

**City of Baltimore**

Department of Public Works

**Modified Consent Decree  
Collection System Operations and Maintenance Annual Report**

Sanitary Sewer Overflow Consent Decree

Civil Action No. JFM-02-1524

July 1, 2022 to June 30, 2023

Prepared by:

Office of Asset Management

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## Executive Summary

On October 6, 2017, the City of Baltimore (City) entered into a Modified Consent Decree (MCD) with the United States Environmental Protection Agency (EPA), the State of Maryland Department of the Environment (MDE) and the Department of Justice (DOJ). The objective of Paragraph 13 of the MCD is to “implement a maintenance program for the Collection System, including its gravity sewer lines, force mains, Pumping Stations and other appurtenances (e.g., manholes, pressure sewers, inverted siphons, meter vaults), to provide for the proper operation and maintenance of equipment while minimizing failures, malfunctions, and line blockages due to the lack of adequate preventative care.” This report details the progress of the Collection System Operations and Maintenance (O&M) activities undertaken by the City. This report provides a fiscal year (FY) comparative analysis of O&M operations carried out by the City of Baltimore

The requirements for the Annual Report are specified in Paragraph 13 of the Consent Decree, which reads as follows:

“After implementation of the maintenance program required under Paragraph 13, Baltimore shall submit an annual report to EPA and MDE providing:

- i. A list of complaints related to the Collection System.
- ii. A list of completed work orders for the calendar year.
- iii. A list of outstanding work orders.
- iv. Current preventive maintenance (PM) schedules.
- v. A list of tests performed of new sewer installations and rehabilitations.
- vi. An evaluation of the efficacy of the grease control program.
- vii. An evaluation of the efficacy of the root control program.
- viii. An updated list of known locations where Baltimore does not have ready physical and/or legal access to the Collection System.”

The graphs and tables below summarize the number of customer complaints, main line blockages and dry-weather sanitary sewer overflows that have been recorded over the past 5 years.

**Table ES-1: Sewer Related Complaints Comparison**

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>Sewer Complaints</b>	7,595	9,227	9,867	9,142	9,421

**Table ES-2: Mainline Choke Work Orders Comparison**

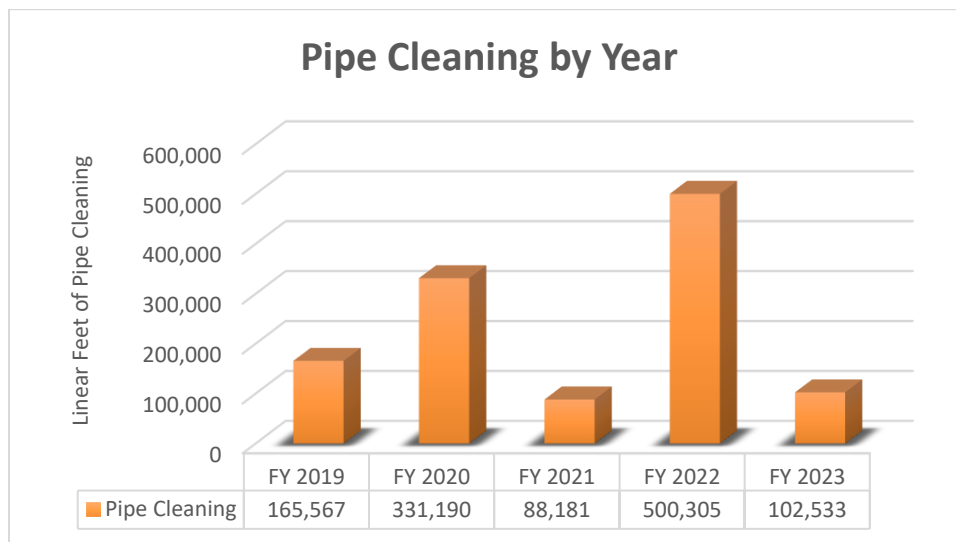
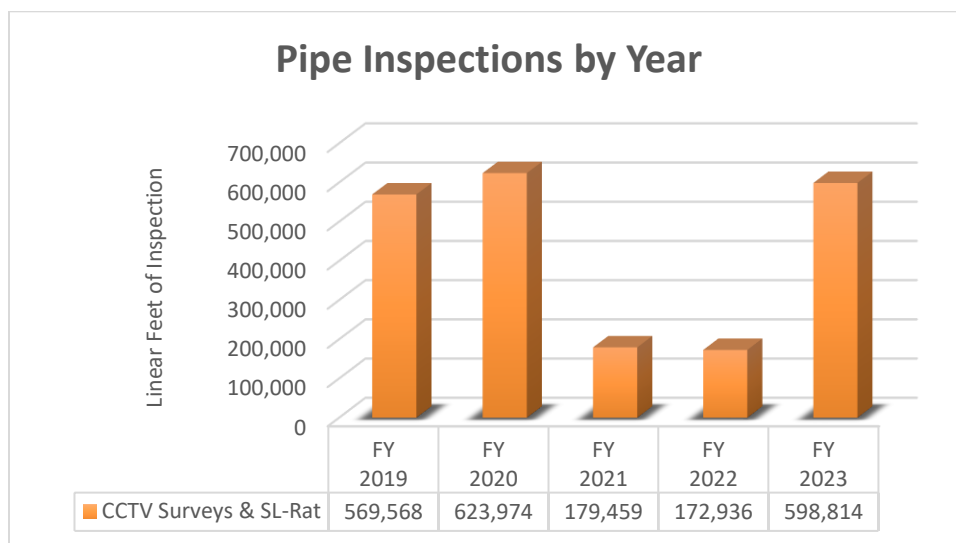
	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>Mainline Chokes</b>	558	537	581	678	641

