Ross Valley Sanitary District

Year-End Metrics Report

FY 2023/24

July 2023 - June 2024

District Mission

We provide our customers with high quality wastewater collection service, through a system that has no avoidable sanitary sewer overflows, at the lowest sustainable cost, in order to protect public health and the environment.

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ROSS VALLEY SANITARY DISTRICT

Year-End Metrics Report
FY 2023/24
July 2023-June 2024

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INTRODUCTION

The efficient management of a wastewater collection system is critical to minimizing performance failures and potential effects that may harm the public and the environment. Several work groups and cross-department teams in the District contribute to operations and maintenance (O&M) performance: pump stations, line maintenance, inspections, condition assessment, repairs, and service call teams including sewer spill response. The District schedules and tracks O&M activities using a computerized maintenance management system (CMMS) and geographic information system (GIS). The District has been steadily increasing the use and functionality of these systems.

The information collected in the field by staff and managed through the CMMS/GIS allows management to make data driven decisions for O&M activities based on metrics. Metrics help in the review and assessment of which decisions are working and which need improvement to support system performance and asset management. Asset management is a continuous process that guides the acquisition, use, and disposal of infrastructure assets to optimize service delivery and minimize costs over the asset life cycle.

The year-end metrics report illustrates District performance for Fiscal Year 2023/24 (FY 23/24) across the work groups. Annual metrics are also compared over time to review and analyze performance trends. The metrics report is organized in the following sections: Flow and Wet Weather Infiltration and Inflow (I&I), Pump Stations, Line Maintenance, Service Calls, Condition Assessment, System Condition Indicators, Repair, Inspections, and Lateral Programs.

FLOW AND WET WEATHER I&I

On an average dry weather day in the summer, RVSD collects and conveys 3.7 million gallons (MG) of wastewater to the Central Marin Sanitation Agency (CMSA) Wastewater Treatment Plant, based on data from FY 15/16 to FY 23/24 (the last nine years). Every year, RVSD sends approximately 1,370 MG of dry weather flow to CMSA. RVSD sends an average of an additional 670 MG of wet weather infiltration and inflow (I&I) flow each year, with a peak of almost 1,300 MG in FY 16/17.

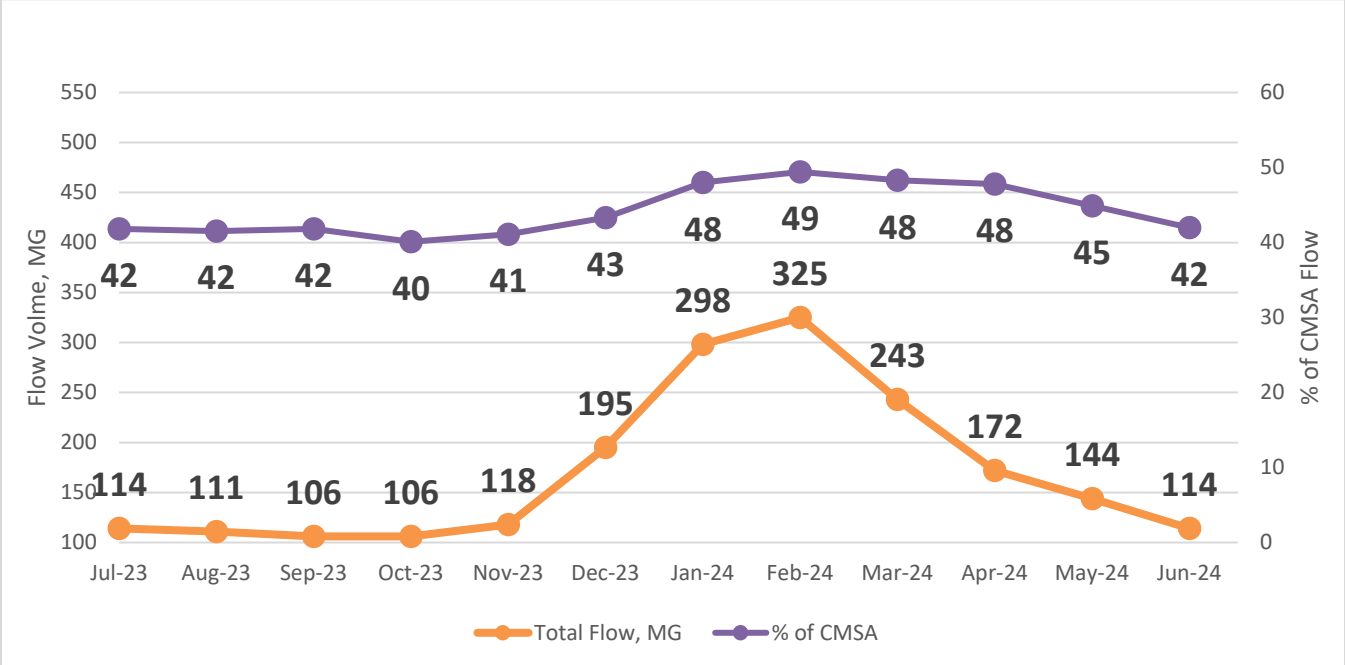
Flows

CMSA collects total flow data for RVSD at their headworks. Flows increase with rainfall events due to wet weather I&I, or storm water, that makes its way into the sewer system. From FY 15/16 to FY 23/24 RVSD flows have averaged approximately 46% of the dry weather flow and 48% of the wet weather flow at CMSA. However, from FY 20/21 to FY 23/24 RVSD flows have averaged approximately 44% of the dry weather flow and 46% of the wet weather flow at CMSA. These data indicate that RVSD conveys more wet weather I&I to the treatment plant than other JPA member agencies, but the amount is declining.

High I&I increases the risks of spills, but also contributes to more potential blending events at the treatment plant, which is allowed but required to be minimized by CMSA's NPDES discharge permit. Blending at the treatment plant occurs during high storm flows and is the bypassing of partially treated (primary) wastewater around secondary treatment processes to avoid washing out those secondary plant processes. CMSA met all effluent limits over the past five years whenever blending occurred.

Figure 1, below, shows the total volume of RVSD flow to CMSA in millions of gallons (MG) and the percentage of overall flow to CMSA that is attributable to RVSD. Typically, wetter months of the year will have higher total flows and RVSD will contribute a higher percentage of overall flow to CMSA.

Figure 1. RVSD Flows to CMSA (1 Year)



Peak Wet Weather Flows

During peak wet weather events, RVSD flows increase to as much as 10 to 17 times the average dry weather flows (ADWF). This "wet weather peaking factor" (WWPF), shown in Table 1 (on the next page), is the peak wet weather flow (PWWF) of the year divided by the ADWF, and it varies year-on-year depending on the rain characteristics. In a good condition collection system with low I&I the WWPF would typically range from three to five times the ADWF. For leaky, high I&I collection systems and/or collection system subbasins, the WWPF would range from 8 to 30 times the ADWF.

Figure 2, below, shows Fiscal Years 17/18 through FY 23/24 of total monthly rainfall in Kentfield (the District's highest wet weather location) and the monthly millions of gallons in flow to CMSA, demonstrating the relationship between rain and total flow from RVSD. Over the last seven years, the winter of 2022/23 was the heaviest wet weather period with a series of storm events and days with localized surface water flooding.

Figure 2. Flow and Rain (7 Years)

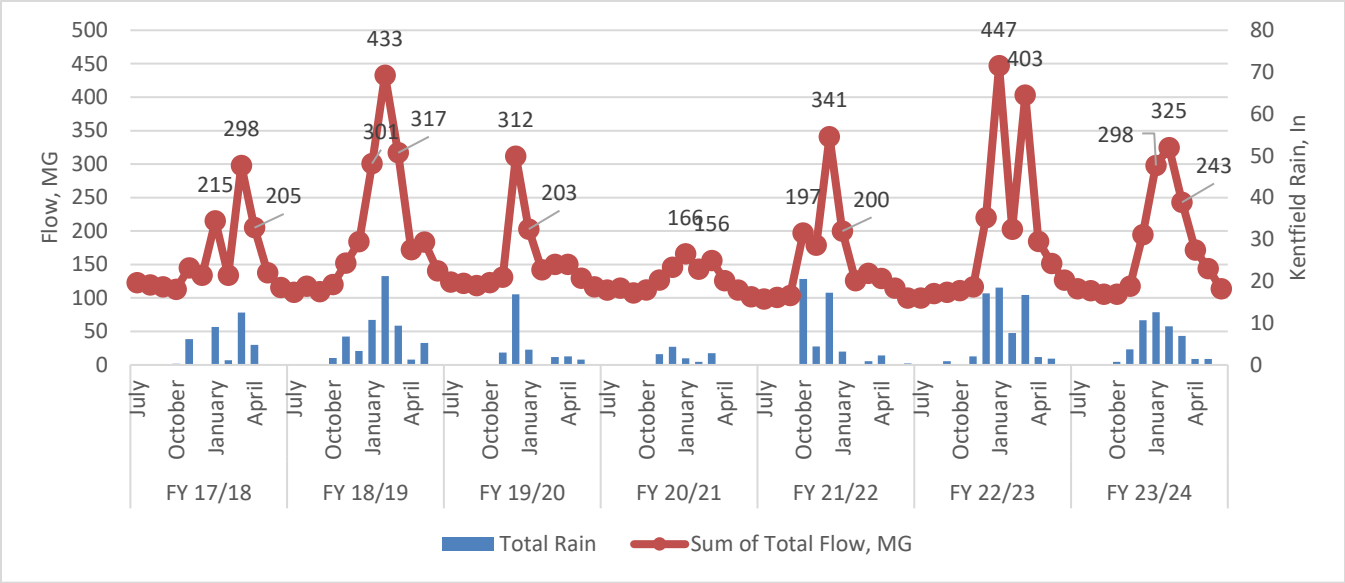


Table 1, below, indicates a PWWF of 51.9 million gallons per day (MGD) this year, the third highest in the last seven years, not especially higher or lower than average. Table 2 shows 47 inches of annual rainfall at the Kentfield gage, close to the average rainfall of 48 inches per year. At 14, the WWPF was lower this year than previous wetter years (FY 18/19 and FY 21/22), suggesting a tighter system to wet weather I&I.

Table 1 shows the ADWF of 3.7 MGD, slightly up from the drought years. Several factors have contributed to this increased dry weather flow rate, back to FY 20/21 levels, including higher groundwater tables from the three consecutive average and wetter years and relaxation of drought water use restrictions.

The RVSD peak wet weather flow (PWWF) has not exceeded the design storm (10-year 24-hour) PWWF of 65 MGD since FY 16/17 (not shown). FY 18/19 was the highest in the last seven years at 61 MGD PWWF.

Table 1. RVSD Peak Wet Weather Flows[1]

	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24
ADWF* (July, August, June)	3.9 MGD	4.0 MGD	4.0 MGD	3.6 MGD	3.3 MGD	3.6 MGD	3.7 MGD
PWWF**	49.9 MGD	61.0 MGD	41.0 MGD	17.0 MGD	56.3 MGD	49 MGD	51.9 MGD
WWPF***	**13**	**15**	**10**	**5**	**17**	**14**	**14**

*ADWF = Average Dry Weather Flow
**PWWF = Peak Wet Weather Flow
***WWPF = PWWF/ADWF (Wet Weather Peaking Factor)

Wet Weather I&I Volume

Approximately 7% to 9% of all the rain that falls on the District makes its way into the infrastructure, based on nine years of data collected at Kentfield rain gauge and from CMSA. This percentage of I&I volume divided by rain volume is known as the "R Factor". A relatively new collection and conveyance system typically has an R Factor of 3% or less, and an older system with low I&I would have an R Factor of 5% or less. From FY 15/16 to FY 23/24 the R Factor has decreased from 8.6% (not shown in table) to 7.9%. Table 2 below demonstrates that this calculated I&I volume is fairly flat from 2017 to 2024 .

The decrease of I&I volume since 2015 is attributable to the sustained efforts of RVSD to reduce I&I through its efforts in its capital program, in-house repair program, and lateral ordinance program.

Table 2. Wet Weather I&I Volume

	FY17/18	FY18/19	FY19/20	*FY20/21**	FY21/22	FY22/23	FY23/24
Total Flow Volume to CMSA (in MG)	1,858	2,341	1,823	*1,525*	1,828	2,281	2,046
Dry Weather Flow Volume[2] (in MG)	1,414	1,476	1,452	*1,316*	1,200	1,336	1,356
Wet Weather I&I Volume (in MG)	444	865	371	*209*	628	945	690
Rainfall[3]	34 in	60 in	29 in	*12 in*	49 in	66 in	47 in
Rain Volume[4] (in MG)	6,290	11,100	5,365	*2,220*	9,065	12,210	8,695
R Factor (Wet Weather I&I Volume/Rain Volume)[5]	**7.1%**	**7.8%**	**7%**	***9.4%***	**7%**	**7.7%**	**7.9%**
Change Year-over-Year[6]	**-13%**	**10%**	**-10%**	***34%***	**-25%**	**10%**	**2.6%**

[1] Data from CMSA
[2] Annual based on average of July, August, June
[3] Approximate as it assumes rain across the entire District is the same as was recorded at the Kentfield rain gauge.
[4] Based on SHECAP Contributing Area of 6,813 acres.
[5] How much of the rain that falls on the ground makes it into the District's system.
[6] This could be representative of I&I reduction progress. Other wet weather factors such as the distribution of rain across the District, the intensity and duration of storms, and whether the soil is saturated prior to a storm event may also affect the reliability of the year-over-year comparison.

*FY20/21 is an outlier year – See Figure 2 and WWPF in Table 1

The calculation of the R Factor in years of average-or-above rainfall show a slightly declining trend of rain volume entering the RVSD system since FY 15/16 (8.6%) and FY 16/17 (8.2%), although in the last two years the calculation suggests a slight increase in rain volume.

To evaluate trends in the R factor, abnormally low rainfall years probably need to be grouped and evaluated separately. Also, additional years of data and more localized flow monitoring will be used to continue to assess how accurate this trend is and if the completion of additional repair and rehabilitation improves I&I reduction progress.

