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Acronyms and Abbreviations

BMP	best management practice
CMMS	Computerized Maintenance Management System
City or Baltimore City	Mayor and City Council of Baltimore
CCTV	closed circuit television
CCA	Baltimore City Department of Public Works – Office of Communications and Community Affairs
CIPP	cured-in-place-pipe
CNA	cannot access
CNL	cannot locate
CNO	cannot open
CSR	Customer Service Request
DPW	Baltimore City Department of Public Works
FOG	fats, oils, and grease
FSE	food service establishment
GIS	Geographic Information System
GCD	grease control device
DHCD	Baltimore City Department of Housing and Community Development
I/I	infiltration and inflow
MCD	Modified Consent Decree
NOV	Notice of Violation
OAM	Baltimore City Department of Public Works – Office of Asset Management
O&M	operation and maintenance
PCS	Baltimore City Department of Public Works – Pollution Control Section
QA/QC	quality assurance/quality control
SR	service request
SSO	sanitary sewer overflow
SSES	sewer system evaluation survey
UMD	Baltimore City Department of Public Works – Utility Maintenance Division
WIC	water-in-cellar

1.0 INTRODUCTION

This section introduces the City's Operation and Maintenance (O&M) Plan for the Collection System.

1.1 Purpose

The City of Baltimore (the "City" or "Baltimore City") operates its wastewater Collection System under the terms of a Modified Consent Decree ("MCD") with the U.S. Environmental Protection Agency and the Maryland Department of the Environment. Paragraph 13 of the MCD requires the City to submit a revised operation and maintenance plan ("O&M Plan") for the Collection System to "provide for the proper operation and maintenance of the Collection System in order to minimize failures, malfunctions, and line blockages due to the lack of adequate preventative care." The O&M Plan has been developed to meet these requirements.

1.2 Goals

The City's Department of Public Works ("DPW") is responsible for operating and maintaining the Collection System. DPW has established the following goals for the O&M of the Collection System as listed below:

- Prevent dry weather-related sanitary sewer overflows ("SSOs")
- Maintain system capacity to convey wet weather flows to minimize wet weather related SSOs
- Minimize customer service disruptions
- Maximize the useful life of the Collection System

1.3 O&M Plan Implementation

Highlights of the O&M Plan will help to meet the goals as stated in Section 1.2 due to the following:

- Comprehensive cleaning and inspection of all sewer mains greater than 8 inches at least once every 7 years to minimize blockages that may cause SSOs and identify structural defects for repair.
- Targeting small diameter gravity sewer mains in areas of reoccurring blockages and/or reoccurring dry weather SSOs for cleaning/inspection at a greater than once every 7-year frequency.
- Identifying and addressing grease accumulation and root growth.
- Assessing sewer laterals where repeat backups occur and prioritizing necessary repairs.

Table 1-1 summarizes the key requirements based on the MCD listing above along with the section in this O&M Plan where the requirement is addressed.

Table 1-1. O&M Plan MCD Requirement Checklist

MCD Ref	MCD Requirement	O&M Plan Discussion Location
13.a.(i)	System-wide gravity sewer cleaning and inspection program to inspect and clean, if required, sewers greater than 8 inches in diameter at least once every 7 years and to identify and clean target areas more frequent than every 7 years	Section 2, System-wide Gravity Sewer Cleaning and Inspection Program
13.a.(ii)	Sealing, where appropriate, and maintenance of manholes	Section 3, Manhole Sealing and Maintenance Programs
13.a.(iii)	Identification and remediation of poor construction	Section 4, Identification and Remediation of Poor Construction
13.a.(iv)	Program to prioritize and repair Collection System laterals that cause recurring Building Backups	Section 5, Recurring Building Backup Program
13.a.(v)	Grease control program	Section 6, Fats, Oils and Grease (FOG) Control Program
13.a.(vi)	Root control program	Section 7, Root Control Program
13.a.(vii)	Procedures for updating and maintaining the list of locations where the City does not have ready physical and/or legal access to the Collection System	Section 8, Physical or Legal Limited Access Areas
13.a.(viii)	Documentation of complaints, work orders, updates to equipment inventory, and changes to Collection System components into the information management system	Section 9, Information Management System
13.a.(ix)	Corrective maintenance response and reporting procedures	Section 10, Corrective Maintenance Response and Reporting Procedures (also see separate <i>Revised Emergency Response Plan</i>)
13.a.(x)	Mapping of recurring problems and the effective use of that information in preventing problems that can cause dry weather SSOs	Section 11, Mapping of Recurring Problems
13.a.(xi)	Public education and outreach efforts necessary to inform the public of the need to minimize introduction of debris, grease and other items into the Collection System	Section 12, Public Education and Outreach Program and Section 6, Fats, Oils and Grease (FOG) Control Program