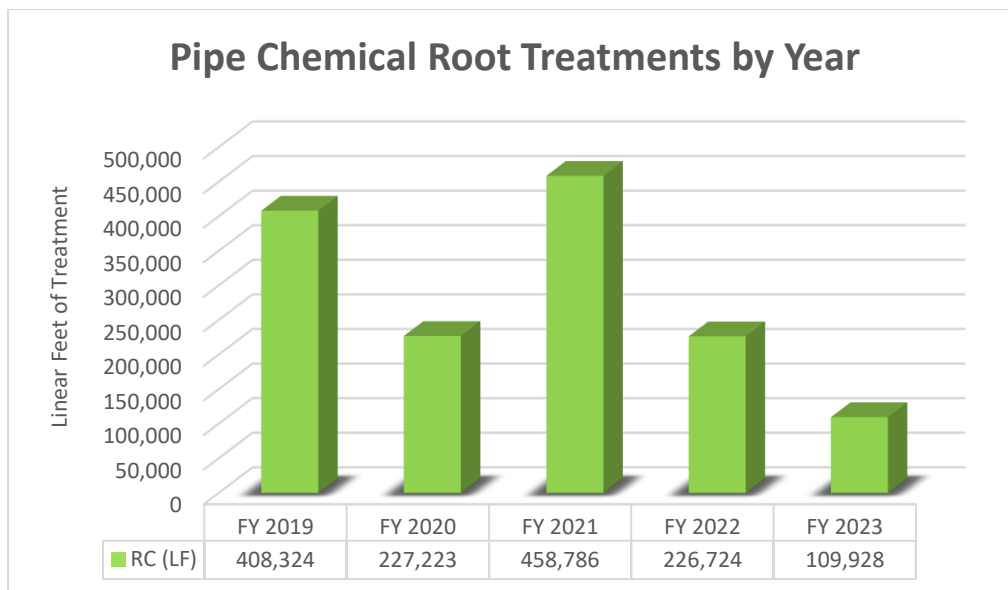
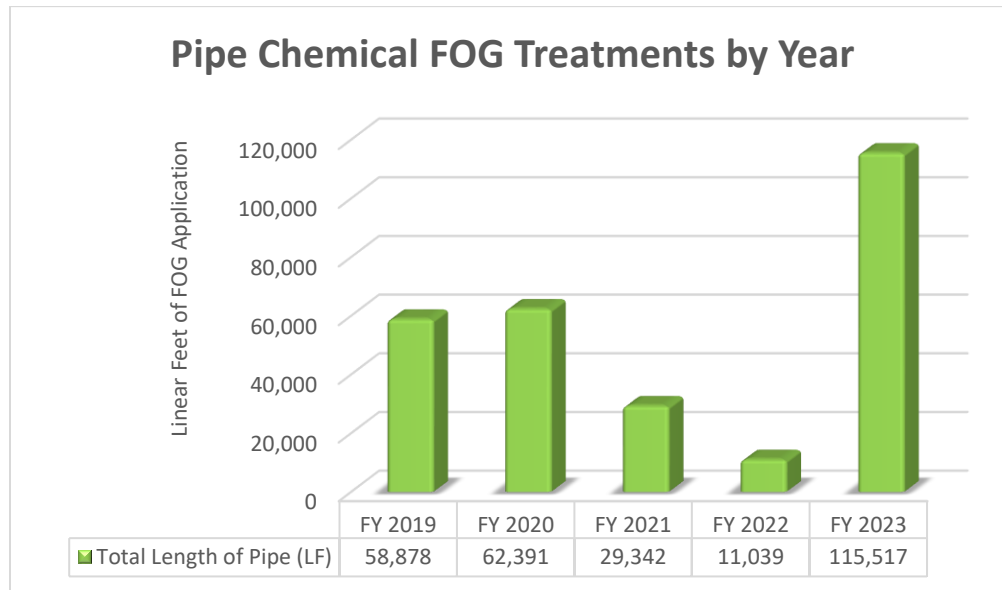
**Table ES-3: Repeat Dry Weather SSOs Comparison**

<b>Less than 50 Gallon Overflows</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Repeat Dry-weather SSOs (24-month period)	27	36	43	39	34
Volume of Repeat Dry-weather SSOs (G)	240	198	197	106	143

<b>50 Gallon or More Overflows</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>2023</b>
Repeat Dry-weather SSOs (24-month period)	19	12	10	22	7
Volume of Repeat Dry-weather SSOs (G)	432,145	224,313	5,884	219,194	78,425

The graphs below summarize the City’s wastewater operation and maintenance accomplishments over the past 5 years.





## SECTION 1 – Introduction

This Annual Report provides an update of the City of Baltimore (City’s) wastewater Operation and Maintenance (O&M) activities as required by the Consent Decree and an analysis of those activities that were conducted during the reporting period.

The requirements for the Annual Report are specified in Paragraph 13 of the Consent Decree, which reads as follows:

“After implementation of the maintenance program required under Paragraph 13, Baltimore shall submit an annual report to EPA and MDE providing:

- i. A list of complaints related to the Collection System;
- ii. A list of completed work orders for the calendar year;
- iii. A list of outstanding work orders;
- iv. Current preventive maintenance schedules (task description, location, frequency), description of changes made to the schedules during the calendar year.
- v. A list of tests performed of new sewer installations and rehabilitations (location, date, description of new installation and/or rehabilitation);
- vi. An evaluation of the efficacy of the grease control program (summary of grease-related blockages identified, corrective action taken, preventive action taken, monthly rate of grease-related blockages and (if available) comparison of current and previous year performance, list of referrals to pretreatment staff, identification of remaining persistent and chronic blockage areas);
- vii. An evaluation of the efficacy of the root control program (summary of root-related blockages identified, corrective action taken, preventive action taken, monthly rate of root-related blockages and (if available) comparison of current and previous year performance, identification of remaining persistent and chronic blockage areas); and
- viii. An updated list of known locations where Baltimore does not have ready physical and/or legal access to the Collection System and the strategies Baltimore is employing to improve and secure such access to the Collection System.”



Elements of the O&M Program Include:

- Sewer inspections (CCTV)
- Sewer cleaning
- Sewer repairs, replacement, and rehabilitation
- Root control
- Grease abatement by chemical treatment
- Fats, Oils and Grease (FOG) Program (*e.g.* Food Service Establishment inspections)
- Limited Access Areas

The Department of Public Works' (DPW's) Office of Asset Management (OAM) prioritizes the renewal of aging infrastructure, justifies infrastructure investments, provides transparency of the true cost of operating a utility system, and effectively manages limited resources. The Office of Asset Management utilizes a risk-based approach to optimize asset service life at the most appropriate and acceptable level of risk.

The Office of Asset Management maintains and analyzes key performance indicators (KPIs) to evaluate the effectiveness of new and existing preventive maintenance programs and provide transparent reporting to internal and external stakeholders. Transparent reporting is key for DPW to improve stakeholder understanding of the relationships between risk, cost and expected level of service.

## SECTION 2 – Complaints

### 2.1 Customer Complaints

The City’s Control One Emergency Dispatch operation is a central call system, which is for Baltimore City customers to report sewer-related complaints. The service is available via phone (311), online and mobile application 24 hours a day, seven days a week. Each complaint in the 311 system is assigned a Customer Service Request (CSR) number for tracking purposes.

When a sewer related complaint is entered into the 311 system, it is forwarded to DPW’s Computerized Maintenance Management System (CMMS). After a DPW investigator has arrived on site, investigated the complaint, and determined corrective actions, a work order is generated, and the appropriate crew is assigned to complete the work. After completion of the work, the work order status is updated in the CMMS. In cases when multiple complaints in the 311 system are made by citizens for the same problem, all complaints are forwarded to the CMMS and one work order is created for investigation. Table 2-1 shows sewer complaints during the past 5 years.

**Table 2-1: Sewer Related Complaints Comparison**

	<b>FY 2019</b>	<b>FY 2020</b>	<b>FY 2021</b>	<b>FY 2022</b>	<b>FY 2023</b>
<b>Sewer Complaints</b>	7,595	9,227	9,867	9,142	9,421

A list of all sewer complaints recorded during the reporting period is attached in Appendix 2-1 of this report.

### 2.2 Completed Work Orders

The CMMS work order is closed when the problem has been resolved. A list of closed work orders that were recorded during the reporting period is provided in Appendix 2-2 of this report. A heat density map of the closed work orders is shown in Figure 2-1.