PUMP STATIONS

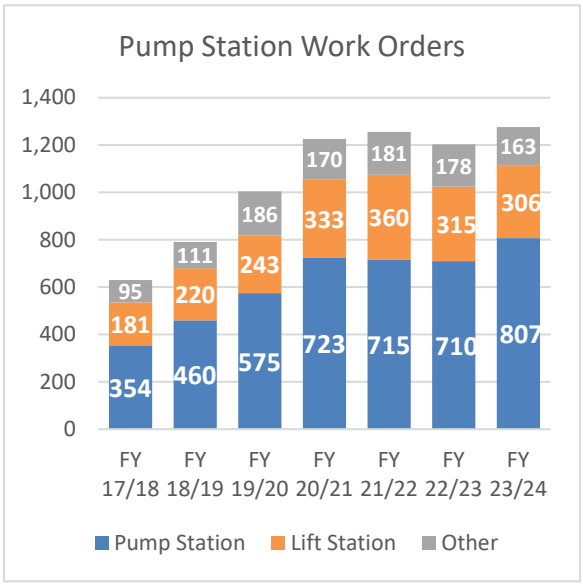
Pump stations convey wastewater collected by gravity through force mains to points downstream in the system or to the CMSA wastewater treatment plant. Lift stations are a type of pump station that discharges flow back into the gravity system, not into the force main network. The District has seven pump stations ("PS") and 12 lift stations ("LS"). Flow data since 2014 is available at four pump stations: PS10 Larkspur Landing B, PS13 Greenbrae, PS14 Larkspur, and PS15 Kentfield. Additional flow monitoring equipment has been added at PS12 Bon Air and at PS24 and PS25, both along South Eliseo Drive in Larkspur.

Pump Station Maintenance

Pump stations require preventive and corrective electrical and mechanical maintenance at the pump stations and lift stations, and other appurtenances such as air relief valves (ARVs) and isolation valves along the force mains. Most of the pump station maintenance is on mechanical components (pumps, valves, piping), as specialized electrical service providers are often used for maintenance of electrical components. The more complex pump stations, which have larger and more varied equipment, require more time to maintain than lift stations (Figures 3 and 4). The new variable frequency drives (VFDs) and pumps at PS12, PS13, PS14 and PS15 reduce electrical and mechanical maintenance needs. The pump station crews schedule and spend more time on preventive measures than corrective measures (Figures 5 and 6).

O&M staff have significantly improved pump station preventive maintenance over the last seven years through computer maintenance management system (CMMS) scheduling tools and development and implementation of the Pump Station Standard Operating Procedures (SOPs) as part of the Competency Based Training (CBT) program implementation.

Figure 3 and Figure 4. Number of Pump Station Work Orders and Hours of Maintenance



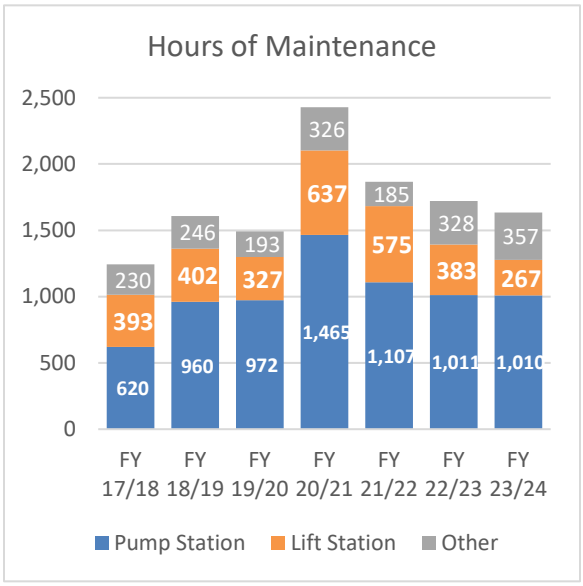
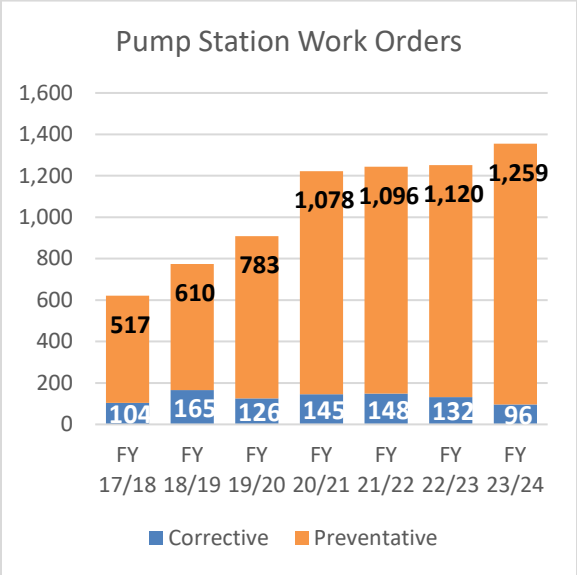
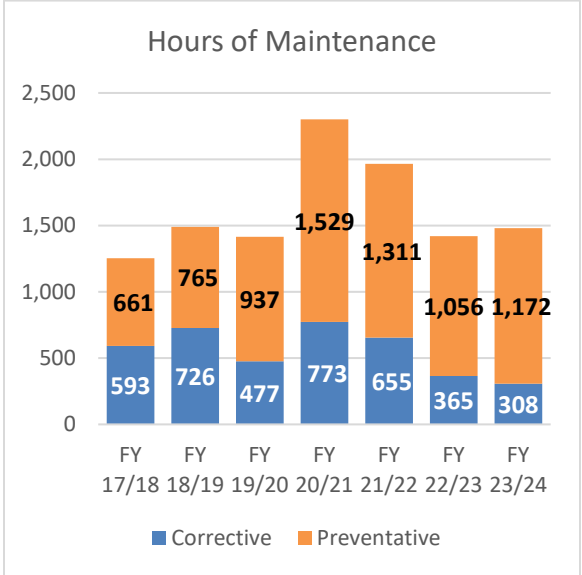


Figure 5 and Figure 6. Number of Corrective and Preventive Work Orders and Hours of Maintenance





Power Consumption

Power consumption is higher during wet weather due to higher flows that must be pumped. Power costs have been rising, outpacing the District's energy saving efforts. Figure 7 shows how PG&E costs for pumping (green bars) compare to the District's use (red line), with a big jump in cost shown in February 2024.

Figure 7. Monthly Power Usage and Cost FY 23/24

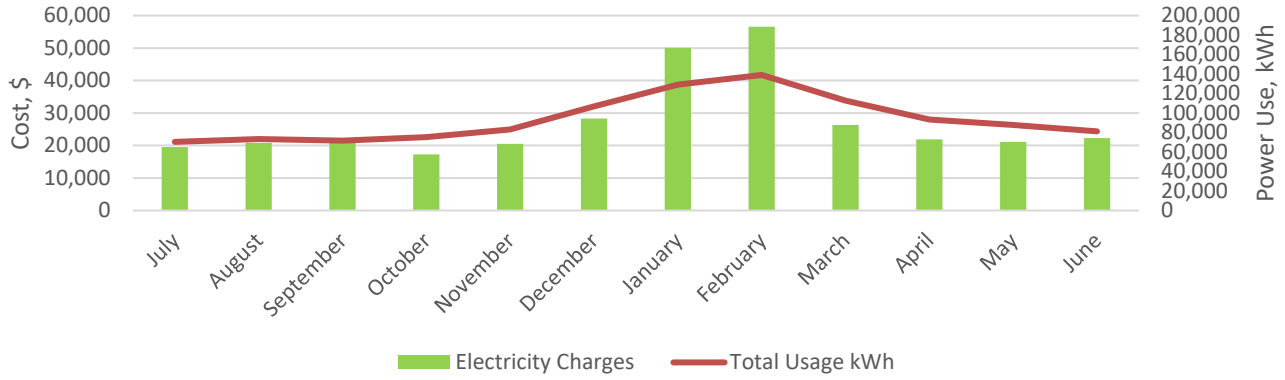
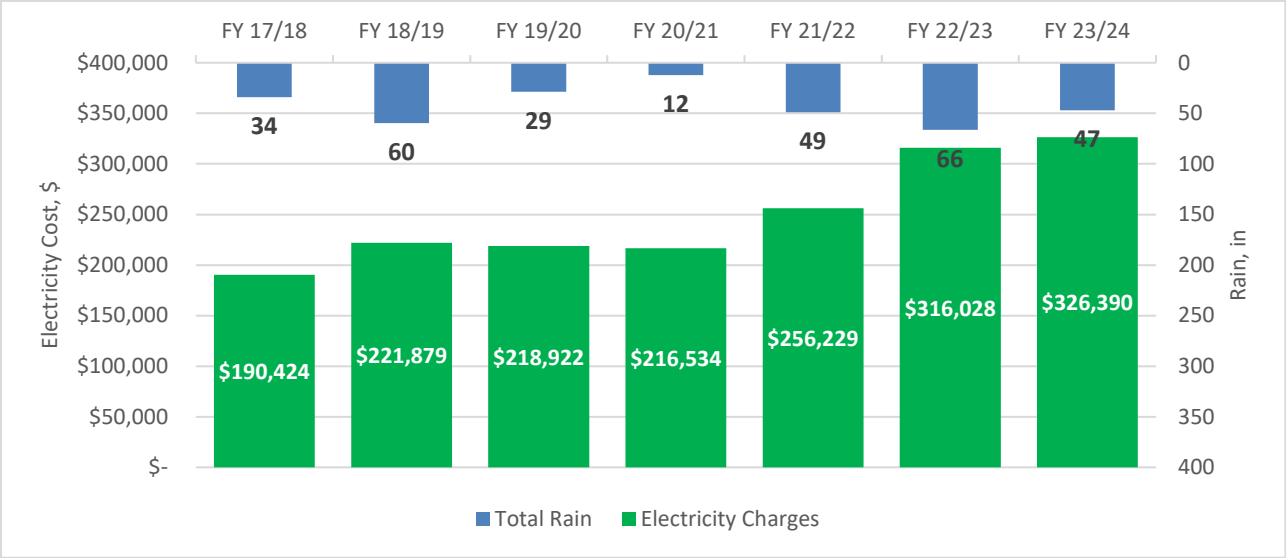


Figure 8, below, shows how higher rainfall years generally incur higher electricity costs than years which experience less rainfall, but this is over-shadowed by significant energy rate hikes in the last few years. The cost was especially high this last year despite lower rainfall than the previous year. Charges in FY 19/20 and FY 20/21 did not show reduced costs despite lower flows pumped. Costs were increased in FY 18/19 compared to FY 16/17 by PG&E introducing a "max peak rate" structure for billing for transmission costs as well as more expensive rate increases. Staff compared 2019 rates to 2023 rates and determined that PG&E has significantly raised rates 30% over these past four years for the mandatory daily charge (30%), the max demand charge (31%), the price per peak kWh used in summer (31%) and the price per

peak kWh used in winter (30%). With about the same total rainfall, the annual cost for electricity charges was 27.4% higher this year compared to FY 21/22 (two years ago).

Figure 8. Total Rain vs Electricity Charges



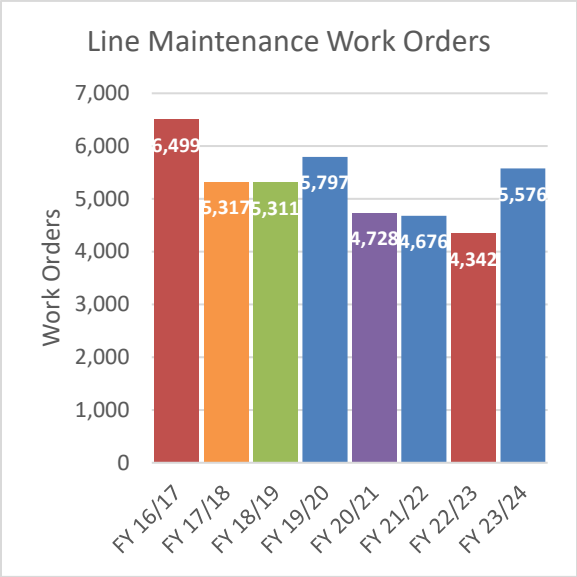
LINE MAINTENANCE

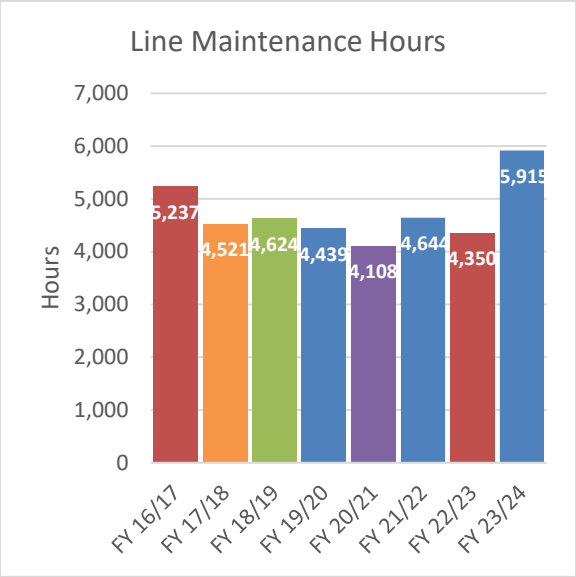
Gravity sewer lines collect and convey wastewater downstream. Maintenance, assessments, and repairs can prevent avoidable sewer spills, protect public health and the environment, and minimize costs. Pipe cleaning is the fundamental preventive maintenance activity for gravity sewer pipelines and can prevent spills, reduce service calls, and extend the life of the assets. The District implemented efficiency and quality assurance programs to provide a higher level of service through the use of CCTV cameras.

Pipe Maintenance

Improvements in cleaning techniques, methods, and equipment as well as asset inventory and location information have decreased the amount of time needed to maintain the pipes, from over 6,850 hours in FY 15/16 to 5,900 hours in FY 23/24. A declining trend of work orders and line maintenance hours was reversed this past year to implement targeted programs designed to prevent spills, shown in Figures 9 and 10.

Figure 9 and Figure 10. Line Maintenance Work Orders and Line Maintenance Hours



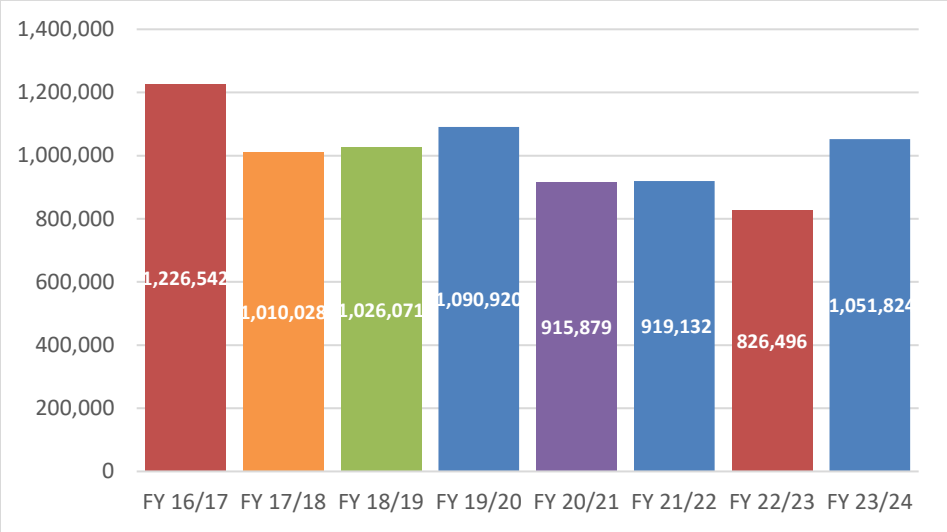


Length of Pipe Maintained

The District cleans or QA/QC inspects (to verify if cleaning is needed) about one million feet per year (Figure 11), and the trend is a decrease in length of actual pipe cleaning, particularly in the length of pipe that is being rodded. A line maintenance program goal is to reduce cleaning over time because cleaning should be a targeted activity. Some pipes are cleaned multiple times per year, some once per year, and some every three to eight years (Figure 12). The cleaning frequencies are regularly reviewed and adjusted, and while some frequencies are expected to be reduced, condition assessment or lower wastewater flows from water conservation may necessitate higher frequency cleaning in some locations. In the previous three years (FY 20/21 through FY 22/23), the length of maintained lines decreased below

one million feet for various reasons. One reason is that new QA/QC protocols have been instituted to prevent spills from maintenance activities. The higher length of pipe maintained in FY 23/24 is due to better planning efficiency and a majority of the three-year pipes needing to be cleaned.