2.0 SYSTEM-WIDE GRAVITY SEWER CLEANING AND INSPECTION PROGRAM

The Collection System inspection and cleaning activities are detailed in this section.

2.1 Inspection and Cleaning Purpose

The purpose of gravity sewer inspection and cleaning program activities is twofold:

- To remove blockages in sewer mains caused by grease accumulation, root intrusion, and debris in order to reduce the potential for SSOs and Building Backups to occur; and
- To identify and subsequently remedy defects in sewer mains that may compromise the structural integrity or proper functioning of the Collection System.

2.2 Inspection and Cleaning Programs

The Collection System cleaning and inspection program is comprised of comprehensive inspection and cleaning (if necessary) for sewer mains that are greater than 8 inches in diameter, and inspection and cleaning (if necessary) of targeted areas for sewer mains that are 8 inches or smaller in diameter. Subsequent sections of this Plan detail these programs.

In addition to the comprehensive and targeted programs, the City proactively cleans individual pipe segments at a frequency of 3, 6, or 12 months, as necessary to maintain proper operation of the Collection System.

2.2.1 Comprehensive Inspection and Cleaning >8-inch Diameter Pipes

Based on the City's Geographic Information System ("GIS"), there are approximately 340 miles of gravity sewer pipes that are larger than 8 inches in diameter. The City will inspect and clean, where needed, these sewers every 7 years. Therefore, approximately 256,500 linear feet of sewer pipe greater than 8 inches in diameter will be inspected and cleaned (if necessary) on average each year.

2.2.2 Targeted Small-Diameter Inspection and Cleaning Protocol

2.2.2.1 Identification of Targeted Areas

Sewer pipes in targeted areas are inspected and cleaned, where needed, at a recurring cycle that is more frequent than 7 years. The majority of these pipes are 6 to 8 inches in diameter. Targeted areas are identified based on a risk score for each area. The risk score is based on the condition, history, and criticality of each targeted area:

- The **condition score** is based on the number of main line blockages¹ per 1,000 linear feet during the past 3 years in sewer pipes ranging in size from 6 to 8 inches in diameter in the targeted area.
- The **criticality score** is determined by pipe size, proximity to wetlands or streams, and water consumption.

The risk score is determined by multiplying the targeted area condition score by the criticality score.

2.2.2.2 Assigning Pipe System Cleaning Frequency.

An inspection/cleaning schedule will be prepared that assigns an inspection/cleaning frequency to the targeted areas with a cycle frequency between 2 and 4 years. The highest risk targeted areas will be assigned during the first year of the MCD and will be updated each subsequent year to ensure the highest risk targeted areas are inspected/cleaned first. In order to maximize efficiency and reduce costs, efforts will be made to level out the workload for each year and to assign targeted areas within each sewer basin to be inspected/cleaned at the same time when feasible.

2.2.2.3 Modifying the Cleaning Frequency of the Targeted Area Inventory

Each year, the risk scores will be re-calculated based on a rolling 3-year total of main line blockages that have occurred in each targeted area. The new risk score will then be compared to the prior year risk score and the results will trigger the following actions:

- If the new risk score for the targeted area remains within the cycle frequency range that was previously assigned, the scheduled year for inspection/cleaning will remain unchanged.
- If the new risk score for the targeted area is either greater or less than the inspection/cleaning frequency range currently assigned, the new schedule will be revised to reflect the changes in the inspection/cleaning cycle frequency.

The inspection/cleaning cycle frequency for targeted areas will be assigned between 2 and 4 years based on the risk score for each targeted area.