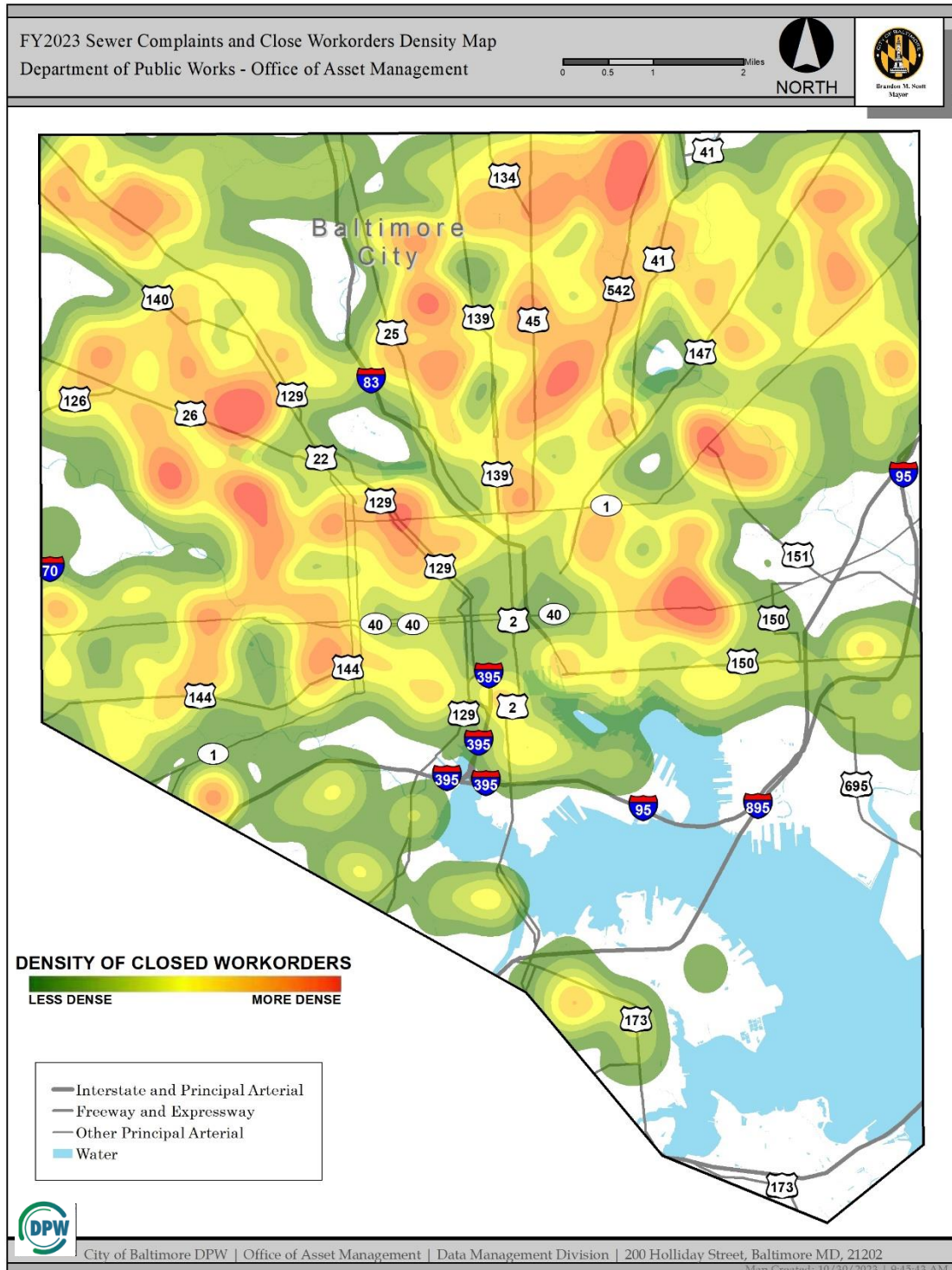


Figure 2-1: Sewer Complaints Density Map in FY 2023

The number of sewer related work orders completed during the past five fiscal years is illustrated in the Table 2-2 below.

**Table 2-2: Work Orders Completed by Fiscal Year**

	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023
<b>Completed Work Orders</b>	16,753	16,300	17,001	16,751	14,901

### 2.3 Outstanding Work Orders

Reactive work orders are created in response to a customer complaint as opposed to proactive work orders, which are created to perform work on a cyclical basis and prevent customer complaints. A summary of reactive and proactive work orders is provided below. A breakdown of work orders by type is provided in Figure 2-2.

**Figure 2-2: Types of Work Orders Completed**



## SECTION 3 – System-Wide Gravity Sewer Cleaning and Inspection Program

### 3.1 Preventive Maintenance

The City maintains several preventive maintenance programs including:

- Sewer Cleaning/Inspection
- Trunk Sewer Inspections
- Grease Abatement and Inspection of Food Service Establishments
- Root Control

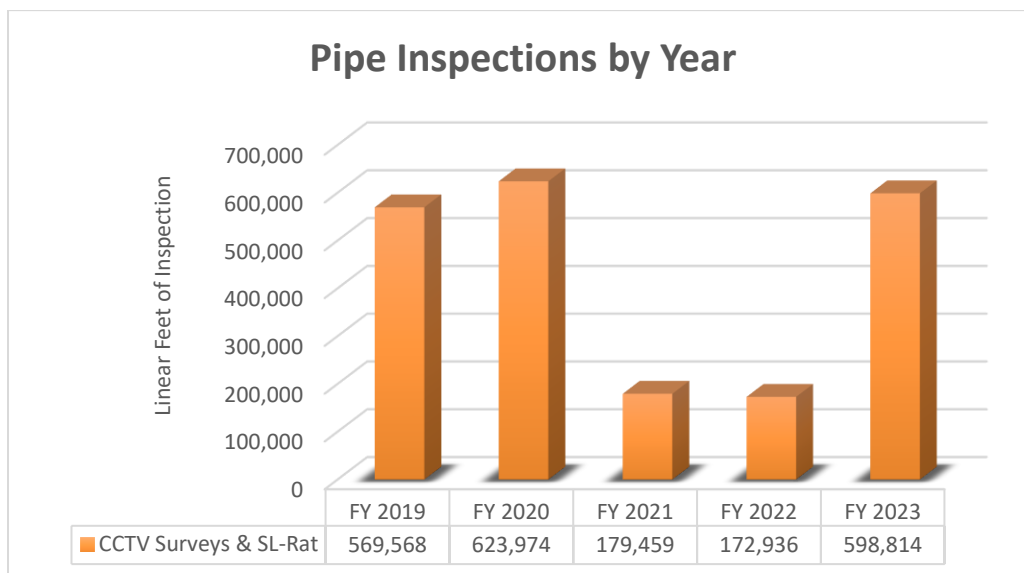
The FOG and Root Control programs are described in detail in Sections 5 and 6, respectively.

### 3.2 Comprehensive and Targeted Cleaning/Inspection Program

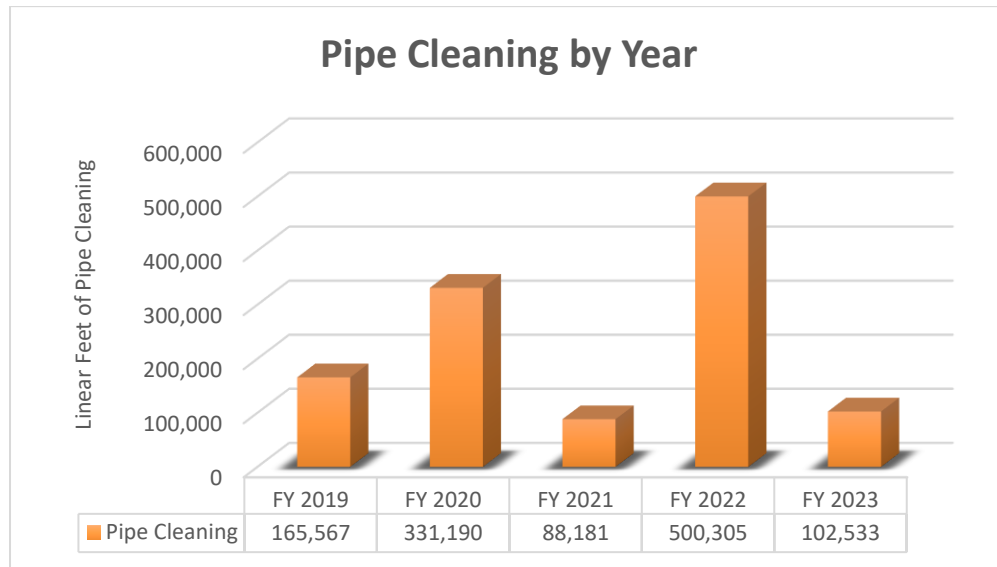
The Department of Public Works has developed programs to inspect all sewers greater than 8 inches in diameter and clean, as necessary, every 7 years. Additionally, the City has developed targeted cleaning programs to identify sewers 8 inches and smaller that have experienced high incidents of sewer blockages. The targeted areas were identified and prioritized based on a risk analysis of the target areas. The targeted areas are scheduled to be cleaned on a 3-year cleaning cycle.

