Department of Watershed Management

Scott Towler, P.E.
Director

Via Electronic Mail and U.S. Mail

November 1, 2016

Chief, Clean Water Protection Branch
ATTN: Ms. Sara Janovitz
Water Protection Division
United States Environmental Protection Agency,
Region 4
61 Forsyth Street
Atlanta, Georgia 30303-8960

Re: Clean Water Act Consent Decree 1:10cv 4039-WSD
November 1, 2016—Revised Annual Report #4 and Sanitary Sewer Overflow Trends Analysis

Dear Ms. Janovitz:

As required by §IX. Reporting Requirement of the Consent Decree associated with the above referenced civil action, DeKalb County ("County") is submitting the following document for your review and comment:

- November 1, 2016—Revised Annual Report # 4 and Sanitary Sewer Overflow Trends Analysis

The County is providing a Revised Annual Report #4 which covers the reporting period of January 1, 2015 to December 31, 2015 and which includes the required Sanitary Sewer Overflow (SSO) Trends Analysis. The primary changes in the Revised Annual Report # 4 are revisions to certain KPI's included at Tables 10-1 and 11-1.

As has been previously discussed, in early 2016, the County became aware of inconsistencies between the frequency and classification of actual SSO events versus what was being reported to EPA and EPD. As a result of these inconsistencies, the County conducted an in-depth review of its Service Requests and other records dating to the beginning of the Consent Decree period to verify the number of SSOs that had been previously reported. The details of that initial review and its findings were previously reported in documents submitted by the County on August 1, 2016. After that date, it was determined that an additional level of review, to include additional service requests and relevant email correspondence, was necessary to ensure that all reportable events had been discovered, properly classified, and reported in accord with Consent Decree requirements. While the details of the methodology employed and the results of each phase of this review are related in the separately submitted Supplement to Previously Submitted Quarterly Reports and detailed in the Summary of DeKalb County's Discovery, Investigation, and Correction of Sanitary Sewer

Overflows Reporting Concerns, the results of each phase of this review have been incorporated into the 4th Annual Report and Sanitary Sewer Overflow Trends Analysis attached hereto.

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering such information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations pursuant to CWA Section 309(c)(4).

If you have questions or comments, please contact me at 770-621-7234.

Sincerely,

Scott Towler, P.E.
Director, Department of Watershed Management

Enclosure

cc: Georgia EPD
O. V. Brantley, County Attorney
Margaret Tanner, Deputy Director
Reggie Wells, Deputy Director
Darren Eastall, Consent Decree Administrator
Patricia Moore, Document Control Coordinator
Matthew Welch, Sr. Asst. County Attorney
E. Fitzgerald Veira, Troutman Sanders

Revised Annual Report #4

January 1, 2015, to December 31, 2015
Civil Action No. 1:10cv4039 - WSD

DeKalb County
Department of Watershed Management

November 1, 2016

Table of Contents

Acronyms

ARV	air release valve
BI	business intelligence
CCTV	closed circuit television
CD	Consent Decree
CDPMT	consent decree program management team
CERP	contingency and emergency response plan
CIP	capital improvement program
CM	corrective maintenance
CMMS	computerized maintenance management system
CMOM	capacity, management, operations, and maintenance
DWM	Department of Watershed Management (DeKalb County)
EM	emergency maintenance
FOG	fats, oils, and grease
FSE	food service establishment
GAEPD	Georgia Environmental Protection Division
GIS	geographic information system
ID	identification number
I/I	infiltration/inflow
KPI	key performance indicator
LF	linear feet
LS	lift station
MMS	maintenance management system
O&M	operation and maintenance
OSARP	Ongoing Sewer Assessment and Rehabilitation Program
PASARP	Priority Areas Sewer Assessment and Rehabilitation Program
PM	preventive maintenance
QA/QC	quality assurance and quality control
RD I/I	rainfall-derived infiltration and inflow
SSO	sanitary sewer overflow
USEPA	U.S. Environmental Protection Agency
WAM	work and asset management
WCTS	wastewater collection and transmission system

Introduction

DeKalb County (the "County") Department of Watershed Management (DWM) submits this revised fourth Annual Report in accordance with Section IX, Paragraph 58 of the Consent Decree (Civil Action 1:10cv4039-WSD) to provide:

a) "A narrative summary of progress made, including key accomplishments and significant activities, under the Capacity, Management, Operations, and Maintenance (CMOM) programs implemented or modified pursuant to this Consent Decree for the most recent twelve (12) month period."

b) "A trends analysis of the number, volume, average duration, and cause of the County's Sanitary Sewer Overflows (SSOs) for the previous twenty-four (24) month period."

Executive Summary

The report that follows is divided into two sections as required by the Consent Decree (CD). The first section, a report on the Capacity, Management, Operations and Maintenance (CMOM) Programs' Implementation Activities, is a revised version of the 4th Annual Report as originally submitted by the County on March 1, 2016 and is submitted to correct certain information included in that March 1, 2016 submittal. The second section, the Sanitary Sewer Overflow Trends Analysis, is intended to meet the County's reporting obligations as referenced above. As is more fully explained in the Executive Summary introducing the Trends Analysis, that portion of this report is also intended to serve as a cumulative corrective addendum to all previously submitted Trend Analyses.

As has been previously discussed, in early 2016, the County became aware of inconsistencies between the frequency and classification of actual SSO events versus what was being reported to EPA and EPD. As a result of these apparent inconsistencies, the County conducted an in-depth review of its Service Requests and other records dating to the beginning of the Consent Decree period to verify the number of spills and overflows reported and analyzed herein. The details of that initial review and its findings were previously reported in documents submitted by the County on August 1, 2016. After that date, it was determined that an additional level of review, to include additional service requests and relevant email correspondence, was necessary to ensure that all reportable events had been discovered, properly classified, and reported in accord with Consent Decree requirements. The details of this second review and the results thereof are being separately reported, but the first section of this Annual Report, a report on the Capacity, Management, Operations and Maintenance (CMOM) Programs' Implementation Activities, incorporates currently available information and includes the additional SSO events discovered during all phases of the County's in-depth retroactive review of Service Requests wherever appropriate. The primary changes to this first section are concentrated in the section reporting on Contingency and Emergency Response Plan (CERP) activities and in the Key Performance Indicators (KPIs) reported in the Priority Areas Sewer Assessment and Rehab Program (PASARP) and Ongoing Sewer Assessment and Rehabilitation Program (OSARP) sections.

During the period from January 1, 2015 to December 31, 2015, the following DWM CMOM implementation programs, reports, and deliverables were approved by or submitted to the United States Environmental Protection Agency (USEPA) and Georgia Environmental Protection Agency (GAEPD), as noted in Table ES-1.

Table ES-1 Consent Decree Submittals – Schedule and Status

Consent Decree #	Title	DWM Submittal for Review	USEPA/GAEPD Comments	DWM Final Submittal	USEPA/GAEPD Approval
IX.(56)	4th Quarterly Report 2014	-	-	1/15/15	-
IX.(57)	6th Semi-Annual Report	-	-	1/30/15	-
IX.(58)	3rd Annual Report	-	-	3/02/15	-

Table ES-1 Consent Decree Submittals – Schedule and Status

Consent Decree #	Title	DWM Submittal for Review	USEPA/GAEPD Comments	DWM Final Submittal	USEPA/GAEPD Approval
VI.B.(i)	Contingency and Emergency Response Plan (CERP)	12/30/14	1/29/15	2/18/15	3/27/15
VI.B.(iii)	Sewer Mapping	12/30/14	1/29/15	2/18/15	3/27/15
VI.B.(vi)	Flow and Rainfall Monitoring	1/30/15	2/10/15	2/18/15	3/27/15
VI.B.(vii)	Hydraulic Model	1/30/15	2/10/15	2/18/15	3/27/15
VI.B.(ix)	Infrastructure Acquisitions	1/30/15	2/10/15	2/18/15	3/27/15
IX.(56)	1st Quarterly Report 2015	-	-	4/20/15	-
IX.(56)	2nd Quarterly Report 2015	-	-	7/22/15	-
IX.(57)	7th Semi-Annual Report	-	-	7/30/15	-
VI.B.(iv)	Maintenance Management System (MMS)	4/16/15	6/2/15	8/3/15	8/18/15
VI.B.(viii)	Financial Analysis	4/16/15	6/2/15	2/1/16	2/17/16
VI.B.(x)	Priority Areas Sewer Assessment and Rehabilitation Program (PASARP)	4/16/15	6/2/15	8/3/15	8/18/15
VI.B.(x)	Ongoing Sewer Assessment and Rehabilitation Program (OSARP)	4/16/15	6/2/15	8/3/15	8/18/15
IX.(56)	3rd Quarterly Report 2015	-	-	10/31/15	-

Consistent with the requirements of the Consent Decree, this document details, in narrative form, progress made in the 2015 timeframe as well as significant program accomplishments and SSO Trends Analysis. Any revised milestones and the associated corrective implementation plans are noted in the previously submitted Semi-Annual Report. Table ES-2 summarizes the major activities and key milestone completed in 2015.