2.2.2.4 Removing Pipe Systems from the Target Cleaning Schedule

A targeted area will be removed from the target cleaning schedule when the risk score has reduced to a level that it no longer requires frequent inspection/cleaning.

A targeted area will be removed from the new target cleaning schedule for the next 3 years if the targeted area has been re-lined or replaced during the current year. Thereafter, the risk

¹ Blockages may be caused by roots, rags, FOG, debris and/or sediment build-up, which are primary causes of dry weather SSOs.

score for the rehabilitated targeted area will determine if it will be targeted for inspection and/or cleaning.

Refer to Appendix A for a map showing the targeted areas and respective inspection/cleaning frequency. Appendix A also presents a listing of targeted areas and the inspection/cleaning frequency that will be updated annually.

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3.0 MANHOLE SEALING AND MAINTENANCE PROGRAMS

Inspection of manholes will identify potential sources of infiltration and inflow (I/I). Reduction of I/I prevents storm water and groundwater from entering the Collection System and conserves hydraulic capacity, reducing the need for costly upgrades. The trunk sewer inspection program described in Section 10 will provide an ongoing assessment of manholes in proximity to streams and flood prone areas where sources of I/I are most likely to occur. The observations made will include manholes that have ongoing infiltration and inflow, which may also show as severe staining on manhole walls. Observations of manhole defects in other areas will also be made during the inspection and cleaning of Collection System sewers as referenced in Section 2: System-wide Gravity Sewer Cleaning and Inspection Program, and may also be noted during routine maintenance.

Manholes that have structural defects, such as cracks or breaks in the walls, rim, or bottom, are potential sources of infiltration and inflow. Manholes found to be in unacceptable condition will be scheduled for corrective measures or replacement once the appropriate method is determined. OAM will coordinate manhole repair work to restrict I/I until more permanent capacity, I/I reduction projects, or capital projects can be implemented (if practicable).

Prior to any method of manhole sealing or repair, all surfaces of the manhole will be cleaned. If root intrusion has occurred, the roots will be removed and chemical root control will be applied.

Manhole repair work fixes cracks and other defects in the interior face of manhole walls, pipe seals, frames, frame seals, and covers. The scope of work includes all steps necessary to inhibit potential leaks and seal cracks by applying cementitious repair and/or grout injection. The choice of repair material will be based on site conditions and the manufacturer's specifications for the material application. The types of materials used to repair interior defects are as follows:

- Cementitious-leakage sealing mortar (injectable);
- Rapid setting, high early strength, non-shrink cementitious mortar (coating);
- Two component epoxy coating;
- Expanding polyurethane hydrophilic injection grout; and
- Spun Fiberglass Lining coating.

If I/I intrusion is due to issues with the manhole frame and cover, the type of repair will depend on the specific cause of the problem. The type of repair may be as follows:

- Replacement of vented or cracked covers;
- Replacement of damaged frames and covers;
- Resetting of shifted frames;

5.0 COLLECTION SYSTEM LATERAL PRIORITIZATION PROGRAM

5.1 Program Purpose

The City has a sewer lateral program to prioritize corrective action in Collection System laterals that cause recurring Building Backups. The program has three components: (1) identification, (2) inspection and condition assessment, and (3) prioritized repair/replacement and/or maintenance. Collection System laterals with acute or catastrophic failures causing Building Backups will be remediated promptly as provided in the City's Emergency Response Plan.

5.2 Identification

Addresses that have experienced two or more Building Backups within the past 3 fiscal years will be identified on a rolling basis. The addresses will be identified using data collected through service requests and work orders for lateral-based WICs² in Cityworks. The addresses will be continually reviewed to remove any Collection System laterals that have been repaired through the program. If a Building Backup occurs after the repair is completed, the Collection System lateral will be flagged for further assessment.

5.3 Lateral Inspections and Condition Assessment

Each address identified through the process described above will be reviewed for any previous CCTV and other relevant information (e.g., tap connection location, length of lateral). If the available information is of sufficient quality, a recommendation of repair may be made. Laterals will be removed from repair consideration if there is no repair to be recommended or if the problem is determined to be a private side issue. For laterals that do not have useable CCTV records, an inspection will be assigned and conducted through the cleanout. If no cleanout is available or there is a blockage in the stack, a lateral launch camera may be required to complete the lateral assessment.