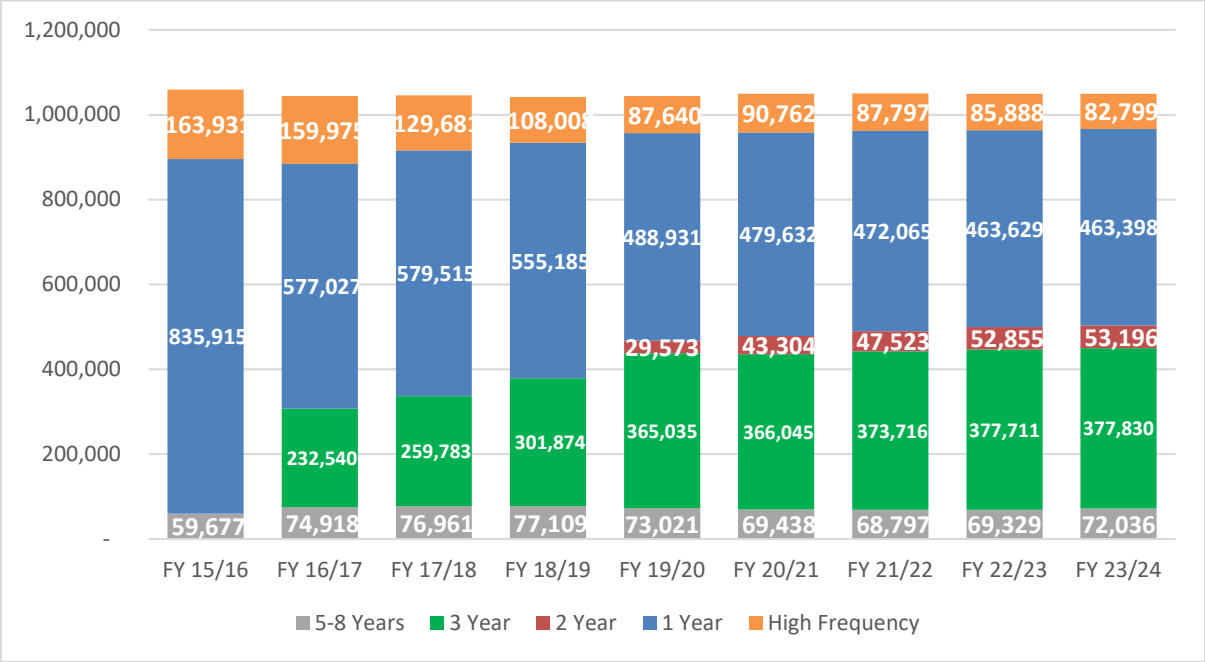
Figure 11. Length of Pipe Maintained



Cleaning Frequency Model

Reducing cleaning frequencies over time is a line maintenance program goal to increase efficiency and prevent unnecessary wear and tear. For example if a pipe is already clean it can do more harm than good to clean it again with high pressure jets or mechanical metal rods. In FY 23/24 District staff started a data-driven review of high frequency cleaning sewer (HFC) lines, where lines are cleaned more than once per year, using significant staff resources to address the highest risk sewer lines in the District. Of the 400 HFC lines reviewed in the CMMS, over a quarter showed an immediate potential for reduced cleaning frequency based on a variety of management measures. As this program continues, District staff will review other cleaning frequencies in order to more efficiently maintain the system. Figure 12 below shows the history of the cleaning schedules and is expected to show an overall reduction in high frequency cleaning in the future.

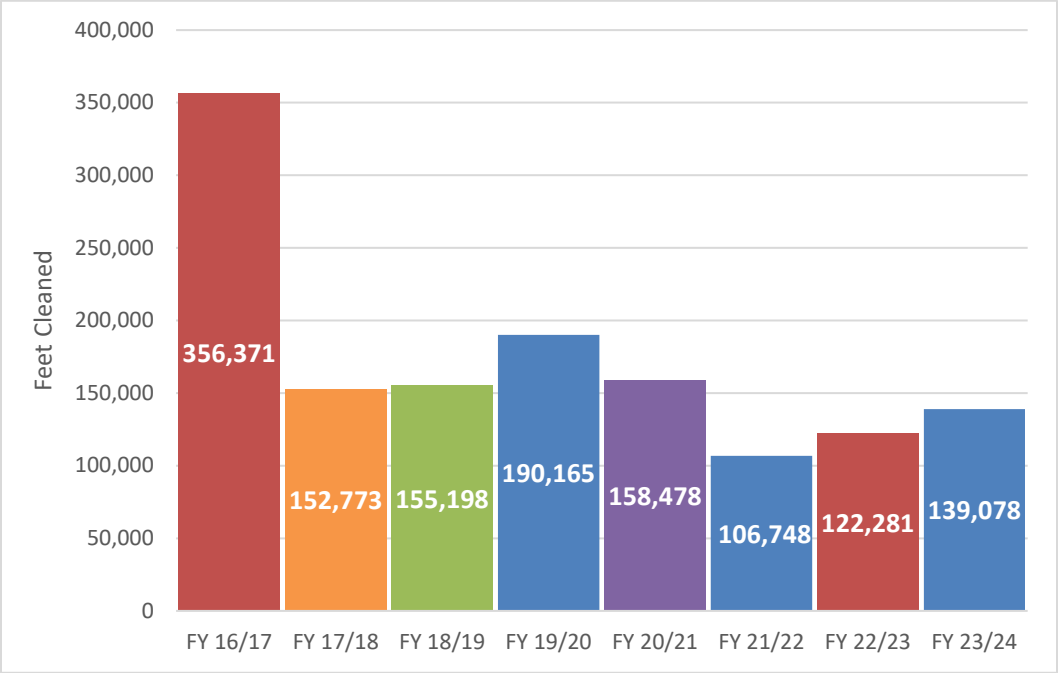
Figure 12. Pipe Length by Maintenance Schedule



Cleaning Efficiency

Staff training, improvements to the District's CMMS, new tools and equipment, and application of a pipe cleaning model have resulted in efficiencies in line maintenance that will also extend the life of these assets by reducing wear and tear. The District has implemented a pipe cleaning model that uses data from the field operators to modify the maintenance schedule based on what is retrieved using a catch guard at the downstream manhole. Roots, debris and grease are classified into one of three levels depending on the amount recovered: Clear, Light or Heavy. If the pipe has two consecutive cleaning cycles that indicate a "Clear" classification for roots, debris and grease, the schedule is changed to a less frequent cleaning (for example, from a one-year to a three-year schedule), and it is marked as "pipe cleaned unnecessarily". Figure 13 shows the amount tracked, in feet, of "pipe cleaned unnecessarily". This performance indicator demonstrates improved efficiencies in line maintenance activities that decrease staff and equipment costs over time.

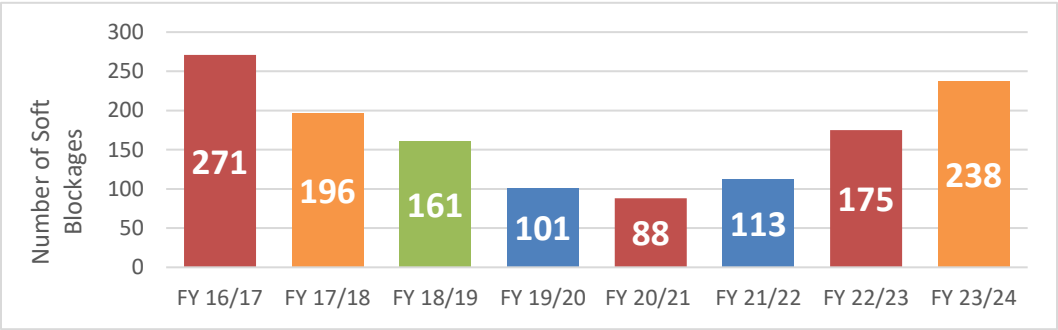
Figure 13. Footage of Pipe Cleaned Unnecessarily



Soft Blockages Broken/Future Spills Prevented

During line maintenance activities, operators document any soft blockages they encounter (Figure 14). Soft blockages are constrictions in the flow capacity due to various reasons such as rocks and soil debris, root intrusion, structural failure, and fats, oils, and grease (FOG). Over time, soft blockages can become full blockages causing a sewer spill. When soft blockages are encountered, staff investigates using CCTV to determine if repair, rehabilitation, or other corrective maintenance, or a change in preventative cleaning methods or schedule are necessary. A decline in this metric signals more efficiency and better planning in line maintenance cleaning. The recent increase in this metric occurred mostly in high frequency and annually cleaned lines (81%), suggesting lower flows from water conservation may be allowing more of these blockages to form.

Figure 14. Potential Future Spills Prevented



District Water Use

The District started a recycled water use program for sewer cleaning, dust control and other activities as needed, using disinfected-23 MPN quality water made from wastewater effluent at the CMSA Truck Fill Station. Recycled water was transported to the 2000 Larkspur Landing Circle site to fill water trucks for dust control and hydroseeding of the cleanup of contaminated soils at the former wastewater treatment site completed in September 2020. The District equipped its Ramjet hydro-jetting trucks for recycled water and began a pilot program to clean sewers and maintain lines with recycled water as well as potable water. Recycled water use by purpose is indicated in Table 3, below.

Table 3. Recycled Water Use By Purpose (gals)

Purpose	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24
Sewer Cleaning	105,542	309,505	635,103	326,883	391,995
Dust Control	21,787	34,615	977	0	1,428
Hydroseeding	0	1,400	0	0	0
TOTAL	**127,329**	**345,520**	**636,080**	**326,883**	**393,423**

Figure 15 on the next page shows the cumulative potable and recycled water use over FY 23/24. Figure 16 on the next page shows how efforts to maximize recycled water use during the 2021 drought increased the percentage of recycled water to about 50%, with relative use returning to between 25% and 30% after the drought ended. In RVSD, it is more efficient to fill up trucks with recycled water one time per day, at the beginning or end of the day, since recycled water is not available in a distribution system. In addition, recycled water introduces more wear and tear on sewer cleaning equipment due to higher chlorine and solids levels in the recycled water, and not all sewer cleaning systems can sustainably use the available recycled water. The use of potable water extends the life of the sewer cleaning equipment by washing out the excess chlorine and solids from the sewer cleaning equipment on those vehicles that can use recycled water.

Using recycled water for various operational activities is environmentally responsible and sustainable in the long term. The volume of recycled water use equals the volume of potable water conserved. Conserving potable water makes more available for human uses of water for health and safety, and environmental uses of water for fish and wildlife habitat in the Lagunitas Creek and Russian River watersheds.

Figure 15. FY 2023/24 Cumulative Potable and Recycled Water Use (gals)

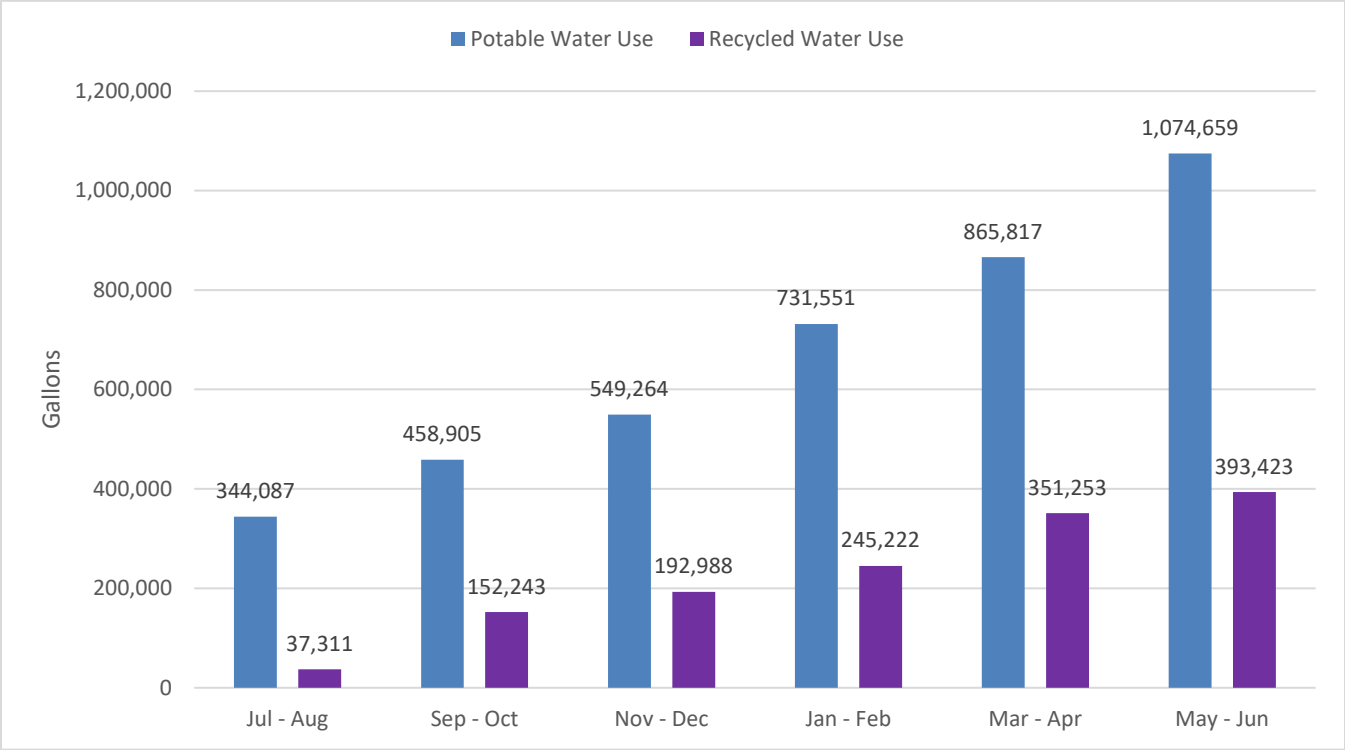
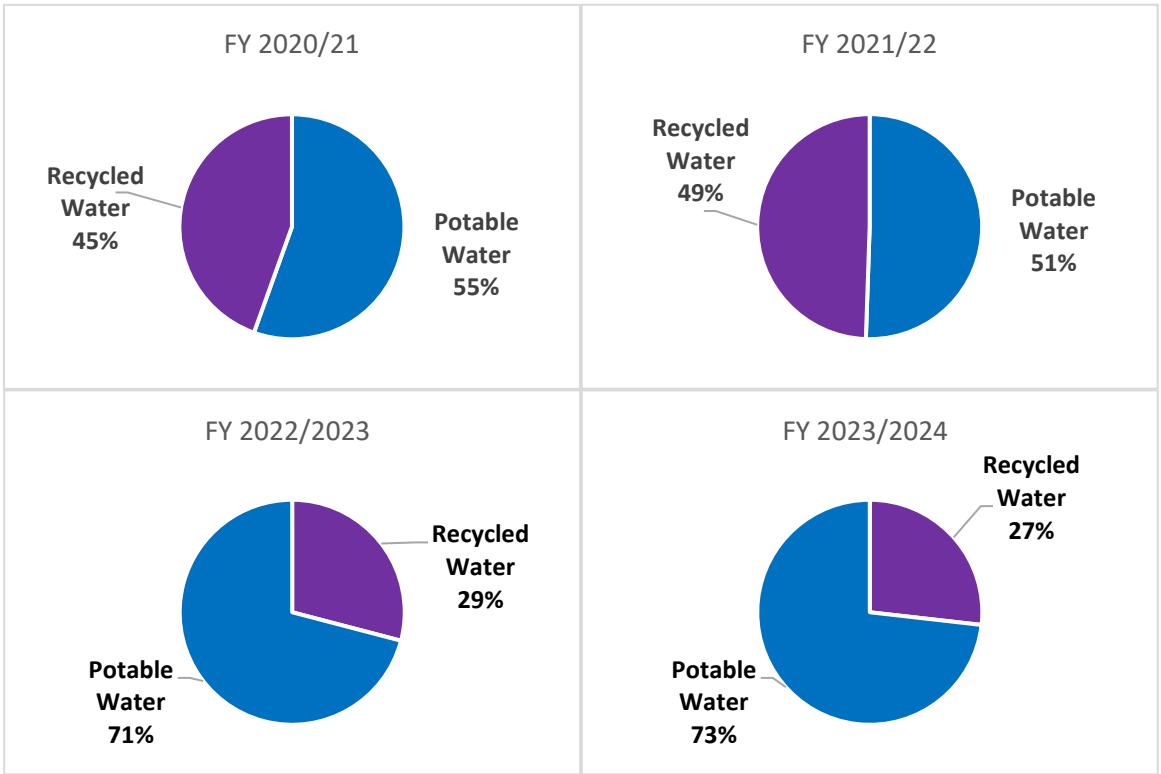


