

WASTEWATER SYSTEM OPERATION AND MANAGEMENT

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TARGET AUDIENCE

Operators, policy makers, and others who may have an interest in the proper operation and management of a wastewater collection system.

WASTEWATER COLLECTION OPERATION AND MANAGEMENT

- A wastewater system is usually a community's largest infrastructure investment. Identifying and fixing problem areas in your sewage collection system maximizes the useful life and performance of this asset, and also protects the public health and welfare of your community.
- Communities across the United States are working to find cost-effective, long-term approaches to managing their aging wastewater infrastructure and preventing the problems that lead to sanitary sewer overflows.

SANITARY SEWER OVERFLOWS

Q. What are sanitary sewer overflows?

A. Sanitary Sewer Overflows (SSOs) are a release of untreated or partially treated sewage from a municipal sanitary sewer.

CAUSES OF SEWER SYSTEM OVERFLOWS

SSOs occasionally occur in almost every sewer system, even though systems are intended to collect and contain all the sewage that flows into them. When SSOs happen frequently, it means something is wrong with the system.

Problems that can cause SSOs include:

- Inappropriate materials sent to the sewers – materials such as fats, oils and grease (FOG), and some household products (including some marked 'flushable') such as baby wipes, facial wipes, sanitary pads, and tampons. All of these may create blockages,
- Tree roots entering through defects or openings in a sewer line may cause blockages,
- Leaky sewers – stormwater, ground water and snowmelt entering the sanitary sewer from cracks and faults in the sewer or leaky sewer joints can overload a sanitary sewer,
- Inappropriate connections – Connections of sources of water such as sump pumps, roof leaders, foundation drains and area drains can overload a sanitary sewer,
- Improper or inadequate maintenance and cleaning of sewers,
- Inadequate pump maintenance and lack of backup power,
- Undersized sewers and/or pumps, and
- Equipment failures and breaks

COURSE OBJECTIVES

- Provide training in the safe and effective operation and maintenance of wastewater collection systems.
- Train operators in the practical aspects of wastewater collection system operation and maintenance.
- Focus on the knowledge and skills operators need to identify system problems and select appropriate methods to solve them.

WASTEWATER COLLECTION OPERATION AND MANAGEMENT

- Maintaining wastewater collection infrastructure – pump stations, force mains, and sewers – is an integral component of the proper management of a treatment system and critical to preventing illegal wastewater releases.
- Effective operation and maintenance programs have been shown to significantly reduce the frequency and volume of untreated sewage discharges, help communities plan for the future and save money on emergency response.

WASTEWATER OPERATION AND MANAGEMENT BENEFITS

- Communicate with and educate citizens and local officials
- Address financial and regulatory needs
- Develop and conduct preventive maintenance programs
- Better manage infrastructure assets
- Improve system capacity and address system overflows

WHAT IS A WASTEWATER COLLECTION SYSTEM?

A wastewater collection system is a series of pipes and devices that includes: mainline + manholes + lift stations + private laterals that transport wastewater from homes, businesses and industries to a central treatment facility.

OPERATION AND MAINTENANCE ACTIVITIES

- Collection system O&M is an essential element of wastewater treatment. Just like your car, it will eventually fail to perform without regular maintenance and repairs
- What O&M tasks should you be doing? Studies have shown that optimizing collection system performance depends on specific maintenance tasks and frequencies. You should summarize and review your maintenance activities each year.

DO YOU KNOW THE CONDITION OF YOUR SEWERS?

Condition assessment of your collection system is an investment in managing risk. Knowing the structural condition of your underground assets will allow you to avoid emergencies, prioritize repair and replacement projects and plan for the future.

Maintenance issues are the leading cause of backups and overflows of collection systems. Condition assessment helps utilities discover maintenance and capacity issues before they become maintenance problems.

WHY PERFORM A CONDITION ASSESSMENT?

- The compelling reason to perform a condition assessment of your collection system is to preserve the existing valuable infrastructure, minimize O&M and avoid emergencies and unexpected costs.
- Performing a condition assessment has a cost, but prioritizing work by focusing on critical assets and the maintenance and replacement needs for your collection system is an essential step toward better management.

STRUCTURAL ASSESSMENT

- If a sewer pipe is about to fail and you don't know about it, is it a problem?
- Structural problems can cause major headaches.

HYDRAULIC ASSESSMENT

Hydraulic capacity is a primary performance measure for a wastewater collection system. Capacity (both hydraulic and treatment) can be taken up by clean water entering the sewer collection system.

Too much flow or constricted areas in sanitary sewer pipes can cause overflows or backups of wastewater into homes and businesses.

Overflows and backups of untreated wastewater may spread disease and cause environmental damage.

PREVENTIVE MAINTENANCE PROGRAM

A preventive maintenance program is designed to help communities document knowledge as well as better understand their collection system.

And by knowing the condition and critical areas of their collection system, a community can improve operations and implement preventive maintenance practices to help reduce or eliminate Sanitary Sewer Overflows (SSOs).

A good preventive maintenance program is key to keeping a wastewater collection system in good repair. It helps preserve capital investment while preventing service interruptions and the excessive infiltration/inflow (I/I) and system failures that can result in Sanitary Sewer Overflows (SSOs).

PHYSICAL INSPECTION

A physical inspection is vital to an O&M program. Without it, a maintenance program cannot be implemented in a systematic way since system problems cannot be quantified. Elements of a physical inspection program include visual and equipment-based techniques that use established industry methods of system evaluation. Physical inspections should be performed on a regularly scheduled basis as a part of the preventive maintenance program.