Lateral CCTV inspections are normally performed from a cleanout that is installed on the private side of the lateral at or near the property line. The City may perform lateral repairs from the property line to the sewer main. Any portion of the lateral connection inside the property line is the owner's responsibility to maintain. The property owner will be notified of any major defects discovered on the private side of the lateral.

² A "WIC" refers to a water-in-cellar incident. Notably, not all WICs involve sewage, and not all sewage backups relate to issues in a Collection System lateral. The City evaluates records of WIC incidents to determine whether the WIC was a Building Backup, and, if so, whether the Building Backup arose from an issue in a Collection System lateral.

6.0 FATS, OILS, AND GREASE CONTROL PROGRAM

In 2013, the fats, oils, and grease (“FOG”) program was incorporated into the City’s pretreatment program under the authority of Article 25 of the Baltimore City Code. The pretreatment program minimizes the discharge of FOG to the Collection System by requiring grease-generating food service establishments (FSEs) to install and maintain grease control devices (GCDs) properly, and promotes kitchen best management practices (BMPs) to residential and commercial customers. In addition, DPW cleans the Collection System and applies commercial grade degreasers as necessary to reduce and eliminate accumulated grease.

The FOG program is a two-pronged approach, managing FOG through mandatory BMPs, such as GCD installation and operation in regulated facilities, and abating grease in sewer lines using a commercial grade degreaser. The FOG program targets non-residential facilities that discharge or have the potential to discharge FOG-laden wastewater; however, since residential FOG discharges also contribute to blockages, a residential outreach component is included.

The goals of the FOG program are to:

- Maintain compliance with the Clean Water Act and requirements set forth by the MCD;
- Substantially reduce or eliminate dry-weather, grease-related SSOs;
- Minimize the amount of FOG discharged to the Collection System;
- Improve current GCD maintenance practices; and
- Educate all users of the Collection System about kitchen BMPs.

The objectives of the FOG program are to:

- Maintain an inventory of regulated grease generating facilities and their associated GCDs;
- Ensure that regulated grease-generating facilities have a valid wastewater discharge permit;
- Require all FSEs that discharge or have the potential to discharge FOG-bearing wastewater to have an adequately sized and properly installed GCD;
- Perform inspections to verify FSE compliance with pretreatment requirements;
- Apply appropriate enforcement responses to code or permit violations;
- Perform routine grease control application and associated inspection (CCTV);
- Abate grease accumulation in sewer mains;
- Facilitate inter-agency coordination to minimize the discharge of FOG to the Collection System and enforce applicable codes;
- Facilitate partnership with FSEs to control FOG discharges;

- Distribute kitchen BMP educational material to residential and commercial customers; and
- Perform community outreach and education.

6.1 FOG Abatement

FOG abatement activities include application of a chemical degreasing agent to dissolve grease deposits so FOG blockages can be easily removed in lines that experience rapid accumulation of grease. An inventory of pipes that require FOG abatement has also been developed that is available to pretreatment staff. These pipes are scheduled to be maintained on either a 3- or 6-month FOG abatement cycle, depending on the severity of FOG accumulation in the pipe sections. Prior to initiating the treatment process, DPW inspects and records the flow conditions and any evidence of current or previous surcharges from the upstream or downstream manholes of each pipe section. If an inspection reveals evidence of un-permitted FOG discharges from regulated facilities, pretreatment staff are notified. Use of acoustic testing devices may be employed to aid in determining the degree of grease buildup and to determine the optimal treatment frequency. The inventory consists of approximately 400 pipe sections, with the majority of the pipe sections undergoing 6-month treatment cycles.

6.2 Inspections of Food Service Establishments

Routine FSE inspections are performed annually by DPW Pollution Control Section (PCS) inspectors, and follow-up inspections are conducted on an as-needed basis. Initial inspections focus on education. Routine and follow-up inspections evaluate compliance. Examples of conditions leading to an enforcement action include:

- Lack of a required GCD or improper installation of a GCD;
- Inadequate maintenance of GCD (exceeds 25% rule during inspection);
- Evidence of pass-through;
- No maintenance log or maintenance log not up-to-date;
- Inadequate maintenance of waste/recycle grease area;
- Inaccessible GCD;
- Plumbing code nonconformities; or
- Refusal to allow inspection.

