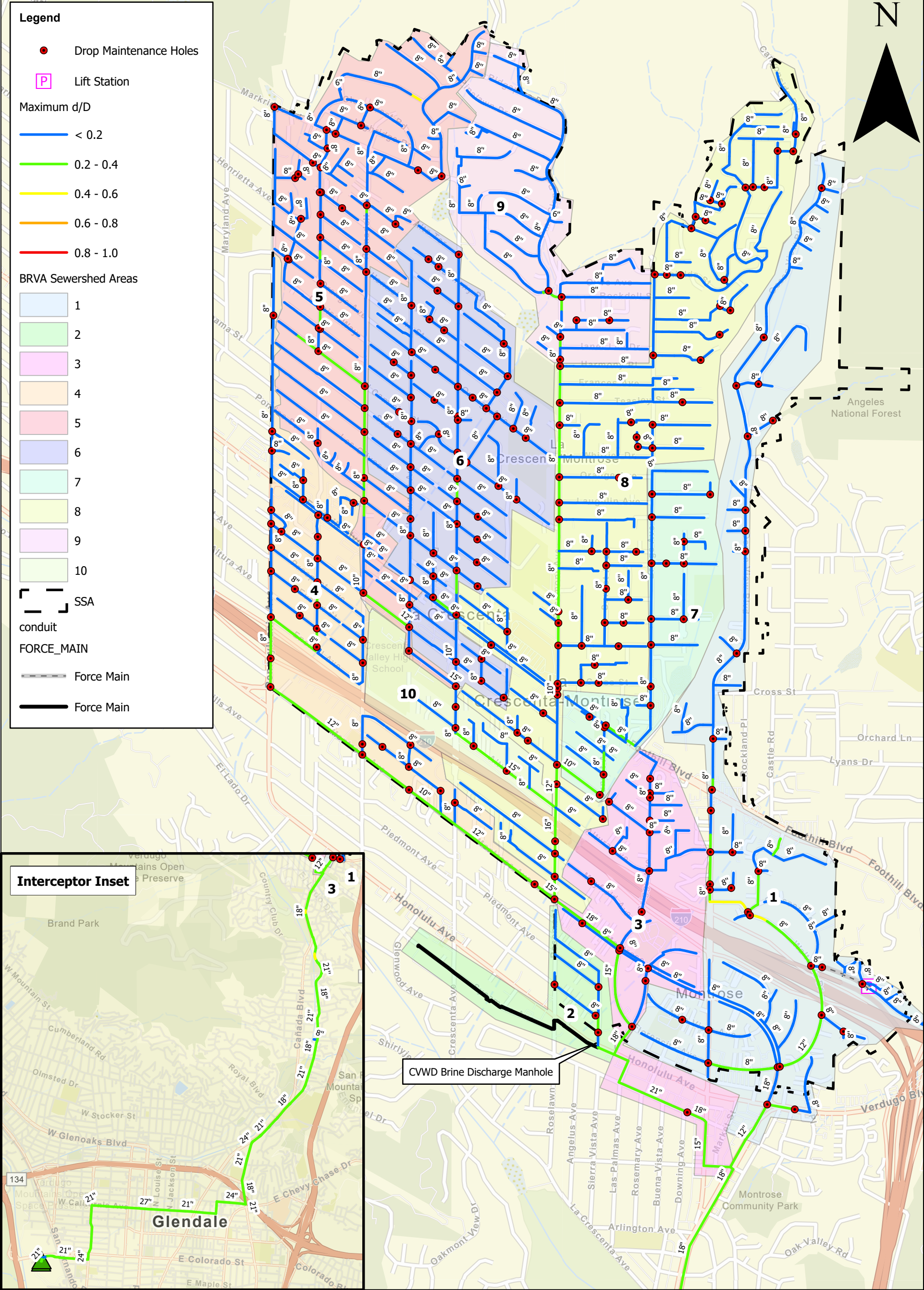
5.1.1.1 d/D Capacity Analysis

One of the key performance indicators (KPIs) of a sewer collection system, is limiting the occurrence of sanitary sewer overflows (SSOs). This objective hinges on the ability of each pipe within the collection system to convey to accumulated upstream sewer flows without exceeding the pipe flowing full. As soon as a gravity sewer pipe turns from gravity to pressurized flow, known as surcharging, the risk an SSO drastically increases.

Flow depth has long been a key design parameter in sewer design, exemplified by the flow depth-to-diameter (d/D) ratio. This ratio, integral to sewer design guidelines, is calculated as d/D , where 'd' represents the flow depth in inches, and 'D' is the sewer diameter in inches. Gravity sewers are typically designed with some reserve capacity, the degree of which can vary based on various design recommendations. For instance, the American Society of Civil Engineers (ASCE) and the Water Environment Federation (WEF) recommend that sewers up to 15 inches in diameter maintain dry weather d/D ratios below 50%, and larger sewers keep these ratios under 75%. Sewers are not intended to operate under surcharge conditions, hence wet weather d/D ratios should ideally remain below 100%.

Specific design criteria from the SSMP dictate that the d/D ratio should be less than 60% under ADWF and below 80% under PWWF. A focal area of concern is Waltonia Drive, influenced by shallow slopes (0.0036 – 0.0043) and upstream LCID customers. Here, the d/D ratios are measured to be between 0.52 - 0.55 under DWF and 0.67 – 0.71 under WWF in Sershed 1. These standards are necessary to ensure the sewer system's effectiveness to reliably convey raw sewage through pipeline infrastructure. Figure 5-1 and Figure 5-2 shows the results of the existing flow conditions d/D capacity analysis.

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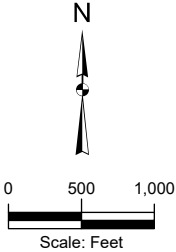


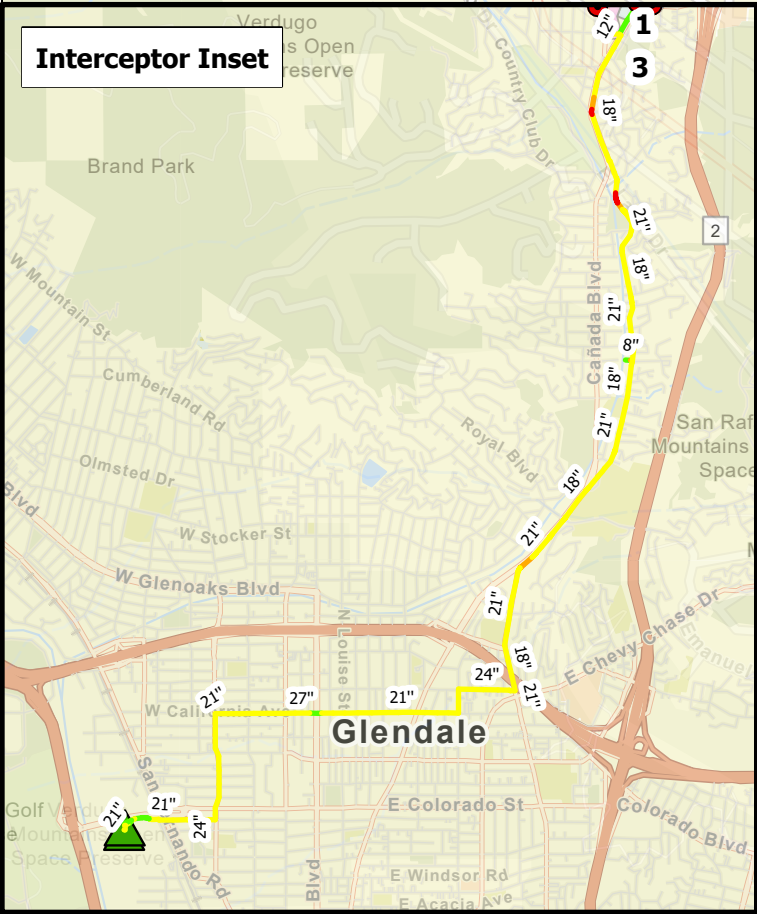
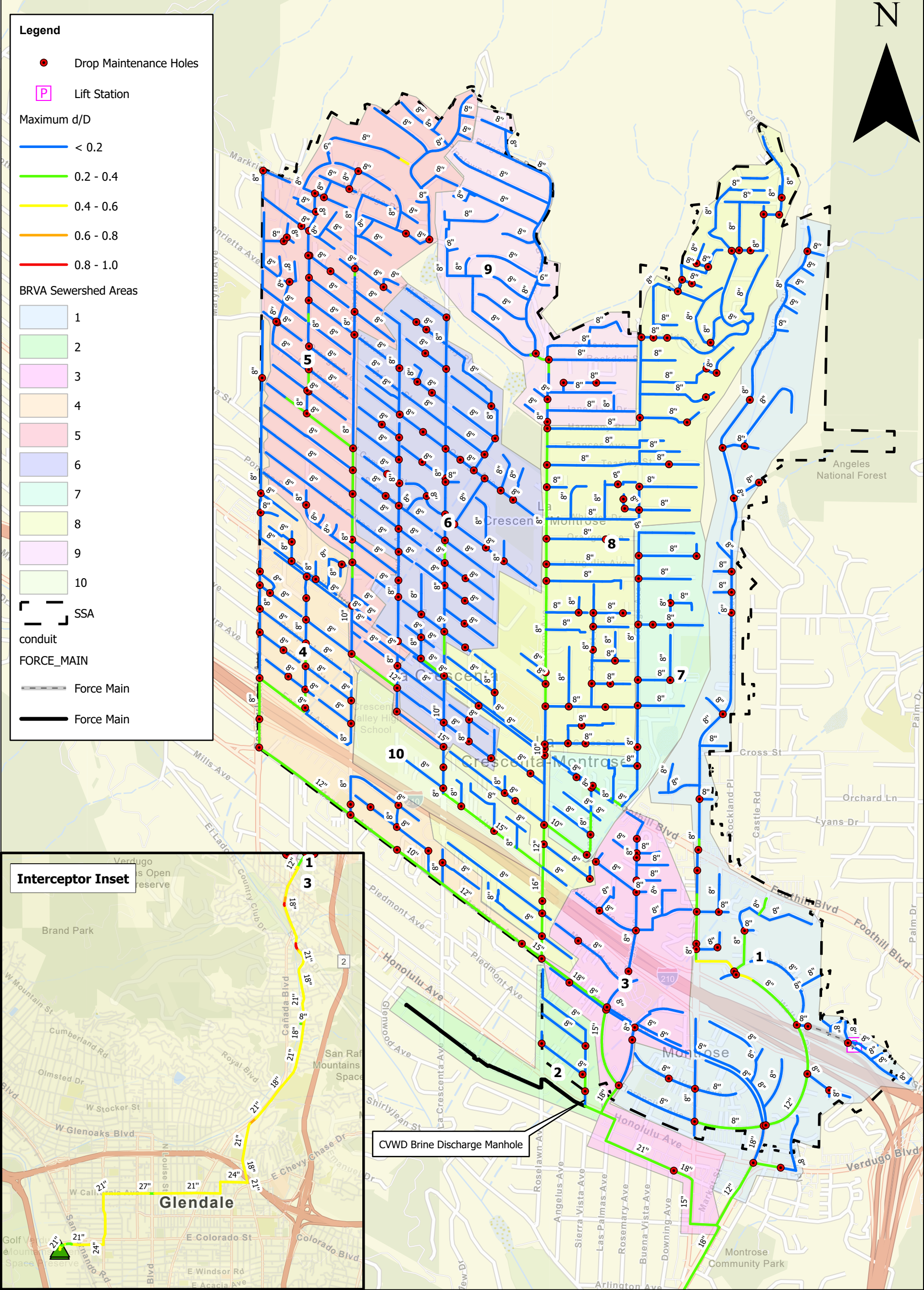
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Kennedy Jenks
Crescenta Valley Water District
Wastewater Master Plan

System Overview
Existing ADWF d/D

2244508*00
Figure 5-1

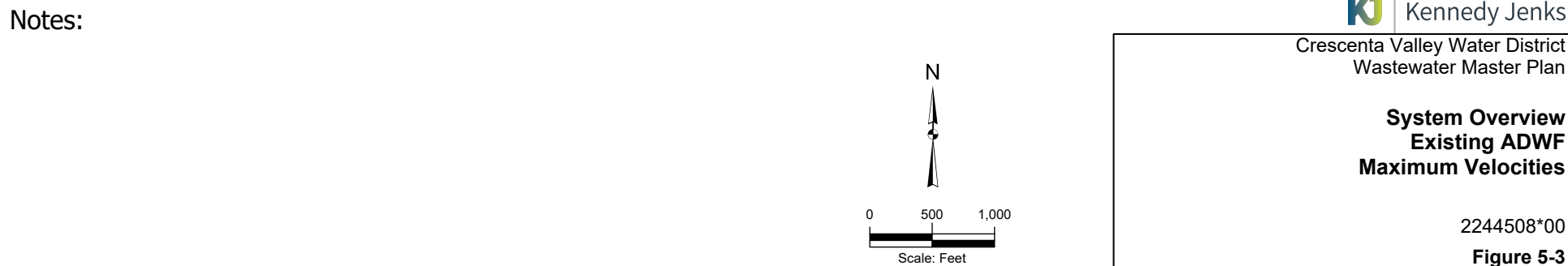




5.1.1.2 Pipe Velocity Analysis

The other main KPI for collection systems is the range of sewer flow velocities. Pipe velocity is driven by pipe diameter, pipe slope, and sewer flow rates. Pipe velocities should be high enough to prevent debris and solids from settling and collecting at the bottom of the pipe, but low enough to avoid significant flow turbulence/hydraulic jumps, which releases more corrosive gasses that could lead to maintenance hole corrosion and/or odor complaint issues. The calibrated hydraulic model was used to evaluate system pipe velocities to identify any potential areas not achieving CVWD's design velocity criteria. According to the SSMP, sewer mains must uphold a minimum velocity of 2.5 feet per second (fps) and a maximum of 10 fps, adhering to a minimum pipe slope of 2%.

The primary goal under Average Dry Weather Flow (ADWF) conditions is to maintain a minimum velocity to achieve effective scouring. Scour velocity is crucial in addressing issues related to impacts of Fats, Oils, and Greases (FOGs) as well as sanitary products, such as baby wipes. The typical industry standard for minimum sewer velocity is 2 fps. Even using this less conservative minimum velocity criterion, the hydraulic evaluations reveal that under ADWF, 93% of collectors and 26% of trunk sewers did not meet the 2-fps criterion. One possible contribution to this issue could be the water conservation efforts that have taken place over the last decade, resulting in lower sewer flows. With the collaboration of CVWD, the O&M staff indicated that no odor complaints have been made in the SSA. Odor complaints are typical in areas with low sewer pipe velocities. Consequently, there's no need for extraordinary measures beyond regular maintenance to maintain system efficiency and reliability. This approach ensures both the effectiveness of wastewater management and the longevity of the sewer infrastructure. Figure 5-3 shows the results of the analysis.



5.1.1.3 Inflow & Infiltration Analysis

I&I refers to the entry of groundwater (infiltration) and stormwater (inflow) into a sewer system. When a collection system is compelled to handle a greater flow than it was designed for, I&I can result in pipeline surcharging and downstream impacts to pumping and/or wastewater treatment facilities. This increased effluent not only poses challenges for wastewater treatment facilities but also escalates costs since the stormwater and groundwater mix with sewage and the entire volume must be processed at the treatment plant.

I&I can constitute a significant portion of annual flow to treatment plants, reaching up to 45% in some cases. This excess burden can overwhelm the collection system, leading to several adverse consequences.

- **Uncontrolled SSOs:** I&I can exceed the capacity of pipelines, pumping stations, or treatment plants, causing raw sewage to overflow and pollute the environment.
- **Pipe Failures:** Excess flow due to I&I can stress and damage pipes, increasing the risk of leaks and breaks.
- **Soil Subsidence and Sinkholes:** I&I can undermine the supporting soil around pipes, potentially leading to ground collapse and sinkholes.

These issues highlight the importance of addressing I&I effectively to safeguard public health, environmental quality, and infrastructure integrity.

Calculating I&I involves flow monitoring, where wastewater flow in the system is measured over time and compared with a baseline flow estimate. These measurements are crucial for determining the extent of I&I in the sewer system. Flow monitoring not only aids in identifying and prioritizing areas for further inspection but also serves as a basis for visual inspection methods to assess the severity of I&I in a given area.

5.1.1.3.1 Graphical Identification of I&I

Inflow is usually recognized graphically by large-magnitude, short-duration spikes immediately following a rain event. Infiltration is often recognized graphically by a gradual increase in flow after a wet-weather event. The increased flow typically sustains for a period after rainfall has stopped and then gradually drops off as soils become less saturated and as groundwater levels recede to normal levels.

Figure 5-4 provides a visualization from a portion of flow meter data for FM01. The storm event used for I&I analysis was February 24th storm which was the same as validation period. The wet weather flow hydrograph was overlayed with the measured dry weather flow hydrograph of the days prior to the storm. The difference between the two-time series is equal to the volume of I&I entering the collection system. The total I&I volume is an indicator of combined inflow and infiltration which was calculated for all sewersheds based on available flow meter data to identify which sewersheds have the highest portion of I&I.

Infiltration refers to groundwater that enters a sewer system through faulty pipes, pipe joints, connections, or maintenance holes. Typically, it is measured during periods of high groundwater

levels during dry weather conditions after a storm event. After analyzing the scattergraphs from different flow meters, the flow returns to ADWF levels right after the conclusion of the observed storm event. This pattern suggests the absence of groundwater infiltration. Therefore, inflow data was used to determine the Inflow and Infiltration (I/I) within the system.

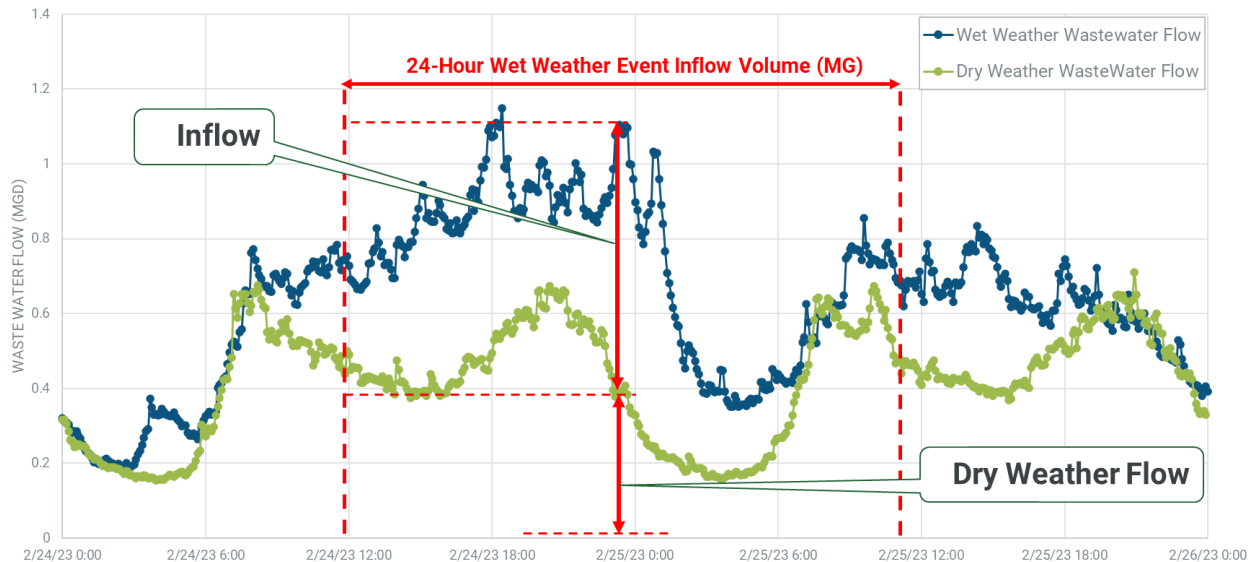


Figure 5-4: Overlay of Wet and Dry Weather Events for FM01

5.1.1.3.2 I&I Results Summary

To compare I&I levels across different sewersheds, several methods normalize the analysis metrics. One common approach is gallons per day per inch-diameter mile (gpd/idm). This unit accounts for both pipe diameter and length, allowing for meaningful comparisons even when sewersheds have different layouts.

Using gpd/idm, sewersheds can be ranked based on their highest I&I rates. This ranking helps prioritize areas with the most severe I&I problems. Table 5-1 summarizes the calculations and rankings for the sewersheds based on highest I&I rate, in units of gallons per day, per inch-diameter mile (gpd/idm).

Table 5-1: I&I Analysis – February 2023, 24-Hour Storm

Ranking*	Sewershed	Average Pipe Diameter (Inch)	Total Length (Feet)	Inch- Diameter Mile (idm)	Design Storm Total Inflow Volume (Gallons)	Design Storm Total Inflow Rate (Gpd/idm)	% Total I&I*
1	Sewershed 2+3	10.3	25,176	49	403,639	8,247	34%
2	Sewershed 1	8.2	45,258	71	245,517	3,474	21%
3	Sewershed 7	8.1	16,205	25	72,608	2,922	6%
4	Sewershed 6+10	8.4	54,599	86	200,442	2,320	17%
5	Sewershed 9	8.0	24,120	36	52,856	1,448	4%
6	Sewershed 5	8.2	55,257	86	116,773	1,354	10%
7	Sewershed 4	8.7	32,166	53	37,972	720	3%
8	Sewershed 8	8.2	68,746	107	63,917	597	5%
TOTAL			321,526		1,193,724		100%

*Ranking based on Highest I&I Rate (gpd/idm)

Based on the findings of the I&I analysis, Sewersheds 1, 2, and 3 should be targeted for future flow metering efforts to attempt to narrow down the locations of the I&I and eliminate the excessive I&I.