Figure 16. Potable Water vs Recycled Water Use Percentage



SERVICE CALLS

Service calls are by nature unplanned activities and can be a measure of the quality of wastewater collection service. A high number of service calls reduces the availability of O&M resources to complete preventive maintenance and scheduled repairs. In FY 23/24 the District recorded its lowest service calls and service call hours in the last eight years, an indicator of improved wastewater collection service (Figures 17 and 18).

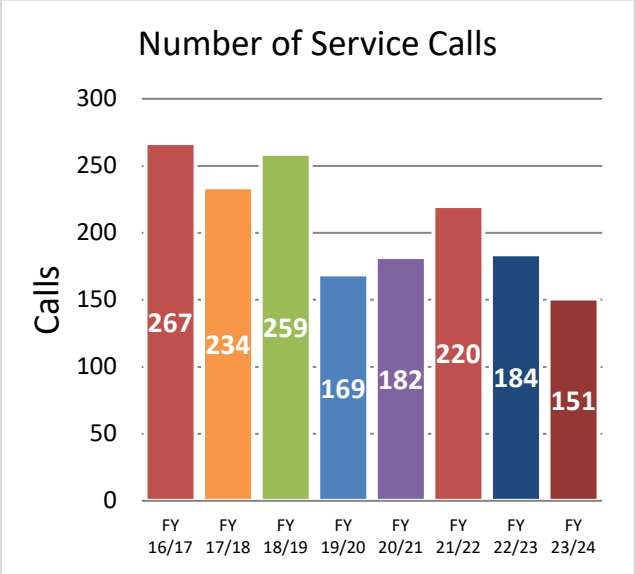
Service Calls

To provide a high level of service to customers, the District is committed to comprehensive management of all calls received. These service calls require a considerable amount of staff resources. Understanding service call distribution by type of call allows more effective planning of future O&M activities. Table 4 and Figures 19 and 20 include the types of service calls, the number of each type of call, and the staff hours dedicated to each type of call. Public spills are overflows of sewage from blockages or lack of capacity in the public sewer system. Public spills require a higher proportion of staff hours to comply with requirements of the State Water Board's Sanitary Sewer Systems Waste Discharge Requirements (SSSWDR). Private spills are overflows of sewage from blockages in private sewer laterals.

Table 4. Calls and Hours by Type of Service Call

Service Call Type	# Calls	Staff Hours
General	52	148
Public Spill	8	126
Private Spill	25	95
Odor complaint	12	34
Noise complaint	3	6
Pump Station Alarms	26	85
Non-District Incidents	17	52
System Monitoring	8	43
TOTAL	**151**	**589**

Figure 17 and Figure 18. Number of Service Calls and Service Call Hours



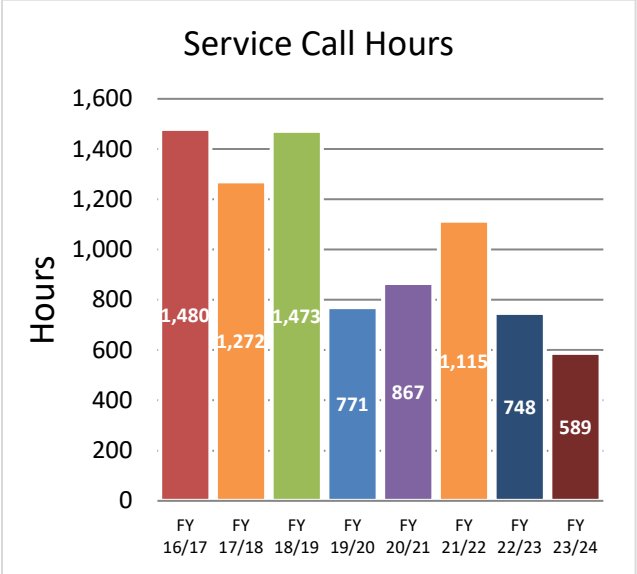
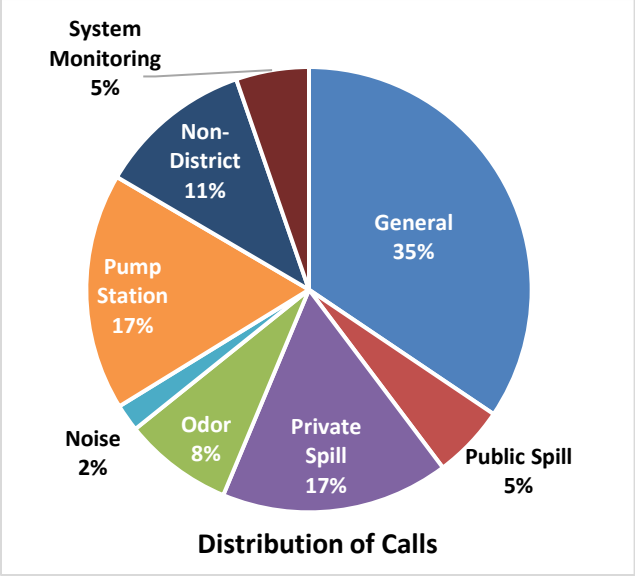
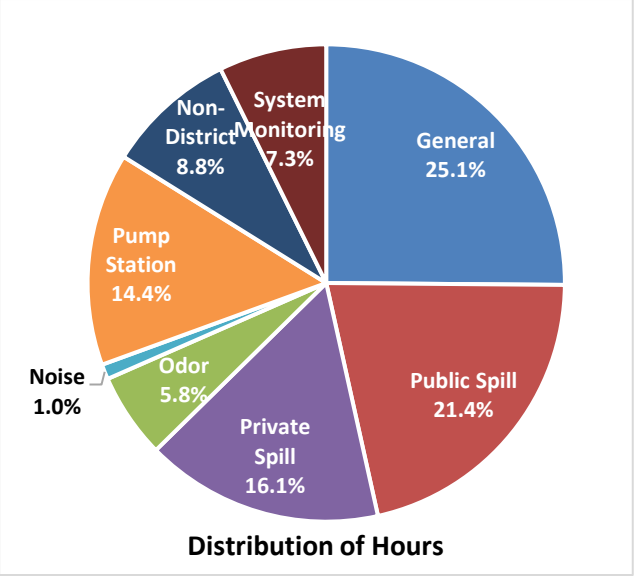


Figure 19 and Figure 20. Distribution of Service Calls and Service Call Hours





Insurance Claims

The District contracts with the California Sanitation Risk Management Authority (CSRMA) for insurance services. Some service calls related to sewer backups or other incidents can result in claims if there is property damage. This section presents a summary of the paid insurance claims during FY 23/24 (Table 5) and are typically categorized under "General" if they are related to a service call.

Table 5. Insurance Claims and Cost

Claim #	Date of Loss	Property Address	Property City	Total Loss	Deductible	Reason for Claim
3047320	5/25/2023	228 McAllister Ave.	Kentfield	$611.15	$611.15	Paint overspray
3028517	12/27/2021	114 Jordan Avenue	San Anselmo	$33,906.91	$10,175.01	Maintenance overspray
3032249	10/24/2021	3 Berens Drive	Kentfield	$15,313.55	$140.40	Sewer back-up
3062811	10/4/2023	8 Boardwalk One	Larkspur	$1,544.40	$1,514.40	Sewer back-up
3039339	10/7/2022	2017 Sir Francis Drake Blvd	Fairfax	$371.55	$371.55	Manhole cover damage
3042017	1/8/2023	82 Berens Dr	Kentfield	$220.35	$220.35	Sewer back-up
3042577	1/18/2023	82 Berens Dr	Kentfield	$101.55	$101.55	Sewer back-up
			Totals	**$ 52,069.46**	**$ 13,134.41**	-

Spills by Category

Spills, or sanitary sewer overflows (SSOs) from the public system, are categorized for regulatory purposes by the State of California and reported through California Integrated Water Quality System (CIWQS) to the Regional Water Quality Control Board (RWQCB) and State Water Resources Control Board (SWRCB) in compliance with the Sanitary Sewer Systems Waste Discharge Requirements (SSSWDR). Spills are a potential impact on public health and the environment. Preventing spills is fundamental to the proper management of the wastewater collection system. Table 6 includes number and volume of spills by category.

Category 1: Discharge of untreated or partially treated wastewater of any volume resulting from a sanitary sewer system failure or flow condition that either:

- Reaches surface water and/or drainage channel tributary to a surface water; or
- Reached a Municipal Separate Storm Sewer System (MS4) and was not fully captured and returned to the sanitary sewer system or otherwise captured and disposed of properly.

Category 2: Discharge of untreated or partially treated wastewater greater than or equal to 1,000 gallons resulting from a sanitary sewer system failure or flow condition that either:

- Does not reach surface water, a drainage channel, or an MS4, or
- The entire spill discharged to the storm drain system was fully recovered and disposed of properly.

Category 3: A spill of equal to or greater than 50 gallons and less than 1,000 gallons, from or caused by a sanitary sewer system that does not discharge to a surface water.

Category 4: A spill of less than 50 gallons, from or caused by a sanitary sewer system that does not discharge to a surface water.

Table 6. Spills by CIWQS Category

Category	# Spills	Volume, gal
1	4	3,472
2	0	0
3	3	1,498
4	1	1
TOTAL	**8**	**4,971**

Spill Volume versus Conveyance to Wastewater Treatment Plant (WWTP)

Spills are wastewater that was not conveyed by the collection system to the treatment plant.

Table 7. Spill Volume versus WWTP Influent

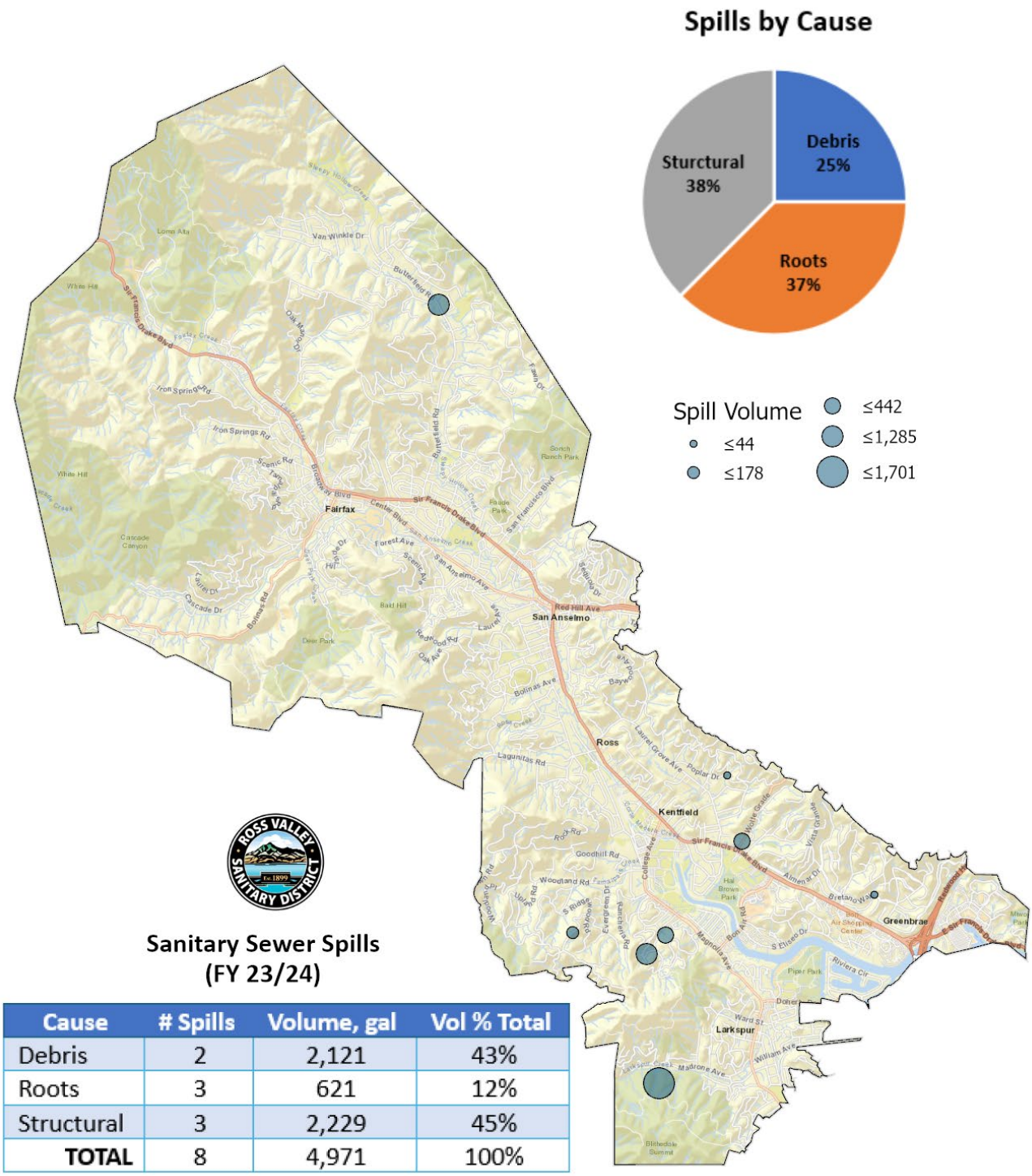
Fiscal Year	Spill, MG	WWTP, MG	%
23/24	0.0050	2,046	0.0002%

Spills by Cause

Tracking the cause of spills is a regulatory requirement in the SSSWDR for CIWQS spill reporting. The data are used in planning, O&M, capital improvement, and enforcement activities. Understanding how spills are distributed by cause allows more effective planning of future O&M, capital improvement, and enforcement activities. Figure 21 shows that spill causes were from debris, roots and structural issues, and both short and long term corrective actions were specified for each spill site, documented in the CMMS.