In general, the City's response to violations is to issue a Notice of Violation (NOV) and perform a follow-up inspection after the facility has had time to correct the violation. When the condition directly violates the Baltimore City Plumbing Code or Food Service Regulations, Baltimore City code enforcement officers from the Baltimore City Department of Housing and Community Development ("DHCD") or the Baltimore City Health Department may be engaged to correct the condition.

The FOG program is enforced through a combination of permit issuance, inspection, and education. Enforcement actions for violations of the FOG program are made in accordance with Article 25 and the Baltimore City DPW's *Enforcement Response Plan for Fats, Oils and Grease (FOG) Generated by Food Service Establishments (FSE) Emergency Response Plan*. In addition, communication with DHCD and the Health Department ensures compliance with the Baltimore City Building Code and Food Service Regulations.

The records required to manage the FOG program and FSE inspections are maintained in the FOG program database. This database was created by merging the Health Department's food control database with the DPW Pollution Control Section's (PCS) Wastewater Discharge Permit data. The database contains detailed information about each registered FSE and its associated GCD(s), inspection results, and compliance tracking information.

The FOG program database is maintained by OAM and updated by the PCS FOG Inspectors as they conduct inspections. OAM makes data structure changes as needed. The Pollution Control Section inputs data obtained during inspections and per the Wastewater Discharge Permit application and permit issuance process. When performing an inspection, the PCS FOG Inspector creates records using an electronic inspection form, which is automatically saved in the FOG program's FSE database.

The FOG program database is also used to document violations and enforcement actions. The database is used to track dates and responses to violations and enforcement. Entering enforcement and compliance activities into the database ensures they are documented and tracked. In addition, as inspections progress and conditions are noted, certain responses in the inspection forms may trigger an enforcement action such as a NOV. The NOV will cite the noted violations based on the inspection data.

The FSE locations are maintained in the Geographic Information System ("GIS") database and linked to the lateral to which the GCD discharges. These locations can be viewed as a map layer, allowing network traces to be performed to identify potential sources of FOG at a specific location.

During an SSO investigation or other complaint investigation, the FSE database and grease abatement location data are reviewed to determine potential sources of grease. OAM and PCS staff collaborate during these investigations, which may result in an enforcement action.

The pretreatment program also promotes kitchen BMPs to commercial and industrial customers to minimize the discharge of FOG-bearing waste streams to the Collection System.

The public education and outreach targets both the FSEs and commercial/industrial customers under the pretreatment program and the residential customers discharging from single- or multi-family homes. Public education and outreach is coordinated through the Communications and Community Affairs (CCA) Division.

In addition to assisting pretreatment staff with BMP-focused educational efforts, the CCA Division handles the City's *From the Pan to Can* educational initiative. DPW produces and

distributes outreach material explaining FOG disposal consequences and steps people can take to prevent grease from entering their pipes and the Collection System. Plastic lids with the slogan are distributed to encourage customers to store fats, oils, and grease in cans until the material cools and can be safely disposed of as solid waste.

The CCA Division also works with local environmental groups and interested citizens to increase public awareness of FOG issues and problems. During FY 2016, a “Pledge Campaign” initiative was launched to work with private groups to develop a community outreach program to encourage citizens to pledge not to discharge FOG materials to the sewers. DPW continues to promote the campaign’s educational message through the DPW website.

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7.0 ROOT CONTROL PROGRAM

The City has a root control program that provides both short-term and long-term planning to mitigate root intrusion into the Collection System. The goal of the root control program is to reduce the occurrence of SSOs and Building Backups caused by root-related blockages.

The City uses a contract for the application of chemical root control to areas within the City's existing root control inventory. The contract requires the chemical root control product to kill the root growth in the sewer line and inhibit re-growth for at least two years without permanently damaging the overlying vegetation. In addition, the contractor's warranty coverage guarantees that roots will not cause a blockage in the initial two year period after the first treatment. If the pipe is re-treated within 6 months of the expiration of the two year warranty period, the guarantee is renewed for three additional years from the time the subsequent treatment is made. This warranty can continue on a cycle, as long as the pipe is treated within 3 years and 6 months of the previous treatment. If the warranty is breached, the City notifies the contractor to re-treat the line at no cost to the City.