Table ES-2 2015 Major Consent Decree Milestones and Accomplishment Summary

Program or Project	Milestones and Accomplishments
CERP	✓ Continued cleaning and inspection program ✓ Assigned two instructors to conduct CERP training sessions ✓ Responded to 125 reportable spill events, which is a 10 percent reduction from 2014 events (140)
Fats, Oils, and Grease (FOG) Program	✓ Completed all program milestones as part of the effort to reduce FOG related impacts to the wastewater collection and transmission system (WCTS) with a strong emphasis on public education and outreach to the incorporated cities
	✓ Performed FOG inspections, evaluations, and tracked data 1. Total number of FOG inspections - 7,359 2. Total number of FOG evaluations - 1,541 3. Average inspections per day - 5.34 ✓ Average permitted active food service establishments (FSEs) - 2,555

Table ES-2 2015 Major Consent Decree Milestones and Accomplishment Summary

Program or Project	Milestones and Accomplishments
Sewer Mapping Program	✓ Finished loading more than 141,000 assets [including 35 sewersheds; 247 metersheds; 70,562 manholes; 70,686 gravity mains; 66 lift stations; 67 force mains; and 58 air release valves (ARVs)] into the Oracle work and asset management (WAM) production database ✓ Reviewed detailed field data against the compiled assets and updated with newly discovered assets or ground truthing efforts for other programs, such as Hydraulic Modeling and PASARP
MMS Program	✓ Evaluated and selected business intelligence (BI) software that has the potential to improve maintenance situational awareness ✓ Reviewed and revised, as needed, the procedures for gravity system maintenance and lift station maintenance ✓ Completed 1,809 buried creek and aerial crossing inspections
Collection and Transmission Systems Training Program	✓ Provided technical and skills training to DWM personnel related to their job responsibilities. ✓ Completed 8,295 hours of training in 2015 in 67 different subjects for 512 different staff members
System-Wide Flow and Rainfall Monitoring Program	✓ Established the correlation between flow monitors and rain gauges for subsequent rainfall-derived infiltration and inflow (RD I/I) and peaking factor analysis and determination ✓ Consolidated data storage and backup solutions for flow and rain gauge equipment ✓ Compiled data for processing and application in the hydraulic model development and simulations. The compiled data provide the County with pre-rehabilitation information that can be used to make post-rehabilitation data comparisons to evaluate the effectiveness of the rehabilitation on extraneous sewer system flows
System-Wide Hydraulic Model	✓ Completed modeling development tasks including sewer system mapping data validation, model network construction, dry weather flow input and calibration, and initial simulations for subsequent Peak Flow Capacity Assessment for Snapfinger and Pole Bridge Basins ✓ Substantially completed similar tasks for the Inter-Governmental Basin and eight of its sewershed models ✓ Performed field activities primarily in the Inter-Governmental Basin at select sites of the sewer system to clarify system information associated with sewer connectivity and pipe invert elevations
Financial Analysis Program	✓ Tracked expenditures for both the operations and maintenance (O&M) budgets and capital improvement projects (CIP) budgets. DWM is on track to meet its revenue target and is expected to fall within its expenditure budget ✓ Separated drinking water and wastewater budgets
Infrastructure Acquisitions Program	✓ Evaluated and/or acquired 49,031 linear feet (LF) of pipe and one lift station
PASARP	✓ Performed work in the PASARP prioritized areas utilizing ongoing annual assessment and rehabilitation contracts in conjunction with preparation for the larger PASARP tiered assessment contracts that address the remainder of the assets within the Priority Areas ✓ Implemented, tracked assessment and rehabilitation projects including 109 manhole assessments and 413,724 linear feet of closed circuit television (CCTV).

Table ES-2 2015 Major Consent Decree Milestones and Accomplishment Summary

Program or Project	Milestones and Accomplishments
OSARP	✓ Implemented and tracked assessment and rehabilitation projects including 539 manhole assessments, 137 point repairs, 315,144 linear feet of CCTV, force main replacement, sewer line upsizing, and sewer line relocation ✓ Evaluated the inspections using analysis tools (such as InfoMaster, Geographic Information System [GIS], and System Condition and Risk Enhanced Assessment Model) and procedures ✓ Identified priority repairs
Supplemental Environmental Project	✓ Completed program in 2014
SSO Trend Analysis	✓ Completed a detailed SSO trends analysis and major spill analysis – Identified grease as a predominant cause of SSOs and continued an aggressive cleaning program – Identified other underlying causes of SSOs that included storm related capacity and infiltration events, resolution of these problems are being addressed via the assessment and rehabilitation processes under the PASARP and OSARP

Part I – Capacity, Management, Operations and Maintenance (CMOM) Programs' Implementation Activities Completed

1. Contingency and Emergency Response Plan – CERP (CD VI.B.i)

The updated CERP was approved by USEPA/GAEPD on March 27, 2015. DWM continued to implement the CERP in 2015 using the approved strategy to mobilize labor, materials, tools, and equipment to respond to and appropriately remedy conditions that may cause or contribute to an SSO.

SSOs continue to receive the highest priority response within the DeKalb County DWM operations. Additionally, the County refined the investigation and root cause analysis processes as summarized below.

Key Accomplishments and Significant Activities:

1. Performed CERP training for 79 personnel in 2015.
2. Assigned two instructors to conduct the CERP training sessions.
3. Conducted 27 self-evaluation meetings with field personnel based on the review of SSO responses and identified improvements to the response process.
4. Conducted monthly SSO Meetings with all program area managers.
5. Conducted monthly Review Meetings with the Director.
6. Responded to 127 reportable spill events, which is a 10 percent reduction from 2014 events (143).
7. Properly published public notices for 21 major spill events.
8. Completed the following activities related to SSOs:
    a. Cleaning total 1,692,649 feet
        i. First response 18,673 feet
        ii. Additional follow-up 23,770 feet
        iii. Contractor cleaning 1,650,206 feet
    b. Manhole inspections 4,816
    c. Point repairs 41
    d. CCTV 56,782 feet
9. Completed 470 follow-up service requests as a result of SSO investigation. Updated and reviewed the CERP program document and provided updates to the response crews and managers.

2. Fats, Oils, and Grease (FOG) Management Program (CD VI.B.ii)

The DeKalb County FOG Program milestones were completed and fully implemented in 2015, consistent with Consent Decree and program documents. DWM successfully continued efforts to engage the municipalities within the County to ensure the uniform enforcement of the FOG ordinance throughout the County. The County also engaged the DeKalb County municipalities to enhance educational programs to better inform citizens about the importance of following the best management practices to dispose of FOG from both commercial operations and residential activities. The FOG program will continue to be performed by DWM consistent with the fully developed program.

Key Accomplishments and Significant Activities:

1. Tested and finalized the construction/renovation tracking software to include the FOG reviews, inspections, and fees for incorporated cities review to optimize the City Permitting Processes.
2. Improved the FOG permitting process by coordinating meetings with the larger incorporated city authorities, such as Cities of Decatur and Brookhaven in November and December 2015, respectively. Maintained communication with other cities such as Dunwoody, Chamblee, and Doraville to ensure continuation of the FOG review and permitting agreements.
3. Communicated with school authorities (Joshua Williams – Chief Operation Officer, John Wright - Deputy Program Director and other directors at the DeKalb County Schools) from August through September 2015 to plan and review the schools' grease traps updates.
4. Distributed educational materials (344 door hangers and 150 brochures) at multi-family apartment complexes and residential neighborhoods that have been identified as located near sewer spills and attended Homeowners Association and other group meetings.
5. Distributed medical waste brochures to medical facilities identified in high spill areas where medical waste is the cause.
6. Reviewed 5,903 pump-out manifests as part of the Hauler Company Assessment program.
7. Delivered 791 warning notices and 10 court summons to non-compliant FSEs.
8. Performance Measures:
    a. Total number of FOG inspections 7,359
    b. Total number of FOG evaluations 1,541
    c. Average inspections per day 5.34
    d. Average permitted active FSEs 2,555
9. Mailed 2,041 best management practices brochures to FSEs with renewed FOG permits under the public education program.
10. Finalized the FOG permit renewal payment incorporation into water billing.

3. Sewer Mapping Program (CD VI.B.iii)

The 2015 Sewer Mapping Program continued building on the previous year's milestones such that the field surveyed sewer assets have now been assigned the required asset identification number (ID)s within the GIS database and are fully uploaded into the Computerized Maintenance Management System (CMMS) of Oracle WAM. GeoWorx Sync, a software solution, was scripted to actively maintain the link between WAM and GIS, allowing for updates to existing assets between the two systems and insertion of new assets. The successful upload and linkage of the assets between the two systems furthers the County's goal of using the GIS, CMMS, and modeling tools to provide real-time, visual information for planning and scheduling system maintenance and improvements. Moreover, other CMOM programs such as OSARP and PASARP, have taken advantage of the GIS innovations by using a mobile map application to track assessment work and rehabilitation projects against the GIS assets.

Key Accomplishments and Significant Activities:

1. Established asset cost hierarchies and completed the loading of more than 141,000 assets into the Oracle WAM production database, the assets included 35 sewersheds; 247 metersheds; 70,562 manholes; 70,686 gravity mains; 66 lift stations; 67 force mains; and 58 ARVs.

2. Implemented and successfully tested a scripted software solution to maintain a two-way link between Oracle WAM and the GIS.
3. Reviewed final sewer mapping deliverables against the central GIS and updated with either newly discovered assets from residential developments or field verification efforts for other programs, such as Hydraulic Modeling and PASARP.
4. Assisted OSARP and PASARP programs with generation of mobile maps showing sewer assets in the GIS and allowing assessment and rehabilitation personnel to track work against assets. These maps are used by managers to track work completed, in-field inspectors to verify work completed, public outreach to verify customer notification by- and permission on property given to- contractors, and by the contractors to show completion of assigned work.

   Figures 3-1 through 3-4 show screen shots of mobile mapping application.