Figures 3-1 and 3-2 show the linear feet of sewers that were inspected and cleaned during the past 5 years, respectively. Figures 3-4 and 3-5 show the location of pipes inspected or cleaned during the reporting period

**Figure 3-1: Collection System Inspection (Linear Feet)**



**Figure 3-2: Collection System Cleaning (Linear Feet)**



In addition to the scheduled and targeted sewer cleaning work, DPW completes routine sewer cleaning work of sewers with known maintenance issues that cannot be easily resolved or are slated for future projects. Routine cleaning is performed on a 3 to 12-month cleaning cycles, depending on the severity of the issue. Routine cleaning supplements comprehensive and targeted cleaning efforts. Regular evaluations of these locations are made to determine the adequacy of the cleaning intervals and modifications to the schedule are made when appropriate.

A list of all routine cleaning locations is included in Appendix 3-1.

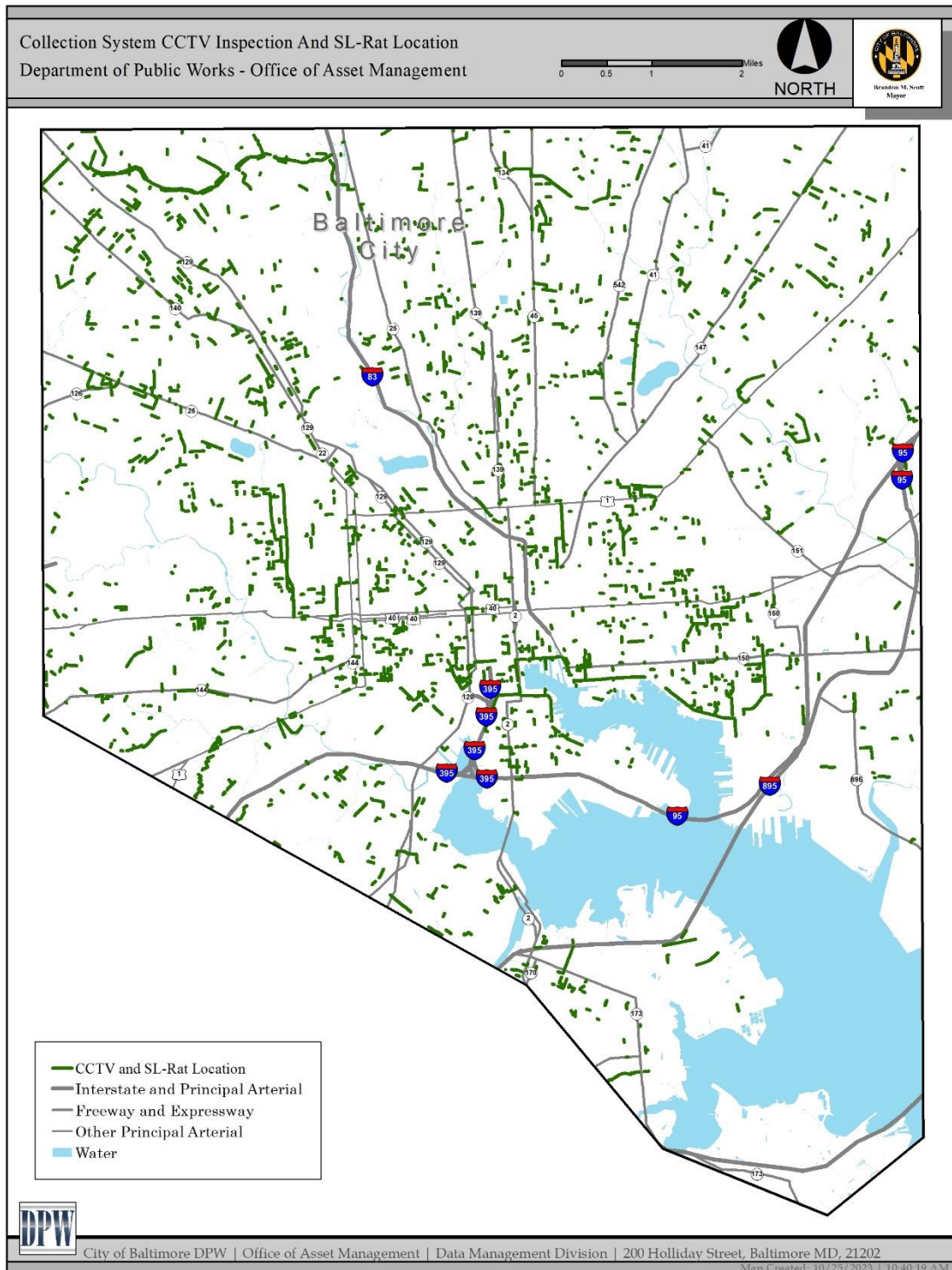


Figure 3-3: Collection System Inspection Locations FY 2023

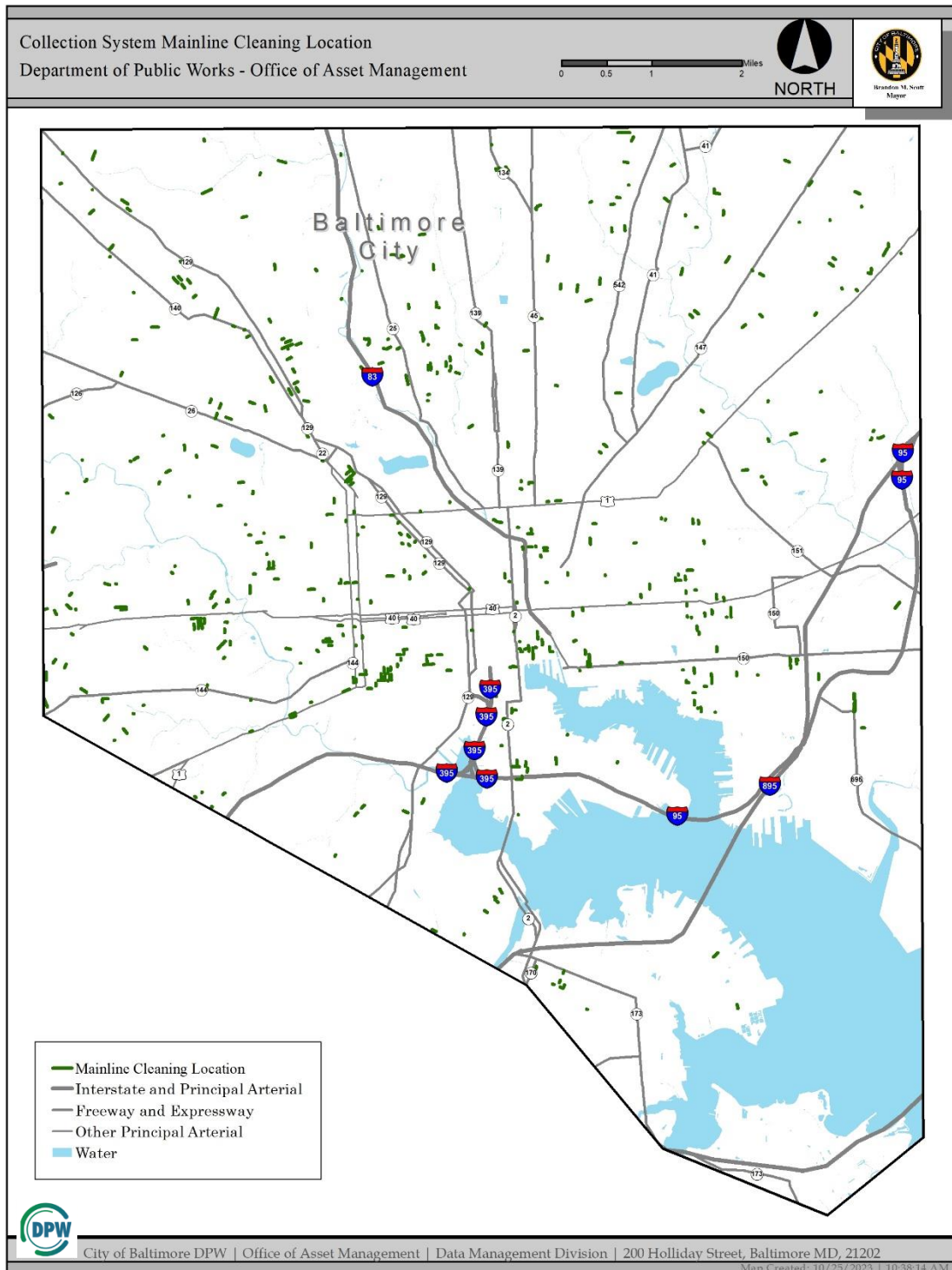


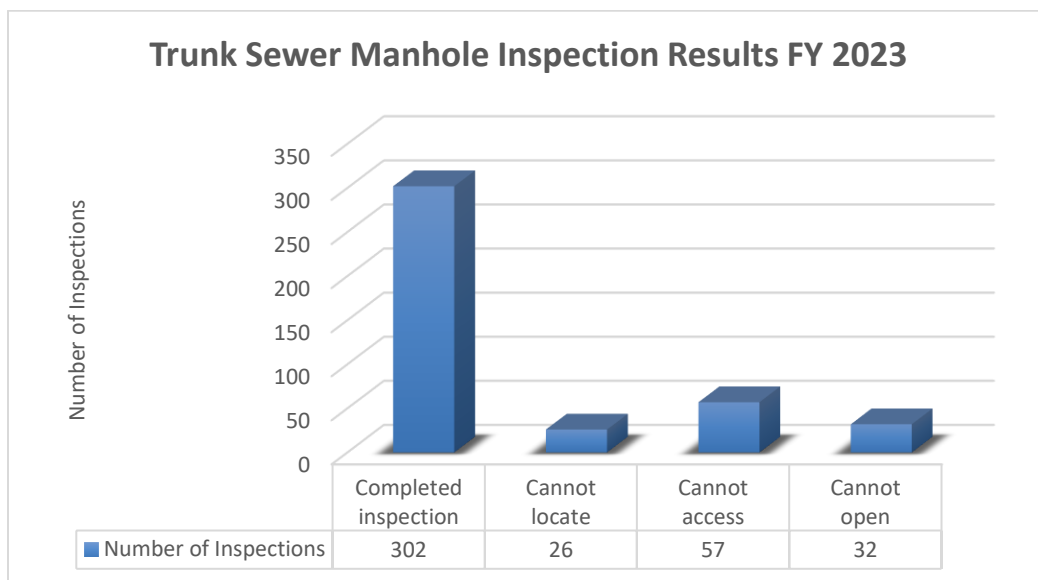
Figure 3-4: Collection System Cleaning Locations FY 2023



### 3.3 Trunk Sewer Inspection Program

In FY 2015, the City implemented the Trunk Sewer Inspection Program to proactively inspect and identify maintenance needs in the sanitary collection system along streams and in wooded areas. DPW completes visual inspections along the sewer alignment and inspects the upstream and downstream manholes. Past identified maintenance deficiencies included heavy manhole cleaning, pipe cleaning, CCTV inspection, and manhole cover replacements. Inaccessible manholes are re-inspected when the foliage is minimal. Figure 3-6 provides a breakdown of the results of manhole inspections completed in the Trunk Sewer Inspection Program during the reporting period. Figure 3-7 shows the manhole inspection locations.