In FY 23/24, RVSD had a decrease in spills compared to all previous years (for the second consecutive year), and one spill was Category 4 which had little to no impact. Total spill volume was slightly higher than the previous year. No significant wet weather spills have occurred since FY 21/22, the last year the total spill volume exceeded 100,000 gallons (Figure 22).

Figure 21. FY 23/24 Spills



Cause	# Spills	Volume, gal	Vol % Total
Debris	2	2,121	43%
Roots	3	621	12%
Structural	3	2,229	45%
TOTAL	8	4,971	100%

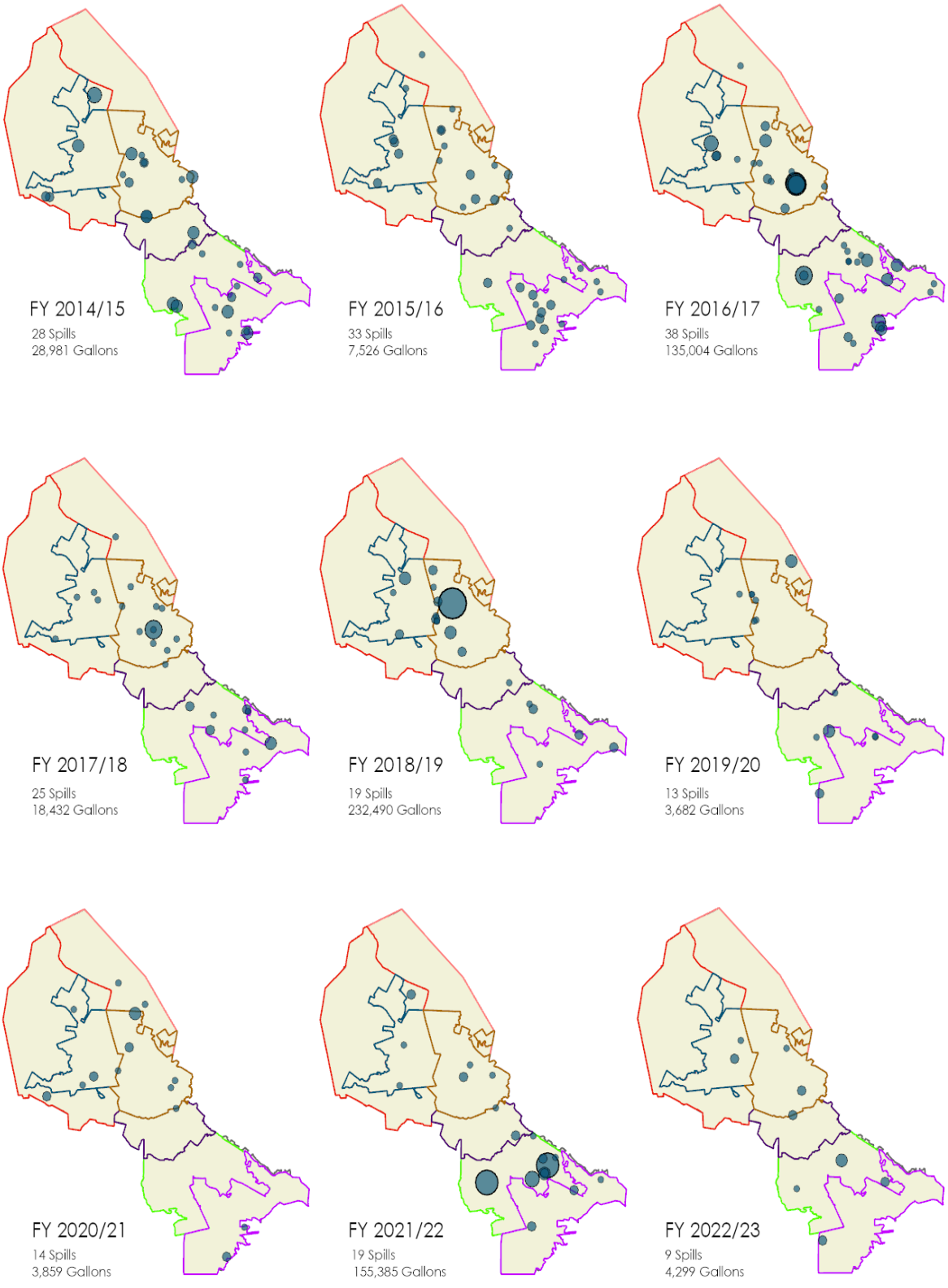
Spills from FY 14/15 to FY 22/23

Spill location, counts, and volumes from FY 14/15 to FY 22/23 are shown in Figure 22. The trend is a reduction in spills and volume, except for the construction-related event at Broadmoor in FY 18/19 and the record storm in FY 21/22. In the relatively wet winter of FY 16/17, eight wet weather spills totaling approximately 94,000 gallons represented 70% of the total spill volume that year.

For comparison, in FY 21/22, four spills on the day of the historic 200-year October 24, 2021 storm totaling 153,380 gallons represented 98.7% of the total spill volume. Outside of this record storm and the construction-related event of FY 18/19, RVSD has had declining wet weather-related spills following completion of several capacity improvement projects and hundreds of point repairs and lateral replacements in the District.

The lowest spill volume years in FY 19/20 and FY 20/21, in the 3,000-4,000 gallon range, tracked with low rainfall years. The spill volume from the last two years was slightly higher in the 4,000-5,000 gallon range, but significantly lower than the prior years where storm water infiltration had a larger impact.

Figure 22. Spills from FY 14/15 to FY 22/23



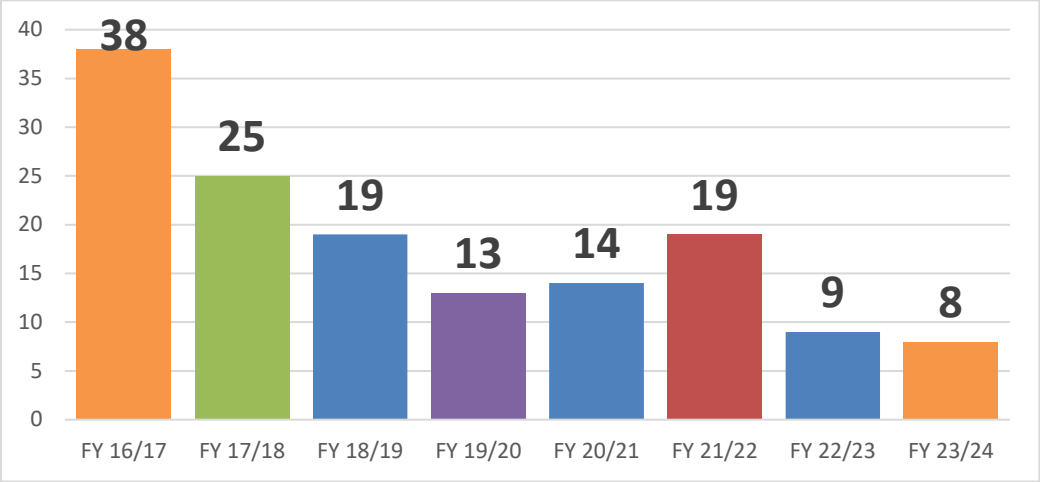
Number of Spills

Preventing sanitary sewer spills is fundamental to the proper management of the collection system. The number of spills from the public system that occur annually is a performance indicator that integrates the efforts of the various Operations & Maintenance and Capital programs of the District. Activities of line maintenance, repair, condition assessment, inspections, pump station O&M, capital and lateral programs documented in this report all contribute to lowering the risk of spills.

During FY 23/24, several initiatives were continued based on corrective actions suggested by recent spills. These initiatives include the Supervisor Review Function and the Lateral Enforcement Program. In late FY 23/24 the High Frequency Cleaning (HFC) lines were systematically reviewed and targeted for management actions to reduce cleaning frequency and spill risk.

Figure 23 shows a sharp and sustained reduction in spills that accompanied these recent initiatives complemented by capital improvements and the numerous O&M activities documented in this report. The District has recorded its lowest number of spills for two consecutive years, showing steady improvement in one of the most important performance metrics.

Figure 23. No. of Spills



CONDITION ASSESSMENT

Condition assessment is used to understand and monitor the condition of infrastructure assets. Condition assessment methods used in the District include CCTV pipe inspection, manhole inspection, lateral connection inspection, remote "Smart Cover" manhole water level monitoring, and GPS surveys.

CCTV Pipe Surveys

RVSD has inspected and documented the District's 198 miles (1,045,440 feet) of gravity sewer infrastructure and is now either resurveying pipes that haven't been assessed recently or performing responsive maintenance and post-rehabilitation surveys. Pipes identified with Grade 5 or Grade 4 structural defects are subject to regular reinspection every four to eight years, and condition assessment data greater than twelve years old is prioritized for resurveying. Table 8 and Figure 24 show the different purposes of CCTV inspection completed this year, which was approximately 13.6% of the system length.

Table 8 and Figure 24. CCTV Inspection by Purpose

CCTV Purpose	Feet Inspected
Maintenance Related	53,278
Routine Assessment	43,897
Post Rehabilitation Survey	22,282
Resurvey	21,962
Other	504
TOTAL	**141,923**

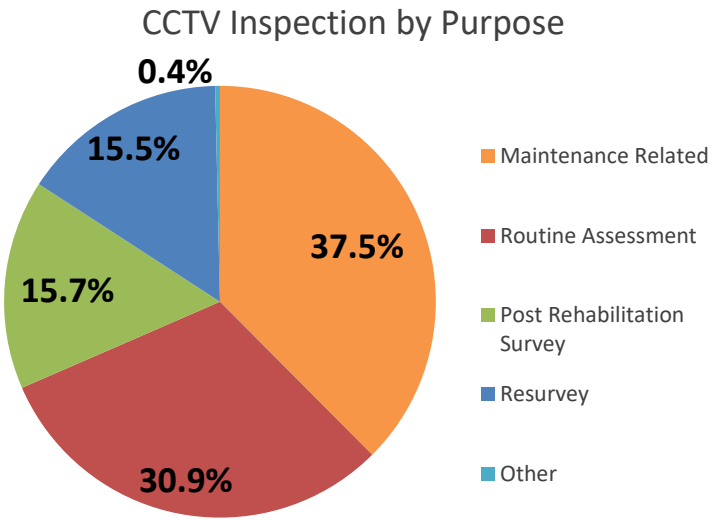
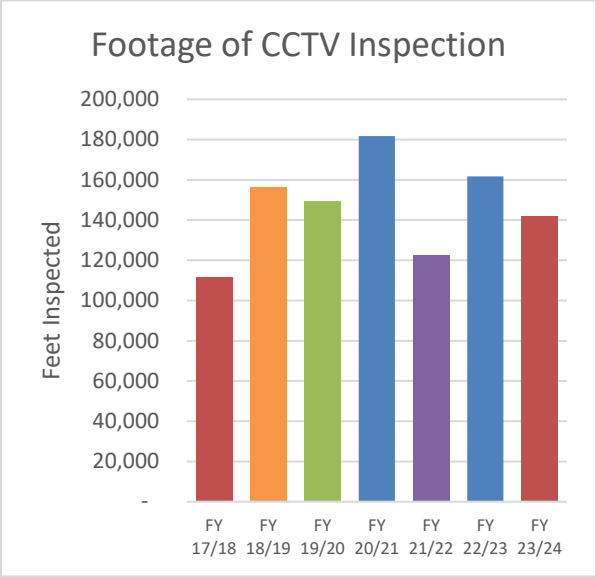
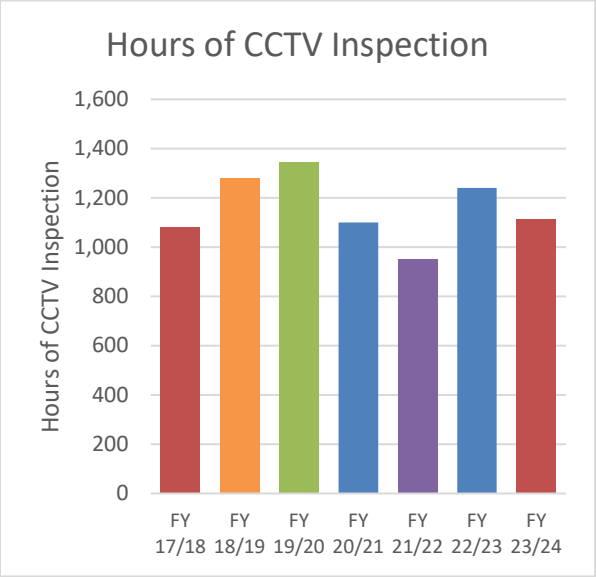