Figure 3-1 Assignment Pipes for Tier I Smoke Testing Activity in Priority Area ISF3

Figure 3-2 Tier I Smoke Defect Form to Accompany Smoke Test on the Assigned Main

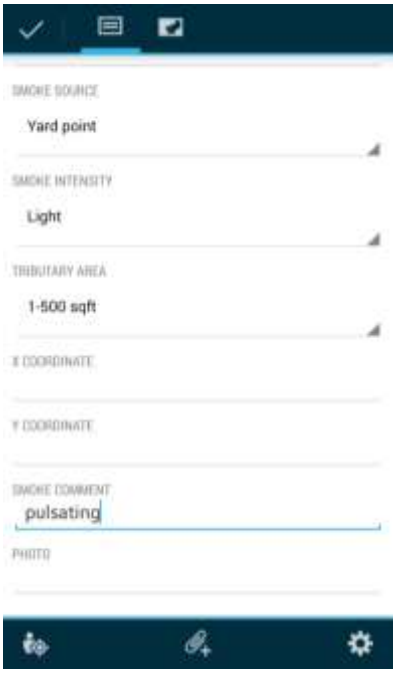


Figure 3-3 Displaying Assignment for Smoke Testing (Green) and Acoustic (Blue), as well as Manholes for Condition Assessment

Flow meters shown for contractor to plan for removal and reinsertion.

Figure 3-4 Displaying Completed Manhole Condition Assessments within a Priority Area

Each Assignment Activity Has a Tabular Form Associated with It, as Shown in Figure 3-2.

4. Maintenance Management System Program (CD VI.B.iv)

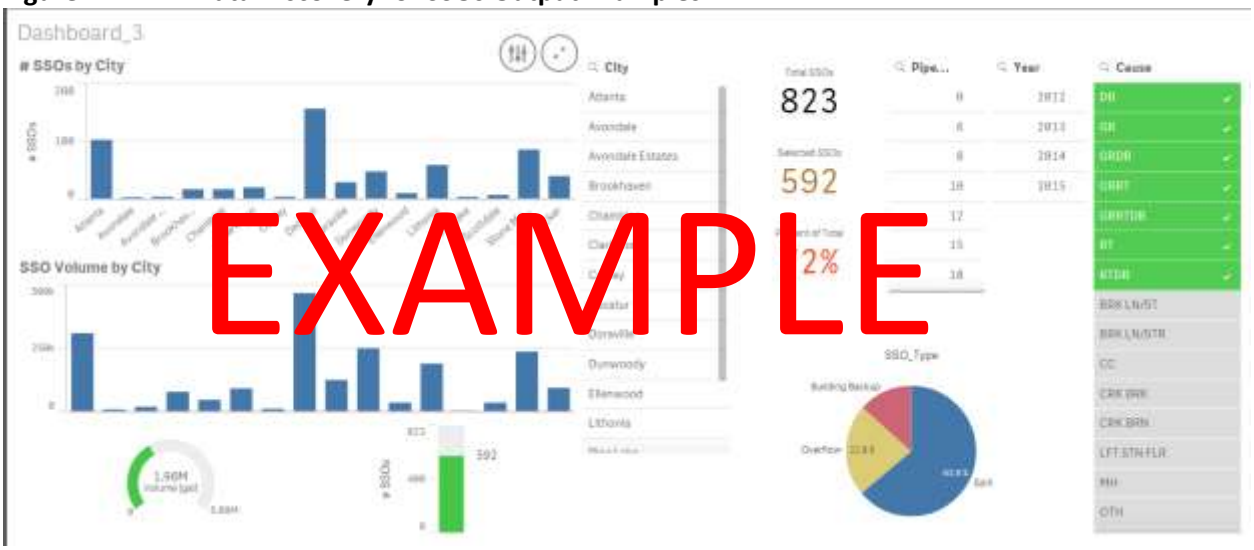
The County's MMS Program involves a combination of preventive, corrective, and predictive inspection and maintenance activities to maintain the WCTS. The Program is divided into two key areas: (1) tools that support the maintenance activities and (2) specific maintenance activities performed for the County's gravity system, lift stations, and force mains. Communication Systems, Physical Inspection and Testing, Information Management, and Inventory Management describe the tools used to support maintenance activities. Gravity System Maintenance and Lift Stations, Force Mains, and ARVs Maintenance describe the County's maintenance activities established under the MMS Program. Finally, the MMS provides Key Performance Indicators (KPIs) that will enable the County to measure its performance.

Key Accomplishments and Significant Activities:

1. Communication Systems – Laid the foundation for the deployment of devices for a mobile work order solution via the assignment of asset ID and the development of a work order tracking strategy. The mobile work order solution is an enhancement scheduled to be fully implemented in 2017.
2. Information Management – Evaluated and selected BI software. The selected software, Qlik Sense Desktop, was obtained and installed on several computers. DWM's SSO data was evaluated for trends and to mine insight into the occurrence and cause of SSOs. One of the benefits of BI is the data discovery capability and dynamic data querying and results display. BI allows DWM managers to access data about SSOs throughout the year to monitor progress and trends. BI also allows

customized dashboards for consuming data from any of DWM's enterprise systems, such as Oracle WAM and GIS. Each user can have data relevant to their role in a format that is efficient to comprehend. With BI, data becomes knowledge and knowledge improves decisions made to manage the collection system. Finally, BI provides an effective means to communicate data-driven conclusions and decisions. Figure 4-1 shows examples of the output from data discovery for SSOs.

Figure 4-1 Data Discovery for SSOs Output Examples



3. Inventory Management

   a. Initiated efforts to improve the efficiency of the spare parts re-order process as part of the inventory management strategy implementation to ensure parts are consistently available for corrective and proactive maintenance tasks. The Central Warehouse was able to add stocking levels to its systematized stock codes (over 1000) with Maximums, Minimums, Reorder Points and Reorder Quantities, which had not been previously established.

   b. Performed physical inventory successfully at each warehouse location. The DWM Operations warehouse location achieved outstanding audit results of a 101% for 2015.

   c. Continued to improve warehouse operations by reorganizing to maximize the use of existing space, installing self-serve vending machines for personal protective equipment and consumables, improving maintenance of portable equipment such as pavement saws and dewatering pumps, and developing and tracking warehouse metrics.

   d. Expanded warehousing efforts at the Snapfinger Plant with plans to add Warehouse Lead personnel to both the Scott Candler Water Treatment Plant and the Snapfinger Warehouses.

   e. Barcode scanner program was fully implemented and installed at each warehouse location.

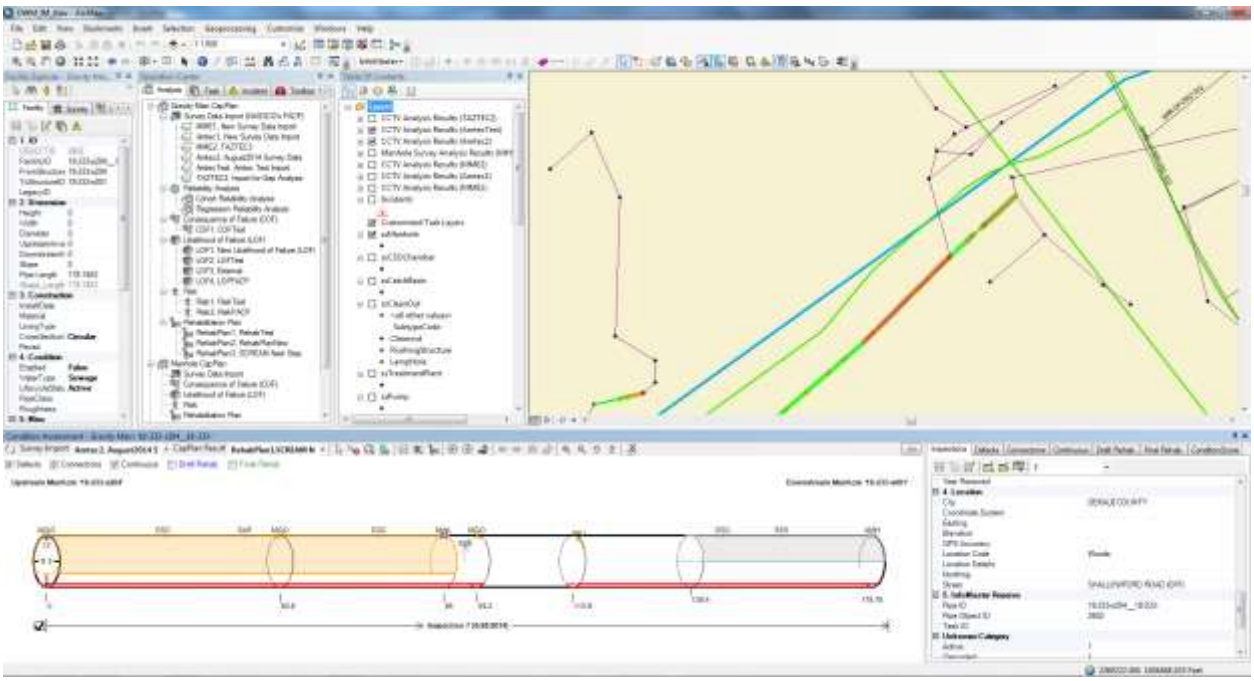
4. Gravity System Maintenance

   a. Completed a review of gravity system maintenance procedures. The MMS includes standard operating procedures for gravity system maintenance. It is important for these to be current and understood by field crews so they work in a manner that is effective, and thus reduce the likelihood of SSOs.

   b. Installed an asset condition scoring tool for gravity system assets. The tool will allow DWM to efficiently manage the large amount of asset condition assessment data generated by PASARP

and OSARP. Through scoring and reporting, the tool will prioritize those assets whose condition should be addressed first. This tool, when coupled with other tools such as GIS and InfoMaster, provides a powerful and efficient means to present data, improve decisions for rehabilitation and repair, and manage asset risk of failure. Figure 4-2 shows a screenshot from InfoMaster that illustrates how these tools come together.