**Figure 3-5: Trunk Sewer Manhole Inspection Results FY 2023**





## SECTION 4 – New Sewer Installation and Rehabilitation

### 4.1 New Sewer Installation and Rehabilitation

The City is continuously evaluating the sanitary sewer collection system to develop and implement measures for elimination of sanitary sewer overflows. The evaluations identify capacity deficiencies, infiltration/inflow, and maintenance problems, in order to repair or replace portions of the collection system. A listing of sanitary sewer projects conducted during the reporting period is provided in Table 4-1 below.

**Table 4-1: Sewer Construction Projects**

SC No.	Location	Pipe Cleaning (LF/Tons)		New Pipe (LF)	Pipe Rehabilitation (LF)
SC 940	High Level	0	LF	0	205
SC 941	Jones Falls	3,001	LF	0	1,364
SC 964	HL, JF	0	LF	0	108
SC 965	Herring Run	0	LF	0	9,106
SC 966	Outfall	8,066	LF	0	0
SC 977	Gwynns Falls	0	LF	0	29
<b>Grand Total</b>		<b>11,067</b>	<b>LF</b>	<b>0</b>	<b>10,812</b>

Once construction is complete, new and rehabilitated sewers are tested in accordance with the City’s specification standards. In general, new sewers are tested from manhole to manhole or from manhole to terminus if there is no upstream manhole. Typical testing is usually done by low-pressure air and/or infiltration/exfiltration tests. Closed circuit television inspections are typically required for Cured-In Place Pipe sewer lining rehabilitation. Sewer cleaning projects require post-cleaning CCTV testing to verify that work was performed as specified.

## **4.2 NEW SEWER CONSTRUCTION FIELD TESTS**

### **A. Low Pressure Air Test**

1. Test gravity sewers including house connections with low air pressure after completion of backfill. Field testing will commence when not more than one thousand feet (1000') sewer has been completed and includes immediate remedial required repair, replacement or modification to the installation procedures if the test section fails the test.

### **B. Hydraulic Test**

1. Sewers over twenty-seven inches diameter and manholes are tested by the hydraulic method if approved air test procedure is not available.

### **C. Post-Construction Closed Circuit Television (CCTV)**

1. Upon completion of the pipe installation, the Contractor performs a CCTV inspection using NASSCO Pipeline Assessment Certification Program (PACP) standards.

