Addressing SSOs in Austin, Texas: Initial Call to Final Fix

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ABSTRACT

Austin Water Utility of the City of Austin, Texas faces a challenge of correcting sanitary sewer overflows (SSOs) from its wastewater collection system. Austin is required to address and eliminate the SSOs from the collection system on a short schedule to meet a Federal regulatory mandate. The regulatory mandate requires the Utility to correct overflows and to reduce infiltration and inflow (I/I) into the collection system. This paper presents the implementation of the SSO Emergency Response (ER) plan to attend and reduce the amount of wastewater discharged from the collection system and correct the system-wide deficiencies of the system. The presentation will include various investigative methodologies, equipment used, and processes developed to correct SSOs.

KEYWORDS

Sanitary Sewer Overflows, SSOs, Wastewater Collection System Overflows

INTRODUCTION

The City of Austin, the capital of the State of Texas and home to the University of Texas, is a community of nearly 800,000 people. The City owns and operates the water and wastewater systems providing service to about 180,000 connections in the City limits and outlying areas. The City’s wastewater system consists of over 2,400 miles of separate sanitary sewers, 46,000 manholes, 112 wastewater lift stations, three major wastewater treatment plants with a combined treatment capacity of 135 million gallons per day, and one central bio-solids processing plant. The City has experienced rapid growth over the last twenty years because of its unique blend of high tech industry and governmental affairs. The City of Austin is consistently rated as having one of the highest quality of life in the country. This explosive growth has led to problems with the wastewater collection system leading to increasing numbers of SSOs.

In 1998 a lightning-induced failure of a wastewater lift station just north of Austin resulted in a discharge of raw sewage into Brushy Creek. The episode drew attention to wastewater overflows and resulted in the United States Environmental Protection Agency (USEPA) issuing...
an Administrative Order (AO) requiring the City to correct I/I, conduct Sanitary Sewer Evaluation Surveys (SSESs), remove capacity constraints, and eliminate SSOs from its wastewater collection system by June 2009. The AO also established interim deadlines for completion of several tasks for different areas of the City including I/I studies, SSESs, lift station elimination, lift station SCADA implementation, and collection system improvements. In order to effectively address the requirements of the AO, the Austin Water Utility has initiated the Austin Clean Water Program to implement a massive (over $200 Million in construction costs) upgrade of its wastewater collection system, and to implement operation and maintenance improvements to ensure that the upgraded collection system is properly maintained and protected.

The Utility adopted and initiated the development of the EPA-proposed Capacity Management Operation and Maintenance (CMOM) Program for its collection system. As part of the CMOM implementation, the Utility has initiated significant changes on how SSOs in the collection system are addressed, and significantly enhanced the maintenance of the collection system. A permanent flow monitoring system identifies high I/I areas and overflow locations. The maintenance program includes enhanced cleaning of the collection system and SSESs of the high I/I areas to identify defects. The Utility performs all the maintenance activities in-house except cleaning large diameter interceptors. Figure 1 shows the City of Austin CMOM workflow process.

SSO EMERGENCY RESPONSE PLAN

The vast majority of the SSOs in Austin are dry weather overflows caused by blockages due to roots, grease, trash, broken pipes, and vandalism. The Utility’s central dispatch office receives and processes over 2,000 calls per year related to wastewater troubles. About 30% calls are related to SSOs, 40% are related to stop ups, 20% are related to backups, and 10% are odor and other related calls. In over 45% of cases, the cause of backup, stop up, or overflow is debris in the line, majority of them are due to grease. Roots account for over 23% of troubles, broken pipe accounts for 14% of troubles, grease blockage accounts for 11% of troubles.