Figure 4-2 InfoMaster Screen Shot



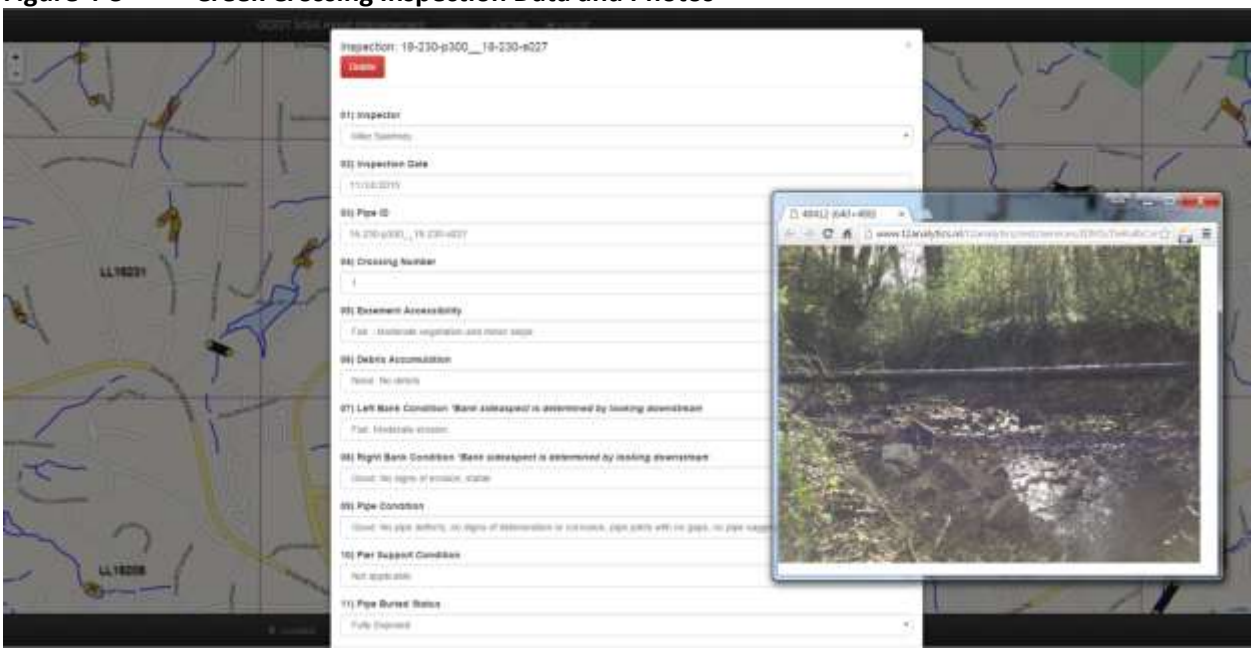
c. Continued to input repair and maintenance data into Oracle WAM.

d. Began the initial round of creek crossing inspections in 2015, with 1,809 creek and aerial crossing inspections completed.

   i. Nine crossings were submitted for follow-up repairs and another 42 identified for further review.

   ii. The inspections are accessible online by DWM staff and include data and observations about each crossing as well as photographs (see Figure 4-3).

Figure 4-3 Creek Crossing Inspection Data and Photos



5. Lift Station, Force Main, and ARV Maintenance

   a. Completed renovations at several lift stations (The current status of the MMS Lift Station projects is shown in Attachment A).

   b. Working statistics:

      i. Completed 4,693 preventive maintenance work orders (391/month).

      ii. Maintained a back log of two or less work orders per month over 30 days.

      iii. Averaged 1.4 lift stations per month with one pump out for service at some point.

      iv. Inspected sixty force main easements this year.

      v. Inspected twenty-two discharge manholes.

      vi. Performed force main pressure testing at forty of the stations.

      vii. Inspected twenty-two air relief valves.

      viii. Completed 9,081.5 total work orders hours:

         1. 51% preventive maintenance

         2. 41% corrective maintenance

         3. 8% went toward emergencies

   c. Reviewed and revised lift station maintenance procedures as needed to improve lift station maintenance operations.

   d. Initiated procurement of the hardware for each station needing bypass pumping connections.

      i. A bypass pump connection is located on the effluent side of the station where a bypass pump can be connected to allow wastewater to be pumped using the existing wet well and force main.

ii. This capability is helpful for both maintenance and operations and in the event of catastrophic failure at the lift station.

e. Developed a protocol for force main performance monitoring for those stations equipped with a pressure logger and flow meter.

i. By monitoring performance, DWM would have the ability to check for trends over time and proactively address issues before mechanical failure or significant degradation of lift station performance.

6. Tracked KPIs (see Attachment B).

5. Collection and Transmission Systems Training Program (CD VI.B.v)

In 2015, the County continued to deliver technical and skills training to DWM personnel related to applicable job responsibilities.

Key Accomplishments and Significant Activities:

1. Completed 8,295 hours of training in 2015 in 67 different subjects for 512 different staff members.
2. Includes training sessions, which DWM participated in, hosted, planned, conducted in house, or contributed to such as:
   a. Accountability
   b. Confined Space
   c. Continuity of Operations
   d. Portable saw training
   e. USEPA Decontamination Seminar
   f. Hazard Mitigation
   g. Ladders and scaffolds
   h. Personal Protective Equipment
   i. Walking and Working Surfaces
   j. Wastewater Collection System
   k. Wastewater Regulations and Compliance
   l. Safety
   m. Purchasing and Contracts
   n. CERP
   o. Chlorine Safety
   p. Defensive Driving
   q. Human Relations courses
   r. Computer Software
   s. First Aid
   t. Flagging

u. Forklift

v. Georgia Association of Water Professionals

i. Annual, Spring, Fall and Industrial Conferences

ii. District Meetings

iii. Special Seminars such as Knowledge Pipeline, Utility Executive, Water Loss, Asset Management, Emergency Response, etc.

6. System-Wide Flow and Rainfall Monitoring Program (CD VI.B.vi)

The Program's goal is to provide an efficient and effective data monitoring network to assess capacity and infiltration/inflow (I/I) issues within the WCTS. Additional flow and rainfall monitors were installed in 2014 to expand the data collection efforts in support of the hydraulic model development and to investigate connectivity issues. Dry weather flow data were sufficiently collected in 2014; however, from January through June 2015 wet weather flow data were collected and compiled for further processing and application in the hydraulic model development and simulations. The compiled data provide the County with pre-rehabilitation information needed to compare the effectiveness of future rehabilitation efforts under the PASARP and OSARP.

Key Accomplishments and Significant Activities:

1. Collected, compiled, and performed quality assurance/quality control (QA/QC) review of January through June flow monitor and rain gauge data, site assessment and testing reports, site inspection reports, and other required documentations.
2. Updated the flow monitor basin delineation maps and flow monitor relational schematic diagrams based on additional sewer mapping data.
3. Observed the hydrographs and scatter graphs periodically on flow monitor and rain gauge data. Anomalies found were investigated further.
4. Established the correlation between flow monitors and rain gauges for subsequent rainfall-derived infiltration and inflow (RD I/I) and peaking factor analysis and determination.
5. Consolidated data storage and backup solutions for flow and rain gauge equipment.

7. System-Wide Hydraulic Model (CD VI.B.vii)

DWM is developing a computer-based dynamic hydraulic model (the Model) for the County's WCTS. The Model will integrate data from the Sewer Mapping Program and the System-Wide Flow and Rainfall Monitoring Program. The Model will be used to determine the system capacity under dry weather and wet weather conditions and to enable the County to identify, characterize, and address hydraulic deficiencies. By modeling the system, an understanding of the hydraulic behavior of the WCTS will assist DWM in making informed decisions concerning strategic planning and capital improvements required to meet the performance goals of the County and environmental regulations.

In 2015, modeling development tasks included sewer system mapping data validation, model network construction, Dry Weather Flow input and calibration, and initial simulations for subsequent Peak Flow Capacity Assessment. Field activities were performed primarily in the Inter-Governmental Basin at select sites of the sewer system to clarify system information associated with sewer connectivity and pipe invert elevations.

Key Accomplishments and Significant Activities:

1. Used the identified and assembled sewer system component data and attributes as required to successfully build the basin-wide and sewershed models.
2. Continued to update, document, and refine the modeling protocols used to build and calibrate the hydraulic models.
3. Completed model network construction and flow loading of the Snapfinger and Pole Bridge Basins.
4. Substantially completed the model's sewer system network construction and flow loading for the Inter-Governmental Basin sewershed models except for the Dry Weather Flow loading for the North Fork Peachtree Creek and South Fork Peachtree Creek sewersheds.
5. Performed Dry Weather Flow calibrations of Snapfinger and Pole Bridge Basin models and Inter-Governmental basin sewershed models (except North Fork Peachtree Creek and South Fork Peachtree Creek).
6. Completed the Peak Flow Capacity Assessment simulations for the Snapfinger and Pole Bridge Basin models to prepare the network for subsequent model runs.

8. Financial Analysis Program (CD VI.B.viii)

DWM Financial Analysis Program incorporates aspects of revenue estimating, budgeting, costs analysis, and customer rate setting such that DWM provides the desired level of service to its customers while meeting its regulatory requirements. In 2015, the reporting changes for separating drinking water and wastewater budgets were implemented and the 2016 Operating and CIP budgets were submitted timely. The Department continues to monitor its revenue and expenditure budgets.

Key Accomplishments and Significant Activities:

1. Implemented the reporting changes for separating drinking water and wastewater budgets.
2. Projected the 2015 year-end financial results for revenue and expense are on track.
3. Concluded the 2015 Revenue Sufficiency and Rate Review Study with no rate adjustment for 2016.
4. The chart below provides estimates of maintenance costs:

Cost Category	Amount
Corrective	$1,909,030
Preventive	$3,032,278
Emergency	$8,145,929
Total	**$13,087,237**

9. Infrastructure Acquisitions Program (CD VI.B.ix)

The goals of the Infrastructure Acquisitions Program are to acquire infrastructure that meets County standards for design, construction, capacity, and efficiency and to maintain a program that properly monitors the acquisition process, encourages input, and is efficient for contractors, developers, property owners, and the County. In 2015, an additional engineer was brought under this program to facilitate reviews and customer service.