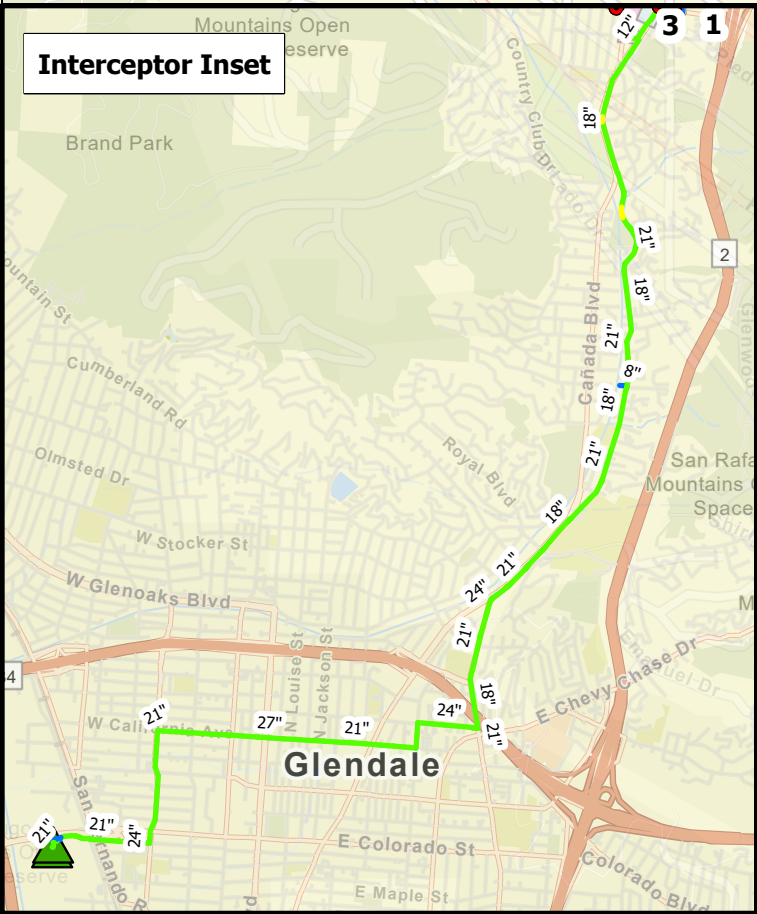
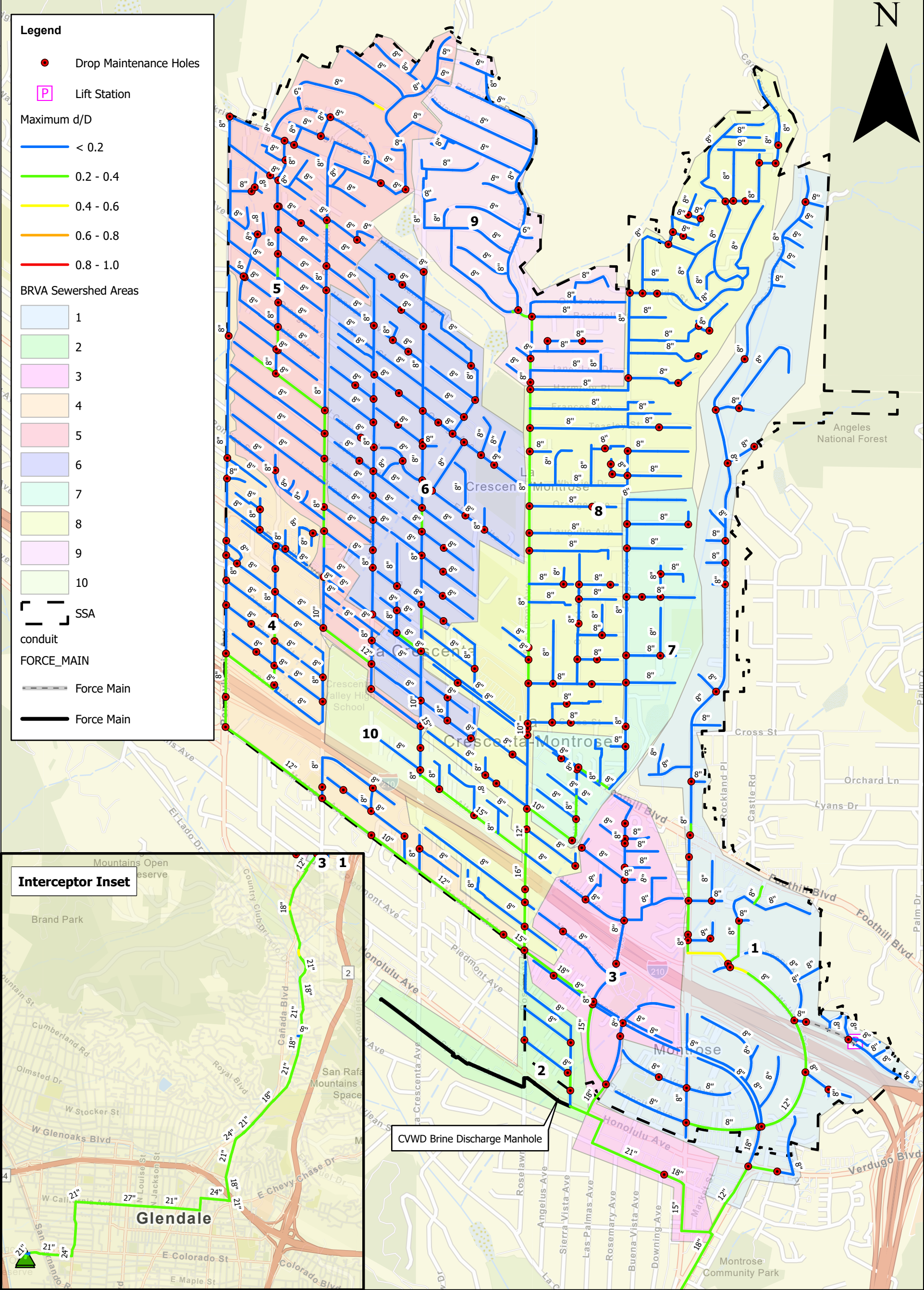
5.1.2 Future Flow Conditions

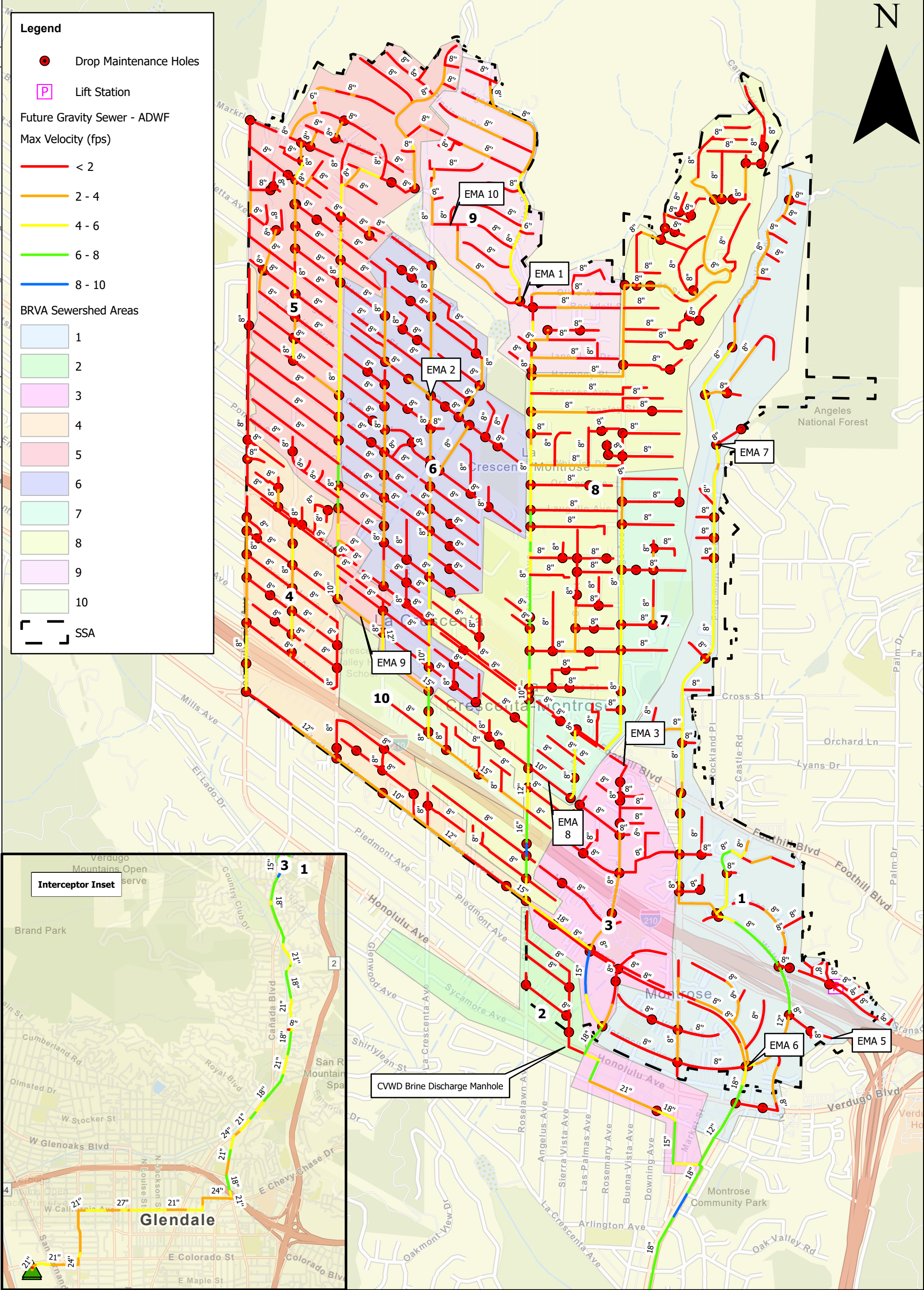
The collection system was also evaluated under future sewer flow conditions aligning with the 2045 population and demand projections provided by the 2020 UWMP. Section 3.3 describes the total projected sewer flows for CVWD's SSA.

5.1.2.1 Future d/D Capacity Analysis

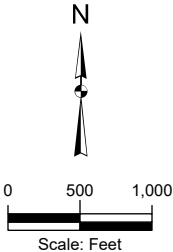
An identical d/D capacity analysis was performed for the future sewer flow conditions. Because the existing and future flow conditions do not vary significantly, the same areas of concern identified in the existing flows d/D capacity analysis were identified in the future flows d/D capacity analysis, mainly on Waltonia Drive where the slope of sewer pipeline alignment is extremely flat, and the d/D ratio does not meet industry standards. Figure 5-5 shows the results of the future flow DWF d/D capacity analysis.

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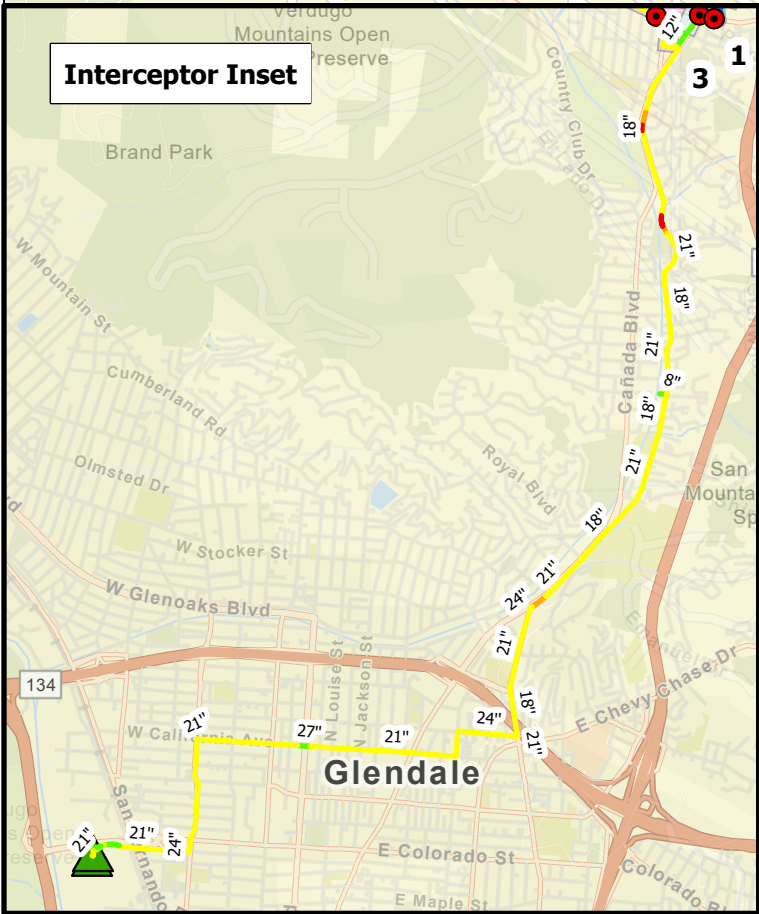
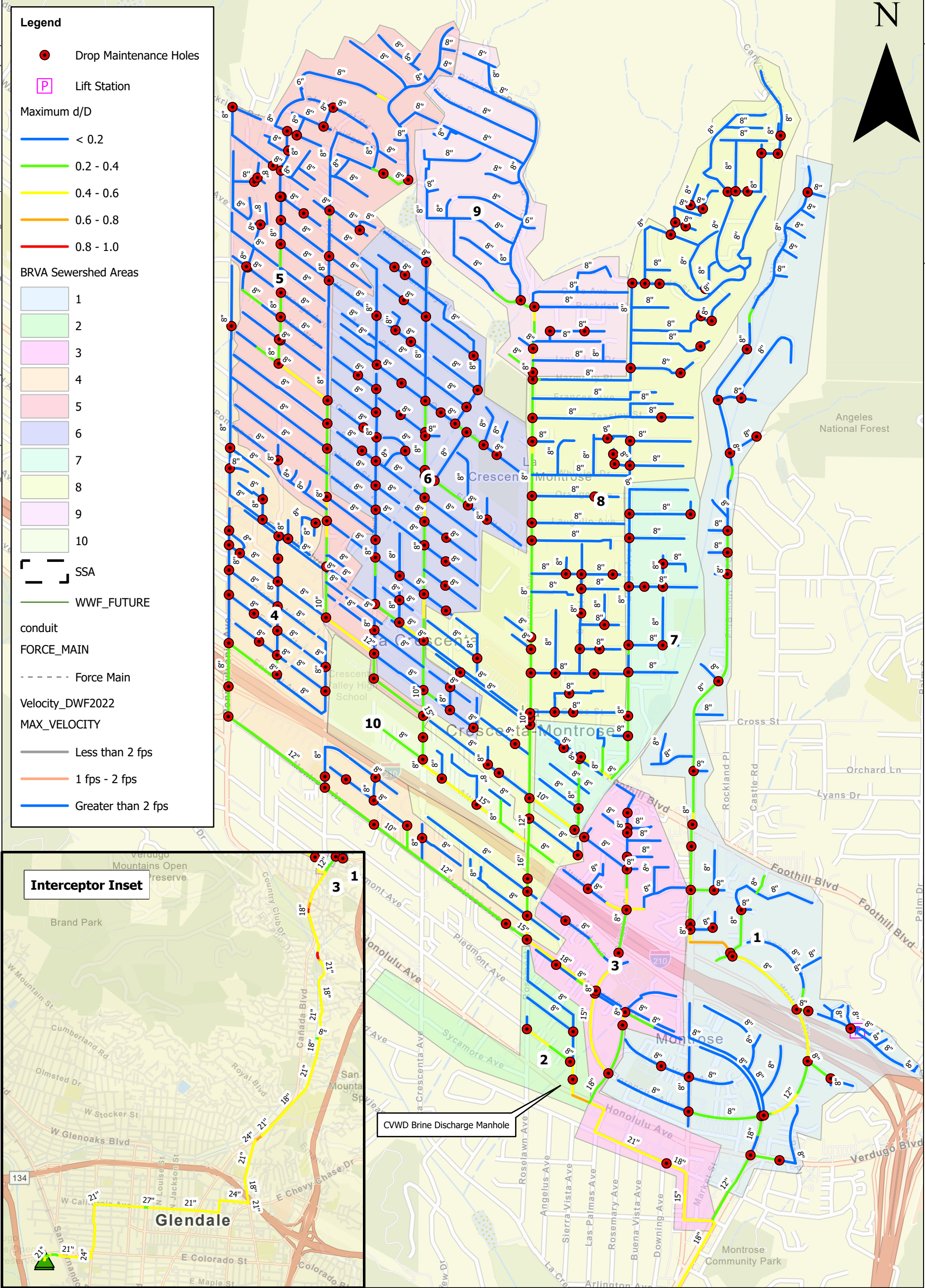
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5.1.2.2 Future Pipe Velocity Analysis

An identical minimum pipe velocity analysis was done for future flow conditions. Because future flows were almost identical to existing flows, the results of the future system analysis were almost identical to the existing system analysis. Figure 5-7 shows the resulting maximum pipe velocities under future ADWF conditions.

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CVWD Brine Discharge Manhole

5.2 La Granada Lift Station Condition Assessment

An in-person condition assessment of the La Granada Lift Station was conducted in July 2023 to identify any risks, deficiencies, and to provide improvement recommendations. A summary of the findings for each facet of the lift station is documented in the following subsections. See Appendix D for more detailed notes and photographs from the condition assessment.

5.2.1 Lift Station Building

Field Observations:

The lift station building is a 14 ft x 16 ft CMU building with a wood frame roof. The roof has a built-in skylight hatch to remove/replace pumps, motors, or other internal lift station components. The building has a single man door for access as well as a privacy fence around the entire site to reduce visual impact to the neighboring community. The lift station building encloses all the electrical equipment, pump, and motors, as well as the access to the lift station wet well. The circular wet well is 11 ft deep and 5 ft in diameter.

Building Ventilation: The wet well within the lift station pump building lacks proper ventilation due to not having vents. The absence of vents may cause corrosion and lead to potential damage of station equipment. The field observations discovered a direct opening of the maintenance hole into the pump building which houses electrical equipment. This direct opening to electrical gear leaves the components vulnerable to corrosion and presents a possible explosion hazard due to the presence of flammable gasses in the wet well.

Noise Attenuation: To mitigate noise pollution, a wood-framed roof and skylight were added to the top of the CMU building. The roof and skylight appear to be in fair condition.

Building Access: The lift station building has a single door which limits access for maintenance ingress and egress. The single leaf door configuration may impact the maintainer's ability to transport tools and equipment to conduct major repair or replacement tasks, requiring overhead access through the skylight to remove/replace any larger mechanical or electrical components.

Fire Protection: Field observations discovered that the building could possibly be non-compliant with the National Fire Protection Association (NFPA) code relative to potential explosive environment exposure. Upon examination of the NFPA 820 standard, it was determined that the building is non-compliant for Fire Protection requirements in Wastewater Treatment and Collection Facilities. See Figure 5-8 and Table 5-2 which provide the relevant portions of the standards set by the NFPA.

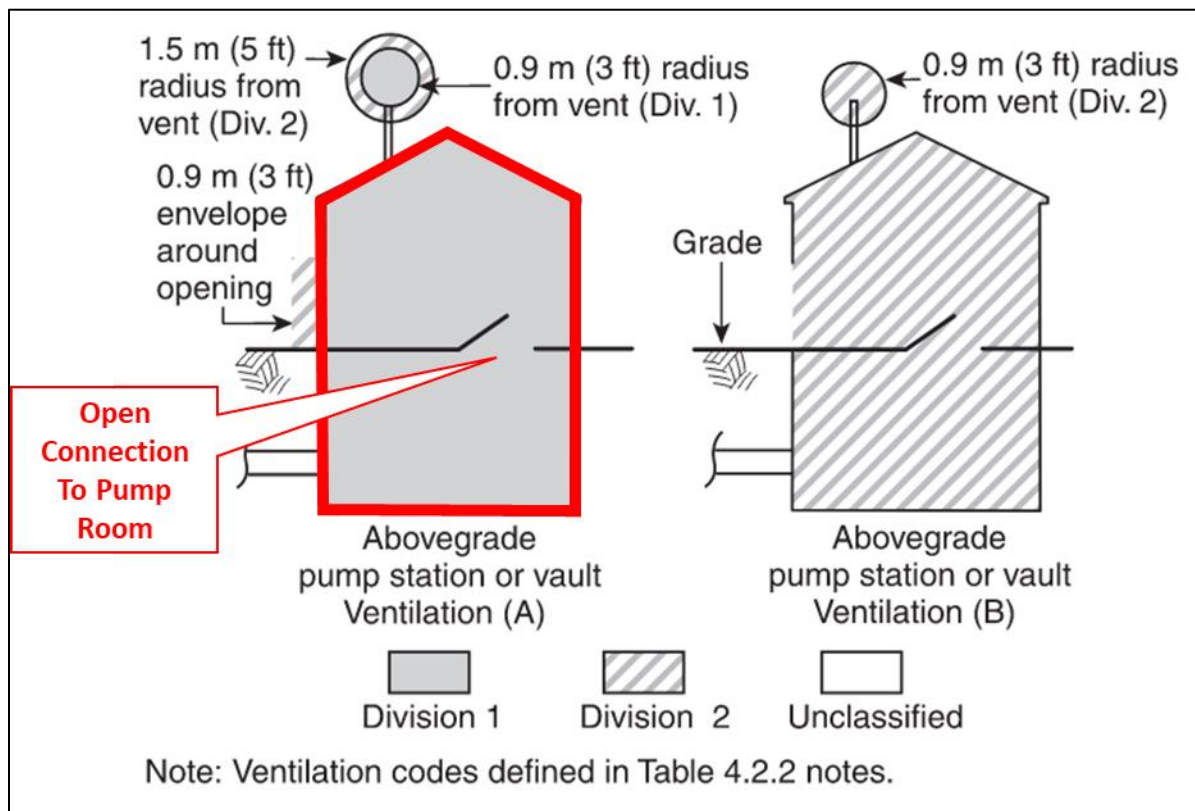


Figure 5-8: NFPA 820 Figure A.4.2(e) Above-grade Wastewater Pumping Station Not Physically Separated from Wet Well; Illustration of Table 4.2.2, Row 17 (NFPA, 2023)

Table 5-2: NPFA 820 Table 4.2.2 Collection Systems Classifications (NFPA, 2023)

Row ^a	Line ^a	Location and Function	Fire and Explosion Hazard	Ventilation ^b	Extent of Classified Location	NEC Hazardous Location Classification (All Class I, Group D)	Materials of Construction ^c	Fire Protection Measures
17	a	ABOVEGRADE WASTEWATER PUMPING STATION	Possible ignition of flammable gases and floating Class I liquids [flash point < 37.8°C (100°F)]	A	Entire space or room plus envelope 0.9 m (3 ft) around vents	Division 1	NC	FE
	b			A	1.5 m (5 ft) beyond vent plus envelope 0.46 m (18 in.) extending 0.9 m (3 ft) beyond openings (hatches or doors)	Division 2	NC	FE
	c	Pump room not physically separated from wet well; pumping of wastewater from a sanitary or combined sewer system through closed pumps and pipes		B	Entire space or room plus envelope 0.9 m (3 ft) around vents	Division 2	NC, LC, or LFS	FE

Note: The following codes are used in this table:

A: No ventilation or ventilated at less than 12 air changes per hour

B: Continuously ventilated at 12 changes per hour

C: Continuously ventilated at six air changes per hour

CGD: Combustible gas detection system

D: No ventilation or ventilated at less than six air changes per hour

FAS: Fire alarm system

FE: Portable fire extinguishers installed, located, and maintained in accordance with NFPA 10

LC: Limited-combustible material

LFS: Low flame spread index material

N/A: Not applicable

NC: Noncombustible material

NEC: In accordance with NFPA 70

NNV: Not normally ventilated

NR: No requirement

^aThe "Row" and "Line" columns are used to refer to specific figures in A.4.2 and specific requirements for each location and function.