The Utility studied the SSO response and correction process, and made significant improvements on how the SSOs are addressed. The Utility also developed the SSO Emergency Response (ER) plan as a part of the CMOM program implementation. The new SSO correction program has been divided into the following 5 steps:

1. Emergency response,
2. Immediate investigation, correction, and reporting,
3. Engineering investigation,
4. Permanent correction, and
5. Continuous improvement process.
COLLECTION SYSTEM

Austin’s Collection System lies in three major sewer sheds, known as the Crosstown Tunnel, Govalle, and Onion Creek basins. Wastewater from these basins flows through three large-diameter tunnels to two different wastewater treatment plants (WWTPs), Walnut Creek, and South Austin Regional WWTP. Due to capacity limitations and the age of the Govalle WWTP, the majority of the flows from the Govalle sewer shed are diverted to the South Austin Regional WWTP.

The City of Austin owns the tunnels and sewer mains located in the right-of-way and in utility easements. Sewer laterals connecting customer plumbing from a building to the main line is co-owned by the City and the property owner. The City maintains the lateral within the right-of-way or the easement, and the property owner maintains the segment of the lateral within the property owner’s property boundary. A cleanout generally separates the responsibility at the property line on the newer installations. On the older installations, there may not be a cleanout at the property line, and the only access to the sewer lateral is through the cleanout on the property owner side near the building or from the main line. There are only a very few basements in Austin so that basement flooding is not an issue.
EMERGENCY RESPONSE SETUP

The emergency response (ER) team consists of three members, a team leader and two assistants. Currently two teams and a supervisor work every shift during weekdays. The morning shift starts at 7:00 AM and continues to 3:30 PM, and the evening shift starts at 2:30 PM and continues to 11 PM. From 11 PM to 7 AM, when the calls are very infrequent, an on-call team consisting of a supervisor and three crew members provides coverage in order to respond to emergencies. Weekend shifts consists of one supervisor and an ER team working in the morning and evening shifts. A mix of ER employees and routine maintenance employees work the weekend shifts. The Utility’s goal is to respond to every emergency within 90 minutes of receiving the call. Currently the average response time is around 45 minutes, with over 60 percent of the calls addressed in less than 60 minutes, and 13 percent of the calls taking over 90 minutes.

ER teams are dedicated to respond to emergency trouble calls. In addition all routine maintenance teams are equipped with basic ER tools to use if they are ever called to help out during peak call times. During off-peak call times, ER teams perform routine inspections and maintenance work that can be interrupted on short notice. These routine inspections performed by the ER crews include lateral repair inspections, manhole inspections, and other routine work as necessary. Figure 2 presents the flow diagram for wastewater trouble call resolution.

EQUIPMENT

Every ER team is equipped with the necessary tools to respond to emergencies. These tools include a flat tape, electric eel, portable mini CCTV unit with recorder, laptop computer loaded with all available collection system maps, flusher unit, vacuum unit, generator, pump, sonde radio detection unit, sand bags to provide temporary berms to contain wastewater, and other ancillary equipment. Routine maintenance teams also carry a flat tape on their trucks, including flow monitoring, smoke testing, CCTV inspection, and cleaning trucks. The cleaning trucks also carry a 100 feet of small-diameter hose that can be attached to the large-diameter flusher pressure hose and can be used to flush the lateral lines at low pressure.

INITIAL CALL AND RESPONSE

All trouble report calls are handled by a central dispatch office. Customers are advised to call the Utility because of the split responsibility of the lateral line. The Utility responds to every call it receives to the trouble report line. Trouble calls include back ups, stop ups, SSOs, odor complaints, missing manhole covers, acts of vandalism, overflowing cleanouts, malfunctioning lift stations and private grinder pump stations, missing cleanout caps, and rodent problems. Calls are taken by the dispatch office and radioed to an ER supervisor who is on duty to receive the call.
Figure 2 - Wastewater Trouble Call Resolution
City of Austin, Austin Water Utility

Trouble call to central dispatch;
SSO – Sanitary Sewer Overflow,
SLBKP – Backup, or SLSTP – Stopup
Dispatch radio to emergency response (15 min).