Key Accomplishments and Significant Activities:

1. Evaluated and/or acquired 49,031 LF of pipe and one lift station.

2. Conducted various reviews as required under the program included one private lift station retrofit review; 29 Sketch Plat reviews; 137 City Land Disturbance Permit Reviews; 146 Unincorporated Land Disturbance Permit Reviews; 19 Peer Reviews; 684 City Reviews; 69 Final Plat Reviews; 16 Easement Reviews; and 11 Septic Tank Conversions.
3. Met daily with DWM inspectors to avoid and address field issues, to streamline the process for review, approval, acceptance of new infrastructure.
4. Began enforcing the requirement that incorporated Re-zonings, Special Land Use Permits, Lot Splits, Plats, Variances be reviewed and approved by DWM prior to approval of the local governments for future development.

10. Priority Areas Sewer Assessment and Rehab Program (CD VI.B.x)

The main purpose of the PASARP is to provide for the identification, delineation, assessment, prioritization, and rehabilitation of Priority Areas (both Initial Priority Areas and Additional Priority Areas as explained in the Consent Decree) within the County WCTS. The Initial and Additional Priority Areas total approximately 776 miles of sewers (approximately 29.5% of the WCTS). In implementing the PASARP, the County is undertaking certain condition, structural, and hydraulic assessments within the Priority Areas, in order to identify, prioritize, and complete appropriate rehabilitation measures within those areas. As part of the implementation process, the County is tracking rehabilitation measures completed within the Priority Areas and will determine the effectiveness of those measures, using selected KPIs.

In 2015, the County performed work in the PASARP prioritized areas utilizing ongoing annual assessment and rehabilitation contracts in conjunction with preparation for the larger PASARP tiered assessment contracts, which address the remainder of the assets within the Priority Areas. The work performed for these contracts included contract document preparation, procurement of the assessment contractors, and preparation of the County's data collection and analysis applications to manage the large amounts of data and information the contractors will generate. These advanced preparations will expedite the delivery of cost-effective rehabilitation recommendations. The tiered assessment contracts include rehabilitation directed toward making urgent point repairs and raising buried manholes to allow for asset access.

Key Accomplishments and Significant Activities:

1. Performed assessments and cleaning under general DWM contracts that included approximately:
    a. 413,724 LF of CCTV
    b. 109 manhole condition assessments followed by manhole lining and/or other rehabilitation
    c. 398,935 LF of cleaning sewer main
2. Performed 109 manhole lining.
3. Refined the post SSO assessment approach to identify and mitigate associated root cause structural or maintenance defects.
4. Developed program rehabilitation decision logic tools incorporating customized approach for risk based prioritization.
5. Finalized technical specifications for assessment and urgent point repair rehabilitation and distributed specifications according to the ranking area priority.
6. Completed procurement process of the following PASARP tiered assessment and rehabilitation contracts:

a. PASARP Assessment Contracts, Sewer Group 1, 2, and 3: Bids were opened on July 9, 2015
b. Notice of Award issued November 27, 2015
c. Notice to Proceed issued on December 30, 2015

7. Continued execution of project communications and community outreach for ongoing projects.
8. Developed quality assurance tools and protocols and provided contractor training for the assessment contractors to screen data prior to submitting to DWM.
9. Expanded application of mobile devices to report status of contractors' activities and record field inspection data.
10. Continued the development and refinement of work flow and decision tools that would be applied to the results of the condition assessments and integration with the hydraulic modeling results
    a. Included the scoring of the condition assessment inspections,
    b. Incorporated risk determination with the consequence of failure into the scoring
    c. Formulated a multi-criteria rehabilitation decision logic that is integrated with the modeling results
11. Tracked KPI as shown in Table 10-1.

Table 10-1 PASARP Key Performance Indicators

KPI	2013 Performance	2014 Performance	2015 Performance
SSOs per 100 miles of WCTS within the Priority Areas per year	20.8 per 100 miles within the Priority Areas per year	18.9 per 100 miles within the Priority Areas per year	14.1 per 100 miles within the Priority Areas per year
SSOs per 100 miles of WCTS within the Priority Areas per year per inch of rain within the Priority Areas	0.31 per 100 miles per year per inch of rain within the Priority Areas	0.40 per 100 miles per year per inch of rain within the Priority Areas	0.24 per 100 miles per year per inch of rain within the Priority Areas
Total volume of spills per 100 miles of WCTS within the Priority Areas	70,694 gallons per 100 miles within the Priority Areas	32,214 gallons per 100 miles within the Priority Areas	89,629 gallons per 100 miles within the Priority Areas
Total volume of spills per 100 miles per inch of rain within the Priority Areas	1,071 gallons per 100 miles per inch of rain within the Priority Areas	676 gallons per 100 miles per inch of rain within the Priority Areas	1,557 gallons per 100 miles per inch of rain within the Priority Areas
Number of dry weather SSOs* within the Priority Areas	153 dry weather SSOs* within the Priority Areas	142 dry weather SSOs* within the Priority Areas	89 dry weather SSOs* within the Priority Areas

** Dry weather SSO KPI, removed the SSOs with cause listed as STORM (assumed others were dry weather SSOs).*

11. Ongoing Sewer Assessment and Rehabilitation Program (CD X 38.)

The main purpose of the OSARP is to ensure continuous assessment and rehabilitation of the County's WCTS. The OSARP governs assessment and rehabilitation of those areas outside the Priority Areas while the Consent Decree is in effect, and will continue to exist after the Consent Decree expires. It is enabling the County to continuously and proactively identify, delineate, and prioritize areas or sewer segments within the WCTS for condition assessment and rehabilitation, as appropriate, starting with areas not being addressed under the PASARP. The implementation of the OSARP takes into consideration data obtained through other ongoing County programs and operations including the:

- CMOM programs, information obtained from customers and the general public
- Assessment and rehabilitation work performed under the PASARP
- Hydraulic modeling results
- Knowledge and experience of County personnel
- Best engineering practices and/or best management practices

In 2015, after reviewing CERP SSO data, DWM determined that additional preventive efforts would be beneficial. Therefore, sewer cleaning and CCTV contract documents were developed for 15 areas that included approximately 800,000 LF of sewer and 5,000 manholes. These contracts started in the third quarter of 2015. The inspections in these areas are being evaluated using the same analysis tools and procedures as those for PASARP. The rehabilitation portion of the contracts is directed more towards making urgent point repairs and raising buried manholes.

Attachment C provides a map of the 15 areas (cross-hatched) planned Cleaning, Manhole Condition and CCTV Assessment Locations for General Area Contracts.

Key Accomplishments and Significant Activities:

1. Completed procurement process and started assessment in the OSARP areas:
    a. General Area Manhole Assessment Contract: Notice to Proceed issued on August 31, 2015 and inspected approximately 539 manholes
    b. General Area CCTV Contract: Notice to Proceed issued July 28, 2015 and cleaned and/or CCTV'd approximately 315,144 LF of sewers
2. Tracked KPI as shown in Table 11-1.

Table 11-1 OSARP Key Performance Indicators

KPI	2013 Performance	2014 Performance	2015 Performance
SSO per 100 miles of WCTS per year	18.0 per 100 miles per year	16.6 per 100 miles per year	14.4 per 100 miles per year
SSO per 100 miles of WCTS per year per inch of rain	0.27 per 100 miles per year per inch of rain	0.35 per 100 miles per year per inch of rain	0.25 per 100 miles per year per inch of rain
Total volume of spills per 100 miles of WCTS	51,833 gallons per 100 miles	34,357 gallons per 100 miles	79,099 gallons per 100 miles
Total volume of spills per 100 miles per inch of rain	785 gallons per 100 miles per inch of rain	721 gallons per 100 miles per inch of rain	1,374 gallons per 100 miles per inch of rain
Number of dry weather SSOs*	419 dry weather SSOs	389 dry weather SSOs	309 dry weather SSOs

** Dry weather SSO KPI, removed the SSOs with cause listed as STORM (assumed others were dry weather SSOs).*

12. Supplemental Environmental Project (CD VIII)

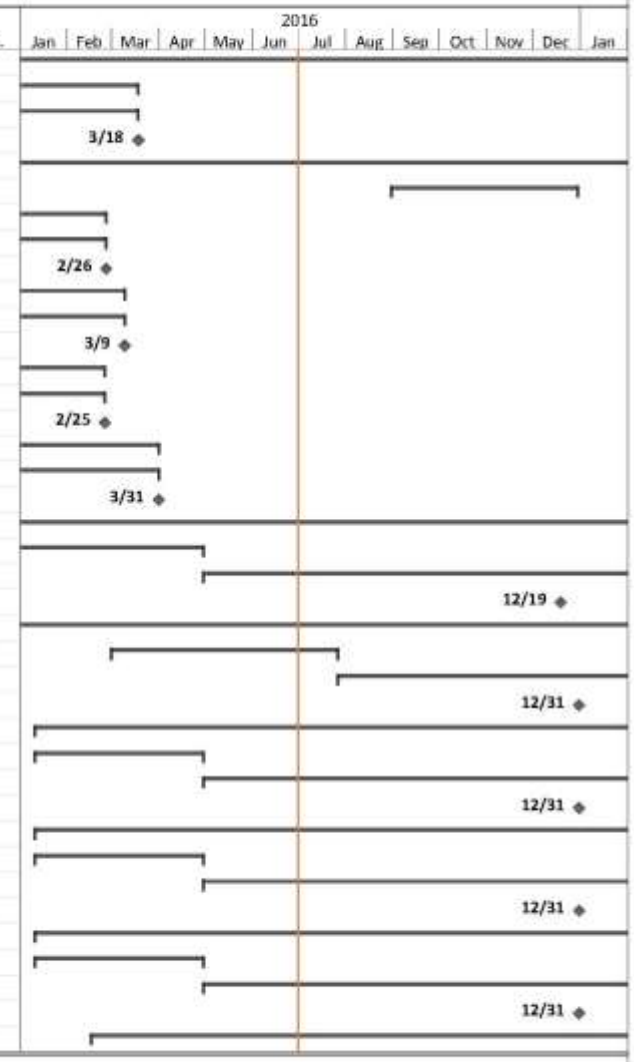
The Supplemental Environment Project was completed in 2014.