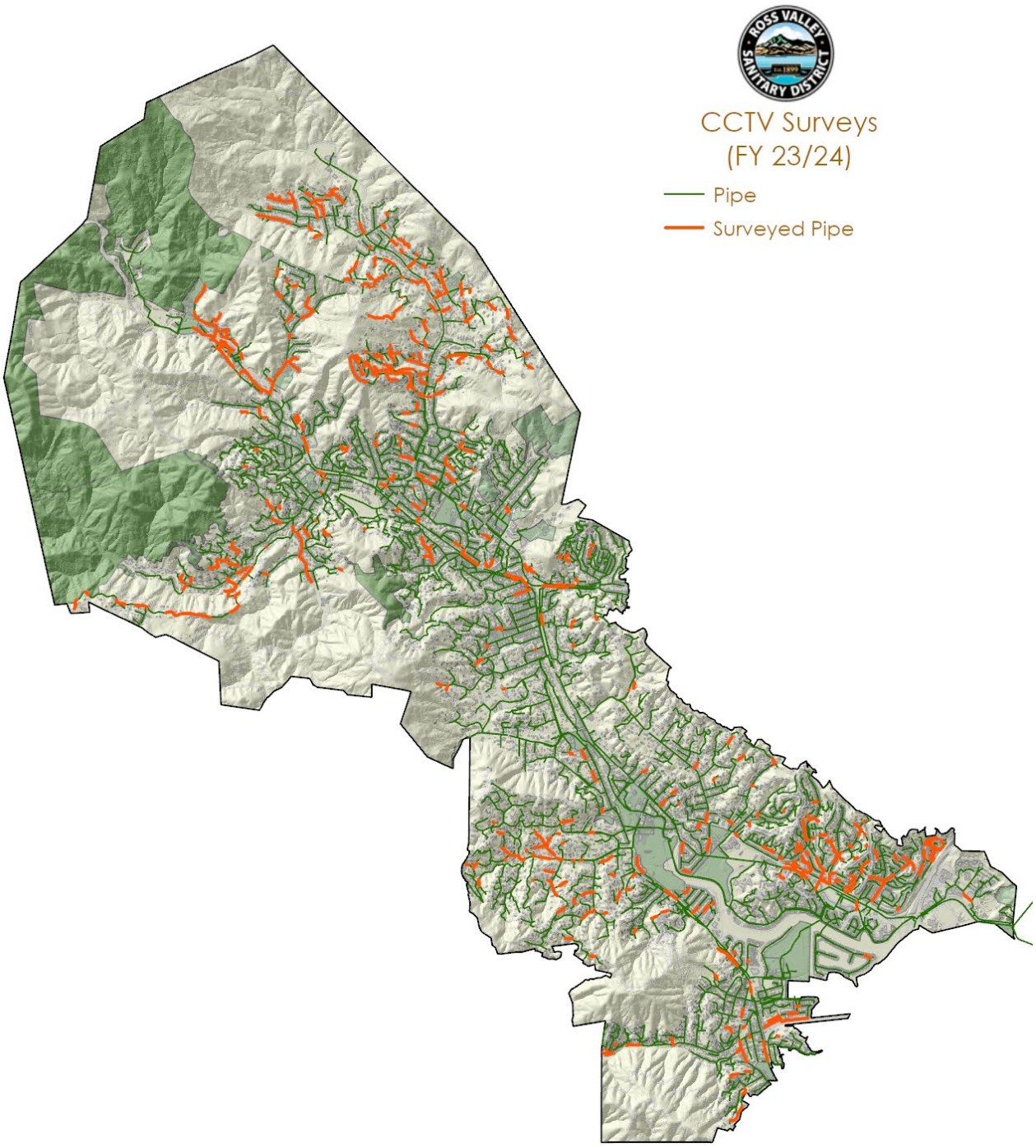
Figure 25 and Figure 26. Footage of CCTV Inspection and Hours of CCTV Inspection





Figures 25 and 26 show a rebound of footage and hours for CCTV inspection in FY 22/23 and FY 23/24 that corresponded to an increased commitment to routine assessments. Figure 27 shows how the CCTV work orders were distributed throughout the service area.

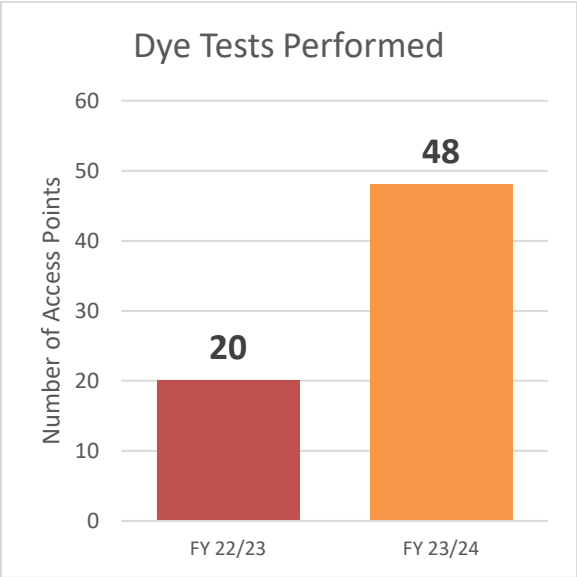
Figure 27. FY 23/24 CCTV Surveys

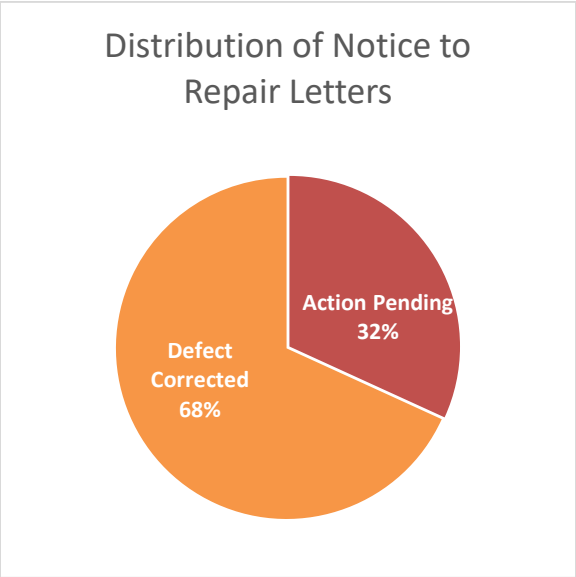


Dye Testing and Notice of Defective Lateral

At the end of FY 22/23, the District began an initiative to correct defective laterals and lateral connections identified during CCTV inspections in order to reduce spill risk. When condition assessment staff identify a defective lateral during a routine assessment, a dye test is performed to confirm ownership. The dye test information is used to generate "Notice of Defective Lateral" or "Notice to Repair" letters and the homeowner is notified of their responsibility to fix the defective lateral or lateral connection.

Figure 28 and Figure 29. Dye Tests Performed and Distribution of Pending Notice to Repair Actions





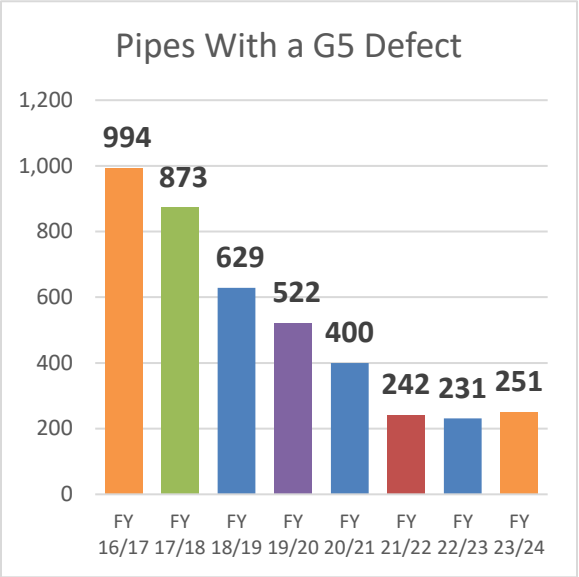
SYSTEM CONDITION INDICATORS

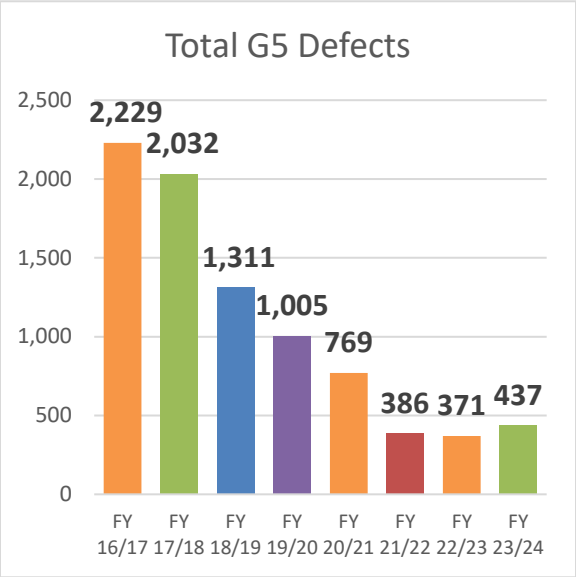
As CCTV pipe surveys and manhole surveys are conducted, information gathered can be used to provide indicators of collection system condition, with a goal of these performance metrics showing improvement over time. As the system is surveyed and various repairs and capital improvements implemented, information will be reviewed, and indicators of overall condition tracked and discussed. System condition indicators demonstrate the "outcomes" of the integration of various investments in the system, to complement the "outputs" of surveys conducted, lines maintained, assets replaced, and repairs completed.

Grade 5 Defects

The Pipeline Assessment and Certification Program (PACP) is used by collection systems to categorize various pipe defects identified by condition assessment activities. A PACP Grade 5 Defect is the most severe defect (on a scale of 1 to 5) and the District's capital and O&M programs are organized around addressing Grade 5 and Grade 4 defects over time. Grade 5 and Grade 4 defects include pipe cracks and holes where I&I and debris can enter the system, increasing the risks of spills. A system condition indicator that can be tracked is the number of Grade 5 defects identified by CCTV surveys. Figures 30 and 31 below show that in the last eight years, the number of pipes with Grade 5 defects and total number of Grade 5 defects have declined, evidence of improved system condition and performance. The recent flattening and slight increase in defects is likely from pipes that had not been assessed for over 12 years as well as using an upgraded Version 7 of the PACP coding system (since 2020) which codes 75%-or-greater sags as Grade 5 instead of Grade 4 defects. A continued focus on Grade 5 defects is expected to lead to further decreases in this indicator.

Figure 30 and Figure 31. Pipes with Grade 5 Defect and Total Grade 5 defects[7]





[7] Numbers based on current CCTV data

REPAIR

District repairs allow for completion of cost effective and high priority rehabilitation and system improvement work. District repairs have primarily been localized pipe liner repairs, towards the goal of restoring all pipe with Grade 5 or Grade 4 structural defects, which will reduce I&I over time, lowering risks of spills and potential issues at the downstream CMSA treatment plant.

Repair Activities

Understanding the distribution of repair work allows more effective planning of future O&M and capital improvement activities. Repair activities primarily include scheduled localized liner and open cut pipe repairs, manhole repairs, and manhole installations either at the top of a system, to replace a lamp hole or rod hole, or where two pipes come together underground but there is no access for cleaning or inspections (known as “blind tees”).

Over the past eight years, shown in Table 9, the District has completed 2,344 trenchless pipe repairs, 86 open cut pipe repairs, 425 manhole repairs, and installed 35 new manholes. In FY 23/24 the District completed more open cut pipe repairs than any previous year, as well as a large number of manhole repairs. These more time-consuming activities accompanied a reduced number of trenchless liner repairs completed this past year and reduced the overall total repairs compared to the peak years of FY 16/17 to FY 19/20.

Table 9. Repair Activities

Repair Type	FY16/17	FY17/18	FY18/19	FY19/20	FY20/21	FY21/22	FY22/23	FY 23/24
Localized Pipe Liner	349	343	400	369	268	290	171	154
Open Cut Repair	6	9	2	15	9	5	17	23
Manhole Repair	28	71	70	69	34	27	54	72
Manhole Install	4	9	5	1	5	4	2	5
TOTAL	**387**	**432**	**477**	**454**	**316**	**326**	**244**	**254**

Restored Pipe

The District restores pipe through both internal rehabilitation activities and through external activities of capital improvements of replacement or rehabilitation by licensed contractors. When the District repairs or rehabilitates a pipe by either removing all Grade 4 or 5 structural PACP defects, that pipe has been restored to a condition that extends the useful life of the asset and reduces the risk of failure criteria under the Infrastructure Asset Management Plan (IAMP) risk assessment model. Table 10 is a summary of miles of pipe replaced or rehabilitated by the capital program and the miles rehabilitated by the Repair Crew, categorized by Grade 4, 5, and other defects. These figures include the pipe length from manhole to manhole. Since the 2013 IAMP, the District has restored 85.95 pipe miles, more than 40% of the 198-mile system.

Table 10. Summary of Pipe Restored

Fiscal Year	Miles Replaced or Rehabilitated (Capital: Manhole to Manhole)			Miles Rehabilitated by Repair(s)		Total Miles Restored
	Grade 5	**Grade 4**	**Other**	**Grade 5**	**Grade 4**	
FY 13/14	3.12	0.06	0.91	2.66	0.47	**7.22**
FY 14/15	0.01	00.00	0.06	4.98	0.84	**5.89**
FY 15/16	3.53	0.35	1.65	6.07	0.81	**12.41**
FY 16/17	0.90	0.00	0.00	3.68	0.56	**5.14**
FY 17/18	5.10	1.21	1.45	4.69	0.40	**12.85**
FY 18/19	1.99	0.80	0.49	3.70	1.16	**8.14**
FY 19/20	4.11	0.83	1.37	4.10	0.94	**11.35**
FY 20/21	0.42	0.42	1.5	3.11	0.33	**5.78**
FY 21/22	0.68	0.76	1.68	4.23	0.38	**7.73**
FY 22/23	0.05	0.71	1.14	2.11	0.37	**4.38**
FY 23/24	0.70	0.82	1.53	1.36	0.65	5.**06**
Total	20.61	5.96	11.78	40.69	6.91	**85.95**

Pipe Repair Reliability

To evaluate the high-quality work of the Repair Crew, the District monitors failure rate of pipe repairs that have been surveyed by CCTV. Over the history of the repair program the average failure rate is 6% (Table 11). The failure rate of the past two years has increased as the evaluation process has been updated in light of some point repair failures that occurred during storms over the past few years. Repairs conducted using an inferior batch of epoxy, cited in a recent spill report, have been targeted for condition assessment and repair, temporarily raising the failure rate. Correcting defective repairs is prioritized in the CMMS work order system to ensure that they do not lead to negative consequences such as spills or backups.