ER crew to trouble location (45 min)
Response Team
Flusher / vacuum / combination unit,
Flat tape, mini camera, VCR, sonde, etc.

Initial Assessment:
- Quantity of spill, Route of flow,
- Active / not active, Contained / not contained,
- Emitting component.
Call additional support personnel and equipment as necessary.

Activate reporting SOP for local, state,
Federal agencies, and media, if necessary.

Contain and stop overflow:
Vacuum truck, bypass pumps,
Sand bag containment.

Isolate problem and remove obstruction:
Flat tape for laterals,
Flusher or combination truck for
Laterals or mains.

Spill recovery:
Portable pumps,
Vacuum trucks.

Inspect lateral or main for defects
Using CCTV or mini cameras.

Verbal notification
To resident that
Private plumbing is
Defective.

Financial assistance and/or enforcement of
Private lateral ordinance.
(Under development)

Problem on
Main or city side of
Lateral?

Flow restored or
Overflow stopped?

Emergency repair by
Utility line maintenance
Or contractor.

System / capacity problem?

Recommendation for Abatement:
Spot repair, Relay, CIPP rehabilitation,
Repair / relay using
Service contract or add to
CIP project for implementation.

Routine cleaning pending completion of
Abatement project.

City crews
Make repair.

NO

NO

NO

YES

YES

YES

YES

YES

YES

YES

YES

NO

NO

NO

NO

City crews able to perform work?

City crews make repair.

City crews able to perform work?

City crews make repair.

City crews able to perform work?

City crews make repair.

City crews able to perform work?

City crews make repair.
Based on the nature of the call and the information provided by the caller, the supervisor radios the crew closest to the location of the call. The crew will immediately go to the problem location as soon as it receives notification from the supervisor. If the crew is busy addressing another call, the second crew is asked to take the call. If both crews are busy, and if it will take over 90 minutes to respond to the location of the call, the supervisor asks the routine maintenance crew closest to the location to respond.

As soon as the crew arrives at the location, they assess the situation and radio in the condition assessment to the central dispatch office. The on-duty SSO supervisor monitors the radio and assists the on-site ER crew by calling in additional personnel for support and equipment as needed. If the routine maintenance crew responds to the call, since they are not equipped with all the tools required to investigate, they provide temporary relief and ask the ER crew to go back and perform the investigation. With the equipment they carry, the ER crew will be able to address over 95 percent of the problems. In some cases, the crew has to call in for additional personnel and equipment such as a large flusher-vacuum combination truck, a CCTV inspection unit, or a lateral line inspection camera.

**NOTIFICATION**

Based on the conditions reported by the on-site crew and pre-set SSO conditions, the dispatcher makes a decision whether to notify additional personnel through paging. A list of pagers are programmed for paging information on all SSOs over 50 gallons. The pager list include first-line supervisors, superintendents, division managers, the public information office, engineering support, regulatory personnel, the Austin / Travis County Health Department, the City’s Watershed Protection and Development Review Department (WPDRD), and the regional office of the Texas Commission on Environmental Quality. The paged information includes the service request number, the location of the problem, the quantity of flow, if the flow is contained or not, if the overflow is reaching a waterway or a storm sewer inlet, and which crews are on location.

Based on the paged information, additional support personnel will monitor the conversations on the radio and may respond to the site. A spill response employee and engineering support staff typically respond to the site of all potentially significant overflows. If the SSO is large enough to require attention from management, appropriate personnel respond either to the field or to the office to coordinate activities related to addressing the SSO. To meet the requirements for public notification and to provide information on potential impacts, the nearby residents, State and Federal regulatory agencies, and local media outlets are notified of major SSOs.