^bThis column indicates the ventilation requirements for processes. Additional ventilation requirements are provided in Chapter 9. Ventilation signaling and alarm requirements are provided in Chapter 7.

^cThis column indicates the materials of construction for processes. Materials of construction for buildings in which these processes are housed are in accordance with the applicable building code and construction requirements provided in Chapter 8.

Figure 5-11 shows two instances of the same wet well and lift station building configuration. Both conditions have the wet well directly exposed to the pump room. "Division 1" and "Division 2" refer to the amount of ventilation provided to the classified space. Because the lift station building has no ventilation, it is classified as Division 1 (C1D1) since "no ventilation or ventilated at less than 12 air changes per hour" best describes the lift station building. The electrical equipment located in the pump building is not currently designed or rated to be in a C1D1 space, meaning that the lift station building is not currently up to code.

Ventilation could be added to the lift station so that it was “continuously ventilated at 12 changes per hour” to make the space Division 2 (C1D2); however, C1D2 spaces still require significant changes to the electrical equipment. The State of California Department of Industrial Relations (DIR) also has additional directives for electrical equipment in C1D2 spaces, such as requiring de-energizing the entire facility in the event that the ventilation system fails for any reason (DIR, 2021). This would require the lift station to stop conveying sewage entirely, which would require bypass pumping during the period when the lift station was not operational.

Given the current lift station configuration and the direct opening from the wet well to the pump/electrical room, there is no way to make the lift station building an “unclassified” space (not in the presence of any potentially flammable gasses).

Recommendations:

- Abandon interior building wet well and install wet well on the outside of the building.
- Provide proper ventilation to meet NFPA 820 requirements. Consider installing louvers or an exhaust fan for proper ventilation in the PS building.
- Assess and reinforce wood-framed roof for seismic stability.
- Evaluate the feasibility of replacing the wood-framed roof.

5.2.2 Lift Station Pumps

The All-Prime Suction Lift Pumps are equipped with 5 HP motors. The motors have the following specifications:

- 208/230 Volt, Single Phase
- 60 Hertz (Hz)
- Safety Factor 1.15 (non-overloading safety factor)
- 1750 revolutions per minute (RPM)

Field Observations:

Motor Condition: These pumps are belt-driven suction lift pumps, with the belts driven by the 5 HP motors. A vibration dampening system was not observed when inspecting the motors. A handheld vibrometer was used to measure the vibration of the motors while the corresponding pump was in operation. The allowable threshold for acceptable pump vibration is 0.05 inches per second (in/sec). Pump 1 measured 0.178 in/sec, and Pump 2 measured 0.257 in/sec, exceeding the acceptable limits and indicating the potential need to re-level the pump motors or check the belt drive alignments to ensure both are completely level and square (i.e., no tilt in the vertical belt drives).

Pump Capacity: During the field inspection, a pump drawdown test was conducted to assess the performance and condition of the pumps. Because there were no discharge pressure suction gauges, the only immediately available metric to assess pump performance was the measured flow rate. In order to perform the drawdown test, the wet well was filled using a water hose until the high water wet well level was triggered (3.8 ft as read from the PLC), causing the lead pump to kick on. A handheld stopwatch was used to measure how long it took the pump to pump the wet well level down to the low water level (2.6 ft as read from the PLC). The results of the drawdown tests for each pump are shown below in Table 5-3.

Table 5-3: Pump Run Time

	Pump 1		Pump 2	
	WW Level (ft)	Time (min:sec)	WW Level (ft)	Time (min:sec)
Start	3.8	0	3.8	0
Stop	2.6	1:40	2.6	1:35

Using this data, the average flow rate for the duration of the pump run was calculated by dividing the operating volume of the wet well by the run time of the pumps. These calculations are shown below in Table 5-4.

Table 5-4: Pump Capacity Calculations

	Pump 1	Pump 2
Runtime (minutes)	1.67	1.58
Operating Depth (ft)	1.2	1.2
WW Diameter (ft)	5	5
Operating Volume (gal)	176	176
Flow (GPM)	105	111

The results of the drawdown tests show that Pump 1 has a capacity of 105 GPM, and Pump 2 has a capacity of 111 GPM. The firm pump capacity of the lift station is the capacity of the lift station with the largest pump out of service (in this case, Pump 2 due to its higher flow rate), equal to 105 GPM. This firm capacity is below the original design specification of 135 GPM, or 78% of the original intended lift station capacity, indicating an operational inefficiency.

As mentioned above, there were no suction/discharge pressure gauges available to measure the TDH of the pumps. In order to approximate the operating TDH of the pumps, the TDH was calculated using a flow rate of 110 GPM for 3 different roughness coefficients. The static lift was determined based on record drawings of the force main. These calculations are shown in Table 5-5. Figure 5-9 shows a plan and profile view of the force main alignment, illustrating that the high point of the force main is located at the discharge maintenance hole. The range of potential system curves were overlayed with the manufacturer pump curve, along with the POR, on Figure 5-10 to understand how the pumps are performing currently versus how they were originally designed.

Table 5-5: Approximate Pump TDH with Varying Roughness Values

Length (ft)	Suction HGL (ft) ¹	Discharge HGL (ft) ²	Static Head (ft)	HW C	Flow Rate (GPM)	Pipeline ID (in)	Friction Headloss (ft)	TDH needed (ft)
1351	1,288	1317.4	29.2	100	110	4	20.0	49
1351	1,288	1317.4	29.2	120	110	4	14.3	43
1351	1,288	1317.4	29.2	140	110	4	10.7	40

Notes:

1. Bottom elevation of wet well + 2 ft
2. Elevation of discharge maintenance hole

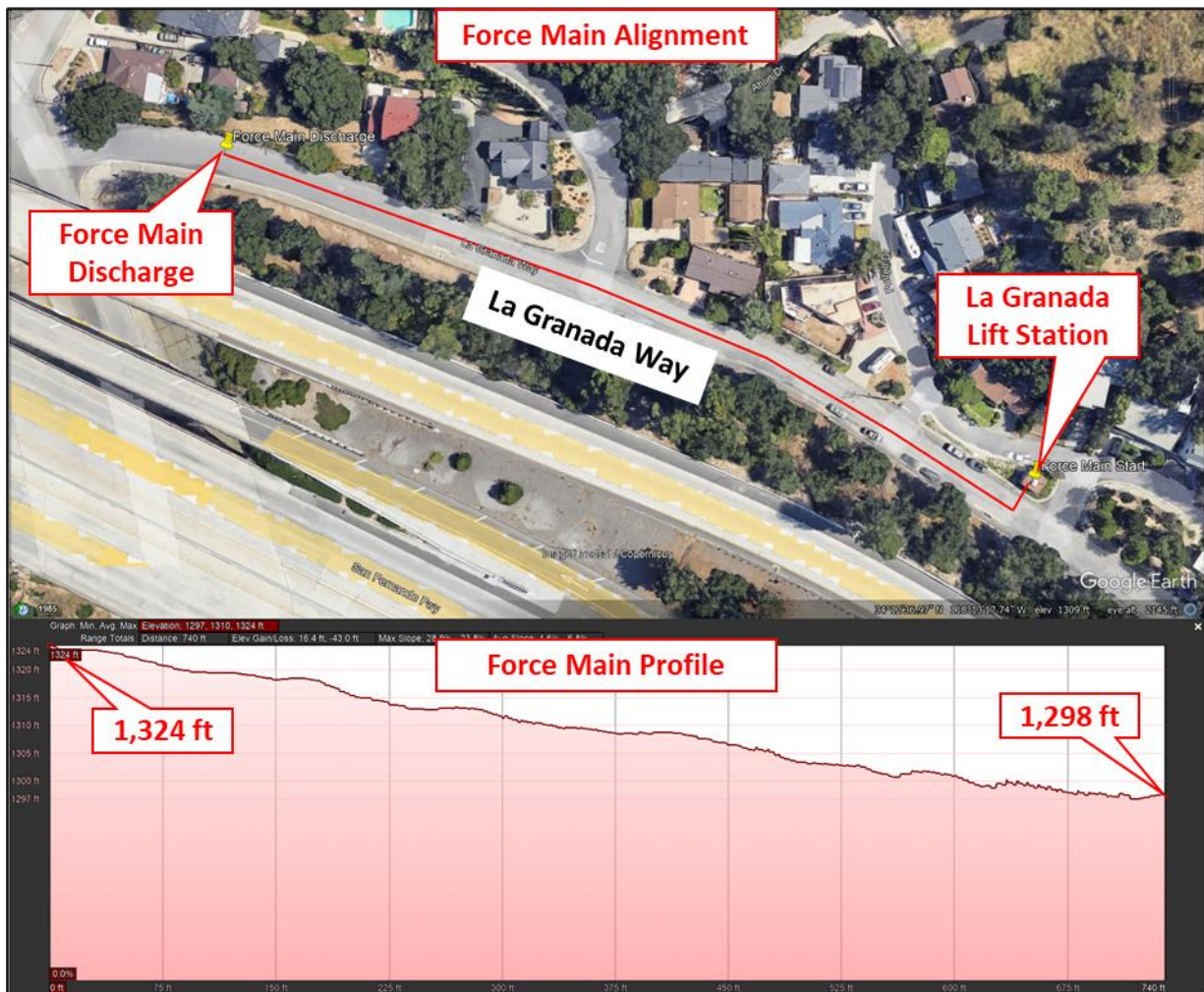


Figure 5-9: La Granada Lift Station Force Main Alignment

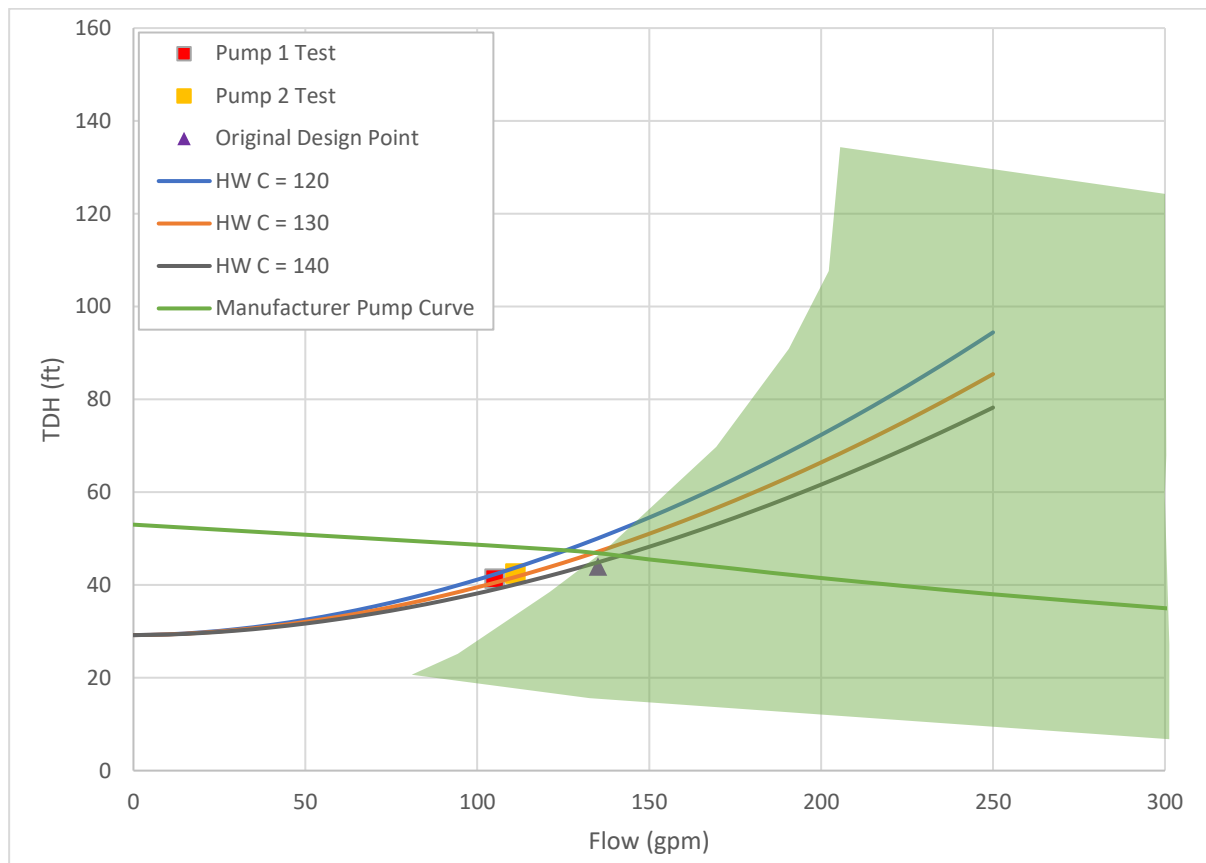


Figure 5-10: Pump and System Curve

As Figure 5-10 shows, the existing suction lift pumps are both operating to the left of the preferred operating range (POR). The potential envelope of simulated system curves contains the current pump operating flow rates between roughness coefficients 120 and 140. A system curve with a roughness coefficient of 140 best matches the original design condition of 135 GPM @ 44 ft TDH. A system curve with a roughness coefficient of 130 intersects the manufacturer pump curve at the measured flow rate. There are two possibilities for the reduction in the pump capacities; either there is additional headloss being incurred within the force main, increasing the required TDH, or the pump components are worn (such as the pump impeller) resulting in less output from the pump under the same original design head condition. The former explanation could be caused by several factors that would result in additional headloss through the force main, including buildup of FOG, partially closed discharge valves, or air entrainment at the top of the pump discharge header (Figure 5-11). The discharge header is currently a local high point for the force main before the discharge pipe returns to the subgrade below the street, and has no air release valve to allow any trapped air to escape. The presence of trapped air can effectively reduce the diameter of force main, causing excessive headloss.

Based on the flow test data, the pumps are currently operating outside of the POR. According to the original manufacturer pump curve, the pumps are operating at less than 35% efficiency when operating outside of the POR. Based on the original manufacturer information, the design point of the lift station of 135 GPM @ 44 ft TDH is already on the edge of the chosen pumps'

POR. The current AllPrime pumps are not an optimal pump selection for the La Granada Lift Station system curve. A pump operating outside of the intended POR may eventually damage the pump components and result in more frequent pump repair and/or replacement.



Figure 5-11: Lift Station Discharge Header

Pump Cycling Calculations: Since the status of each pump and the wet well level are monitored by SCADA, the number of cycles per day per pump can be evaluated. The number of cycles per day is directly related to the lead pump start and stop wet well level setpoints. Over the past 2 years, CVWD has experimented with different setpoints in an attempt to solve ragging issues. Figure 5-12 shows a 6-month period from 2022 pump cycle and flow wet well setpoint data.

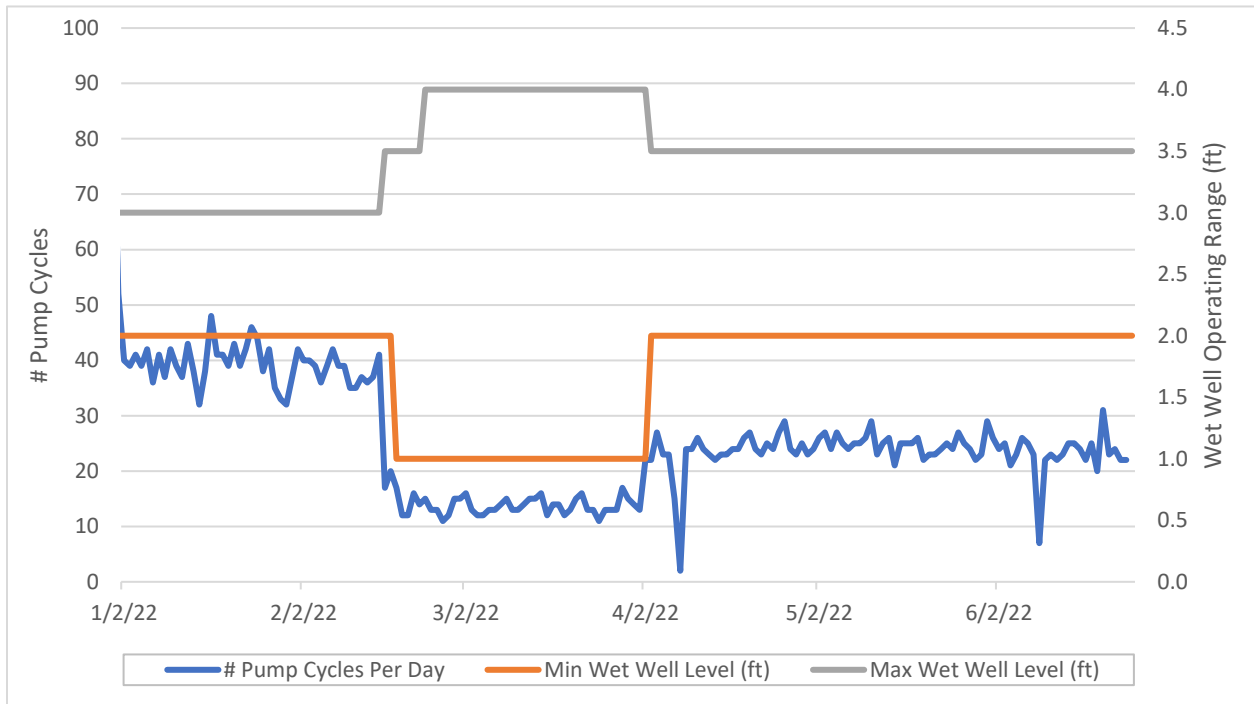


Figure 5-12: Daily Pump Cycles versus Wet Well Level Setpoints

This 6-month period shows three operating ranges for the wet well. From January to the middle of February of 2022, the operating depth for the pumps was at its smallest at 1 ft, with the lead pump on setpoint at 3 ft and the pump off setpoint at 2.0 ft. The resulted in roughly 40 pump cycles per day (20 per pump), equating to less than one pump start per hour. Table 5-6 summarizes the pump starts per hour calculations for the different wet well level setpoints.

Table 5-6: Pump Starts per Hour

Period	Pump On Level (ft)	Pump Off Level (ft)	Operating Depth (ft)	Total Number Pump Starts per Day	Starts per hour per pump ¹
Jan – Feb 2022	3.0	2.0	1.0	40	0.83
Mar – Apr 2022	4.0	1.0	3.0	15	0.31
Apr – Jun 2022	3.5	2.0	1.5	25	0.52

Notes:

1. Lead/lag assignment alternates after every pump cycle, therefore number of pump cycles are divided evenly between the two pumps.

Based on this data, no matter whether the operating depth is 1 or 3 feet, the pumps are cycling less than once per hour. The low end of the industry standard for maximum number of starts per hour is around six. Therefore, the La Granada Lift Station pumps are starting well below the recommended number of starts per hour. Operations staff may adjust the pump on/off levels as needed to improve any ragging issues without being concerned about the number of starts per hour.

Recommendations:

- Regularly monitor motor vibration levels and rebalance the motor plate/belt drives if needed.
- Perform a more detailed evaluation of the pumps, including additional performance testing and analysis of the vibration data.
- Investigate the cause of the decrease in pump flow capacity.
 - Inspect pump components for wear/damage.
 - Install sanitary seal suction and discharge pressure gauges to measure pump TDH.
 - Eliminate the local high point on the discharge header or install a sewage air release valve at the top of the discharge header to prevent air entrainment in the force main.
- Contact pump manufacturer for potential alternative pump model/impeller sizes that intercept the system curve within the pump's POR
- Consider metering the wet well influent sewer line during a wet weather period to understand peak influent flow and potentially revise the chosen design flow rate of 135 gpm.

5.2.3 Electrical and Instrumentation

The lift station is equipped with instruments that are standard for similar stations serving the same functions. The instruments included are suction pressure gauges, a bubbler level transmitter, level transducer, process logic controller (PLC), and a uninterrupted power supply.

Field Observations:

Pressure Indication: Observed the absence of pump discharge pressure gauges, failed suction pressure gauges,

Level Indication: Wet well level uses a bubbler pressure transducer. However, the bubbler air is reliant on temporary compliant. The pressure transducer for wet well level measurement is functional but the original compressor is in a failed state.