## SECTION 5 – FOG Program

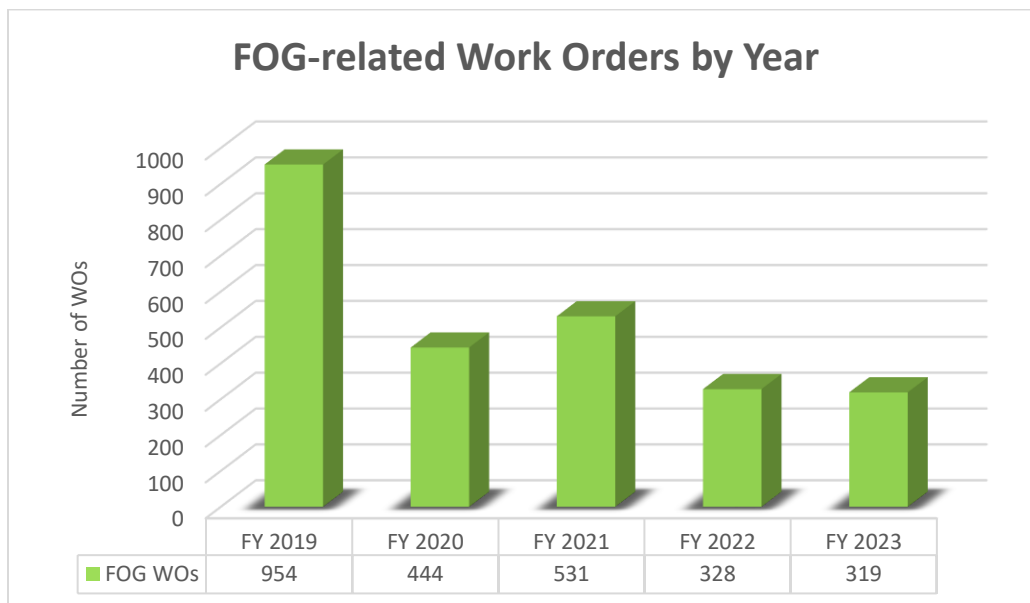
### 5.1 Fats, Oils and Grease (FOG) Program

The Department of Public Works maintains a comprehensive FOG control program. The program has two components: 1) Grease Abatement, and 2) Food Service Establishment (FSE). DPW implemented a Grease Abatement program in 2008 to address those portions of the collection system with FOG accumulation. In FY 2012, the City began developing the FSE Inspection Program, and commenced inspections in FY 2014. In FY 2014, the FSE inspections were incorporated into Baltimore City’s Industrial Pretreatment Program under the authority of Article 25 of the Baltimore City Code. The FOG management aspect of the Pretreatment Program includes promoting kitchen best management practices (BMPs) to residential and commercial customers and minimizing the discharge of FOG-bearing waste streams to the sewer system. The program requires FSEs that discharge or have the potential to discharge process wastewater to the sanitary sewer to have a properly installed and sufficiently maintained grease control device (GCD).

### 5.2 Evaluation of Maintenance (Reactive) Work Orders

The cause of mainline chokes or blockages are recorded in DPW’s computerized maintenance management system. DPW reviews the CMMS data to identify sewers with FOG-related O&M issues. Figure 5-1 summarizes the number of FOG-Related work orders for the past 5 years. The DPW Pollution Control Section staff is notified of grease related blockages so that inspections of FSEs upstream of the impacted sanitary sewer can be performed.

**Figure 5-1: FOG-related Work Orders**



The FOG related work orders are evaluated to determine future targeting efforts for proactive chemical

FOG treatment. Figure 5-3 shows the density of grease-treatment locations/work orders in the sewer system

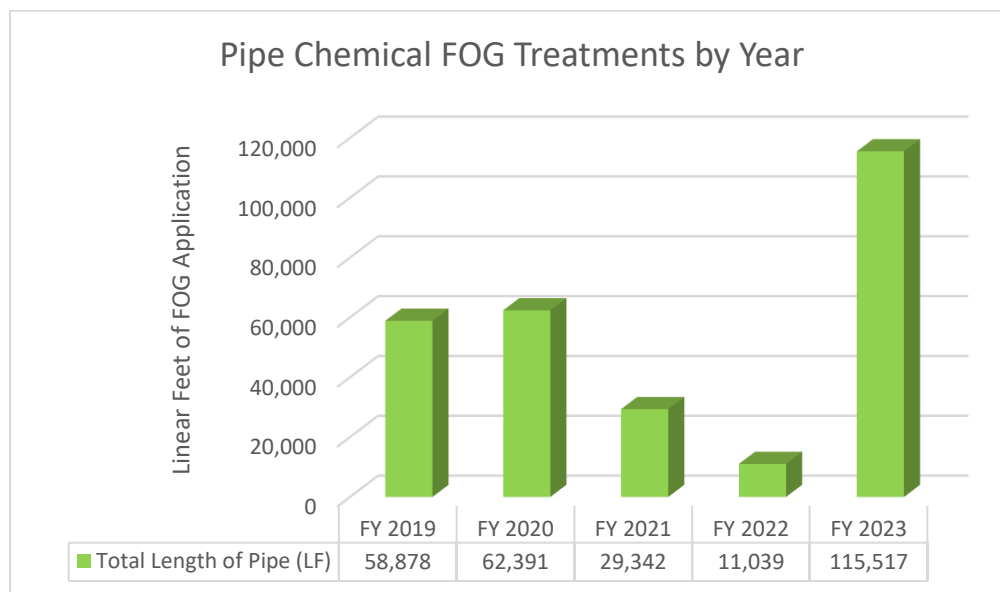
### 5.3 Grease Abatement Chemical Application

Gease abatement work completed during the reporting period include:

- Reviewed work orders and CCTV with notation of grease observations.
- Applied grease-abatement chemicals to sewers located in grease problem areas.
- Maintained information in Cityworks for tracking the grease problem locations and grease abatement chemical applications.

The preliminary chemical application frequency that was assigned to each sewer continues to be refined as field crews return to the sites to perform subsequent grease abatement chemical applications, and more field inspection data is collected and analyzed by DPW. Figure 5-2 shows the length of pipe treated in the past 5 years