Attachment A
Lift Stations and Other CIP Projects' Schedule

Dekalb County Department of Watershed Management

CDPMT Master Schedule
Annual Report - Consent Decree
CIP PROJECTS

ID	Task Name	Start	Finish	CD/CMOM Date	% Complete.
1438	**CIP Rehab/Construction Projects**	**10/10/14**	**3/29/19**	**NA**	
1440	**Superior Ave SS PH II {D/B/B}**	**3/19/15**	**3/18/16**	**NA**	**100**
1474	**Construction**	**8/14/15**	**3/18/16**	**NA**	**100**
1478	Final Completion	3/18/16	3/18/16	NA	100
1484	**Caladium Drive {D/B}**	**2/13/15**	**9/3/17**	**NA**	**3**
1490	**Design/Build Procurement**	**8/31/16**	**12/30/16**	**NA**	**0**
1547	**Perimeter Park LS {D/B/B}**	**3/27/15**	**2/26/16**	**NA**	**100**
1572	**Construction**	**7/1/15**	**2/26/16**	**NA**	**100**
1576	Final Completion	2/26/16	2/26/16	NA	100
1581	**Royal Atlanta I LS {D/B/B}**	**3/27/15**	**3/9/16**	**NA**	**100**
1606	**Construction**	**7/1/15**	**3/9/16**	**NA**	**100**
1610	Final Completion	3/9/16	3/9/16	NA	100
1615	**Pepperwood LS {D/B/B}**	**3/27/15**	**2/25/16**	**NA**	**100**
1640	**Construction**	**7/1/15**	**2/25/16**	**NA**	**100**
1644	Final Completion	2/25/16	2/25/16	NA	100
1659	**Scarbourgh LS {D/B/B}**	**4/22/15**	**3/31/16**	**NA**	**100**
1689	**Construction**	**9/29/15**	**3/31/16**	**NA**	**100**
1693	Final Completion	3/31/16	3/31/16	NA	100
1743	**Columbia Drive LS {D/B}**	**4/3/15**	**3/31/17**	**NA**	**15**
1744	**Design/Build Procurement**	**4/3/15**	**4/29/16**	**NA**	**100**
1770	**Design/Build**	**4/30/16**	**3/31/17**	**NA**	**15**
1772	Substantial Completion	12/19/16	12/19/16	12/31/16	0
1779	**Honey Creek LS ** {D/B}**	**10/15/15**	**3/31/18**	**NA**	**14**
1780	**Design/Build Procurement**	**3/1/16**	**7/26/16**	**NA**	**50**
1797	**Design/Build**	**7/27/16**	**3/31/18**	**NA**	**14**
1799	Design Completion	12/31/16	12/31/16	12/31/16	0
1807	**Stonecrest LS (new) {D/B}**	**1/11/16**	**4/4/17**	**NA**	**23**
1808	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1825	**Design/Build**	**4/30/16**	**4/4/17**	**NA**	**23**
1827	Substantial Completion	12/31/16	12/31/16	12/31/16	0
1834	**Lithonia I LS Demo {D/B}**	**1/11/16**	**4/4/17**	**NA**	**23**
1835	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1852	**Design/Build**	**4/30/16**	**4/4/17**	**NA**	**23**
1854	Substantial Completion	12/31/16	12/31/16	12/31/16	0
1861	**Lithonia II LS Demo {D/B}**	**1/11/16**	**4/4/17**	**NA**	**23**
1862	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1879	**Design/Build**	**4/30/16**	**4/4/17**	**NA**	**23**
1881	Substantial Completion	12/31/16	12/31/16	12/31/16	0
1888	**Leeshire LS ** {D/B/B}**	**2/17/16**	**11/23/18**	**NA**	**3**



Statused thru 6/30/16

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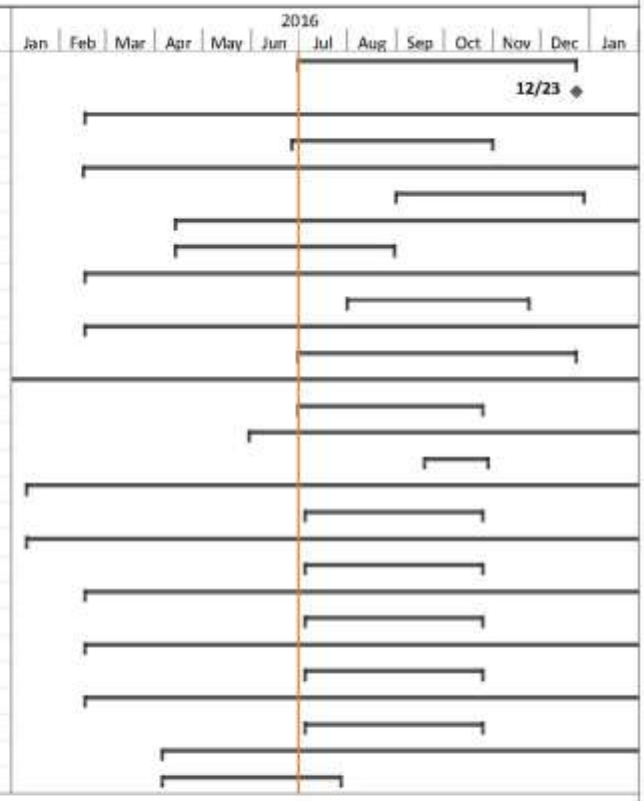
Dekalb County Department of Watershed Management

CDPMT Master Schedule
Annual Report - Consent Decree
CIP PROJECTS

ID	Task Name	Start	Finish	CD/CMOM Date	% Complete.
1891	**Design**	**7/1/16**	**12/23/16**	**NA**	**0**
1893	Design Completion	12/23/16	12/23/16	12/31/16	0
1953	**Hammer Mill I LS {D/B/B}**	**2/17/16**	**12/25/17**	**NA**	**0**
1956	**Design**	**6/27/16**	**10/31/16**	**NA**	**0**
2016	**Royal Atlanta III LS {D/B}**	**2/16/16**	**1/30/18**	**NA**	**8**
2019	**Design / Build Procurement**	**9/1/16**	**12/28/16**	**NA**	**0**
2043	**Johnson Creek LS {D/B}**	**4/14/16**	**1/30/18**	**NA**	**14**
2044	**Design/Build Procurement**	**4/14/16**	**8/30/16**	**NA**	**50**
2070	**Hearn Road LS {D/B/B}**	**2/17/16**	**1/14/18**	**NA**	**0**
2073	**Design**	**8/1/16**	**11/23/16**	**NA**	**0**
2133	**American Fare LS {D/B/B}**	**2/17/16**	**1/27/18**	**NA**	**0**
2136	**Design**	**7/1/16**	**12/23/16**	**NA**	**0**
2197	**Lewis Way LS {D/B}**	**10/15/15**	**6/30/18**	**NA**	**11**
2198	**Design/Build Procurement**	**7/1/16**	**10/25/16**	**NA**	**0**
2287	**I85 / Oakcliff Rd {D/B/B}**	**5/31/16**	**12/27/17**	**NA**	**11**
2290	**Design**	**9/19/16**	**10/28/16**	**NA**	**0**
2350	**Stone Mill I LS {D/B}**	**1/11/16**	**6/30/17**	**NA**	**11**
2351	**Design/Build Procurement**	**7/5/16**	**10/25/16**	**NA**	**0**
2377	**Stone Mill II LS {D/B}**	**1/11/16**	**6/30/17**	**NA**	**11**
2378	**Design/Build Procurement**	**7/5/16**	**10/25/16**	**NA**	**0**
2404	**Camp Creek LS {D/B}**	**2/17/16**	**6/30/17**	**NA**	**11**
2405	**Design/Build Procurement**	**7/5/16**	**10/25/16**	**NA**	**0**
2431	**Pennybrook LS {D/B}**	**2/17/16**	**6/30/17**	**NA**	**11**
2432	**Design/Build Procurement**	**7/5/16**	**10/25/16**	**NA**	**0**
2458	**Fourth St LS {D/B}**	**2/17/16**	**6/30/17**	**NA**	**11**
2459	**Design/Build Procurement**	**7/5/16**	**10/25/16**	**NA**	**0**
2549	**Kings Way LS {D/B}**	**4/6/16**	**7/30/17**	**NA**	**5**
2550	**Design/Build Procurement**	**4/6/16**	**7/27/16**	**NA**	**50**