Station Controls: The Tesco Control Panel equipped with an Allen Bradley COMPACTLOGIX 5380. The control unit appears to be in good condition and still supported by the manufacturer.

Motor Control Center: The starters appear to be sized correctly, However, parts that are no longer supported by the manufacturer, Additionally, a Uninterrupted Power Supply (UPS) is included in control panel, and thermostat readings above 90 degrees were observed. There appears to be no starter overload protection. There appears that a change in the design of MCC from 3-phase power to single phase power.

Recommendations:

- Conduct a deeper inspection to determine precise condition of the bus bars, circuit breakers, wiring, relays, switches, etc. There may be significant signs of corrosion due the minimal separation of the wet well and electrical gear.
- Replace obsolete MCC starter components.

- Update MCC internal wiring for a single-phase to 3-phase converter.
- Explore options for replacing the compressor for the wet well bubbler. Or options for level indicator transmitters such as radar, ultrasonic, guided wave, or submersible pressure transducers.
- Address pressure gauge issues on both the discharge and suction sides.
- Consider upgrading pump motors and using Variable Frequency Drives (VFDs) for better control.
- Improve the monitoring and calibration of the wet well level measurement system.
- Examine the feasibility of updating the MCC for single-phase power.
- Evaluate the SCADA hookup and modem connection for proper functionality.

5.2.4 Backup Generator

Field Observations:

Lift station backup power is provided by a permanent 35 kW diesel generator. The generator has the capacity to operate both pumps simultaneously along with other station power demands. The generator set operates on a weekly basis for 15 minutes. The generator set appears to be in good condition, however, it appears to be oversized for the lift station demands. The automatic transfer switch is vulnerable attacks from hydrogen sulfide gas and may be prone to corrosion of the electrical contacts.

Fuel consumption: The 15-minute weekly runtime equates to 13 hours per year, consuming about a third of the 132 gallons of useable fuel. The 35-kW generator consumes about 3.5 gallons per hour when operating at full capacity. Therefore, the generator could run at fully capacity for 38 hours. Given the current exercise schedule, this means the fuel tank would not need a refill for almost 3 years.

$$\text{Generator Runtime per year: } 15 \frac{\text{min}}{\text{week}} * 52 \frac{\text{weeks}}{\text{year}} * \frac{1 \text{ hrs}}{60 \text{ min}} = 13 \text{ hrs per year}$$

$$\text{Total fuel tank capacity: } \frac{132 \text{ gallons}}{3.5 \text{ gallons per hr}} = 38 \text{ hours}$$

$$\text{Generator Total Runtime: } \frac{38 \text{ hrs}}{13 \text{ hrs per year}} = 2.92 \text{ years or 35 months}$$

Diesel Age: Based on the short generator run times it appears that the oversized fuel tank may have an impact on future generator performance such as reduced power output, hard starting, rough idling and increased emissions. Diesel has an effective lifespan of 6 to 12 months, but the effectiveness of fuel depends on storage conditions, temperature, and the use of diesel additives. The calculations below provide estimates of the consumption rate and total availability of the generator set relative to fuel capacity.

Recommendations:

- Increase generator exercising frequency to prevent wet stacking and fuel degradation. With a total runtime at full speed of 38 hours, the generator would need to be run for roughly 45 minutes every week to turn over the entire fuel tank within a year.

- Decrease fuel input to allow new diesel to cycle through the tank. With the currently runtime schedule of 15 minutes per week (13 hours per year), the fuel tank only needs roughly 46 gallons of fuel so that all of the generator fuel is consumed within one year.
- Define a required level of service (LOS) for the generator, determining how many hours of continuous runtime are needed from the generator given a power outage emergency and accounting for the typical amount of time it takes to restore power to the area.

5.3 Business Risk and Vulnerability Assessment

This section documents the Business Risk and Vulnerabilities Assessment (BRVA) process, detailing its purpose, employed approach, critical findings, and future project recommendations (encompassing both infrastructure and non-infrastructure initiatives). Appendix E provides additional detail on the BRVA workshop discussions and system-level asset interviews.

5.3.1 Purpose

The BRVA provides CVWD with a framework for prioritizing inspections and CIP projects based on risk while aligning the assessment with CVWD's corporate mission. The components of risk include both the existing condition of the asset as well as the consequence of failure of the asset. The BRVA brought all departments of CVWD, including Operations, Engineering, and Finance into the same room to encourage cross talk between departments and to understand how each department perceived and risk tolerance for system-level assets. The BRVA also helped CVWD understand the business practices in place to control and/or mitigate risk in the event of a failure of a portion of the collection system, as well as any improvements that may need to be made.

5.3.2 Approach

The BRVA approach followed the timeline shown below in Figure 5-13.

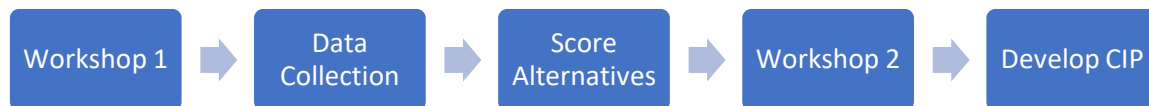


Figure 5-13: BRVA Timeline

Each element of the BRVA approach is described in the sections below.

5.3.2.1 Workshop 1

The first workshop was an all-day workshop attended by all departments of CVWD. The first goal of the workshop was to develop a risk matrix that fit CVWD's business goals and corporate mission statement. The objective of the matrix is to eliminate subjectivity from the failure analysis and confirm group consensus on the consequences of the system failures. The consequence of failure is an aggregated value composed of five major categories:

- Health and Safety for the Public and Employees
- Impact on Environment or Regulatory Compliance
- Quality of Service
- Public Image
- Financial Impact

Each of these categories during the workshop was scored on a scale of 1 to 5. Additionally, the Quality of Service criterion, meaning how many customers does an asset impact, was informed by the results of the calibrated hydraulic model. Assets conveying relatively more flow received higher Quality of Service scores, and vice versa. The 5x5 matrix shown in has the condition score of the asset on the vertical axis and the consequence of failure (COF) on the horizontal axis. The definitions for each COF category are specific to CVWD.

Corporate Risk Matrix Wastewater Master Plan										
Crescenta Valley Water District July 2022										
System Condition	Very Poor, Full Replacement	5						5	X < 1 Yr	Likelihood of Failure
	Poor Condition, Rehab. or Replacement	4						4	1 < X <5 Yrs	
	Fair Condition, Major CM	3						3	5< X <10 Yrs	
	Fair Condition, Minor CM	2						2	10< X < 20 Yrs	
	Good Condition, No Action	1						1	X > 20 Yrs	
		1	2	3	4	5				
Consequence of Failure										
Safety	No injury, and no anticipated future impacts	Minor to moderate injury – contusions & lacerations w/out lost time, first aid applied	Moderate injury/lost time or restricted duty	Major serious health issues (acute & chronic) & long-term injuries – disabling	Fatalities	Safety				
Environmental and Regulatory Impact	No negative impacts on environment, public health or regulatory compliance	No negative impacts on environment or public health; minor compliance issues (i.e., minor NPDES violation, exceed WQ standard triggering effluent limit; SSS WDR Category 3 spill; RW spill < 1,000 gals; minor Title 22 violation; Notice to Comply)	Minor negative impact to the environment and/or public health; compliance issues (i.e. repeated or major NPDES violation; SSS WDR Category 2 spill or Category 1 spill < 1000 gals; recycled water spill > 100,000 gals; minor Notice of Violation)	Moderate negative impact to the environment and/or public health; major permit violation (i.e. NPDES ACL > \$10,000; SSS WDR Category 1 spill > 1,000 gals & < 100,000 gals; recycled water spill > 500,000 & < 1M gals; Title 22 major violation; major Notice of Violation)	Significant negative impact to the environment and/or public health; major permit violation (i.e. Significant NPDES Enforcement Order; SSS WDR Category 1 spill > 100K gals; recycled water spill > 1M gals; potential for Title 22 permit revocation; any violation resolved through the Courts)	Environmental and Regulatory Impact				
Quality of Service and Delivery	No impacts on service delivery or customers	Impact limited to individual customers	Moderate localized impact to groups of customers; short-term service disruption	Sub-basin impacts with potential long-term service disruption	Service area-wide impacts; Long-term service outages	Quality of Service and Delivery				
Public Image	No to minimal Impact; odor complaint, or complaint to staff, with staff acknowledgement, action and response	Some significant social media and no local media coverage; phone call response handled by staff	Social media activity and maybe minor local media coverage; Board may receive complaints to be responded to by staff	Local media coverage with Board of Directors involved in response; potential long-term impact to community trust in District	Lead story in regional/national or industry short and long-term coverage; significant impact to community trust in the District	Public Image				
Fiscal Impact	0 < \$5K	\$5K < X < \$25K	\$25k < X < \$50K	\$50k<x<\$250k	> \$250k	Fiscal Impact				

Figure 5-14: CVWD Risk Matrix (See Appendix E for Full Size / High Resolution Table)

The second goal of the workshop was to interview staff about the collection system assets/asset regions to understand asset condition and business practices in place for each asset. Because there are over 65 miles of gravity sewer pipe, the collection system was divided into 10 regional sewersheds based on major confluence points, as discussed in Section 2.1. Additionally, each of the EMA areas discussed in Section 1.2.1.1 were analyzed as part of the BRVA. The BRVA discussion divided the collection system into the following components:

- Outfall / Diverter Valve

- Sewer Interceptor
 - The Interceptor was divided into two segments. Segment 1 is from the outfall at LAGWRP up to Hillside Drive. Segment 2 is from Hillside Drive up to Sunview Drive.
- La Granada Lift Station / Force Main
- Sewersheds 1 - 10
- EMAs 1 – 10

To easily categorize project locations, gravity sewer pipes were further subdivided within the 10 Sewersheds into trunk sewers and collectors. A “trunk” gravity sewer pipe was any pipe with two or more sewer alignments branching from the sewer alignment. Gravity sewer pipes with no additional upstream branching were defined as “collector” sewer pipes. Figure 5-20 shows these categorized gravity sewer pipes. Each trunk sewer is numbered to assist in categorizing project locations. The location of each asset/potential project discussed during the BRVA was described by the Sewershed number, trunk sewer number, and the nearest cross street. Appendix E documents the tabulated assets and their locations.

In addition to scoring the COF for each asset within the collection system, the business practices in place for each asset were also evaluated. Business practices are used to prevent and/or mitigate a failure event. The better the business practices are, the easier it will be for CVWD to recover from a failure event. Table 5-7 provides the business practices that were scored on a scale from 1 to 5 for each asset. These scorings were then used to calculate the total “Business Vulnerability” (BV) score for each asset.

Table 5-7: CVWD Business Element Definition

CVWD Business Practices	Definition
Work Execution Management (WEM)	How well work orders are issued, processed, and documented.
Asset Condition	What is the current condition of the asset based on O&M inspections.
Training Program	How effective is the O&M training program relative to testing the competencies needed for sustaining assets.
Site Safety Condition	How safe is the work environment when operating and/or maintaining the asset.
Resiliency	Are emergency response plans, abnormal operating procedures, and standard operating procedures well documented.
Reliability Engineering Support	How well does engineering monitor Key Performance Indicators (KPIs), conduct root cause analysis, conduct failure and risk analysis, implement resiliency strategies, and practice continuous improvement to gain system efficiencies.
Asset Performance Management Practices	Available sensors/technology to measure and document the condition of assets.

CVWD Business Practices	Definition
Asset Management Business (AMB) Processes	CIP in place and regularly updated

5.3.2.2 Data Collection

After Workshop 1, additional data was collected to verify the condition of some of the assets discussed. This included the La Granada Lift Station condition assessment (Section 5.2) as well as verifying pipe and maintenance hole inverts/configurations for key areas of the collection system with record drawings. The work done with the calibrated collection system hydraulic model also revealed asset condition information not previously available to CVWD, and informed the asset scores as well.

5.3.2.3 Score Alternatives

The total risk score for each asset is a function of the weighted COF and BV scores, and is calculated as follows:

$$\text{Total Risk Score} = COF * BV$$

The lowest (least risk) score possible is a 1, while the highest (most risk) score is 25. Both of the COF and BV scores were composite scores calculated based on the weighting determined during the first workshop. Category weightings were assigned based on CVWD's priorities and business goals.

The COF component category weightings are shown below in Table 5-8. These weightings were developed based on conversations between operations, engineering, and finance departments to reflect CVWD's priorities. Safety and Environmental categories received the highest weighting based on CVWD's commitments to public safety and the protection of the surrounding natural environment.

Table 5-8: Consequence of Failure Category Weightings

Category	Weighting
Safety (S)	30%
Environmental (E)	25%
Quality of Services (QoS)	15%
Public Image (PI)	10%
Fiscal (F)	20%
Total	100%

The following equation represents the calculation for the COF score.

$$COF = .3 * S + .25 * E + .15 * QoS + 0.1 * PI + 0.2 * F$$

Table 5-9 shows the BV component weightings. These weightings were chosen based on previous experience with other utilities along with the input from CVWD staff, assigning the

highest weighting to the safety condition of the asset due to CVWD's commitment to the safety of their employees. The next highest weighting was assigned to the asset's resiliency, followed by asset condition.

Table 5-9: Business Vulnerability Category Weightings

Category	Weighting
Work Execution Management (WEM)	12%
Asset Condition (AC)	15%
Training (T)	10%
Safety Condition (SC)	30%
Resiliency (R)	20%
Reliability Engineering Support (RES)	8%
APM Practices (APM)	3%
AMB Processes (AMB)	2%
Total	100%

The following equation is used to calculate the composite BV score.

$$BV = .12 * WEM + .15 * AC + .1 * T + 0.3 * SC + 0.2 * F \\ + .08 * RES + .03 * APM + .02 * AMB$$

5.3.2.4 Workshop 2

With the scorings and field data collected, the departments of CVWD and Kennedy Jenks reconvened for a second time to review the risk scores of the assets and discuss potential conceptual-level CIP projects. The risk matrix shown in Section 5.3.2.1 was populated with the calculated COF and asset condition data to visualize the prioritization of the one-time risk mitigation opportunities that may transform into CIP projects. The total risk score profile for all assets was also provided to understand which assets carried the greatest risk, despite potentially not resulting in a CIP project based on the current condition of the asset. These visualizations are discussed further in the following section.

Workshop 2 also yielded additional information on potential vulnerabilities within the collection system based on the discussion of the proposed CIP projects and results of the I&I analysis discussed in Section 5.1.1.3. This information was also considered in the final development of the CIP.

5.3.2.5 Develop a Prioritized CIP List

The findings of the BRVA were used to develop a prioritized CIP plan, outlining project costs and timelines driven by the asset condition and the risk/consequence of failure score. The key findings for each asset category discussed during the BRVA process are broken down into the following subsections.

5.3.2.5.1 Interceptor

The gravity sewer interceptor, stretching over 6 miles from Sunview Dr/Verdugo Blvd to the outfall at LAGWRP, serves as the backbone of CVWD's wastewater collection system. This unlined VCP pipe, dating back 40 years, represents a critical single point of failure. As the sole

conduit for conveying wastewater across the service area, its failure would eliminate CVWD's entire sewage conveyance capacity.

While the interceptor's physical age raises concerns, discussions with staff revealed a further vulnerability: a lack of well-defined emergency procedures in case of a break. Crucial aspects included the following:

- Bypass pumping vendor coordination: Securing reliable and readily available pumping resources is essential for mitigating sewage overflows during an outage.
- Designated bypass laydown areas: Identifying temporary storage locations for bypass equipment ensures immediate deployment in case of an emergency.
- Coordination with nearby agencies: Streamlining communication and collaboration with relevant authorities can expedite response and minimize environmental impact.

The criticality of the interceptor demands immediate attention. Thus, CVWD should consider prioritizing:

- Conducting a comprehensive condition assessment: This in-depth evaluation will reveal the extent of deterioration and prioritize repair needs.
- Developing a robust emergency response plan: Establishing clear protocols for rapid response, resource allocation, and interagency coordination minimizes potential damage and ensures swift restoration of service.
- Exploring long-term rehabilitation or replacement options: Depending on the assessment results, investing in rehabilitation, or even replacing the aging pipeline can safeguard CVWD's wastewater conveyance system for decades to come.

The Diverter Valve at the outfall of the interceptor currently does not have site security (fencing/adequate lighting) and does not have a backup uninterruptible power system (UPS). If the diverter valve were to fail due to loss of power, it would fail in the last position. The Diverter Valve is normally open, conveying flow to LAGWRP. However, during the three-hour period from 12:00 AM to 3:00 AM, the diverter valve must close to convey concentrated brine directly to HTP. If a power failure was to occur at 11:30 PM, prior for brine to be discharged, the valve would fail in the "open" position, and potentially allow concentrated brine into LAGWRP's treatment facilities. Under this possible failure scenario, this will likely result in a regulatory fine against CVWD.

Finally, a private lateral connects to the interceptor at Hillside Drive that currently does not have any backflow prevention in place. Therefore, if a portion of the downstream interceptor (Segment 1) failed, this could result in a significant SSO event at Hillside Drive, and cause significant fiscal, environmental, and public image issues for CVWD.

5.3.2.5.2 Highway Crossings

CVWD has two key locations where gravity sewer pipe crosses above Highway 210 before continuing south. These elevated highway crossings have DIP gravity sewer pipe and are enclosed in a casing within the bridge crossing structure. These Hwy 210 crossings are located at Rosemont Ave and Briggs Ave. There is currently no CCTV or inspection history of the crossing gravity sewer pipe and/or casing pipe, and therefore the condition of these assets is unknown. CVWD recently experienced a water main break in August 2023 at the Rosemont / Hwy 210 crossing which caused significant impacts to traffic and made local news.

5.3.2.5.3 La Granada Lift Station

The La Granada Lift Station poses a current safety issue to CVWD operations staff, as the interior of the pump station building is classified as a Class 1 Div 1 space and is a potential explosion hazard with electrical equipment exposed to flammable gases and explosive environment.

5.3.2.5.4 EMAs

Each EMA was evaluated during the BRVA process, however EMA 1, located at the intersection of Pine Glen Rd and Pineridge Dr, was the key focus of discussion. Due to the “switchback” configuration of the gravity sewer in the area, this portion of gravity sewer is prone to maintenance hole blockages due to the several 90-degree turns the sewage must make before continuing downstream. This EMA is the location of a historical SSO.

5.3.2.5.5 Hillside Sewer Access

There are two maintenance hole locations in the northern portion of CVWD’s SSA that are steep and difficult for CVWD operations staff to access and maintain. These locations are near the intersection of Dorothy St / Goss Canyon Ave and on Starfall Dr / Ridgepine Dr. Maintenance hole blockages could result in SSOs that would travel into nearby wildlife areas that could result in fines for CVWD.

5.3.2.5.6 CVWD Programmatic Issues

CVWD currently does not have a digitized work order database or method for tracking/documenting work completed or condition assessment data, but are currently working on this improvement.

Figure 5-15 provides the total risk score profile from highest to lowest for the evaluated assets. The highest scoring areas included the interceptor and its components as well as the Hwy 210 crossings.

Figure 5-16 shows the system O&M safety condition scoreboard by project. Most notably, the La Granada Lift Station is rated a 5 due to the immediate safety threat it poses to O&M staff.

Figure 5-17 shows the combined COF and asset condition score, showing the driving factors for how the projects were prioritized and scheduled.

Figure 5-18 shows the risk matrix with the asset COF versus asset condition. Figure 5-19 shows the risk matrix with the O&M safety score on the horizontal axis instead to highlight the necessity of the La Granada Lift Station project. Additional risk profiles are available in Appendix E.