**Figure 5-2: Grease Control Chemical Application**



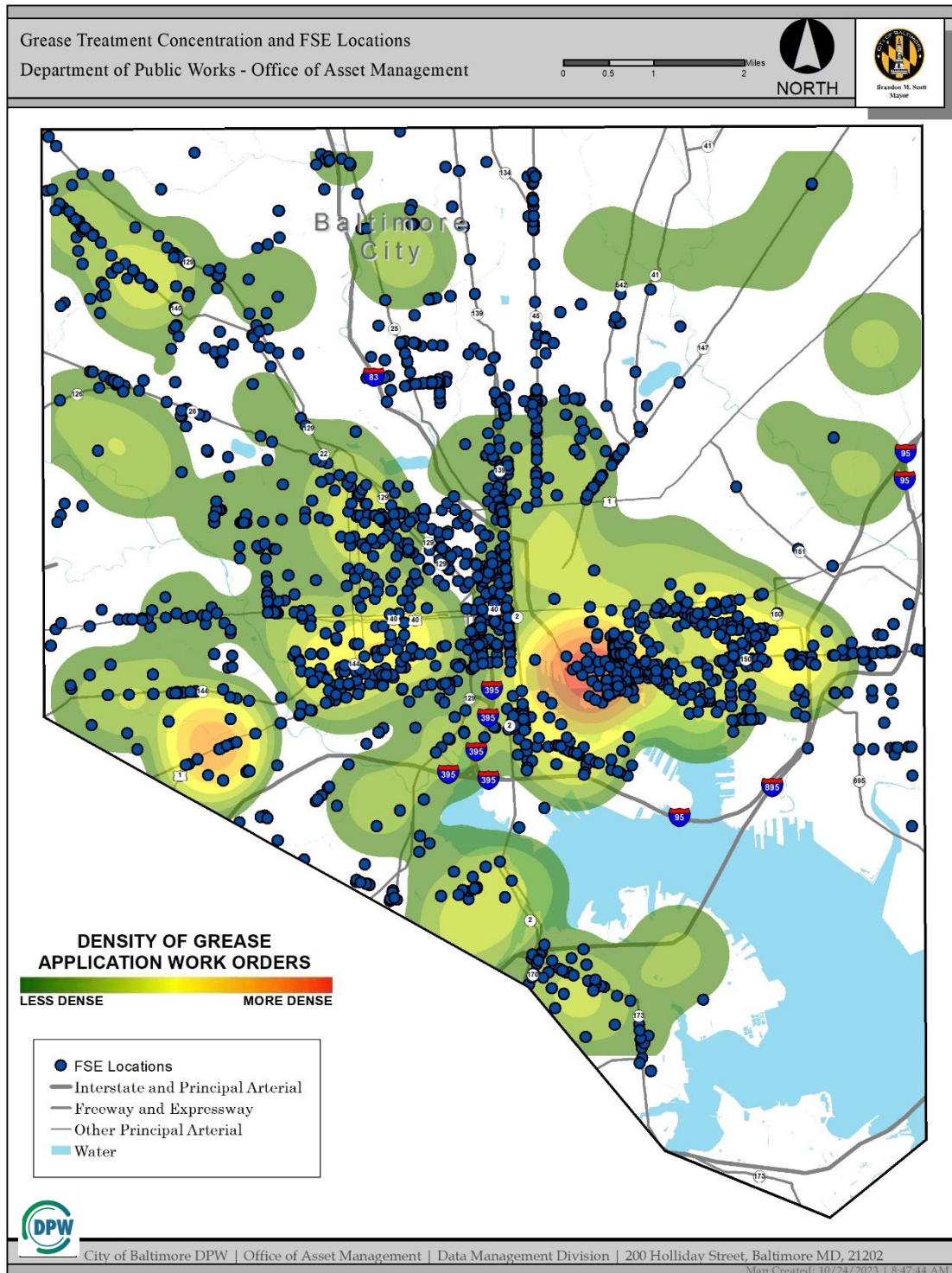


Figure 5-3: Grease Treatment Concentration and FSE Locations

## 5.4 FSE Inspections

All FSEs that discharge or have the potential to discharge FOG to the sanitary sewer must comply with the following requirements:

1. Have a valid Wastewater Discharge Permit. DPW’s Pollution Control Section issues these permits to non-residential users of the sanitary sewer system.
2. Have a properly sized, installed, and functioning GCD. To be effective, each GCD is to be sized and installed in accordance with the Baltimore City Plumbing Code.
3. Clean and maintain the GCD frequently enough to comply with the 25% Rule (FOG Program Manual (2013) 3.3.1.) This frequency will depend on the number of fixtures discharging to it, the seating capacity of the establishment and the capacity of the device. The 25% Rule is an industry-accepted guideline for establishing cleaning frequency and minimizing the amount of FOG discharged to the sewer. The accumulation of solids settled at the bottom of the GCD and the grease floating on the top should not exceed 25% of the hydraulic depth at any time, as measured from the static water level to the interior tank bottom.
4. Keep a GCD maintenance log up-to-date and on-site. The log must document GCD maintenance and disposal activities. Waste hauler manifests and maintenance records must be retained for three years; and
5. Properly collect and dispose of FOG. It should be disposed as solid waste or stored in a covered, leak-proof receptacle until it can be taken off-site by a licensed hauler.

FOG Inspectors use a mobile application (i.e., the FOG Inspection Application) to aid the inspection process and to maintain the database. FSE inspections are performed by DPW, Wastewater Facilities Division, and Pollution Control Section. Inspections focus on customer education about the FOG Program and appropriate grease handling practices to achieve and maintain compliance. A breakdown of the total of FSE inspection violation types for the reporting period is shown in Table 5-1. A list of inspections conducted, and enforcement actions take in contained in Appendix 5-1.

**Table 5-1: FSE Inspection Violation Types FY 2023**

<b>Violation Type</b>	<b>Total</b>
<b>Unauthorized discharge (Fail 25% Rule, improperly operating GCD, certain appurtenances not connected to GCD)</b>	<b>382</b>
<b>No Grease Control Device (Unauthorized Discharge)</b>	<b>6</b>
<b>Inadequate/No Maintenance Log</b>	<b>395</b>
<b>Plumbing Code</b>	<b>9</b>
<b>Refuses Admittance</b>	<b>70</b>
<b>Inaccessible GCD</b>	<b>17</b>
<b>Inadequate Maintenance of GCD, overflow, waste/recycle grease area</b>	<b>57</b>
<b>NOV Rescinded</b>	<b>22</b>
<b>TOTAL</b>	<b>958 -22 = 936</b>



## 5.5 FOG Program Performance

In 2006, the City began evaluating grease-related work orders. Grease related work orders for mainlines and laterals decreased from previous reporting periods.

DPW maintains an FSE database, which is an inventory of FSEs that discharge or have the potential to discharge FOG-bearing wastewater to the sanitary sewer. The FSE database is used to track FSE general information, addresses, GCD details, inspection results and enforcement actions. The inventory is updated based on the results of the field investigations and inspections that are performed. The FSEs can be viewed as a map, allowing network traces to be performed and identifying potential sources of FOG at specific locations.

During post-SSO investigations, DPW references the FSE database and grease abatement data to identify potential FOG generators. Based on the post-SSO investigation findings, DPW's Pollution Control Section may investigate the potential FOG generators and issue an enforcement action that may require either a GCD installation or increased frequency of GCD maintenance.

## SECTION 6 – Root Control Program

### 6.1 Root Control Program

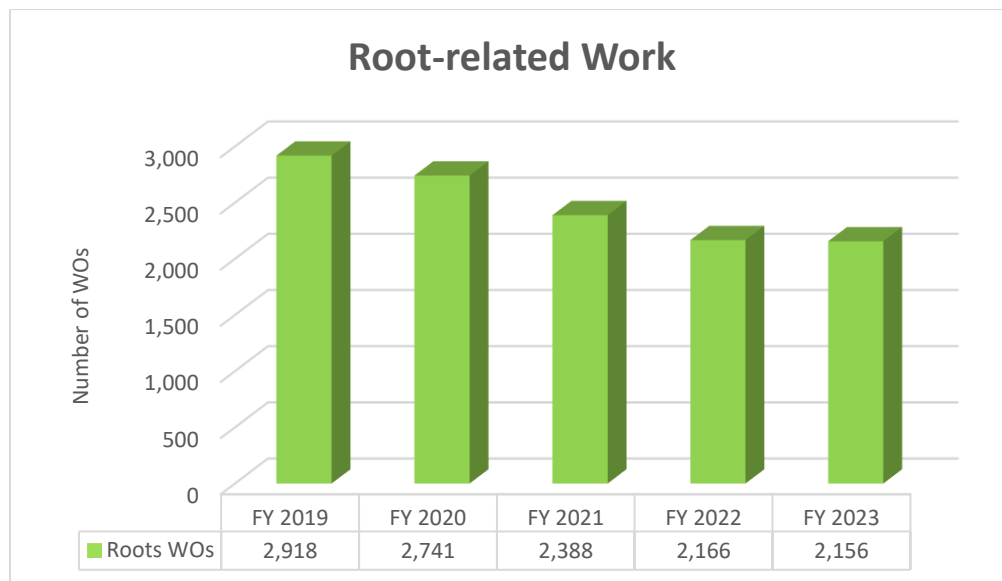
DPW maintains a Root Control Program including:

- Evaluation of complaint records and maintenance work orders related to roots, and identification of areas with severe root problems.
- Identification of significant root growth through sewer inspection CCTV.
- Application of root control chemical to sewers and laterals with significant root intrusion.