7.1 Inventory of Pipes for Root Control Chemical Treatment

CCTV data are used to identify pipes with root intrusion. Pipes found to have roots with measurable cross sectional area loss that have never been treated are added to the inventory for chemical root control treatment. Pipes remain in the inventory until the mainline is scheduled for replacement, abandonment, or CIPP lining.

Pipe segments that receive root control chemical application are prioritized in the following order:

- Mains that have not previously been chemically treated and have medium or heavy roots as identified through current inspections and flagged by the OAM CCTV analyst;
- Mains due for their second chemical treatment, within 2 years after the first treatment;
- Laterals with root infestation identified through UMD CCTV in response to SSOs or complaints about WIC events and flagged by the OAM analyst;
- Laterals identified for treatment inspections conducted under the Collection System Lateral Prioritization Program described in Section 5, which have not previously been treated; and
- Mains that are included in the long-term, 3-year, treatment cycle.

A database of the sewer lines in the root control inventory is maintained by OAM's Data Management Division to map locations and develop chemical treatment planned work for assignment to the root treatment contractor.

7.2 Adding Mainline Pipes to the Chemical Root Control Inventory

All CCTV videos are reviewed by OAM CCTV analysts. If roots are observed that have caused a blockage and/or have the potential to contribute to a blockage, the analyst will check the root control inventory to verify the status of the pipe under review. If the pipe is not in the inventory, the pipe will be flagged for inclusion in the root control inventory.

7.3 Removing Mainline Pipes from the Chemical Root Control Inventory

If roots are no longer determined to be a blockage risk, a pipe may be removed from the root control inventory. Pipes that have been added to Capital Improvement Projects for rehabilitation (i.e., lining or replacement) are typically removed from the inventory after completion of the rehabilitation work. Furthermore, various other conditions, such as root eradication, tree/shrub/brush removal, or re-development, may also trigger removal from the inventory. Finally, if recent CCTV indicates that the root condition will not likely contribute to a line stoppage, OAM may flag the pipe for removal from the root control inventory.

7.4 Adding Laterals/House Connections to the Chemical Root Control Inventory

Laterals may be added to the root control inventory for two reasons: (1) in response to SSOs that have occurred due to house connection chokes that were caused by roots, or (2) through inspections completed under the Collection System Lateral Prioritization Program, where roots are identified as presenting a potential maintenance issue.

SSO-related root control treatments are not scheduled to be repeated for laterals, as the Collection System Lateral Prioritization Program will ultimately analyze these laterals comprehensively and make long-term repair or maintenance recommendations as provided in Section 5. Analysts from OAM's Data Management Division will cross-check addresses for "repair sanitary connection" work orders prior to distribution of treatment lists to the contractor and remove any addresses that have had repairs from the inventory.

7.5 Inspections of Known Problem Areas

The City performs CCTV inspections and quality assurance/quality control (QA/QC) checks through random sampling of pipe sections included within the root control inventory. Additionally, the City performs spot field inspections of areas with high concentrations of SSOs that may be related to root intrusion.

7.6 Long-term Repairs

Pipes in the root control inventory are evaluated to determine if repeat blockages due to roots have occurred following chemical root treatment, or whether there are ongoing indications of heavy root growth. If blockages occur within the warranty period, the lines will be referred to the contractor for re-treatment. Areas with persistent, heavy root growth that cannot be controlled effectively with use of chemical treatment will be evaluated for CIPP lining, point repairs, or pipe replacement.

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8.0 PHYSICAL OR LEGAL LIMITED ACCESS AREAS

The City's Collection System is extensive and was built primarily during the early and mid-20th century. As such, there may be areas of the Collection System where the City lacks ready access due to physical or legal limitations. The following subsections discuss the City's process for identifying areas where physical or legal access is problematic, and describe the City's strategies for obtaining and maintaining access to these locations.

8.1 Physical Access

Following initial construction of a Collection System, situations can develop that limit physical access to sewer assets. For example, vegetation may limit access in off-road easement areas; property owners may encroach upon City easements; fences and other barriers may be installed that restrict access; road construction, excavation or paving may bury manholes; or stream bank erosion may interfere with access. This section describes DPW's activities to identify and remediate areas with limited physical access.