PHYSICAL INSPECTION

- Inspection provides a detailed inventory of the system that includes size, material, condition, line sags, joint types, elevations, slopes, location of manholes and pump stations, location of building lateral connections and other system attributes that are necessary for managing the entire O&M program.
- Inspection data provide location information that allows more efficient O&M planning and scheduling and emergency response. During stoppages that involve overflows and/or backups, valuable time is lost if location information is not available, increasing the risk of regulatory violations, property and environmental damage, and threats to public health and safety.
- Inspection provides the data necessary for managers to make informed decisions on all maintenance, repair, and rehabilitation actions. This results in an O&M program that is effective and efficient.

PURPOSE OF CONDUCTING INSPECTIONS

- Identify what is in the system (inventory).
- Identify the location of the system's components.
- Determine the condition of the components (assessment).
- Prevent problems from developing.

BENEFITS OF PHYSICAL INSPECTION

Physical inspections are performed to accomplish the following goals:

- Identify defects in the system that can contribute to or cause backups, overflows, and bypasses.
- Identify chronic problem areas so maintenance can be planned and scheduled.
- Identify defects that if not fixed will result in a future failure.
- Determine the system needs for long-term replacement and rehabilitation.
- Assist in setting and justifying realistic user charges.

SMOKE TESTING

A smoke test is a sewer inspection method in which a non-toxic smoke, approved by the Public Health Agency, is blown into manholes.

The smoke makes its way through all the connected pipes in the sanitary sewer, helping to locate pipe leaks, broken manholes, cracks, uncapped lines, and more.

CCTV

CCTV evaluation can determine the specific location and cause of I/I in many cases, however, flow data gathered by flow meters has been used to guide sewer system capacity management for decades. Flow data can be used as a tool in condition assessment either to identify areas for further CCTV inspection or to quantify the severity of I/I identified during CCTV work.

Any components of the system located along streams are particularly vulnerable to the effects of rainstorms. Each sewer crossing of a stream should be inspected to be sure the sewer is not in danger of being broken. Also, the manholes on each side of the stream should be checked to see that no excess flow is taking place, which would indicate a leaking sewer under the stream. Since these sewers are often in remote locations, they are susceptible to vandalism and can overflow for long periods of time without detection.

FLOW MONITORING

- Flow monitoring equipment is used to identify areas of the collection system that have rainwater inflow or groundwater infiltration problems, often referred to as I/I. Flow monitoring can also detect areas where surcharging may occur because the volume of wastewater to be carried is greater than the capacity of the sanitary sewers to convey that amount of flow. Surcharging problems can result in sanitary sewer overflows when wastewater rises to the top of a manhole and flows out onto the street or ground.
- Flow meters are placed at varying locations throughout the collection system. These meters measure the amount and rate of wastewater flow in the sanitary sewer lines. The monitors are left in place for a specified period of time. Data is collected and compared to rainfall amounts over the same period. Measurements taken before and after a rainfall event indicate how much I/I contribute to the total flow of wastewater in the collection system.

MANHOLE INSPECTIONS

- Visual and televised inspections verify that manholes and cleanouts are on proper grade and are accessible to maintain sewer lines. Sewer line maps which indicate distances to fixed objects such as hydrants, telephone poles, street lights, etc. from installed manholes can be used to locate manholes or cleanouts that are paved over or concealed.
- Manhole inspections are a relatively quick and inexpensive way to detect holes and leaks that allow rainwater or groundwater to enter the collection system.

MANHOLE INSPECTIONS

- The exact location of the manhole
- The need for grade adjustments.
- Leaks or holes in the cover or frame.
- Evidence of rainwater ponding on the manhole cover.
- The condition of sewer pipes and lateral connections.

LIFT STATION INSPECTIONS

A lift station is an installation of pumps that raise wastewater from areas too low to drain by gravity into sanitary sewers. A typical weekly lift station inspection should include observations that confirm:

- Alarm systems are operating properly.
- Wet well levels are properly set.
- All indicator lights and voltage readings are within acceptable limits.
- Pumps run without excessive heat or vibration and have the required amount of lubrication
- Belts show no excessive wear.

SEWER LATERAL INSPECTIONS

The sewer lateral is an essential component of a wastewater collection system. This plumbing system component ensures that waste from your home is safely discharged to the street sewer main.

SAFETY CAUTION

- Sanitary sewers may contain harmful gases such as hydrogen sulfide or methane, or low concentrations of oxygen. Hydrogen sulfide gas is produced by anaerobic bacteria in slow moving wastewater. This gas is a major source of odors in collection systems and smells like rotten eggs. Heavier than air, hydrogen sulfide gas is often in the lower portion of manholes.
- If the concentration of hydrogen sulfide or methane gas is high enough, unconsciousness will come suddenly to workers exposed to this gas.

SAFETY CAUTION

- Each collection system utility should have a confined space safety program that includes a written plan, entry procedures, and the appropriate three gas monitoring meters for hydrogen sulfide, methane, and oxygen.
- When entering a manhole, use the proper safety harness, calibrated gas detection devices, and ventilation equipment. For more information, see the Occupational
- Safety and Health Administration confined Space regulations at this web site:
- <http://www.osha.gov/SLTC/confinedspaces/index.htm>

IN CONCLUSION

While we recognize that a certain approach may not be directly applicable to every situation, we hope it might provide a new idea, a useful template, or perhaps a potential contact as you work to prevent overflows and improve your collection system.

THANK YOU