Statused thru 6/30/16

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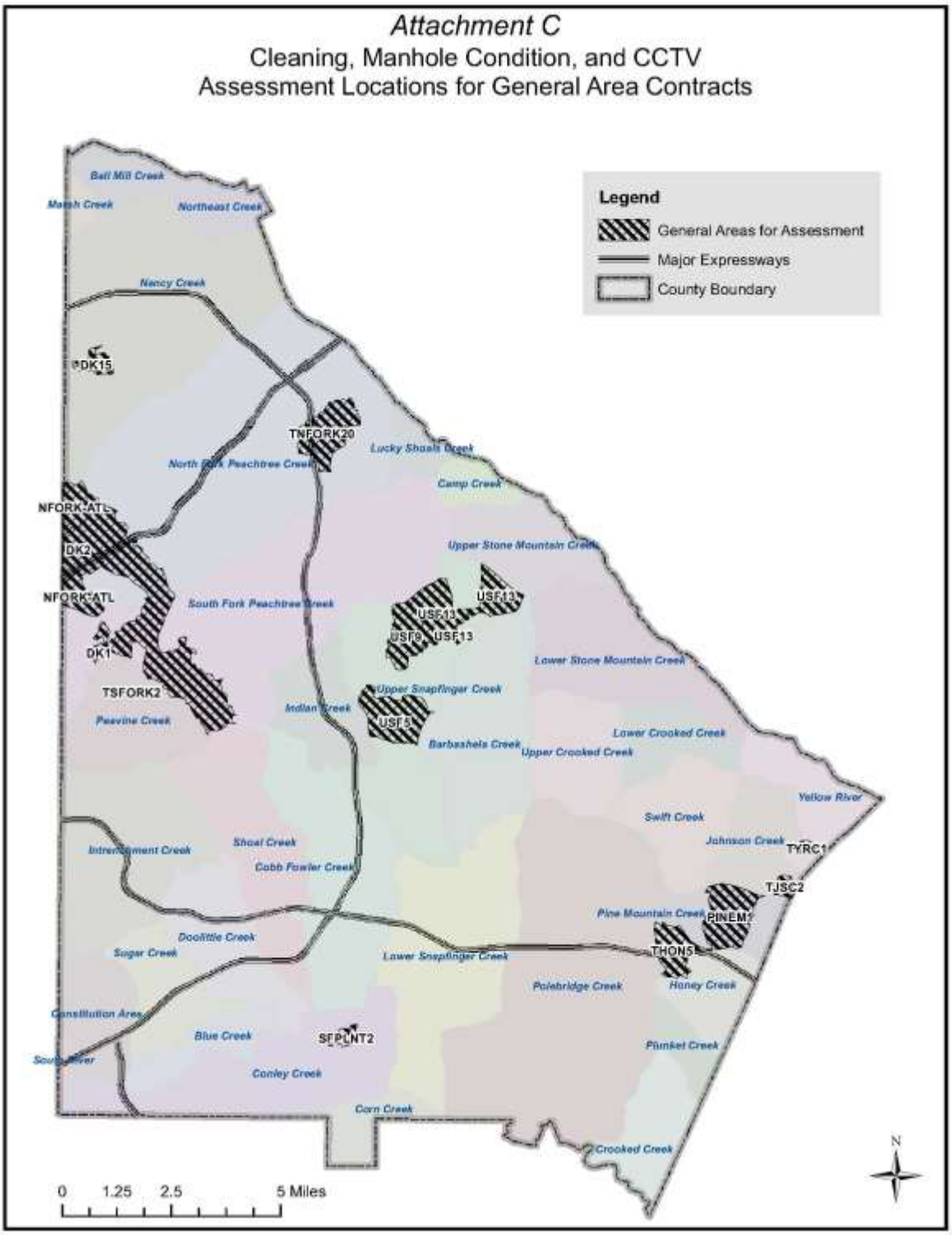
Attachment B
MMS KPIs

KPI	Formula	2015 Results
Communication System Program		
Landline dropped calls	Number of dropped calls	Average of 0 dropped calls per month (for January – May 2015)
Landline missed calls	Number of missed calls	Average of 15 missed calls per month (for January – May 2015)
Call Duration	Duration of calls in minutes divided by the number of calls	To be tracked in 2016
Information Management		
Active SSO-Driven Sewer Service Request Percentage	Number of Active SSO-driven sewer service requests ÷ number of Finished sewer service requests in the reporting period x 100	2.9% SSO-driven sewer service requests
Inventory Management		
Percent out-of-stock items	For the reporting period, the number of parts out of stock when requested ÷ total number of parts requested x 100	1.9% of out-of-stock items
Physical Inventory Performance	The percentage of items whose quantity on hand does match the quantity in Oracle WAM	101% of items match the quantity in Oracle WAM (found additional items)
Physical Inventory Audit	The net cost difference in the value of the physical count vs. the value of inventory shown in Oracle WAM	1% net cost difference
Gravity System		
Preventive Maintenance(PM): CCTV Inspection of Sewer Lines, Operations and Contractors	Number of miles inspected ÷ Total miles of sewer line x 100	5.6% sewer lines CCTV'd
PM: Percent Sewer Lines Cleaned	Number of miles cleaned ÷ Total Miles x 100	25% sewer lines cleaned
PM: Linear feet Root Treatment per year	Number of feet of roots removed ÷ Number of linear feet of sewer system x 100 Conversion factor: 5,280 feet/mile	700 linear feet of root treatment

KPI	Formula	2015 Results
PM: Number/percent of manholes inspected per year	Number manholes inspected ÷ Total number of manholes in system x 100	7.55% manholes inspected
Emergency Maintenance (EM): Number of SSOs per mile of gravity sewer line	Number of SSOs ÷ WCTS total miles of gravity lines x 100	14.1% SSOs per mile of gravity sewer line
Lift Stations, Force Mains, and Appurtenances		
PM: PM Hours Worked versus Corrective Maintenance (CM) and EM Hours Worked	Oracle WAM Value: PM hours total ÷ total hours worked. CM and EM hours total ÷ total hours worked. Each Number x 100 to show percentage. Display as ratio.	PM 51% CM: 49%
PM: Backlogged PM Work Orders	Oracle WAM Value. Number of work order not completed ÷ Total number of Work Orders (x 100)	1.52% backlogged PM work orders
PM: Completed PM Work Orders (based on timeframe specified)	Oracle WAM Value. Number of work orders completed by timeframe	Number of work orders completed within: 0-2 days - 9 3-6 days - 44 7-13 days - 14 14-29 days - 3 30-59 days - 1 > 60 days - 1
CM: Percent lift stations with pumps out	Percent Value. Number of stations with pumps out ÷ Total number of stations (X 100)	1.4% lift stations with pumps out
PM: Percent of ARVs inspected, flushed, and serviced	Number of ARVs inspected, flushed, and serviced per year ÷ Total number of ARVs (X 100)	38.6% ARVs inspected, flushed, and serviced

Attachment C
Cleaning, Manhole Condition, and CCTV Assessment Locations for General Area Contracts


Attachment C
Cleaning, Manhole Condition, and CCTV
Assessment Locations for General Area Contracts
Legend
General Areas for Assessment
Major Expressways
County Boundary
Ball Mill Creek
Marsh Creek
Northeast Creek
Nancy Creek
DK15
TNFORK20
Lucky Shoals Creek
North Fork Peachtree Creek
Camp Creek
NFORK-ATL
DK2
Upper Stone Mountain Creek
NFORK-ATL
South Fork Peachtree Creek
USF13
USF11
USF9
USF13
DK1
Lower Stone Mountain Creek
TSFORK2
Upper Snapfinger Creek
Indian Creek
Peavine Creek
USF5
Lower Crooked Creek
Barbashela Creek
Upper Crooked Creek
Yellow River
Swift Creek
Johnson Creek
TYRC1
Shoal Creek
Cobb Fowler Creek
TJSC2
Pine Mountain Creek
PINEM1
Doolittle Creek
Sugar Creek
THON5
Lower Snapfinger Creek
Honey Creek
Polebridge Creek
Blue Creek
SFPLNT2
Plunket Creek
Conley Creek
Corn Creek
Crooked Creek
N
0
1.25
2.5
5 Miles

Part II Sanitary Sewer Overflow Trends Analysis

Executive Summary

As required by Section IX, Reporting Requirements 58(b) of the Consent Decree, the following trends analysis is submitted for the 24-month period to include calendar years 2014 and 2015.

The referenced section of the Consent Decree calls for a trend analysis to be submitted on an annual basis, as follows:

> *"A trends analysis of the number, volume, average duration, and cause of the County's Sanitary Sewer Overflows (SSOs) for the previous twenty-four (24) month period."*

The report that follows is intended to meet two purposes. First, the report meets the requirements of the annual Trends Analysis in that it looks back at the 24-month period to include calendar years 2014 and 2015, including data from 2012 and 2013 for reference. As required by the Consent Decree, the report addresses the three specific spill types (spills, overflows, and building backups) as they apply to the various data and trends. Section 1 provides a brief overview of the DeKalb County Department of Watershed Management recordkeeping. Section 2 presents the number and volume of SSOs. Section 3 presents an analysis of average duration of SSOs, and Section 4 presents an analysis of causes of SSOs. Section 5 presents other trends, specifically those related to pipe size and rainfall.

Second, the following report serves as a cumulative corrective addendum to all previously submitted Trends Analyses. As discussed above, in early 2016, the County became aware of inconsistencies between the frequency and classification of actual SSO events versus what was being reported to EPA and EPD. As a result of these apparent inconsistencies, the County conducted an in-depth review of its Service Requests and other records dating to the beginning of the Consent Decree period to verify the number of spills and overflows previously reported and analyzed. The details of that initial review and its findings were previously reported in documents submitted by the County on August 1, 2016. After that date, it was determined that an additional level of review, to include additional service requests and relevant email correspondence, was necessary to ensure that all reportable events had been discovered, properly classified, and reported in accord with Consent Decree requirements. The details of this second review and the results thereof are being separately reported, but this Trends Analysis incorporates all currently available information and includes the additional SSO events discovered during all phases of the County's in-depth retroactive review of Service Requests. In order to give an accurate report and the fullest analysis possible, the following report expands the traditional 24-month period to include the 48-month period from January 2012 through December, 2015.