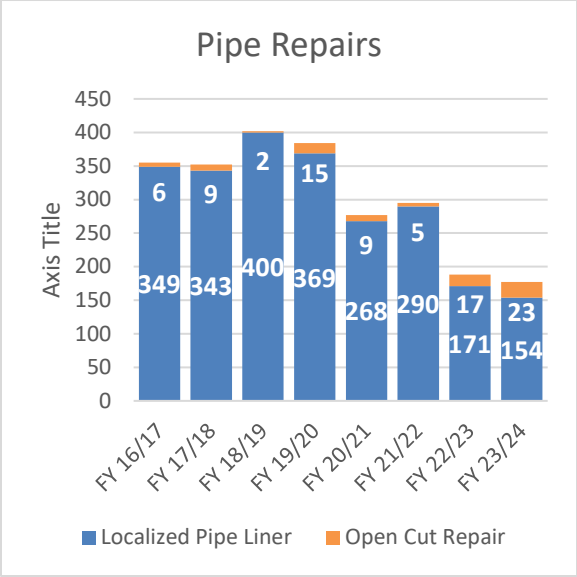
Table 11. Pipe Repair Failure Rate

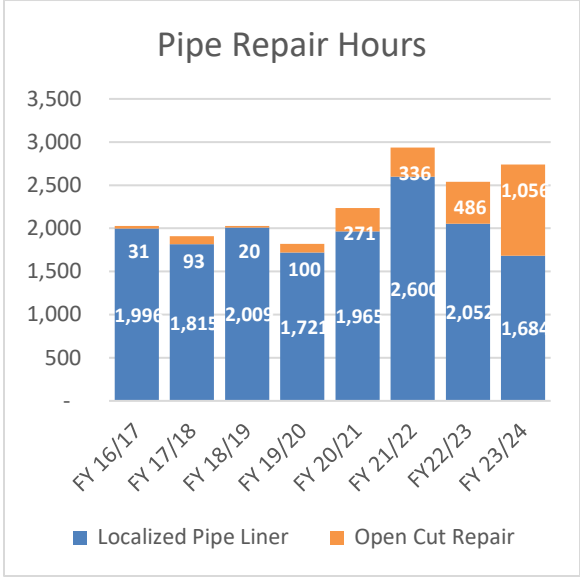
Fiscal Year	Surveyed No. of Repairs	No. Defective	Percent Defective
FY 14/15	50	0	0%
FY 15/16	104	4	4%
FY 16/17	526	20	4%
FY 17/18	171	9	5%
FY 18/19	330	13	4%
FY 19/20	335	10	3%
FY 20/21	625	8	1%
FY 21/22	430	58	13%
FY 22/23	315	40	13%
FY 23/24	277	42	15%
TOTAL	**3,163**	**204**	**6%**

Pipe Repairs

Pipe repairs are performed either by trenchless rehabilitation by inserting and curing a localized pipe liner within the existing pipe or by open-cut removal and replacement of a length of pipe. Repair crew members are experienced installing localized pipe liners, and have the correct equipment, tools, and materials for their efficient installation. This year they spent relatively more time on open-cut repairs.

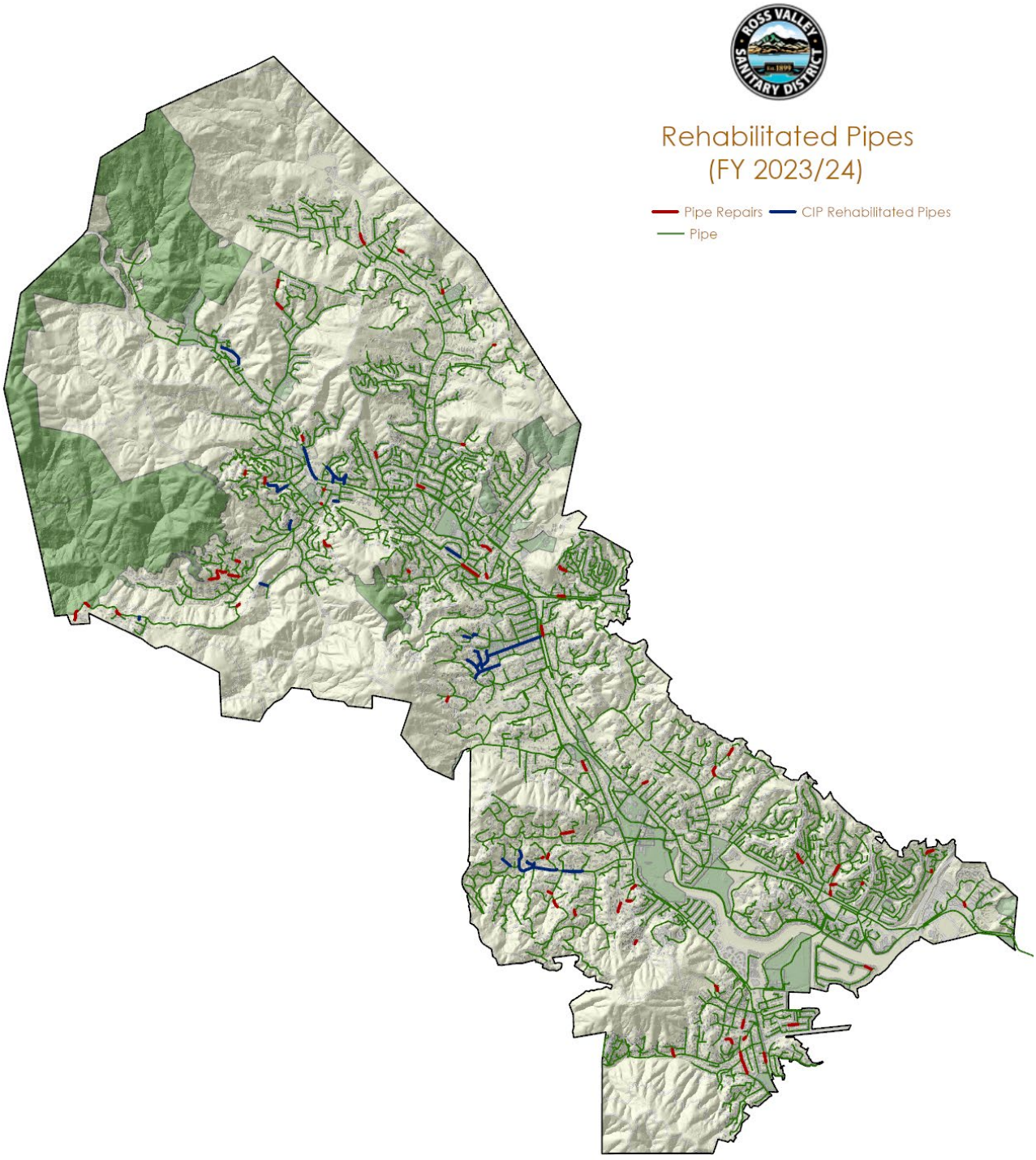
Figure 32 and Figure 33. Total Pipe Repairs and Pipe Repair Hours





Pipes that were rehabilitated by District repair in FY 23/24, i.e., all high-grade structural defects that were repaired, are shown in red in Figure 34 on the following page. Figure 34 also shows pipes rehabilitated in capital improvement projects (CIP) in blue.

Figure 34. FY 2023/24 Rehabilitated Pipes



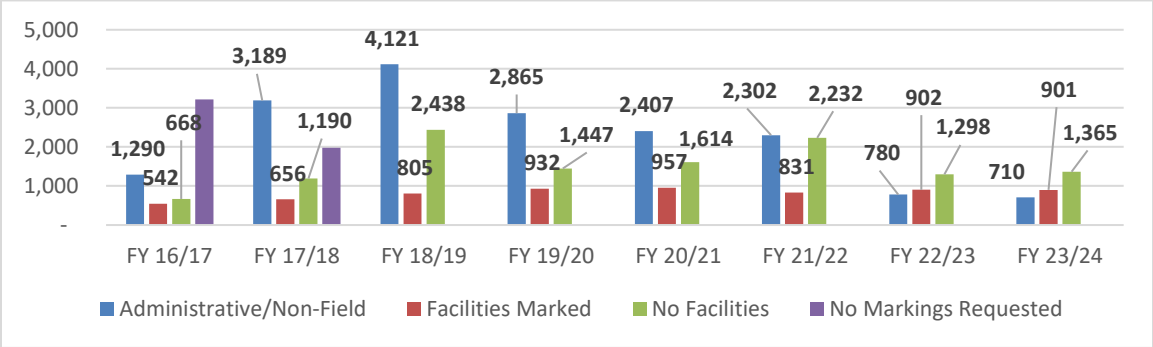
INSPECTIONS

Inspections staff inspect and provide technical customer support and enforcement functions for private sewer laterals. Inspections staff document lateral inspections in the CMMS.

Underground Service Alerts (USAs)

Underground Service Alerts (USAs) are called in any time someone undertakes an excavation, to protect existing underground facilities. The District reviews the alerts and responds to either mark our utilities or indicate that we have no facilities in the area of excavation. We mark our infrastructure at approximately 900 locations each year, mark that our facilities are clear at 700 to 2,000 locations each year and can respond from the office for an additional 700 to 1,000 USAs. In FY 21/22, the District implemented new USA software that integrates with our mapping system. This new system helps the District respond to marking requests more efficiently.

Figure 35. Underground Service Alerts

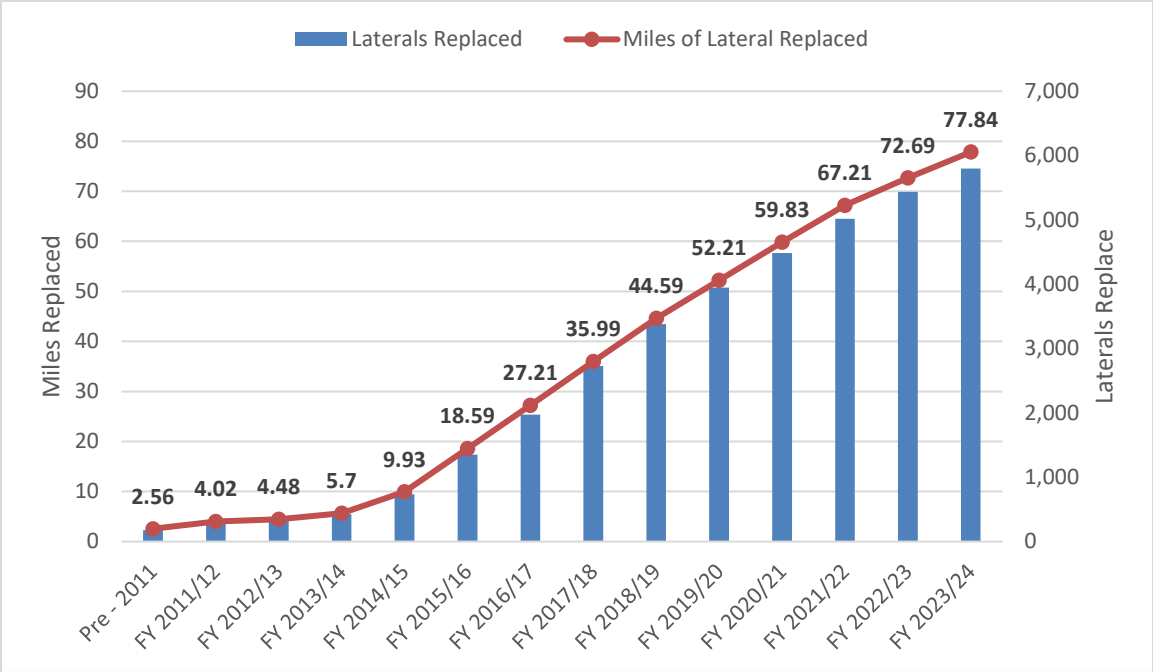


Lateral Inspections

Generally lateral inspections have increased in the last decade due to increased lateral replacement activity driven by the District's lateral programs. The cumulative number and miles of lateral replacements in the District since before 2011 are shown in Figure 36. In FY 23/24 lateral inspections dipped compared to previous years (Figure 37), due mostly to a slower housing market driven by higher interest rates, because property sales are one trigger for lateral inspections. Before the Lateral Replacement Grant Program, the average annual replacement was about 150 laterals. Lateral grants doubled the annual replacements to more than 300. After the Private Sewer Lateral Ordinance was adopted in FY 13/14, lateral replacements were doubled again, to more than 600 laterals per year, and have since leveled off. The miles of laterals replaced in the last six years, an average of approximately 7.6 miles per year, shown in Figure 36 on the next page, is higher than sewer main replaced or repaired in the last two years (4.38 and 5.06 miles, an average of 4.72 miles) shown in Table 10. As a general rule, the length of private laterals in any collection system is about the same as the length of public sewer mains. Consequently, private laterals contribute about the same amount of I&I to the system as the public sewer mains. Therefore, these lateral replacements demonstrate the District's commitment to

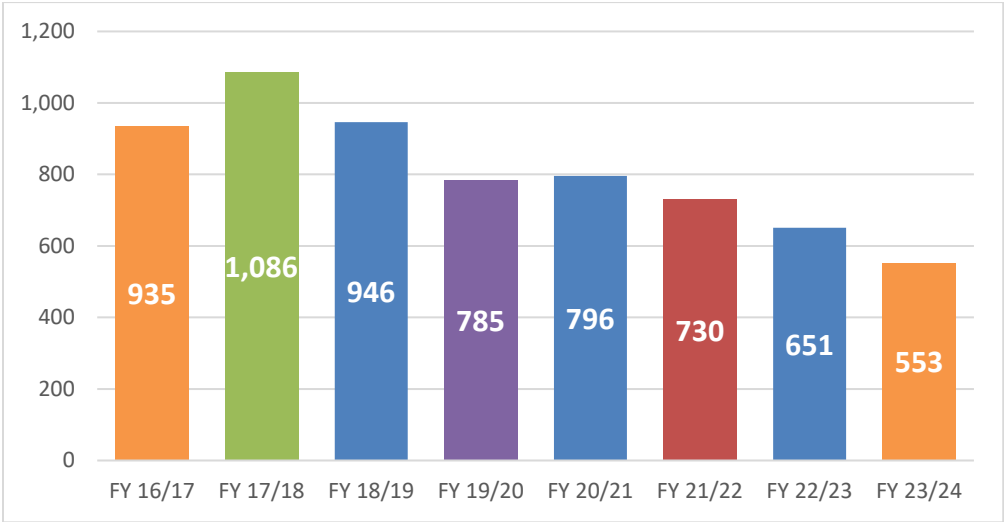
comprehensive I&I reduction to both lower spill risk and prevent flow-related issues at the CMSA treatment plant.

Figure 36. Lateral Replacements



Inspections staff complete more lateral inspection work orders than the number of laterals that are replaced due to additional field meets and investigations as well as re-inspections when the lateral does not pass inspection the first time. In FY 23/24, approximately 52% more work orders were completed than laterals were replaced.

Figure 37. Lateral Inspection Work Orders



LATERAL PROGRAMS

The progress on the lateral programs is tracked through data on permits issued, grant and loan funding, and Private Sewer Lateral Ordinance Compliance.

Permits

A permit must be applied for and approved at the District office before any work on a private sewer lateral can commence. Permit costs include permit fees and capacity charges for new connections. In FY 23/24 a slower housing market driven by higher interest rates led to less lateral permits.