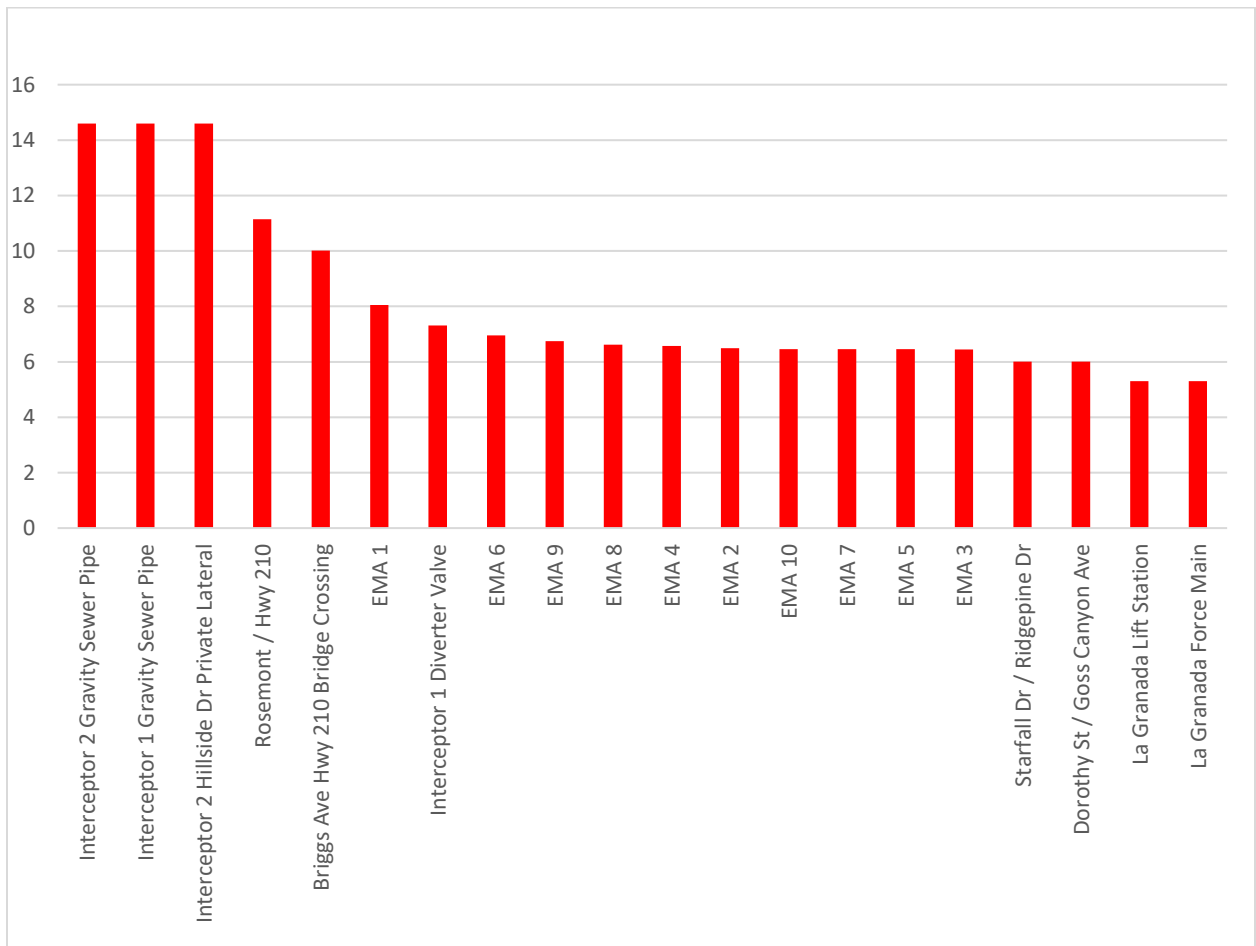


Figure 5-15: System Level Risk Scoreboard

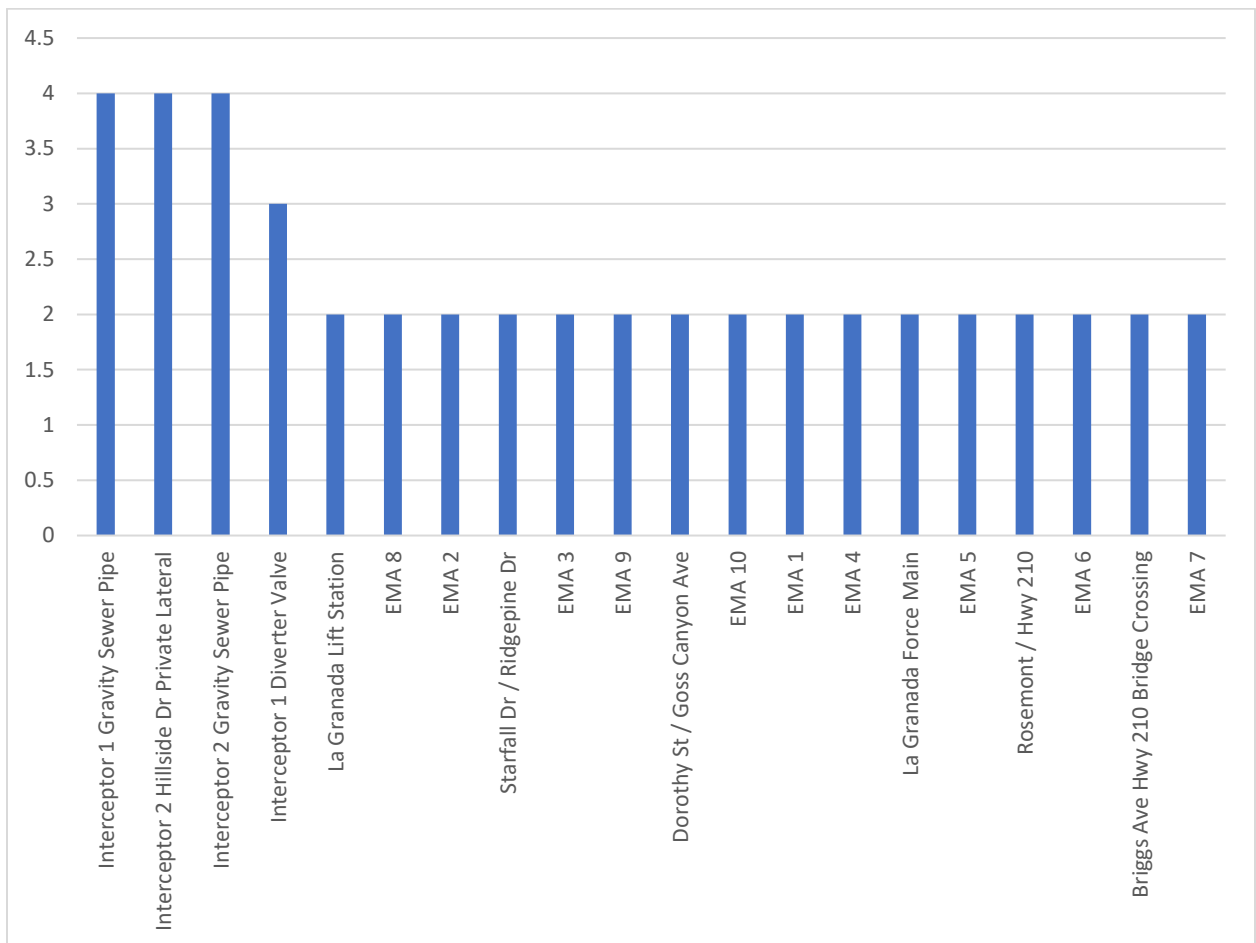


Figure 5-16: System Safety Condition Scoreboard

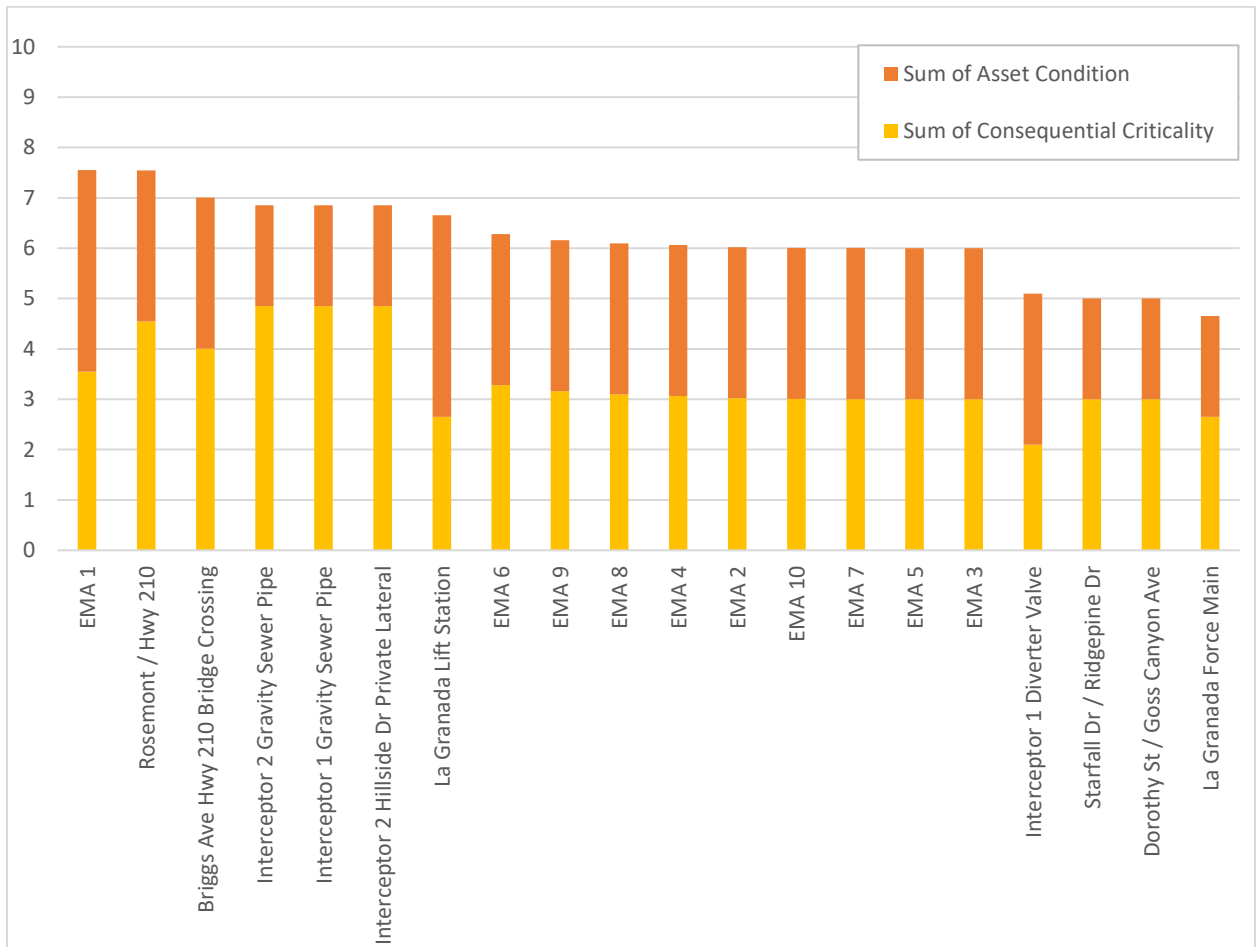


Figure 5-17: Consequence of Failure and Asset Condition Combined Scoreboard

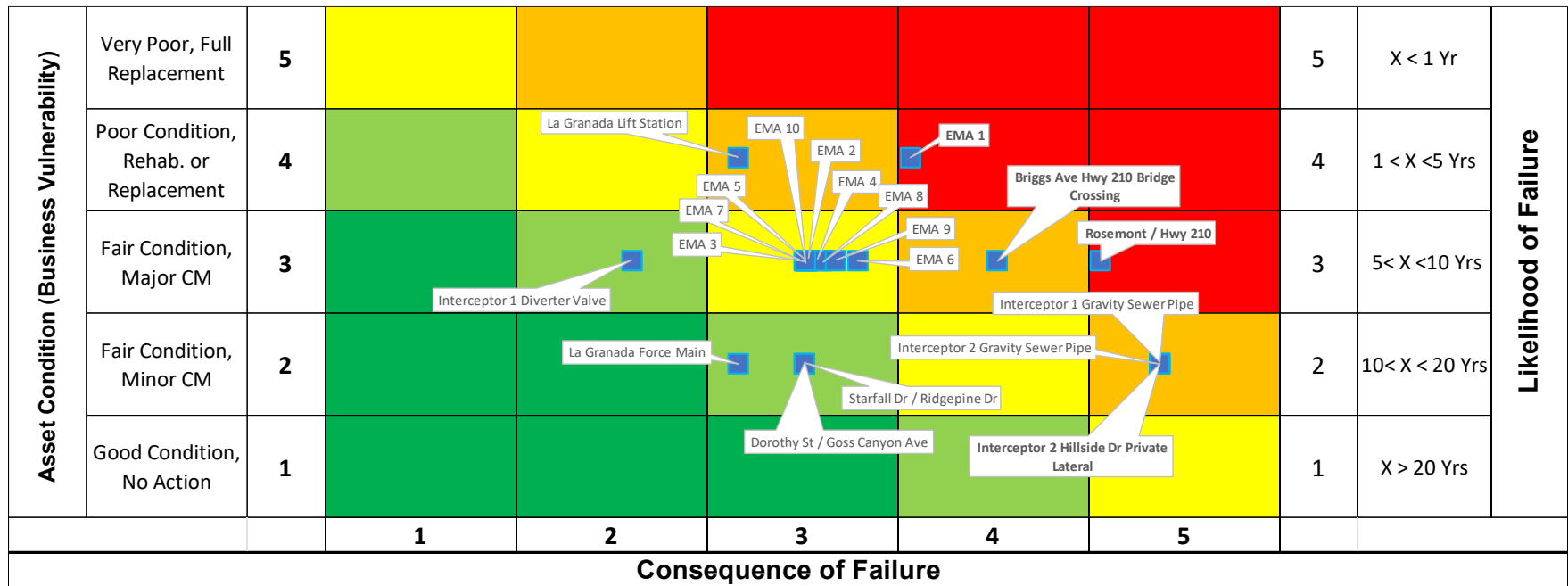


Figure 5-18: Risk Matrix Using Weighted COF

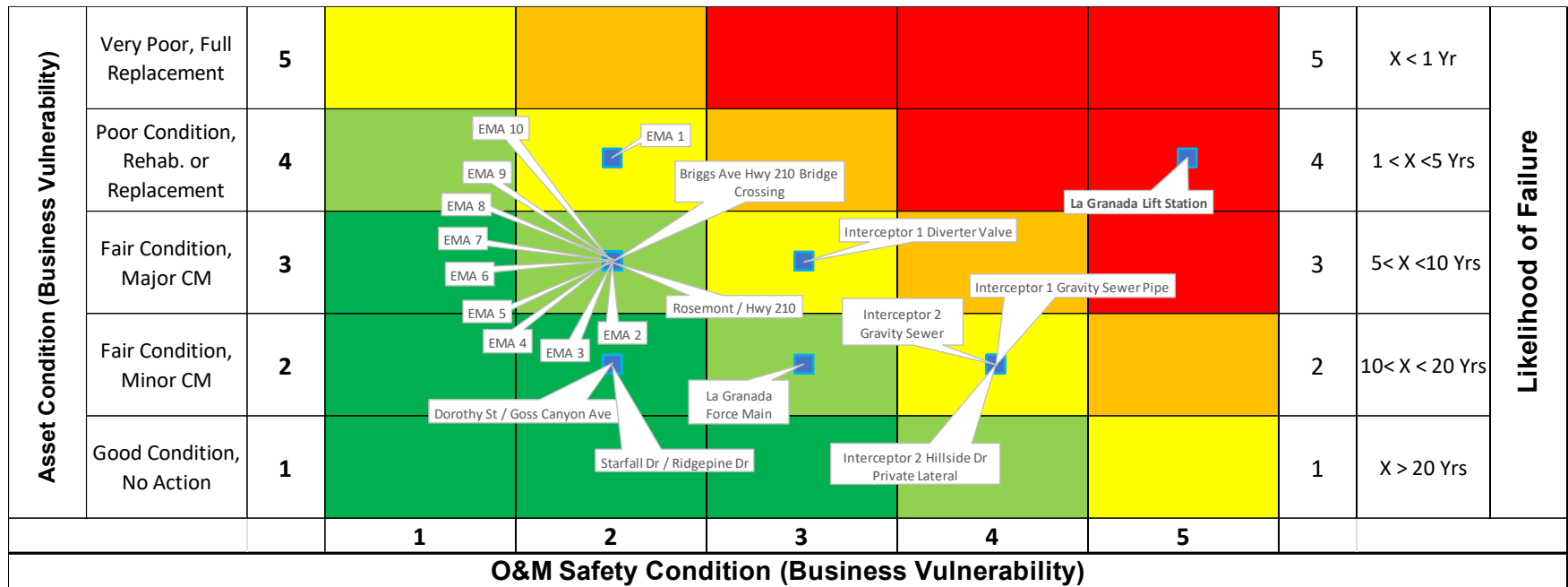


Figure 5-19: Risk Matrix Using O&M Safety Condition

5.3.3 Recommendations

Using the results of the BRVA process, the prioritization of the potential CIP projects was developed and is shown in Table 5-10. Projects with a “short” timeline should be completed as soon as possible, within the next 1 to 3 years. Projects with a “medium” timeline should be completed within 3-5 years. Projects with a “long” timeline should be completed within 5-10 years. Detailed 1-Page Project Summaries are also included in Appendix F.

Table 5-10: Recommended Infrastructure Project Prioritization

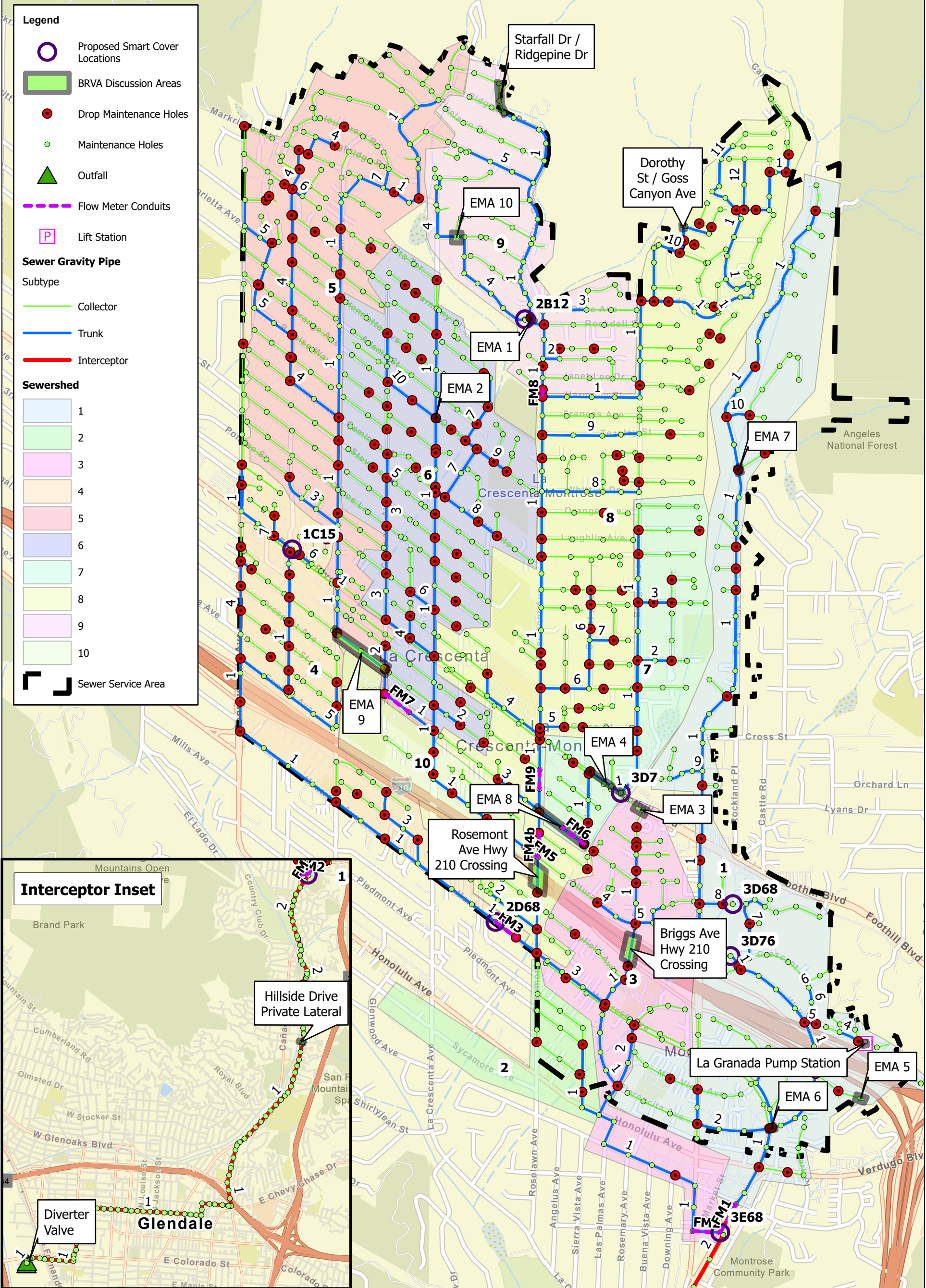
Timeline	Project	Justification
Short	Rosemont / Hwy 210 Crossing Inspection / Rehabilitation	Unknown Condition / Big safety, financial, and regulatory risks
	Pine Glen Rd / Pineridge Dr (EMA 1)	Historical SSO, Consistent problem for Ops, safety, financial, and regulatory risks
	La Granada Lift Station Improvements	Safety issue for Ops team, current code violation
Medium	Briggs / Hwy 210 Crossing	Unknown Condition, safety, financial, and regulatory risks (serves fewer customers than Rosemont)
	Hillside Dr Private Lateral	High safety and financial risk, relatively low effort to fix
Long	Diverter Valve	Low COF – minimal regulatory/financial/safety impacts
	Dorothy St / Goss Canyon Ave Sewer Access	Low COF - minimal regulatory/financial/safety impacts
	Starfall Dr / Ridgepine Dr Sewer Access	Low COF - minimal regulatory/financial/safety impacts

Additional non-infrastructure recommendations related to best business practices are listed below. These recommendations can be completed in-house and would be completed based on availability of operations staff.