### 6.2 Evaluation of Maintenance (Reactive) Work Orders

Figure 6-1 provides the history of work orders which identified the presence of roots as a contributing factor to the blockage.

**Figure 6-1: Root Related Work Orders**



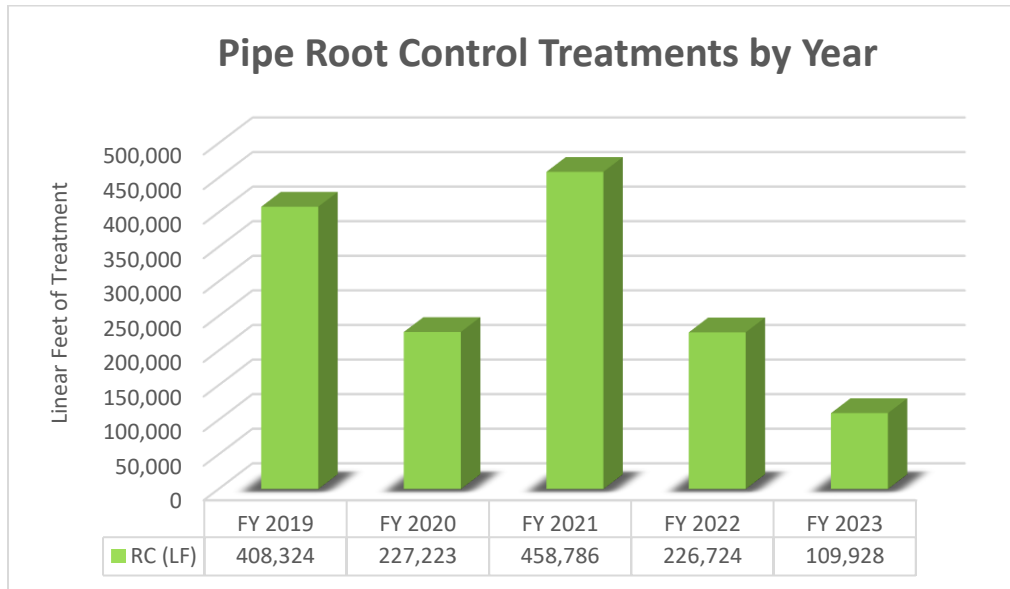
The number and frequency of root-related lateral and sewer blockages are used to identify laterals and sewer segments that should be added to the Root Control Program.

### 6.3 Root Control Chemical Application

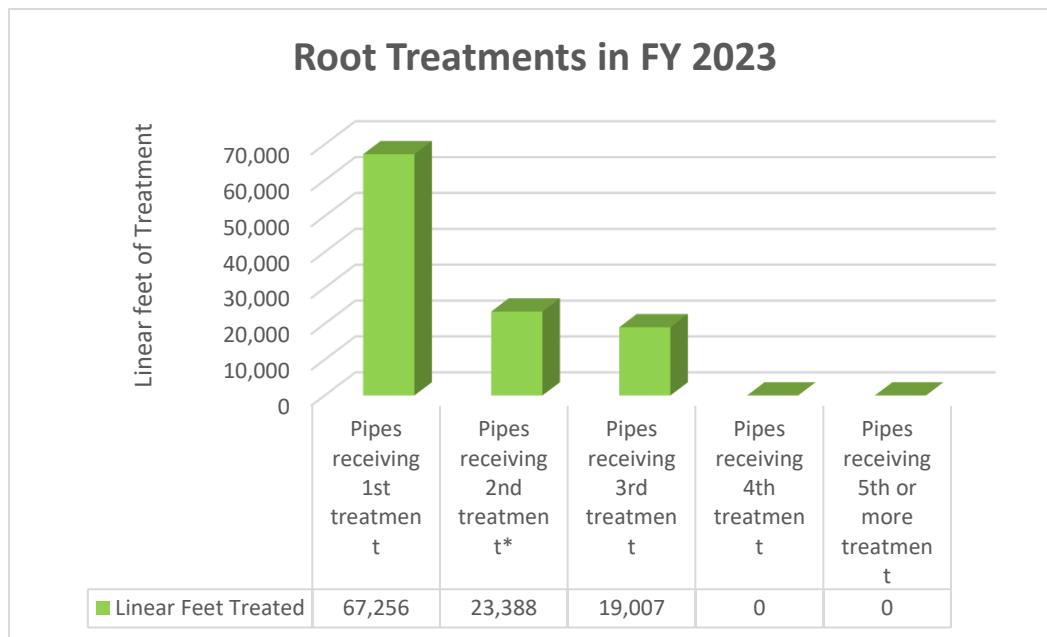
The City has conducted root chemical treatments since FY 2008. Figure 6-2 shows the linear feet of sewer main treated with root control chemical during the past 5 years, while Figure 6-3 reports the linear feet of sewer main treated with root control chemical during the reporting period.

The City began evaluating historical data in FY 2016 to determine the long-term chemical treatment cycle for sewer mainlines. The program will continue treatments until it can be demonstrated that areas do not require further treatment. Evaluation of pre- and post-treatment CCTV videos for a limited number of mains is used to establish the most appropriate long-term treatment cycle for mains that require continuous treatment.

**Figure 6-2: Root Control Chemical Application Treatment**



**Figure 6-3: Root Treatments in FY 2023**



\* Subsequent treatments are within 2-3 years of the previous ones

## **6.4 Root Control Program Performance**

In FY 2014, the City began to perform random, spot inspection of sewer mainlines that are included in the Root Control Program to further evaluate the efficacy of the chemical application. The results of these inspections assist the City in establishing the appropriate treatment frequency for specific lines as the program continues to mature.

## **SECTION 7 – Limited Access Areas**

Limited access areas were previously identified during evaluations for each sewershed and were submitted as attachments in previous O&M annual reports. The list of limited access areas is dynamic and varies over time as additional limited access sewers are discovered through on-going preventive maintenance programs and construction projects. Appendix 7-1 contains a comprehensive list of all manholes with limited access. DPW will address the manhole access issues and will amend the list, when needed.

## SECTION 8 – Collection System Lateral Prioritization Program

The Modified Consent Decree requires the City to address new or reoccurring Building Backups (aka Water in Cellar or WIC). DPW tracks the number of WICs based on the address of structures and the frequency of backups. The prioritization program has three components:

- 1) identification
- 2) inspection and condition assessment
- 3) prioritized repair/replacement and/or maintenance

The figure below reflects the total number of laterals that were identified as needing additional actions to prevent or reduce the number of building backups. Appendix 8-1 lists all work performed on laterals during the reporting period.

**Figure 8-1: House Lateral Rehab Count and Status for FY 2023**