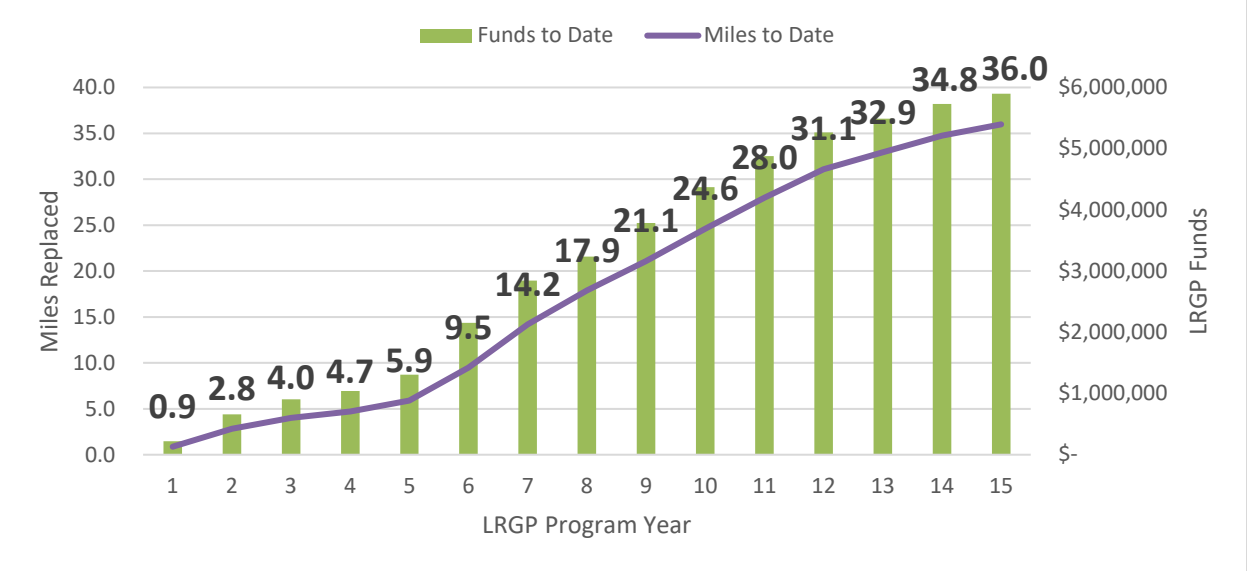
Table 13. Permits Issued

Metric	FY 18/19	FY 19/20	FY 20/21	FY 21/22	FY 22/23	FY 23/24
Number of Permits	738	657	588	537	447	406
Average Permit Cost	$511	$536	$3,461	$804	$1,276	$2,060

Lateral Replacement Grant Program

Over the 15 years of the Lateral Replacement Grant Program (LRGP), the District has granted over $5 million to support the replacement of 36 miles of private sewer laterals (Figure 38), almost half the total length of replaced laterals shown in Figure 36 above. That represents a replacement cost of approximately $164,000 per mile of pipe, only a fraction of the cost of replacing/rehabilitating public sewer mains through capital projects (over $1 Million per mile).

Figure 38. LRGP Funding and Lateral Replacement



In FY 23/24, the District continued to budget higher individual grant amounts by categories to encourage lateral replacements in high I&I basins or in streets with upcoming paving projects where paving moratoriums prevent subsequent lateral replacement for several years. This year a new category was added for customers responding to receiving a Notice of Defective Lateral from our condition assessment and follow-up lateral compliance efforts. The grants awarded per funding category in FY 23/24 are shown in Table 14 below.

Table 14. FY 23/24 Grant Funding

Category	Grants	Total Grant Funding	Maximum Grant Amount	Average Grant Amount	Average Length Replaced	Total Feet Replaced	Total Miles Replaced
High I&I	29	$72,500	$2,500	$2,500	67	2,002	0.38
Paving	8	$20,000	$2,500	$2,500	37	298	0.06
Standard	40	$61,000	$1,500	$1,500	96	3,836	0.73
Lateral Compliance	6	$13,000	$2,500	$2,167	53	320	0.06
Total	**83**	**$166,500.00**	N/A	$ 2,006	84	**6,456**	**1.23**

A record high 100% of the grants approved this year were completed (paid to the customer) as of October 2024 (Figure 39). Figure 40 shows the grant completion status over the past five years. The improvement in FY 22/23 is due to changes in the application process initiated in May 2021. Before, applicants applied for grants prior to work being completed. Now, the grant application is submitted after permitted lateral work is completed, and this sequence of approvals has led to all grants being awarded to the customers.

Figure 39. FY 23/24 LRGP Approved Grants and Funding

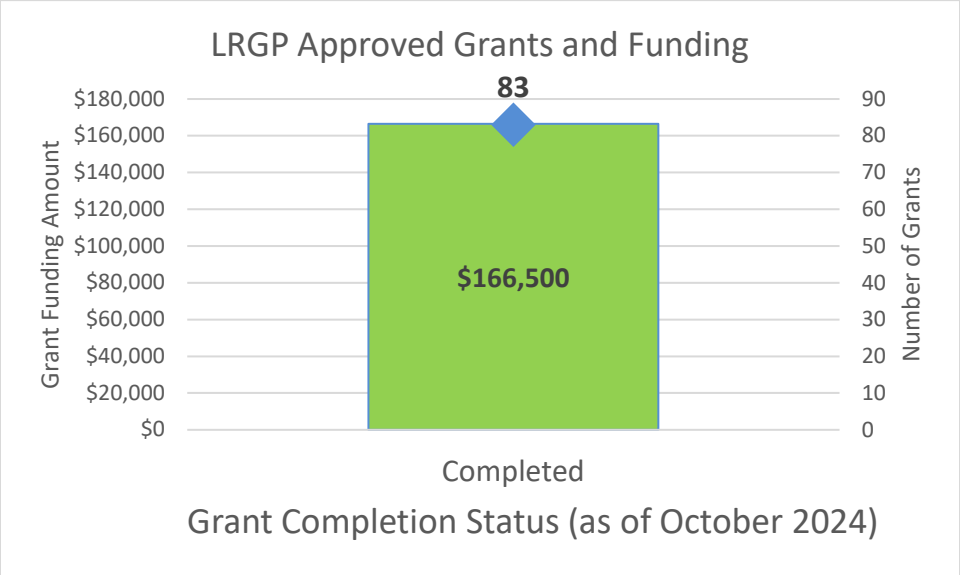
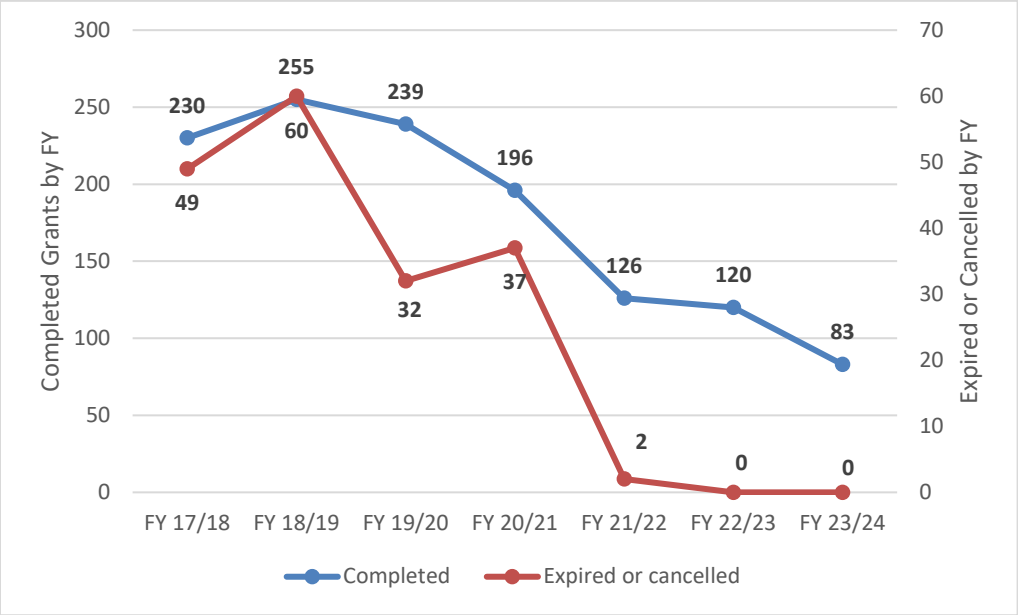
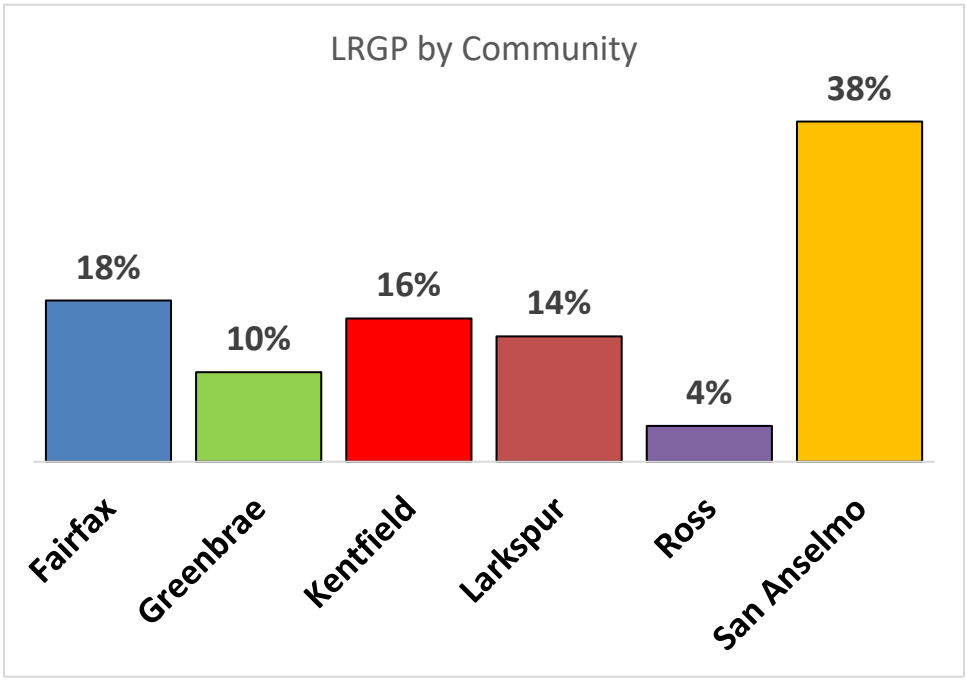


Figure 40. Completed Grants versus Expired/Cancelled from FY 17/18 to Present



District and partner agency project outreach has been a successful driver for the LRGP program. The majority of the paving grants awarded in FY 23/24 went to customers in San Anselmo. San Anselmo was the peak program performer with 38% of the grants exceeding their 28% of laterals in the system. Fairfax's lateral replacement declined this year, decreasing from 31% to 18%. Comparable to their 21% of the laterals in the system. Kentfield continued to participate in the program at a rate comparable to last year, with 16% this fiscal year versus 13% last fiscal year.

Figure 41. Grant Applications by Community



Lateral Loan Program

There is lower participation in the Lateral Replacement Loan Program (LRLP) compared to the LRGP. However, participation increased this year, and the District continues to offer the program for customers who may need greater assistance than the LRGP offers. Repayment is made through the property tax bills amortized over ten years at an interest rate based on the current 10-year U.S. Treasury rate plus 0.5% per annum (fixed). The LRLP continues to be an alternative resource for those who need it, and the number of recipients increased this year from eight to nine.

Table 15. FY 23/24 Loans

Loans	Total Loan Amounts	Maximum Loan Amount	Average Loan Amount	Average Length Replaced	Total Feet Replaced	Total Miles Replaced
9	$158,619	$50,000	$17,624	88	788	0.15

Private Sewer Lateral Ordinance Compliance

Triggers for Private Sewer Lateral Ordinance compliance include, but are not limited to, home sales and remodels. The trend in the District is between 400 and 500 home sales and between 100 and 300 remodels each year. As tracked by the District over the last nine years, properties with triggers under the Ordinance have achieved 88% compliance. Approximately 90% of properties triggered more than a year ago are compliant. As time passes, the current 73% compliance for properties triggered in FY 23/24 is anticipated to increase to 90% compliance.

ACRONYMS, ABBREVIATIONS, TERMS, AND DEFINITIONS

ADWF	Average Dry Weather Flow
ARV	Air Release Valve
CBT	Competency Based Training program
CCTV	Closed Circuit Television
CDO	Cease and Desist Order
CIP	Capital Improvement Plan or Program
CIPP	Cured-In-Place Pipe (a pipe lining method)
CIWQS	California Integrated Water Quality System
CMMS	Computerized Maintenance Management System
CMSA	Central Marin Sanitation Agency
COF	Consequence of Failure
Design Storm	10-year 24-hour design storm (USCS Type IA rainfall distribution curve)
District	Ross Valley Sanitary District
EMS	Enterprise Management System
FM	Force Main
FOG	Fats, Oil, and Grease
ft	Feet
FY	Fiscal Year (July 1 to June 30)
G5	Grade 5
G4	Grade 4
gal	Gallons
GIS	Geographic Information System
GPS	Global Positioning System (for satellite-based location information)
HFC	High Frequency Cleaning (<1 year)
hr	Hour
IAMP	Infrastructure Asset Management Plan
I&I	Infiltration and Inflow
InfoAsset	District's CMMS software
JPA	Joint Powers Authority (such as CMSA)
kWh	Kilowatt-hour; unit of energy
LF	Linear Feet

LOF	Likelihood of Failure
LOS	Level of Service
LRGP	Lateral Replacement Grant Program
LRLP	Lateral Replacement Loan Program
LS	Lift Station
MACP	Manhole Assessment and Certification Program
MG	Million Gallons; measure of flow volume
MGD	Million Gallons per Day; measure of flow rate
MPN	Most Probable Number
MS4	Municipal Separate Storm Sewer System
O&M	Operations and Maintenance
NPDES	National Pollutant Discharge Elimination System
PACP	Pipeline Assessment and Certification Program
PS	Pump Station
PSL	Private Sewer Lateral
PWWF	Peak Wet Weather Flow
QA/QC	Quality Assurance and Quality Control
RDI/I	Rainfall-Dependent Infiltration and Inflow
R Factor	Wet weather I&I volume/rain volume onto tributary area, as a percent (an estimate of how much of the rain that falls makes its way into the sanitary sewer pipes)
RVSD	Ross Valley Sanitary District
RWQCB	Regional Water Quality Control Board
SCADA	Supervisory Control And Data Acquisition
SOP	Standard Operating Procedure
SSMP	Sewer System Management Plan
SSO	Sanitary Sewer Overflow (Spill)
SSSWDR	Sanitary Sewer System Waste Discharge Requirements (Statewide Order for Wastewater Collection Systems issued by State Water Resources Control Board)
SWRCB	State Water Resources Control Board
USA	Underground Service Alert
VFD	Variable Frequency Drive
WWPF	Wet Weather Peaking Factor
WWTP	Wastewater Treatment Plant