8.1.1 Identifying Areas with Limited Physical Access

As part of the City's sewershed studies under the 2002 Consent Decree, the City completed sewer system evaluation survey (SSES) projects for each of the City's eight sewersheds. The SSES activities included flow monitoring, hydraulic modeling, CCTV inspection, smoke testing, and dyed water testing. These activities identified issues that may detract from performance of the Collection System, including potential sources of I/I, capacity constraints, blockages, structural deficiencies, deterioration, dislocated joints, and other factors. As part of the SSES projects, areas with limited physical access were identified and catalogued in a database. DPW maintains this data in its Computerized Maintenance Management System (CMMS) software, which is specific to each Collection System asset. This data is accessible to DPW staff through the CMMS software, and is updated on an ongoing basis through DPW's trunk sewer inspection program as detailed in Section 10, *Corrective Maintenance Response and Reporting Procedures*, as well as through field reports from on-call contracts and other inspection data. Assets are added and removed from the database based on this information.

The data typically includes multiple instances of cannot locate (CNL), cannot access (CNA) or cannot open (CNO) manholes. The CNL manholes may be due to inaccuracies in historical records or GIS mapping, or may have been caused by construction or other activity in the area. The CNA manholes may also be temporary, such as when a vehicle is parked on top of the manhole, or areas where the manhole is located in a fenced area with a menacing dog. The CNO manholes may be partially buried or require heavy equipment or other resources to open.

If inaccessible manholes found during Trunk Inspection are crucial to the inspection or may conceal a serious underlying problem, the inspection crews can create a work order for further investigation of the accessibility issues. OAM also captures the accessibility issue in the CMMS, thereby including the manhole in the limited access database. Additional proactive measures

are undertaken to reduce the number of covered access points in the public right-of-way. These access points may become covered as a result of construction or rehabilitation projects, such as utility work, roadway renovation, or landscape beautification. Pre- and post-construction inspections are performed to ensure that infrastructure is accessible during and after completion of the project, and to ensure that buried infrastructure is identified and brought to grade.

8.1.2 Obtaining Physical Access

In the years since completion of the SSES projects, the City has continued to address lack of physical accessibility through a series of construction contracts. In many cases, the City identifies the means and methods to gain access, thereby reducing costs and using resources more efficiently. For purposes of construction, access may be provided through temporary roads or existing public trails. In other cases, permanent access roads may be constructed.

In order to address temporary access issues, crews will attempt to contact the property owner to schedule a follow-up inspection. If practicable, the property owner will be asked to address the access impairment.

For more permanent physical access issues, such as when the property owner built a structure or out-building over the sewer, DPW will assess the ability to access the sewer from adjacent manholes. If a significant issue persists, the City may require the property owner to remove the obstruction by initiating appropriate legal process.

8.2 Legal Access

When Collection System assets are installed on property that is not owned by the City, access may be provided through an easement. Easements are usually established when Collection System components are constructed on non-City property. If City-owned property is transferred to non-City ownership, easements may also be retained to ensure continued access to utility assets. The Baltimore City Department of Transportation (DOT) reviews all capital improvement and development projects, identifies any necessary easements, and negotiates agreements with property owners. Projects cannot be approved or constructed until appropriate easements have been established.

8.2.1 Identifying Areas of Limited Legal Access

There may be isolated areas where past development proceeded without the necessary easements, or where easements were not documented appropriately. These areas are usually identified when new construction activity is planned. Easement issues may also be identified if UMD crews identify a physical obstruction and subsequent investigation uncovers a missing or improperly documented easement.

8.2.2 Obtaining Legal Access

If a potential easement issue is identified, OAM notifies DOT of the need to identify a valid easement or negotiate an easement with the affected property owner. DOT is then responsible

for researching records, searching tax maps, and conducting a title search. If the research is unsuccessful, negotiations may begin to acquire a new easement. If negotiations are unsuccessful, the City may initiate condemnation proceedings to acquire an easement. Independent of condemnation proceedings, the City also maintains legal authority under Article 25 of the Baltimore City Code to regulate or repair sewer assets on public or private property.

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