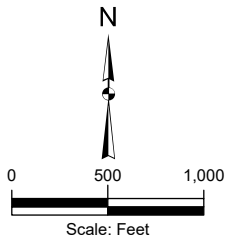
1. **SmartCover Maintenance Hole Lid Installation** – The primary purpose of SmartCovers are to monitor depth of flow within maintenance holes to alert CVWD of potential blockages/breaks in the collection system. Abnormally low flows could indicate and upstream blockage/break, while abnormally high flows would indicate a downstream blockage. The secondary benefit of the SmartCovers is that they provide additional calibration data for the hydraulic model. CVWD staff plans to install 5 SmartCovers in 2024 and 5 more in 2025. Based on discussions with CVWD staff, the following locations were selected for the 2024 SmartCovers (also shown in Figure 5-20):

- a. Waltonia Dr, MH# 3D76 – This is the location with the highest modeled d/D ratio for the collection system, largely due to the shallow slope of the gravity sewer pipe.
 - b. Sunview Dr / N Verdugo Blvd, MH# 3E68 – This is the beginning of the interceptor and a major confluence point on CVWD's system.
 - c. Hillside Dr along Interceptor, MH# 39108 (no VT Number) – This is the middle of the interceptor and provides CVWD with valuable information on the status of the interceptor.
 - d. Pineridge Dr / Pine Glen Rd, MH# 2B12 – This is a historical SSO location and should be monitored given it is a high-risk EMA.
 - e. Foothill Blvd / Briggs Ave, MH# 3D7 – This is a very shallow segment of sewer pipe and is also a classified EMA prone to blockages and debris buildup.
 - f. Two future recommendations for 2025 SmartCover placements are Oceanview Blvd / Barton Rd (MH# 3D68) and Foothill Blvd / Cloud Rd (MH# 1C15). Based on input from operations, these areas are prone to blockages/debris buildup due to the flow received from upstream customers.
2. **Improved Emergency Response Training for Interceptor break** – CVWD currently has a plan outlined for how to address high flow SSO's along the interceptor, but the plan does not address more severe conditions such as a break on the interceptor requiring immediate action. The SSMP should address on-call bypass pumping vendors, identify bypass pumping laydown areas for the interceptor alignment, and provide emergency contacts for local entities that may be impacted such as the City of Glendale.
 3. **Improved Communication with ADS to identify Elk St Flow Meter Failure** – CVWD should discuss with ADS how they could be notified of a meter failure at Elk St, as this has implications for how CVWD reports flows to the City of LA, and also removes a key indicator for CVWD for understanding how the interceptor is performing.
 4. **Develop monitoring method for Canalda tank discharge (EMA 7)** – Canalda tank current discharges unmetered flow to CVWD's SSA. CVWD should attempt to quantify the discharge flow on a more granular scale (GPM) to understand the impacts to collection system capacity.
 5. **Targeted flow monitoring for Sewersheds 1, 2, 3** – Based on the I&I analysis performed, CVWD should consider continuing temporary flow metering during wet weather months in sewersheds 1, 2, and 3 to pinpoint sources of inflow. While smoke testing entire sewersheds is not feasible or cost effective, isolating I&I to one street or sewer alignment could then be followed with targeted smoke testing to identify stormwater cross connections and other areas of leakage.
 6. **Develop Digitized Asset Condition / Work Order Database** – creating a digitized database of work order history and asset condition assessments is crucial to allowing CVWD to effectively maintain the collection system long after key staff and operators have left, taking institutional knowledge with them. It also provides the ability to plot the condition of assets overtime and observe which assets are degrading faster than others, and which need to be prioritized for rehabilitation/repair/replacement. This database will inform CVWD's future cured-in-place piping (CIPP) lining schedule.

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Date: 7/5/2024
Printed by: Connor Rutten



Notes:



Kennedy Jenks
Crescenta Valley Water District
Wastewater Master Plan

Recommended Project
Locations

2244508*00
Figure 5-20

Section 6: Capital Improvement Program Development

This section takes the compiled input from the analyses described in Section 5 and provides an actionable plan regarding the implementation of the proposed projects. This section outlines the development of the Capital and O&M costs, and provides potential CIP plan implementation schedules for the identified projects. This section also provides additional programmatic recommendations beyond the proposed CIP Plan for CVWD's consideration.

6.1 Identified Projects

The projects discussed in Section 5.3.3 are listed in Table 6-1. Table 6-1 provides a description of the project as well as a justification for the project based on the results of the BRVA. 1-Page project summaries are also provided in Appendix F.

In the case of the La Granada Lift Station Improvements project, a secondary project was identified as a potential alternative to the recommendations outlined in Section 5.2, which involved the construction of a new wet well and rerouting the influent gravity sewer.

The alternative project would consist of converting the lift station into an outdoor lift station by removing the building walls and roof, and installing submersible pumps to eliminate the need for noise attenuation. Submersible pumps also offer a wide range of pump selections that will better fit the force main system curve, improving the reliability of the lift station and reducing required maintenance. The electrical equipment would be relocated to the eastern portion of the lot and placed in NEMA 4x outdoor-rated enclosures, far enough from the wet well access to maintain compliance with NFPA 820. A new subgrade valve vault would be installed to match the elevation of the existing force main discharge to remove the issue of creating a local high point. This alternative has the added benefit of keeping all project work within the site, and does not require work/digging in the public right of way. The key drawback of this alternative is that it is twice the cost (an estimated \$416,000), and would likely involve the utility power to be converted back to 3 phase power. A proposed project layout for this alternative is included in Appendix G as well.

For the purposes of developing the CIP schedules, the less expensive pump station improvements project (new wet well and rerouted inlet gravity sewer) was used.

Table 6-1: CVWD CIP Projects

Proj. ID	Project Name	Project Description	Justification
Infrastructure Projects			
I-1	Granada Pump Station Improvements	Site safety and pump system improvements to the Granada Pump Station: entails a new wet well, new gravity sewer influent line, and building, piping, electrical, and site modifications.	Asset condition is poor and is an existing safety issue for operations staff. Regulatory issue with NFPA 820.
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	Improvements to prevent historical debris collection and SSO events: abandonment/demolition of existing sewer lines, new installation of reversed flow sewer line, drop maintenance hole, and chimney lateral.	Asset in poor condition and was a historical SSO site (regulatory issue). Financial risk if surrounding homes are damaged.
I-3	Rosemont / Hwy 210 Crossing Retrofit	Seismic retrofit of highway bridge crossing: retrofit each end of bridge pipe with seismically rated sewer fitting. Option for full bridge sewer line and casing pipe replacement.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
I-4	Briggs / Hwy 210 Crossing Retrofit	Seismic retrofit of highway bridge crossing: retrofit each end of bridge pipe with seismically rated sewer fitting. Option for full bridge sewer line and casing pipe replacement.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
I-5	Hillside Dr Private Lateral Backflow Preventer	Backflow prevention: Installation of duckbill backflow preventer on private lateral off interceptor.	Public safety risk and major financial risk. Relatively low effort to address for large gain
I-6	Dorothy / Goss Canyon Access Road	Improve maintenance hole access: obtainment of easement, construction of access road.	Operations staff safety issue, fiscal liability if backup occurs and damages nearby homes
I-7	Starfall / Ridgeline Access Road	Improve maintenance hole access: obtainment of easement, construction of access road.	Operations staff safety issue, fiscal liability if backup occurs and damages nearby homes
I-8	Diverter Valve Upgrades	Security improvements: installation of UPS, site lighting, perimeter fence.	Safety concern for both public and operations staff due to lack of security
Non-Infrastructure Projects			
N-1	Rosemont, Briggs Crossings Condition Assessment	Thoroughly inspect sewer lines and casings crossing Rosemont and Briggs bridges. Would entail consultant CCTV inspection of sewer and void between pipe and casing. One-time.	Asset condition unknown. Public safety risk due to crossing Hwy 210, large regulatory and public image risk
N-2	Smart Cover Installation	Maintenance hole monitoring and alarms through smart maintenance hole cover systems. 4 covers to stay in position, 6 covers to alternate locations. Ongoing, indefinite.	Low cost method of evaluating system performance and identifying potential areas with frequent blockages/flow issues
N-3	Interceptor Items	Improved Emergency Response Training for Interceptor break (annual, indefinite). Improved Communication with ADS to identify Elk Ave Flow Meter Failure (one-time).	Improve training and resiliency to handle interceptor break, improve ability to know when flow meter is in a failed state
N-4	EMA 7 Monitoring	Monitoring of Canalda tank discharge. 3 months of monitoring; one-time.	Unknown asset condition, receiving unknown quantities of discharge flow
N-5	SS 1,2,3 Monitoring	Targeted flow monitoring for sewersheds 1, 2, 3. 3 months of monitoring per year for 5 years.	Narrow down areas with large I&I contributions for targeted pipe rehabilitation/lining projects
N-6	Work Order Database	Develop work order database with pipe and maintenance hole condition ratings data. One-time.	Improves APM practices by being able to visualize and prioritize pipeline replacement projects based on condition assessment data

6.2 CIP Project Costs

6.2.1 Capital Costs

An Opinion of Probable Construction Cost (OPCC) was developed for each of the CIP projects at a Class 5 level, which represents Concept Screening level detail with an estimated accuracy range between -30% to +50, in accordance with the AACE standard cost estimating guidelines. The following assumptions and inclusions were made in the preparation of each of the cost estimates:

- Projects will be publicly bid projects.
- Prevailing wage requirements will apply.
- Assume there will be at least 3 qualified bids submitted.
- Assume all excess excavated material is hauled and disposed of.
- Assume all demolished material will be hauled and disposed of including a dump fee.
- Costs are rounded to nearest \$1,000 and are in 2024 dollars.

The estimates do not include the following:

- Hazardous materials (lead paint, asbestos, PCBs, etc.) removal or disposal is not included.
- Soil remediation, testing, removal, or disposal.

The Class 5 OPCCs and associated present worth costs for each of the CIP projects are shown in Table 6-2. See Appendix G for a detailed cost estimate breakdown.

Table 6-2: Capital Cost Assumptions

Item	Assumption
Taxes	10.25%
Mobilization/Demobilization/Permits	10%
Contractor Overhead & Profit	15%
Bonds and Insurance	2.5%
Escalation to mid-point of Construction	6%
Estimate Contingency	30%
Engineering ¹	15% / 25%
Construction Management ¹	15% / 25%

Notes:

1. Projects with Subtotal costs (before soft costs) under \$1 Million assumes 25% increase, Projects with Subtotal costs above \$1 Million assumes 15% increase.

Table 6-3: CIP Projects Capital Costs

Proj. ID	Project Name	Capital Cost	Total BRVA Risk Score
Infrastructure Projects			
I-1	Granada Pump Station Improvements	\$209,000	8.5
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	\$221,-000	8.2
I-3	Rosemont / Hwy 210 Crossing Retrofit ¹	\$181,000 - \$1,611,000	11.4
I-4	Briggs / Hwy 210 Crossing Retrofit ¹	\$203,000 - \$1,902,000	10.0
I-5	Hillside Dr Private Lateral Backflow Preventer	\$35,000	14.6
I-6	Dorothy / Goss Canyon Access Road	\$90,000	6.0
I-7	Starfall / Ridgeline Access Road	\$107,000	6.0
I-8	Diverter Valve Upgrades	\$41,000	7.3
Non-Infrastructure Projects²			
N-1	Rosemont, Briggs Crossings Condition Assessment	\$231,000	-
N-2	Smart Cover Installation	\$34,000	-
N-3	Interceptor Items	\$3,000	-
N-4	EMA 7 Monitoring	\$4,000	-
N-5	SS 1,2,3 Monitoring	\$12,000	-
N-6	Work Order Database	\$8,000	-

Notes:

1. Lower end of capital cost range consists of installation of seismic joints only. Higher end of range consists of installation of seismic joints and full replacement of sewer line and casing pipe.
2. Non-Infrastructure Projects not scored as part of BRVA

6.2.2 O&M Costs

For the infrastructure CIP projects, there is assumed to be no increase in maintenance requirements or cost beyond CVWD's existing regular maintenance activities and existing O&M budget, respectively.

For the non-infrastructure CIP projects, the annual O&M costs are shown in Table 6-4.

Table 6-4: Non-Infrastructure CIP Project O&M Costs

Proj. ID	Project Name	Annual O&M Cost
N-1	Rosemont, Briggs Crossings Condition Assessment	N/A
N-2	Smart Cover Installation	\$10,000
N-3	Interceptor Items	\$3,000
N-4	EMA 7 Monitoring	N/A
N-5	SS 1,2,3 Monitoring	\$12,000
N-6	Work Order Database	N/A

6.3 CIP Project Schedule

Based on the listed CIP project costs in Table 6-3 and Table 6-4 and assuming an annual CIP budget of \$500,000, there are two alternative CIP Plans based on the scopes of Projects I-3 and I-4 depending on the findings of the bridge crossing inspections. CIP Plan A reflects the best-case scenario where all that is needed to fix the bridge crossings the seismic join installations. CIP Plan B reflects the worst-case scenario, assuming that full replacement of the bridge crossing casing and gravity sewer pipe require replacement. All dollar amounts displayed in the CIP Plans are in 2024 dollars.

6.3.1 CIP Plan A

CIP Plan A would consist of all listed projects, with Projects I-3 and I-4 being seismic retrofits only. Under Plan A, all project capital costs will be committed with the \$500,000 annual budget within 5 years. CIP Plan A is displayed in Table 6-5.

6.3.2 CIP Plan B

CIP Plan B would consist of all listed projects, with Projects I-3 and I-4 including seismic retrofits and full replacements of sewer line and casing pipe. Under Plan B, all project capital costs can be committed with the \$500,000 annual budget within 10 years. CIP Plan B is displayed in Table 6-6.

Table 6-5: CIP Plan A Schedule

Proj ID	Infrastructure Projects	Asset Condition	Total Risk Score	Year									
				1	2	3	4	5	6	7	8	9	10
I-1	Granada Pump Station Improvements	4.0	8.5	\$209,000									
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	4.0	8.2		\$221,000								
I-3	Rosemont / Hwy 210 Crossing Retrofit ¹	2.0	14.6		\$181,000								
I-4	Briggs / Hwy 210 Crossing Retrofit ¹	2.0	6.0			\$203,000							
I-5	Hillside Dr Private Lateral Backflow Preventer	2.0	6.0		\$35,000								
I-6	Dorothy / Goss Canyon Access Road	3.0	11.4			\$90,000							
I-7	Starfall / Ridgepine Access Road	3.0	10.0			\$107,000							
I-8	Diverter Valve Upgrades	3.0	7.3			\$41,000							
Non-Infrastructure Projects													
N-1	Rosemont, Briggs Crossings Cond. Assessment	-	-	\$231,000									
N-2	Smart Cover Installation ²	-	-	\$34,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
N-3	Interceptor Items ²	-	-	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
N-4	EMA 7 Monitoring	-	-		\$4,000								
N-5	SS 1,2,3 Monitoring	-	-	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000					
N-6	Work Order Database	-	-	\$8,000									
Project Total				\$497,000	\$466,000	\$466,000	\$25,000	\$25,000	\$13,000	\$13,000	\$13,000	\$13,000	\$13,000
CIP Budget				\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000

Notes:

- 1. Bridge crossing projects consist of seismic retrofits only.
- 2. Smart Cover Installation and Interceptor Items are ongoing and indefinite. They will continue to have O&M costs beyond this 10-year schedule.

Table 6-6: CIP Plan B Schedule

Proj ID	Infrastructure Projects	Asset Condition	Total Risk Score	Year									
				1	2	3	4	5	6	7	8	9	10
I-1	Granada Pump Station Improvements	4.0	8.5	\$209,000									
I-2	Pine Glen / Pineridge (EMA 1) Switchback Redesign	4.0	8.2		\$221,000								
I-3	Rosemont / Hwy 210 Crossing Retrofit ¹	3.0	11.4		\$250,000	\$475,000	\$475,000	\$411,000					
I-4	Briggs / Hwy 210 Crossing Retrofit ¹	3.0	10.0						\$487,000	\$487,000	\$487,000	\$441,000	
I-5	Hillside Dr Private Lateral Backflow Preventer	2.0	14.6					\$35,000					
I-6	Dorothy / Goss Canyon Access Road	2.0	6.0										\$90,000
I-7	Starfall / Ridgepine Access Road	2.0	6.0										\$107,000
I-8	Diverter Valve Upgrades	3.0	7.3									\$41,000	
Non-Infrastructure Projects													
N-1	Rosemont, Briggs Crossings Cond. Assessment	-	-	\$231,000									
N-2	Smart Cover Installation ²	-	-	\$34,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000	\$10,000
N-3	Interceptor Items ²	-	-	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
N-4	EMA 7 Monitoring	-	-		\$4,000								
N-5	SS 1,2,3 Monitoring	-	-	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000					
N-6	Work Order Database	-	-	\$8,000									
Project Total				\$497,000	\$500,000	\$500,000	\$500,000	\$471,000	\$500,000	\$500,000	\$500,000	\$495,000	\$210,000
CIP Budget				\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000	\$500,000

Notes:

- 1. Bridge crossing projects consist of seismic retrofits only.
- 2. Smart Cover Installation and Interceptor Items are ongoing and indefinite. They will continue to have O&M costs beyond this 5-year schedule.

6.4 Additional Recommendations

This section covers additional recommendations beyond the development of the CIP implementation plans.

6.4.1 Pipeline Rehabilitation Program

6.4.1.1 Existing Pipeline Age & Materials

Given that most pipes in the system are homogenous in terms of material and age, adopting a distinct approach for prioritizing sewer pipes for rehabilitation is crucial. The use of condition assessment data from the SSMP offers a more nuanced method to distinguish pipes based on their current condition and operational effectiveness. CVWD is currently in the process of developing a digital database of condition assessment data for the collection system gravity sewer pipes. Once this database is complete, the condition data should be imported into GIS to identify any spatial patterns among pipes with abnormally poor condition scores.

CVWD's collection system is over 99% VCP, and CVWD also requires all new gravity sewer to be VCP, as guided by the SSMP. VCP is notably resistant to sewerage contaminants, and has served CVWD well since the inception of the collection system in the 1980's in terms of resistance to seismic events and major breaks. The useful life of VCP is also commonly cited as greater than 100 years. However, VCP has limited tensile strength, making it susceptible to damage from root intrusion and prone to leaks. Table 6-7 shows the age of pipes by number of reaches within the system. A "reach" is defined as one continuous gravity sewer pipe alignment from one maintenance hole to another.

Table 6-7: Sewer Pipe Age – Year Installed by Amount of Reaches

Year Installed (Decades)	No. of reaches	Percentage
Unknown	21	1.27%
1950s	6	0.36%
1960s	135	8.19%
1970s	22	1.33%
1980s	1,449	87.87%
1990s	4	0.24%
2000s	12	0.73%

6.4.1.2 Current Rehabilitation Practices

Per CVWD's SSMP, CVWD has consistently demonstrated its capability to promptly repair any damages in the collection system as soon as deficiencies are identified. To manage extensive repairs and upgrades efficiently, any project with an estimated cost exceeding \$100,000, such as CIPP relining, hydraulic upgrades, or main replacements, is classified as a CIP project and becomes a prioritized project for CVWD. These projects are then scheduled and managed by the Engineering Department to ensure timely and effective implementation as soon as it is

practical to do so. This approach ensures that significant repairs and enhancements to the collection system are handled systematically and efficiently, maintaining the integrity and functionality of the wastewater management infrastructure.

6.4.1.3 Proposed Rehabilitation Methodology

The WWMP's recommended Rehabilitation Methodology adopts a structured and systematic approach to uphold and enhance CVWD's sewer infrastructure. The methodology is organized as follows:

- Condition Assessment
- High Risk Prioritization – BRVA, CIP Schedule
- Rehabilitation Techniques – Planning and Overview
- Design and Engineering
- Implementation
- Quality Control
- Documentation
- Community engagement
- Continuous Monitoring
- Non-Infrastructure Improvements

Utilizing recent CIPP cost data from projects KJ prepared for LACSD (see Table 6-8) , a comprehensive evaluation of the costs associated with CIPP liners was carried out, the details of which are illustrated in Figure 6-1. This analysis is instrumental for appraising future sewer rehabilitation projects. A key finding from scrutinizing past project invoices is that shorter CIPP lining projects tend to be more expensive per LF than longer projects, a phenomenon attributed to economies of scale. To determine the cost per LF for each diameter of sewer pipe owned by CVWD, an initial step involved calculating an exponential function. This function provides a baseline for understanding the varying costs associated with different pipe diameters and lengths, enabling more accurate budgeting and planning for future rehabilitation endeavors.

Table 6-8: LACSD CIPP Liner Cost Data

Project	Year	Total Cost	Liner Size	Length (ft)	Unit Cost
LACSD - District 01 Trunk Sewers Group 1 Rehabilitation	2023	\$3,749,240	10"	2,342	\$80
			12"	4,425	\$102
			15"	1,089	\$177
			18"	7,536	\$165
LACSD - District 05 Trunk Sewers Group 1 Rehabilitation	2023	\$2,457,626	10"	1,304	\$71
			15"	10,390	\$144
			18"	609	\$206
LACSD - Joint Outfall H Unit 9B	2024	In-Progress	24"	662	\$320
			25"	19,681	\$225
			28"	1,937	\$255

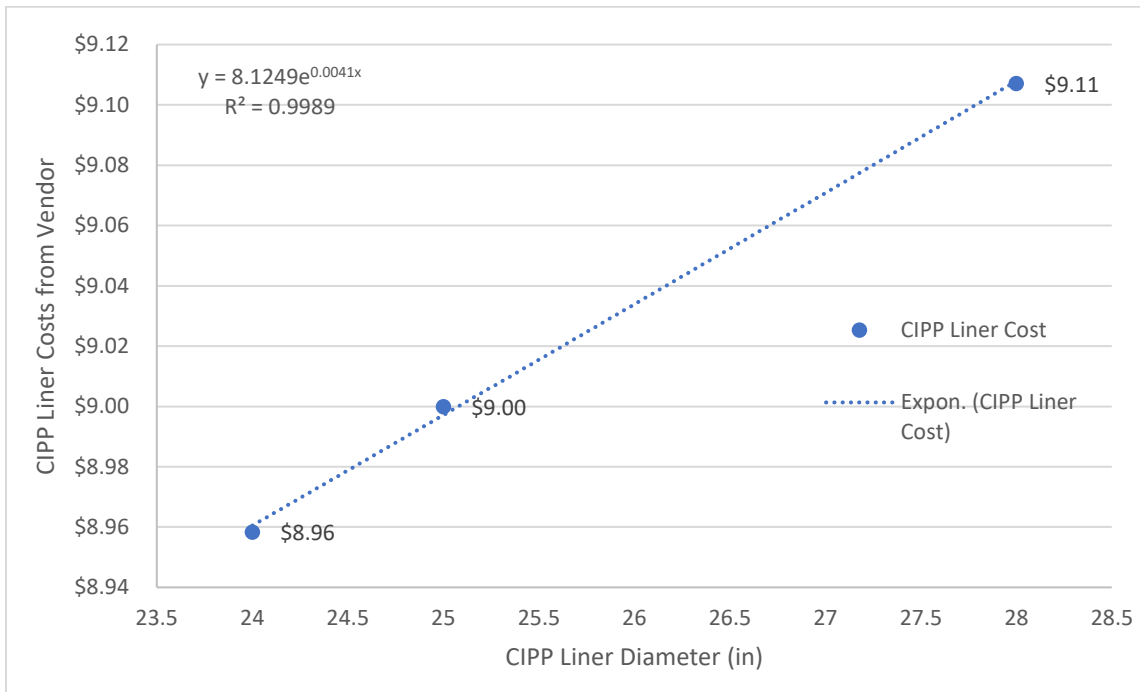


Figure 6-1: CIPP Liner Exponential Function Costs

The next phase in the analysis focused on evaluating the Economies of Scale related to CIPP lining costs. A key assumption was that contractors increase the cost for CIPP liners when the required length is less than 1,000 LF, as liners are typically sold in 1,000-foot rolls. An average incremental rate of \$0.0129 per LF was calculated for each foot below this 1,000 LF threshold. Based on these insights, a series of cost curves was developed (see Figure 6-2), providing the approximate cost per linear foot based on the estimated length of the CIPP project and the diameter of the pipe to be lined. These cost curves allow for a quick estimate of the initial cost for CIPP lining based on pipe diameter and length. This estimate method strictly covers the CIPP liner cost and does not account for additional expenses such as CCTV inspection, sewer pipe cleaning, spot repairs, and other variables that could influence the total project cost.