**IMMEDIATE INVESTIGATION, CORRECTION, AND REPORTING**

The ER crew arrives on the site, assesses the situation, and provides immediate relief by clearing the blockage. If the SSO is on a main that is located in a street or easement, or if the spill is from a lift station or a broken force main, the crew may call in additional personnel and equipment to help. Two supervisors, a superintendent, and an engineer arrive at the site and take over the planning, coordination, and resolution activities. A trailer equipped with various size plugs, a
compressor, fittings, tools, hoses, and other equipment that will help address the SSO can be taken to the overflow location. Additional large pumps may also be deployed for bypass pumping and to recover wastewater. Field support includes personnel to set up and man bypass pumping, clear the blockage, clean up the discharged wastewater, assess repair alternatives, and coordinate equipment and personnel needs with the office. Office personnel monitor wastewater flow meters in the area for flow conditions and provide information on bypass pumping requirements and bypass discharge locations. The office personnel are also available to locate additional equipment and supplies, keep management informed of the situation, and assign crews for various tasks in the field as necessary for shift duties.

Immediate attention is given to relieving the blockage and containing the overflow using sandbags. The ER crews may set up bypass pumping with a small trash pump and also begin pumping wastewater from the creek or ditch into a manhole. Once the blockage is removed, all discharged wastewater is vacuumed or pumped into the manhole and the overflow area or the creek is flushed and cleaned under the direction of the spill response coordinator. Due to the potential for public health hazards and impacts to the environment and waterways, the Utility removes all discharged wastewater on both private and public property. The crew immediately inspects the pipeline to identify the defect or cause of the blockage.

All SSOs are reported to the City’s spill coordinator in the watershed protection department who responds to the location of all major overflows. The spill coordinator monitors the SSO and the corrective action taken by the ER crews and provides assistance to minimize environmental impact. The cleanup of large SSOs is also coordinated with State regulators.

The ER crews frequently encounter problematic situations such as having no cleanouts on the City’s right-of-way, not being able to locate a property owner’s cleanout to access the blocked lateral, and not finding manholes. The crews are trained to handle the majority of the situations that may be encountered in the field. If no cleanout is found to access a lateral line, the crew uses location information from the Utility’s records to approximate the location. If necessary to provide relief for the overflow, ER crews hand-dig or use hydro-excavation to access the pipe. In some instances, if locating the lateral takes too long or is unsuccessful, a CCTV inspection unit equipped with a lateral camera launcher is brought in to transport a sonde radio detection unit up the service line to pin point the location of the lateral.

ENGINEERING INVESTIGATION

An engineering section is called upon to assist in responding to major emergencies and repairs on mains located in streets and easements. This section assists in the evaluation of site conditions, flow characteristics for bypass pumping, and repair technologies. The engineering section also investigates all SSOs from mains. The investigation includes evaluation of line capacity, localized grease problems, and pipeline conditions, as well as coordination with other improvements in the area. All mains with problems are televised to identify the cause of the overflow and to assess the condition of the pipeline. If the investigation shows that the problem is due to excessive I/I, an SSES by a routine maintenance crew will be conducted to identify and correct the I/I sources. If the SSO appears to be related to a capacity problem, it is turned over.
for modeling and problem resolution. Based on the investigation, the engineering section either recommends a local repair or identifies a capital improvement project for implementation. All capital improvement projects are handled through a design, bid, and construction process.

ROUTINE CLEANING

The engineering section maintains a list of known SSO and backup locations where the problem cannot be fixed immediately. These locations are put on a routine maintenance list for cleaning to prevent additional SSOs and backups. A crew is dedicated to clean the pipelines on the routine cleaning list on a set schedule depending on the need. The schedule starts with a 120-day frequency and is adjusted based on feedback from the crew on the amount of trash and hydraulic conditions.

PERMANENT CORRECTION

Once the investigation concludes, a recommendation for corrective action is forwarded to the construction supervisor. Construction activities take place on a schedule based on the nature of the priority. All scheduled repairs have three priorities, priority 1 requiring immediate repair, priority 2 requiring completion within 72 hours, and priority 3 for all others. Examples of priority 1 repairs include collapsed pipes, washed out pipelines in streambeds, leaking manholes, and cleanouts installed to relieve a blocked service lateral.