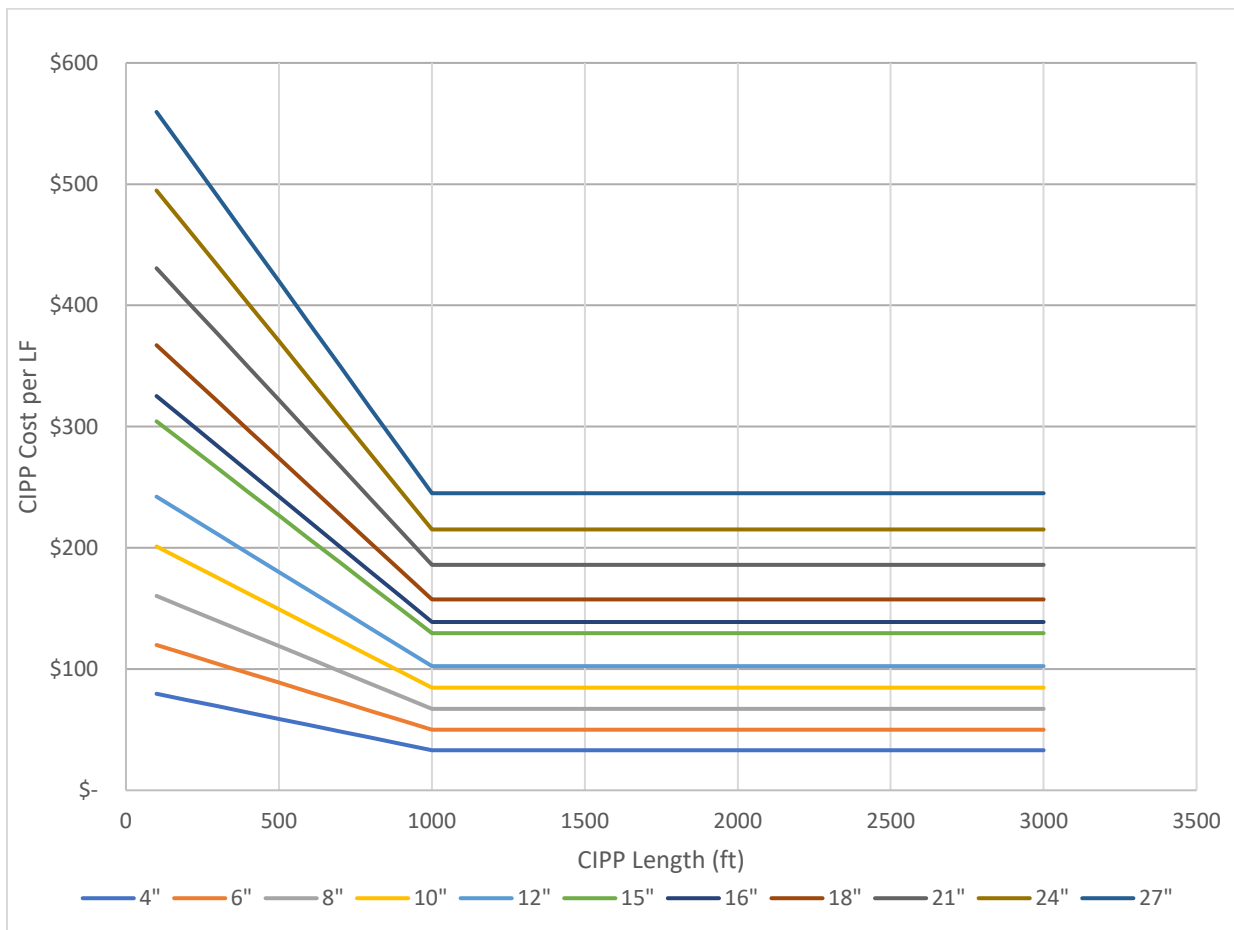


Figure 6-2: CIPP Lining Cost Curves

6.4.2 Recommended SSMP Updates

Based on the findings of this WWMP, the following changes are recommended for the next round of updates for the SSMP:

1. Update Section 5 – Design and Performance Provisions to include language recommending/requiring that the developer utilizes the new collection system hydraulic model to evaluate if the proposed development sewer flows will have any impacts on the downstream gravity sewer pipes. This will protect CVWD from approving a development flow that the existing collection system cannot accommodate within the required capacity criteria and will provide justification for CVWD to have the developer share in the costs of any required infrastructure improvements (likely upsizing the downstream gravity sewer) to accommodate the new development. If new sewer pipe is being constructed, this will also help evaluate whether or not the design criteria laid out in the SSMP will be met by the proposed sewer configuration.
2. Update Section 4.3.4 Enhanced Maintenance Areas (EMAs). Remove language specifying that sewers constructed outside of CVWD's design parameters (flat sewers) should be classified as an EMA. Due to the nature of the collection system and the

decrease in sewer flows due to conservation, A majority of the collection system does not meet the minimum velocity design criterion of 2.5 fps laid out in the SSMP. Therefore, a majority of the collection system would be classified as an EMA, making difficult to distinguish which areas operations staff should focus on regularly maintaining. EMA classification should largely be based on input from operations staff during maintenance activities as well as collected condition assessment data.

3. Update the Lift Station Maintenance & Inspection Checklist to analyze the number of starts per hour per sewer lift station pump. Each pump should be starting no more than 6 times per hour to avoid the motor from overheating.

References

- County of Los Angeles. (2022). *Revised County of Los Angeles Housing Element (2021-2029)*.
- Crescenta Valley Water District. (2019). *Sewer System Management Plan*.
- Crescenta Valley Water District. (2021). *Overview & History of CVWD's Wastewater System - Part 1*.
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- DIR. (2021). *Cal/OSHA - Title 8 Regulations*. State of California Department of Industrial Regulations.
- NFPA. (2023). *NFPA 820.A NFPA 820: Standard for Fire Protection in Wastewater Treatment and Collection Facilities, 2024 Edition*.
- Pacific Institute. (2024, January 17). *California Urban Water Use Data*. Retrieved from <https://pacinst.org/>
- SA Associates. (2021). *2020 Urban Water Management Plan*.
- SA Associates. (2021). *2020 Urban Water Management Plan*.
- State of California Department of Industrial Relations. (2021). *Cal/OSHA = Title 8 Regulations*.
- Tetra Tech. (2021). *Hazard Mitigation Plan*.

Appendix A Enhanced Maintenance Area Locations

EMA #	Location
1	Pine Glen Rd / Pineridge Dr
2	La Crescenta & Orange
3	Foothill & Briggs (76 Station)
4	Foothill between Sunset/Briggs, North Side
5	2000 Hilldale Dr
6	Waltonia between Hilldale and Montrose
7	Canalda and Ocean View flush tank
8	Prospect Ave between Sunset and Rosemont
9	Community between Ramsdell & Glenwood
10	Mountain Pine & Timberlake

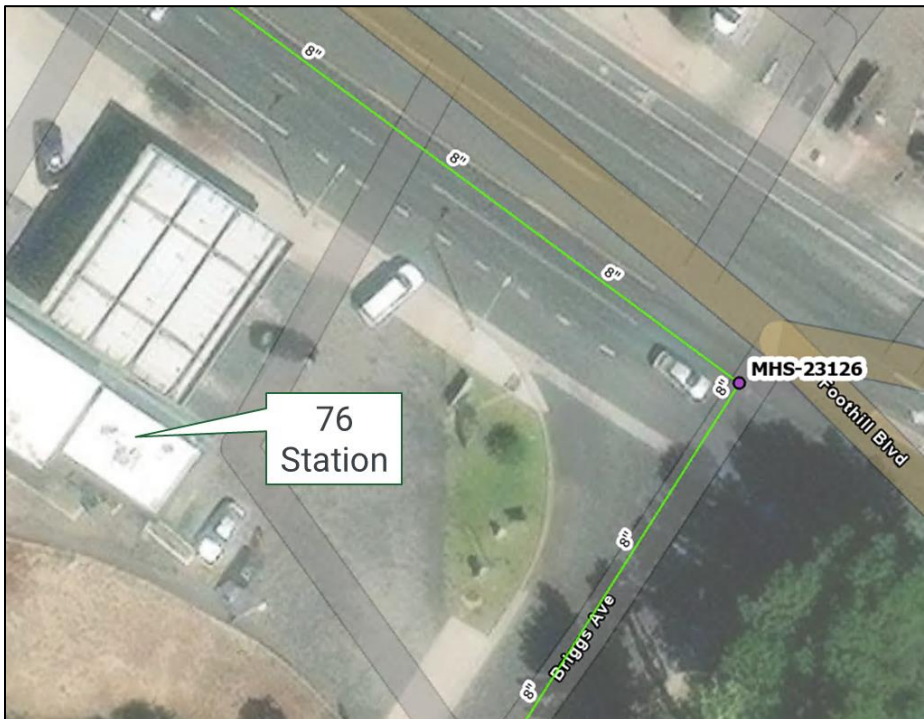
EMA 1 - Pine Glen Rd / Pineridge Dr



EMA 2 - La Crescenta & Orange



EMA 3 - Foothill & Briggs (76 Station)



EMA 4 - Foothill between Sunset/Briggs, North Side



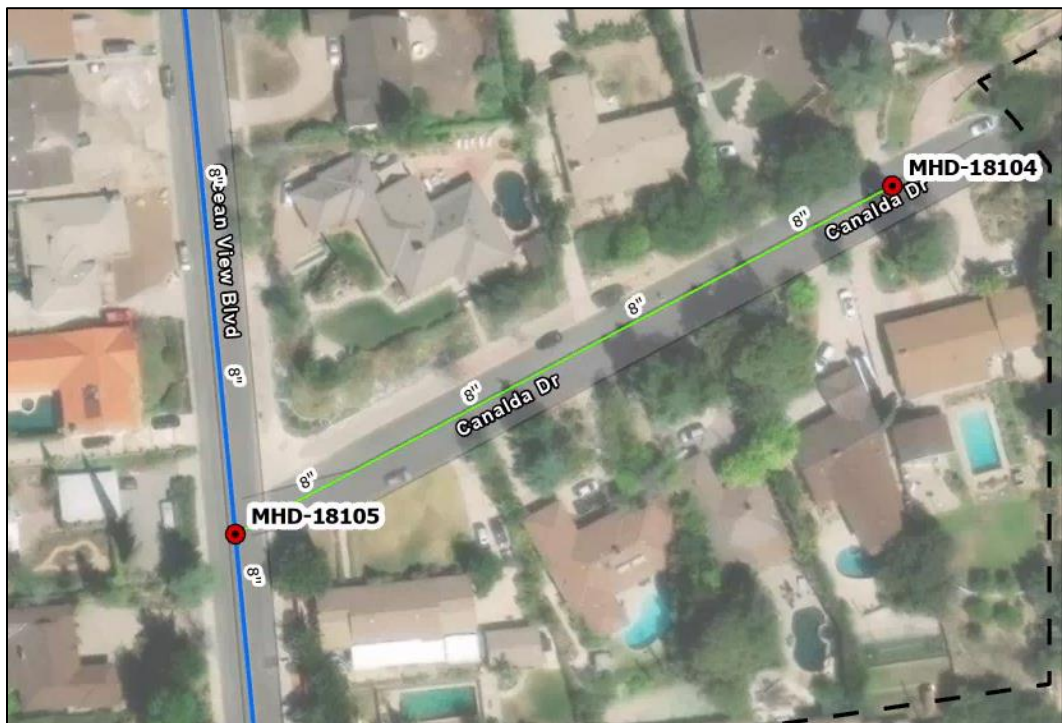
EMA 5 - 2000 Hilldale Dr



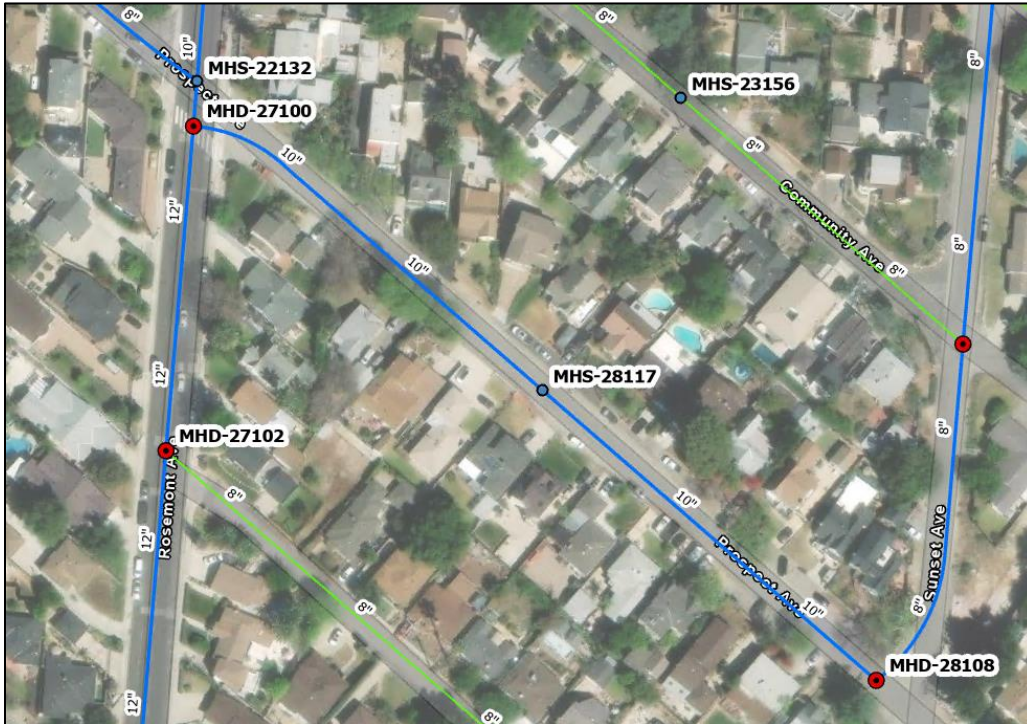
EMA 6 - Waltonia between Hilldale and Montrose



EMA 7 - Canalda and Ocean View flush tank



EMA 8 - Prospect Ave between Sunset and Rosemont



EMA 9 - Community between Ramsdell & Glenwood



EMA 10 - Mountain Pine & Timberlake



Appendix B Housing Element 2021-2029 Parcel Information

Introduction

The following is an excerpt from the Executive Summary from the Housing Element 2021 – 2029 document:

The County of Los Angeles is required to ensure the availability of residential sites, at adequate densities and appropriate development standards, in the unincorporated Los Angeles County to accommodate its share of the regional housing need--also known as the Regional Housing Needs Allocation (RHNA). Unincorporated Los Angeles County has been assigned a RHNA of 90,052 units for the 2021-2029 Housing Element planning period, which is subdivided by level of affordability as follows:

Extremely Low / Very Low (<50% AMI) - 25,648

Lower (50 - 80% AMI) - 13,691

Moderate (80 - 120% AMI) - 14,180

Above Moderate (>120% AMI) - 36,533

Total - 90,052

NOTES - Pursuant to State law, the projected need of extremely low income households can be estimated at 50% of the very low income RHNA. Therefore, the County's projected extremely low income can be estimated at 12,824 units. However, for the purpose of identifying adequate sites for RHNA, no separate accounting of sites for extremely low income households is required. AMI = Area Median Income

The Sites Inventory (Appendix A) is comprised of vacant and underutilized sites within unincorporated Los Angeles County that are zoned at appropriate densities and development standards to facilitate housing development. The Sites Inventory was developed specifically for the County of Los Angeles, and has built-in features that filter sites based on specific criteria, including access to transit, protection from environmental hazards, and other criteria unique to unincorporated Los Angeles County. Other strategies used within the Sites Inventory analysis to accommodate the County's assigned RHNA of 90,052 units include projected growth of ADUs, specific plan capacity, selected entitled projects, and capacity or planned development on County-owned sites within cities. This accounts for approximately 38 percent of the RHNA. The remaining 62 percent of the RHNA is accommodated by sites to be rezoned to accommodate higher density housing development (Appendix B).

Caveats:

This data is a snapshot in time, generally from the year 2021. It contains information about parcels, zoning and land use policy that may be outdated. The Department of Regional Planning will be keeping an internal tally of sites that get developed or rezoned to meet our RHNA goals, and we may, in the future, develop some public facing web applications or dashboards to show the progress. There may even be periodic updates to this GIS dataset as well, throughout this 8-year planning cycle.

"Rezoning"

Field Descriptions:

OBJECTID - Internal GIS ID

AIN - Assessor Identification Number*

SitusAddress - Site Address (Street and Number) from Assessor Data*

Use Code - Existing Land Use Code (corresponds to Use Type and Use Description) from Assessor Data*

Use Type - Existing Land Use Type from Assessor Data*

Use Description - Existing Land Use Description from Assessor Data*

Vacant / Nonvacant – Parcels that are vacant or non-vacant per the Use Code from the Assessor Data*

Units Total - Total Existing Units from Assessor Data*

Max Year - Maximum Year Built from Assessor Data*

Supervisory District (2021) - LA County Board of Supervisor District

Submarket Area - Inclusionary Housing Submarket Area

Planning Area - Planning Areas from the LA County Department of Regional Planning General Plan 2035

Community Name - Unincorporated Community Name

Plan Name - Land Use Plan Name from the LA County Department of Regional Planning (General Plan and Area / Community Plans)

LUP - 1 - Land Use Policy from Dept. of Regional Planning - Primary Land Use Policy (in cases where there are more than one Land Use Policy category present)*

LUP - 1 (% area) - Land Use Policy from Dept. of Regional Planning - Primary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

LUP - 2 - Land Use Policy from Dept. of Regional Planning - Secondary Land Use Policy (in cases where there are more than one Land Use Policy category present)*

LUP - 2 (% area) - Land Use Policy from Dept. of Regional Planning - Secondary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

LUP - 3 - Land Use Policy from Dept. of Regional Planning - Tertiary Land Use Policy (in cases where there are more than one Land Use Policy category present)*

LUP - 3 (% area) - Land Use Policy from Dept. of Regional Planning - Tertiary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

Current LUP (Description) – This is a brief description of the land use category. In the case of multiple land uses, this would be the land use category that covers the majority of the parcel*

Current LUP (Min Density - net or gross) - Minimum density for this category (as net or gross) per the Land Use Plan for this area

Current LUP (Max Density - net or gross) - Maximum density for this category (as net or gross) per the Land Use Plan for this area

Proposed LUP – Final – The proposed land use category to increase density.

Proposed LUP (Description) – Brief description of the proposed land use policy.

"Rezoning"

Field Descriptions:

Prop. LUP – Final (Min Density) – Minimum density for the proposed land use category.

Prop. LUP – Final (Max Density) – Maximum density for the proposed land use category.

Zoning - 1 - Zoning from Dept. of Regional Planning - Primary Zone (in cases where there are more than one zone category present)*

Zoning - 1 (% area) - Zoning from Dept. of Regional Planning - Primary Zone (% of parcel covered in cases where there are more than one zone category present)*

Zoning - 2 - Zoning from Dept. of Regional Planning - Secondary Zone (in cases where there are more than one zone category present)*

Zoning - 2 (% area) - Zoning from Dept. of Regional Planning - Secondary Zone (% of parcel covered in cases where there are more than one zone category present)*

Zoning - 3 - Zoning from Dept. of Regional Planning - Tertiary Zone (in cases where there are more than one zone category present)*

Zoning - 3 (% area) - Zoning from Dept. of Regional Planning - Tertiary Zone (% of parcel covered in cases where there are more than one zone category present)*

Current Zoning (Description) - This is a brief description of the zoning category. In the case of multiple zoning categories, this would be the zoning that covers the majority of the parcel*

Proposed Zoning – Final – The proposed zoning category to increase density.

Proposed Zoning (Description) – Brief description of the proposed zoning.

Acres - Acreage of parcel

Max Units Allowed - Total Proposed Land Use Policy Units

RHNA Eligible? – Indicates whether the site is RHNA Eligible or not. NOTE: This layer only shows those that are RHNA Eligible, but internal versions of this layer also show sites that were not-RHNA eligible, or removed during the development of this layer in 2020 – 2022.

Very Low Income Capacity - Total capacity for the Very Low Income level as defined in the Housing Element

Low Income Capacity - Total capacity for the Low Income level as defined in the Housing Element

Moderate Income Capacity - Total capacity for the Moderate Income level as defined in the Housing Element

Above Moderate Income Capacity - Total capacity for the Above Moderate Income level as defined in the Housing Element

Realistic Capacity - Total Realistic Capacity of parcel (totaling all income levels). Several factors went into this final calculation. See the Housing Element (Links to Other Resources above) in the following locations - "Sites Inventory - Lower Income RHNA" (p. 223), and "Rezoning - Very Low / Low Income RHNA" (p231).

Income Categories - Income Categories assigned to the parcel (relates to income capacity units)

Lot Consolidation ID - Parcels with a unique identifier for consolidation potential (based on parcel ownership)

Lot Consolidation Notes - Specific notes for consolidation

Consolidation - Adjacent Parcels - All adjacent parcels that are tied to each lot consolidation IDs

Shape_Length - Perimeter (feet)

Shape_Area - Area (sq feet)

"Sites Inventory"

Field Descriptions:

OBJECTID - Internal GIS ID

AIN - Assessor Identification Number*

ASI Status - Sites Inventory Status (Nonvacant or Vacant)

SitusAddress- Site Address (Street and Number) from Assessor Data*

SitusCity - Site Address (City) from Assessor Data*

SitusZIP - Site Address (ZIP) from Assessor Data*

LV_IV_Ratio - Land Value to Improvement Value Ratio from Assessor Data*

YearBuiltMax- Maximum Year Built from Assessor Data*

Use Code - Existing Land Use Code (corresponds to Use Type and Use Description) from Assessor Data*

Use Type - Existing Land Use Type from Assessor Data*

Use Description - Existing Land Use Description from Assessor Data*

Publicly Owned - If publicly owned, indicates whether it's Federal, State, County, or Special District

Units Total - Total Existing Units from Assessor Data*

Supervisory District (2021) - LA County Board of Supervisor District

Submarket Area - Inclusionary Housing Submarket Area

Planning Area - Planning Areas from the LA County Department of Regional Planning General Plan 2035

Community Name - Unincorporated Community Name

Plan Name - Land Use Plan Name from the LA County Department of Regional Planning (General Plan and Area / Community Plans)

Zoning - 1 - Zoning from Dept. of Regional Planning - Primary Zone (in cases where there are more than one zone category present)*

Zoning - 1 (% area) - Zoning from Dept. of Regional Planning - Primary Zone (% of parcel covered in cases where there are more than one zone category present)*

Zoning - 2 - Zoning from Dept. of Regional Planning - Secondary Zone (in cases where there are more than one zone category present)*

Zoning - 2 (% area)- Zoning from Dept. of Regional Planning - Secondary Zone (% of parcel covered in cases where there are more than one zone category present)*

Zoning - 3 - Zoning from Dept. of Regional Planning - Tertiary Zone (in cases where there are more than one zone category present)*

Zoning - 3 (% area) - Zoning from Dept. of Regional Planning - Tertiary Zone (% of parcel covered in cases where there are more than one zone category present)*

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LUP - 1 (% area) - Land Use Policy from Dept. of Regional Planning - Primary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

"Sites Inventory"

Field Descriptions:

LUP - 2 - Land Use Policy from Dept. of Regional Planning - Secondary Land Use Policy (in cases where there are more than one Land Use Policy category present)*

LUP - 2 (% area) - Land Use Policy from Dept. of Regional Planning - Secondary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

LUP - 3 - Land Use Policy from Dept. of Regional Planning - Tertiary Land Use Policy (in cases where there are more than one Land Use Policy category present)*

LUP - 3 (% area) - Land Use Policy from Dept. of Regional Planning - Tertiary Land Use Policy (% of parcel covered in cases where there are more than one Land Use Policy category present)*

SP - 1 - Specific Plan from Dept. of Regional Planning - Primary Specific Plan (in cases where there are more than one Specific Plan category present)*

SP - 1 (desc) - Specific Plan from Dept. of Regional Planning - Primary Specific Plan Category Description (in cases where there are more than one Specific Plan category present)*

SP - 1 (% area) - Specific Plan from Dept. of Regional Planning - Primary Specific Plan (% of parcel covered in cases where there are more than one Specific Plan category present)*

SP - 2 - Specific Plan from Dept. of Regional Planning - Secondary Specific Plan (in cases where there are more than one Specific Plan category present)*

SP - 2 (desc) - Specific Plan from Dept. of Regional Planning - Secondary Specific Plan Category Description (in cases where there are more than one Specific Plan category present)*

SP - 2 (% area) - Specific Plan from Dept. of Regional Planning - Secondary Specific Plan (% of parcel covered in cases where there are more than one Specific Plan category present)*

SP - 3 - Specific Plan from Dept. of Regional Planning - Tertiary Specific Plan (in cases where there are more than one Specific Plan category present)*

SP - 3 (desc) - Specific Plan from Dept. of Regional Planning - Tertiary Specific Plan Category Description (in cases where there are more than one Specific Plan category present)*

SP - 3 (% area) - Specific Plan from Dept. of Regional Planning - Tertiary Specific Plan (% of parcel covered in cases where there are more than one Specific Plan category present)*

Acres - Acreage of parcel

LUP Units - Total - Total Land Use Policy Units (note - takes into account different densities and % area covered if there are multiple categories)

Current LUP (Min Density - net or gross)- Minimum density for this category (as net or gross) per the Land Use Plan for this area

Current LUP (Max Density - net or gross) - Maximum density for this category (as net or gross) per the Land Use Plan for this area

Site Status - Status of the site - mostly shows as 'available', but some are flagged as 'Pending Project'

"Sites Inventory"

Field Descriptions:

Very Low Income Capacity - Total capacity for the Very Low Income level as defined in the Housing Element

Low Income Capacity - Total capacity for the Low Income level as defined in the Housing Element

Moderate Income Capacity - Total capacity for the Moderate Income level as defined in the Housing Element

Above Moderate Income Capacity - Total capacity for the Above Moderate Income level as defined in the Housing Element

Realistic Capacity - **Total Realistic Capacity of parcel (totaling all income levels). Several factors went into this final calculation. See the Housing Element (Links to Other Resources above) in the following locations - "Sites Inventory - Lower Income RHNA" (p. 223), and "Rezoning - Very Low / Low Income RHNA" (p231).**

Income Categories - Income Categories assigned to the parcel (relates to income capacity units)

Lot Consolidation ID - Parcels with a unique identifier for consolidation potential (based on parcel ownership)

Lot Consolidation Notes - Specific notes for consolidation

Consolidation - Adjacent Parcels - All adjacent parcels that are tied to each lot consolidation IDs

Used in Previous Housing Elements? - These are the Very Low and Low Income level parcels that showed up in previous Housing Elements

Shape_Length - Perimeter (feet)

Shape_Area - Area (sq feet)

Appendix C Hydraulic Model Calibration Results

Appendix D La Granada Condition Assessment Notes and Photos

Appendix E BRVA Notes and Results

Appendix F CIP Project One Sheets

Appendix G CIP Project Class 5 Cost Estimate

35 N. Lake Avenue
Suite 550, Pasadena, CA 91101

Paul Chau, PE
(626) 568-4311

CRESCENTA VALLEY WATER DISTRICT

STAFF REPORT

Information Item No. 4
August 22, 2024

To: Engineering and Operations Committee
From: Carla Dillon, P.E. –Director of Engineering and Operations
Subject: Monthly Engineering and Maintenance/Operations Reports

INFORMATION ITEM:

Monthly Engineering and Maintenance/Operations Reports – Discussion regarding the content and presentation of information for the Board.

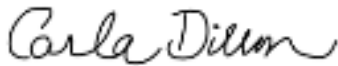
BACKGROUND:

On a monthly basis, staff from the Engineering Department and Maintenance/Operations Departments prepare reports for the Board, attached.

DISCUSSION:

Staff requests input from the Engineering and Operations Committee on the content and presentation to ensure the most relevant information is provided. This agenda item will serve as a discussion about the reports, if any information should be added, any deleted, or any reformatted in the presentation method.

Submitted by:



Carla Dillon, P.E.
Director of Engineering & Operations

Attachments: Past Monthly Report

g:\engineering\engineering committee\2024 ec memo\08212024\item 2\08-22-24 eocm memo item 4.docx

Field Maintenance and Operations Report

May 2024

0

Water Main Repairs

20

Water Service

Repairs: 8 Replacements: 12

3

After Hours Leaks/Repairs

0'

Sewer Maintenance

Clean: 0' Inspect: 0' Reports: 0

- **Field Maintenance Projects**

- * I-1077 – 2700 Fierro Circle – Install 161' 6" water main, 3 services and 1 hydrant
- * I-1076 2600 Upper Terrace – Installed 247' 6" water main, 8 services and 1 hydrant

- **Operations Report**

- * PFAS treatment plant conversion – site visit
- * Control Valve Maintenance – Glenwood Boosters #33 & #34, Montrose 8" PRV, Glenwood booster manifold PRV
- * Goss Canyon Reservoir Rehabilitation – Returned to service
- * I-1077 – 2700 Fierro Circle – Pipeline Disinfection & bacteriological sampling
- * I-1076 – 2600 Upper Terrace – Pipeline Disinfection & bacteriological sampling

- **Electrical/Telemetry**

- * SCE pump efficiency testing

- **Wastewater**

- * Lift Station Visits: 4 (De-rag pumps, check valves)

Field Maintenance and Operations Report

May 2024

Days without a lost-time incident: 165

120+

Water Quality Samples w/ additional
PFAS monitoring samples

53

Valves

Replace: 0 Exercise: 49 Install: 4

2

Fire Hydrant Maintenance

Rebuild: 0 Install: 2 Inspect: 0

0

Water Meter Replacement

¾": 0, 1": 0, 1.5": 0, 2": 0, 3": 0, 4": 0

- **Training/Cross Training**

- * None to Report

- **Events**

- * None to Report

- **New Certification**

- * None to report

- **Safety**

- * Hand Signals
 - O&M Crew

Engineering Report

June 11, 2024
Staff Report

To: Honorable President and Members of the Board of Directors
From: Brook Yared, M.S., P.E. – Engineering Manager
Subject: Engineering Report – May 2024

- **Water Production Report**
 - May 2024 – Water production – 67%/33% split – 95.4 MG for the month
 - May 2024 – Average use – 2.4% more than 2023 and 13.8% less than 5-year average
- **Rainfall Update**
 - 0.34” for May 2024
 - Rainfall Total for WY 2023/24 – 26.14”
- **Engineering Update - Water**
 - **FY 23/24 Capital Improvement Project**
 - Goss Canyon #2 Reservoir Rehabilitation
 - Complete
 - Paschall Booster B
 - Complete
 - LADWP-CVWD Emergency Interconnection
 - Manifold approved by LADWP
 - Manifold and break point chlorination installation – Week of June 10, 2024
 - Ramsdell Mixing Station/Pressure Reducing Station
 - Above ground PRVs Constructed
 - Materials on order for In-house repairs
 - Conversion to Chloramination
 - No Report
 - Mills Booster A VFD Installation
 - Motor removed for rewinding
 - VFD installation rescheduled for July 2024 due to supply chain delay
 - **FY 22/23 Capital Improvement Project**
 - 2600 & 2700 Blocks of Orange Ave
 - Reviewing claim documentation
 - **3000 & 3100 Blocks of Montrose Ave (E-1067)**
 - Complete
 - **Transfer of Services to Glendale Water and Power (E-1051)**
 - Lateral installations scheduled for week of June 3, 2024
 - CVWD to follow up on a lateral extension and abandonments
 - **Replacement of Supervisory Control and Data Acquisition (SCADA) System**
 - Site Hardware installation and implementation complete week of March 5, 2024
 - Remaining work
 - Punchlist items
 - Document all control strategies
 - Server and software update – pending Technology Committee meeting
 - **Well 2**
 - Awaiting quote for filter replacement

- **Engineering Update - Wastewater**
 - Wastewater Master Plan
 - Presentation by Kennedy-Jenks at next Engineering Committee Meeting
- **Grant Program**
 - Water Recycling Grant
 - RFP Preproposal meeting held June 5, 2024
 - Proposals due July 5, 2024
 - New Backhoe – Carl Moyer Grant – Inspection complete, Awaiting Award Letter
 - USBR Small-Scale Water Efficiency Grant 2022 – 3” & 4” Meters – Claim being prepared
 - USBR Small-Scale Water Efficiency Grant 2022 – 1-½” Meters – Project extension request submitted to USBR
 - Stormwater Capture Project at Crescenta Valley County Park – No report
- **Developer Projects**
 - On hiatus
 - 3037/3043 Foothill – Pending payment of materials and inspection estimates
 - 4360 Ocean View – 7 units – Pending Reconciliation and Transfer
 - 4521 Briggs/2413 Foothill – New 81 units
 - 2341 Mira Vista – New 4 Units
 - 2434 Foothill – New 31 units
- **FMWD**
 - No Report

CRESCENTA VALLEY WATER DISTRICT

WATER PRODUCTION REPORT

May 1 - May 31, 2024

Well Production:	57,571,600	Gals		
GWP Production:	5,136,000	Gals		
Gravity Production:	1,467,812	Gals	% GW	67%
FMWD:	31,263,303	Gals		
City of Glendale:	0	Gals	% Import	33%
TOTAL:	95,438,715	Gals		
	292.89	ac-ft		

Glenwood Nitrate Water

Reclamation Plant:*

0

*Included in Well Production

WATER DEMAND COMPARISON

Time Period	Average Daily Usage (gals)	Current Period Change
May 1 - May 31, 2024	3,008,577	
May 1 - May 31, 2023	2,937,586	2.4%
5-yr Average - May 2019 - 2023	3,489,440	-13.8%

RAINFALL: May 1 - 31, 2024

0.34"

Season-To-Date:

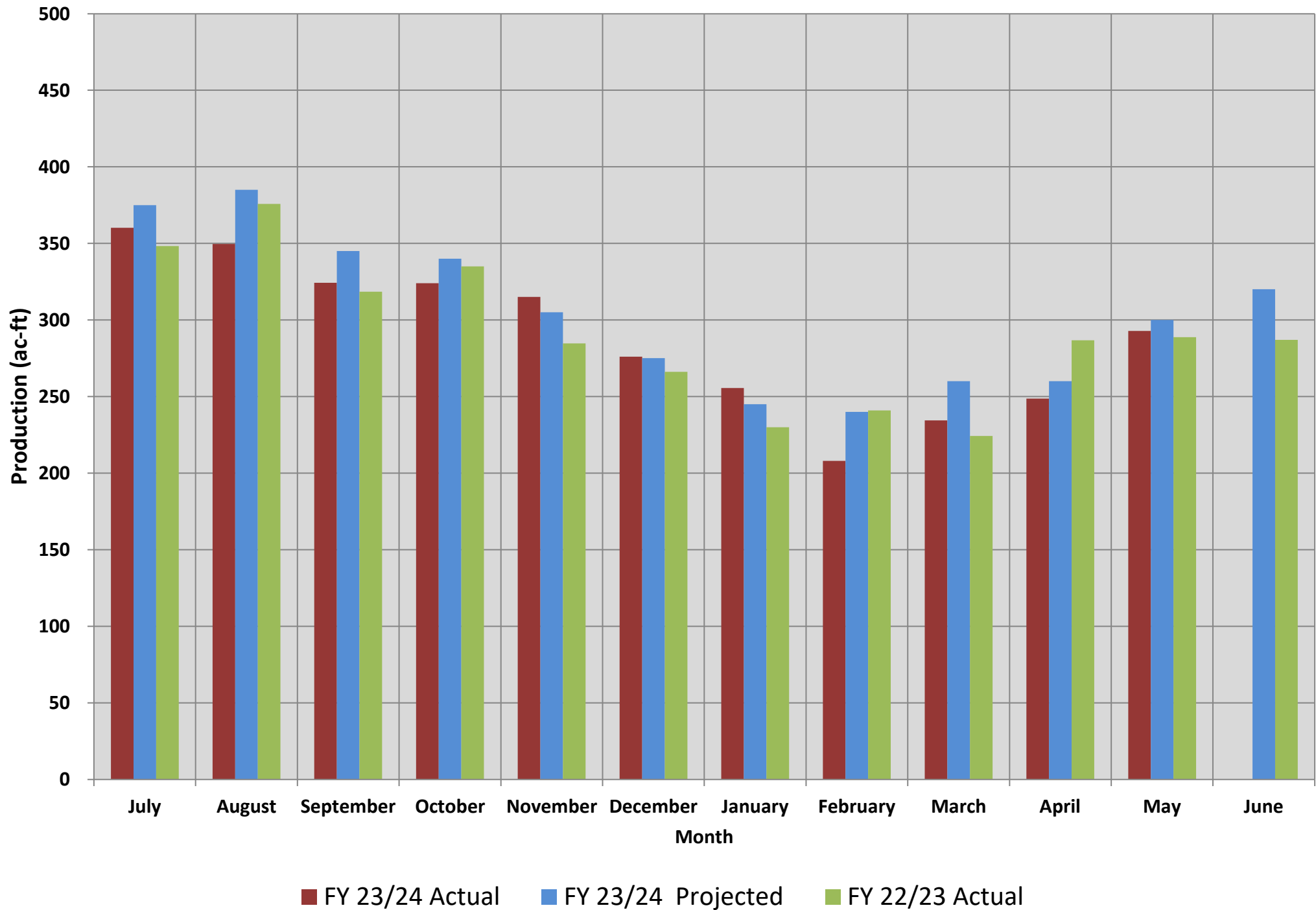
26.14"

2023/24 Fiscal Year Water Production			WY 23/24 - Groundwater Production Water Rights		GWP (Well 16) Water Production - 2024		Purchased Water Production Tier 2 Allocation 2024	
Month	Actual Total Water Production (ac-ft)	Projected Total Water Production (ac-ft)	Month	Month	Month	Well Production (ac-ft)	Month	Imported Water Production (ac-ft)
July	360	375	October	160	January	13	January	79
August	350	385	November	168	February	13	February	53
September	324	345	December	169	March	14	March	51
October	324	340	January	142	April	15	April	74
November	315	305	February	142	May	16	May	96
December	276	275	March	160	June		June	
January	256	245	April	161	July		July	
February	208	240	May	181	August		August	
March	234	260	June		September		September	
April	249	260	July		October		October	
May	293	300	August		November		November	
June		320	September		December		December	
Total to Date	3,189	3,330	Total to Date	1,283	Total to Date	71	Total to Date	353
Projected	3,509	3,650	Water Rights	3,294			Tier 2	2,154
% of Projected	87.4%	91.2%	% of Rights	39%			% of Allocation	16%
Remaining	461	320	Remaining	2,011			Remaining	1,801

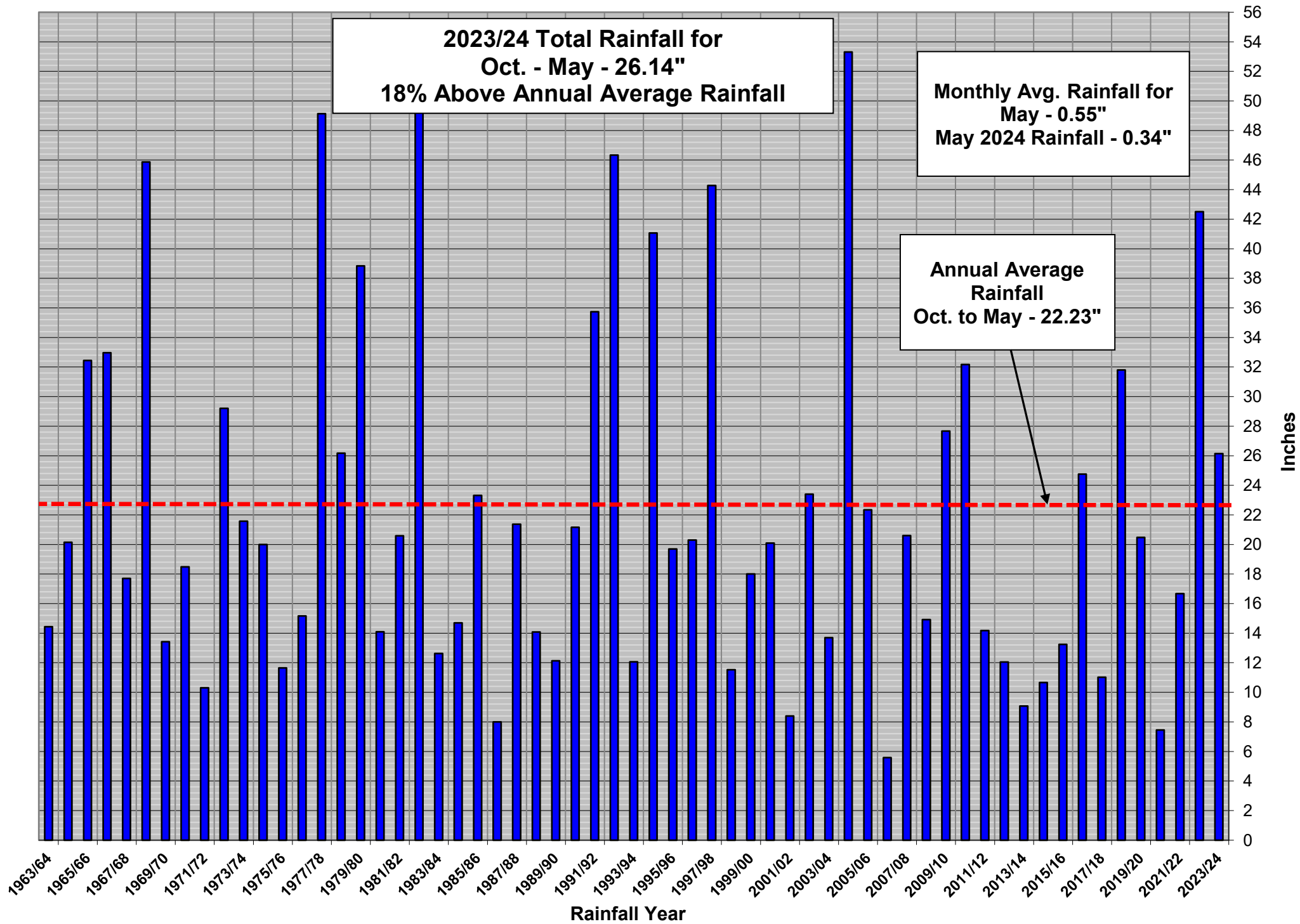
NOTE:

1) Blue Numbers = Estimated Water Production

Monthly Water Production: FY 23/24 Actual, FY 23/24 Projected & FY 22/23 Actual



Monthly Rainfall - 1963/64 - 2023/24 (Oct. 1 - May 31)



Revised Date: 6/6/2024

CVWD Daily Average Wastewater Discharge and Strength
October 1, 2000 - April 30, 2024