For major emergency construction, a representative from the engineering section is requested to come to the location of the overflow to make recommendations before repairs are performed. Minor emergency repairs such as installing cleanouts, repairing laterals, and performing main repairs in streets or easements are routinely handled by the Utility’s in-house construction crews. Outside contractors are hired through emergency contracts to perform major repairs that are too large or take too long for the in-house crews to handle. If the condition does not require immediate attention or there is no imminent threat of another overflow, the project is placed on the priority 3 list for routine construction. Depending on the nature of the project, repairs are made either through in-house crews or contractors hired through service (open scope) contracts. To correct major hydraulic problems or to correct area-wide problems, a capital improvement project is initiated for design and construction.

ENFORCEMENT AND CORRECTION OF PRIVATE LATERAL DEFECTS

All defects on the portion of the lateral owned by the customer are the responsibility of the property owner for correction. The Utility’s ER crews inspect the lateral inside the private property and provide a report of the problems and the location of the problems to the property owner, property manager, or the plumber. The report will include a sketch showing the location of the problem, and the problem description.
A private lateral defect correction ordinance is currently under consideration by the Austin City Council. This proposed ordinance requires the private property owner to correct defects in the private lateral within a specified time or face penalties. The ordinance also provides for financial incentives in the form of interest buy-downs and grants for very low income families who cannot afford to repair their lateral.

A copy of the ER crew’s investigation report is provided to an enforcement coordinator who in turn sends a letter informing the property owner of the defective lateral and the requirements of the ordinance. If the property owners do not complete the repairs, the coordinator will enforce the ordinance requirements by assessing penalties and taking to the property owner to municipal court.

CONTINUOUS IMPROVEMENT PROCESS

All personnel involved in the SSO program meet at least quarterly (or more frequently if necessary) to identify issues that can be improved and to provide effective coordination between various groups that work to resolve the SSOs. Personnel attending the meeting include representatives from ER crews, the engineering section, in-house construction crews, and WPDRD. Crew members take an active role in identifying issues that can improve the process. The goal is to reduce the response time and to not have repeat overflows at the same location. The continuous improvement process has contributed significantly to the SSO correction program.

CUSTOMER SERVICE

A customer liaison handles all customer calls related to wastewater problems. Emergency response crews provide a brochure to the property owner, residents, or property manager that explains the process, damage responsibilities, and contact information for any further action. In case of wastewater backups due to a problem on a City facility, the City hires a private contractor to clean the residence. The City keeps a cleaning contract in place at all times to address backups due to the failure of a City facility. If the backup is due to failure of the privately-owned part of a sewer lateral the owner will be informed that the City will not provide cleaning service. For further clarification of the investigation or if the property owner has any questions they are encouraged to call the customer liaison.

SUCCESSES

As part of the CMOM program implementation, the City of Austin has made SSO elimination a top priority. Although it is practically impossible to totally eliminate SSOs as required by the AO, the City’s new program will significantly reduce health and environmental impacts of SSOs by reducing the volume of wastewater that is discharged from the pipelines. Focusing on reducing response time and correcting the cause of the problem will address all SSOs in the collection system. Improving routine maintenance has also helped in reducing the overflows.
Figures 3 through 6 present the trends of SSOs and the volume of wastewater that is discharged from the collection system. These trends show a definite improvement in addressing SSOs.

**Figure 3 - Number of SSOs per Month**

![Figure 3 - Number of SSOs per Month](image)

**Figure 4 - Volume of SSOs per Month**

![Figure 4 - Volume of SSOs per Month](image)
CONCLUSION

The City of Austin has been able to take advantage of a regulatory mandate to correct SSOs by improving its processes, providing employee training, and using equipment. The response time to correct SSOs and the volume of wastewater entering creeks and streams has been significantly reduced. The improved emergency response plan is expected to further reduce the number of first-time and repeat overflows as the program evolves.