Figure ES-1 compares the number of SSOs by type and year as reported previously to what is now being reported. While the revised numbers reflected in Figure ES-1 confirm a general downward trend in the number of SSOs of all types, the County has likely been over-inclusive in reporting the number of building back-ups from 2012-2015. During the County's comprehensive review of Service Requests for the 1st Quarter of 2016, it became apparent that some Service Requests did not contain enough detail to definitively determine if any materials actually left the County's WCTS, an essential element in determining if an event is properly classified as a building back-up. Out of an abundance of caution, those situations in which such questions remained have been included in the numbers that form the basis of the Trends Analysis. To eliminate such questions moving forward, the County has revised the service request forms and is retraining all response crews on the level of detail required in such reports. As these changes were implemented during the 2nd Quarter of 2016, the County anticipates having all

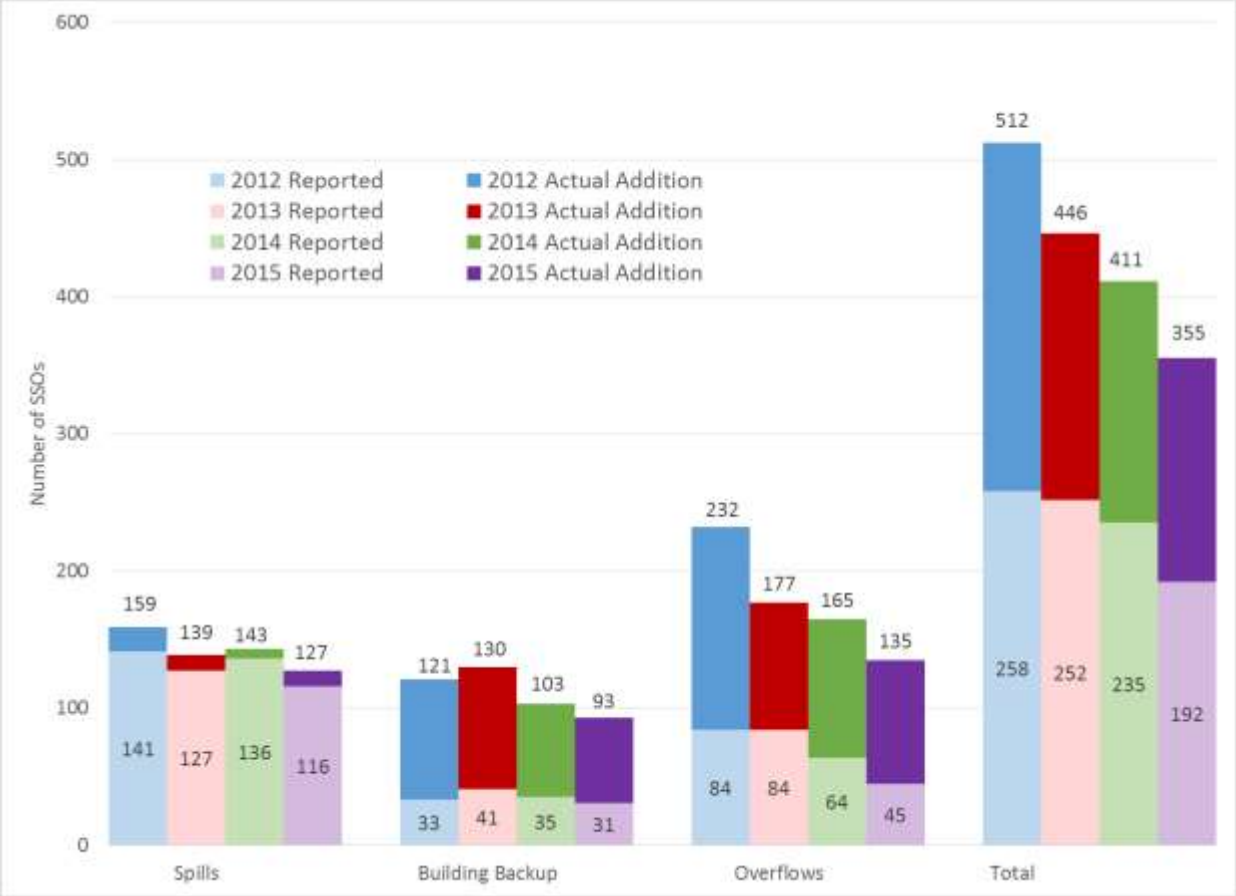
necessary information to accurately track building back-ups for inclusion in the 2016 3rd Quarterly Report.

	Number of SSOs Prior to Reviews	Number of SSOs (Phase I Review)	Number of SSOs (Phase II Review)	Number of SSOs (Phase IIIA Review)	Number of SSOs (Phase IIIC Review)	Number of SSOs (Phase IIIB Review)	Total Number of SSOs
2012	258	250	0	4	0	0	512
2013	252	186	2	6	0	0	446
2014	234	169	3	4	1	0	411
2015	192	156	2	5	0	0	355
TOTAL	**936**	**761**	**7**	**19**	**1**	**0**	**1724**

The number of spills has decreased approximately 20 percent from 2012 to 2015 (see Figure ES-2).

Overall, the number of spills has decreased for the categories of grease, structural, and debris (see Figure ES-3). This is a positive trend and directly correlates to the increased field activity undertaken by DWM to expand its preventive maintenance cleaning program and use of closed-circuit television (CCTV) more extensively to check for structural defects. Though the data seems to indicate SSOs attributed to storms are increasing, a series of extreme rain events in December 2015 skewed the results. DWM is working on a hydraulic model of the collection system to better assess wet weather performance.

Figure ES-1 Comparison of Previously Reported to Currently Reported SSOs (2012–2015)



Note:
The number of building backups reflected in Figure ES-1 is likely over-inclusive as it includes those events for which Service Requests did not contain enough detail to definitively determine if any materials actually left the County's WCTS, an essential element in determining if an event is properly classified as a building back-up.

Figure ES-2 Spills by Year (2012–2015)

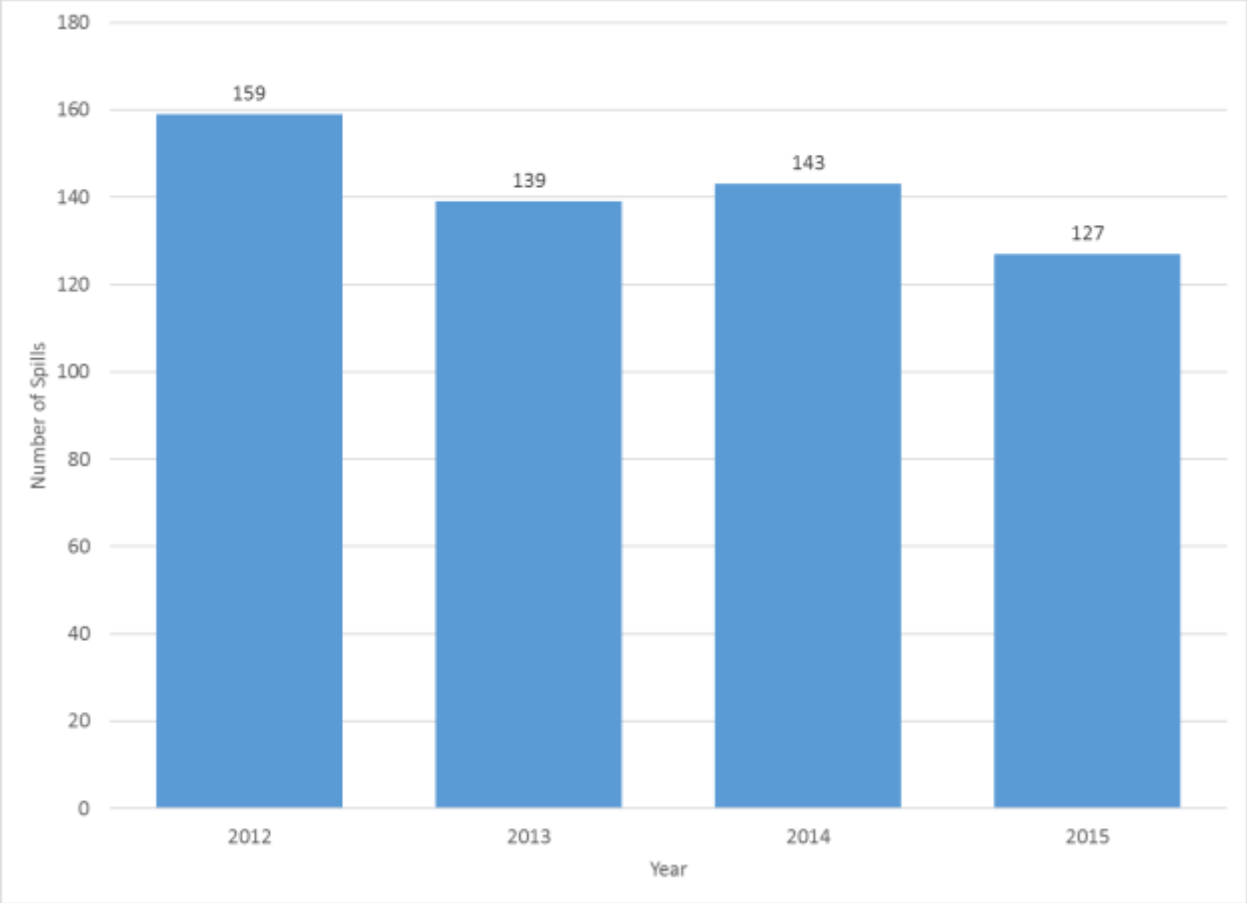
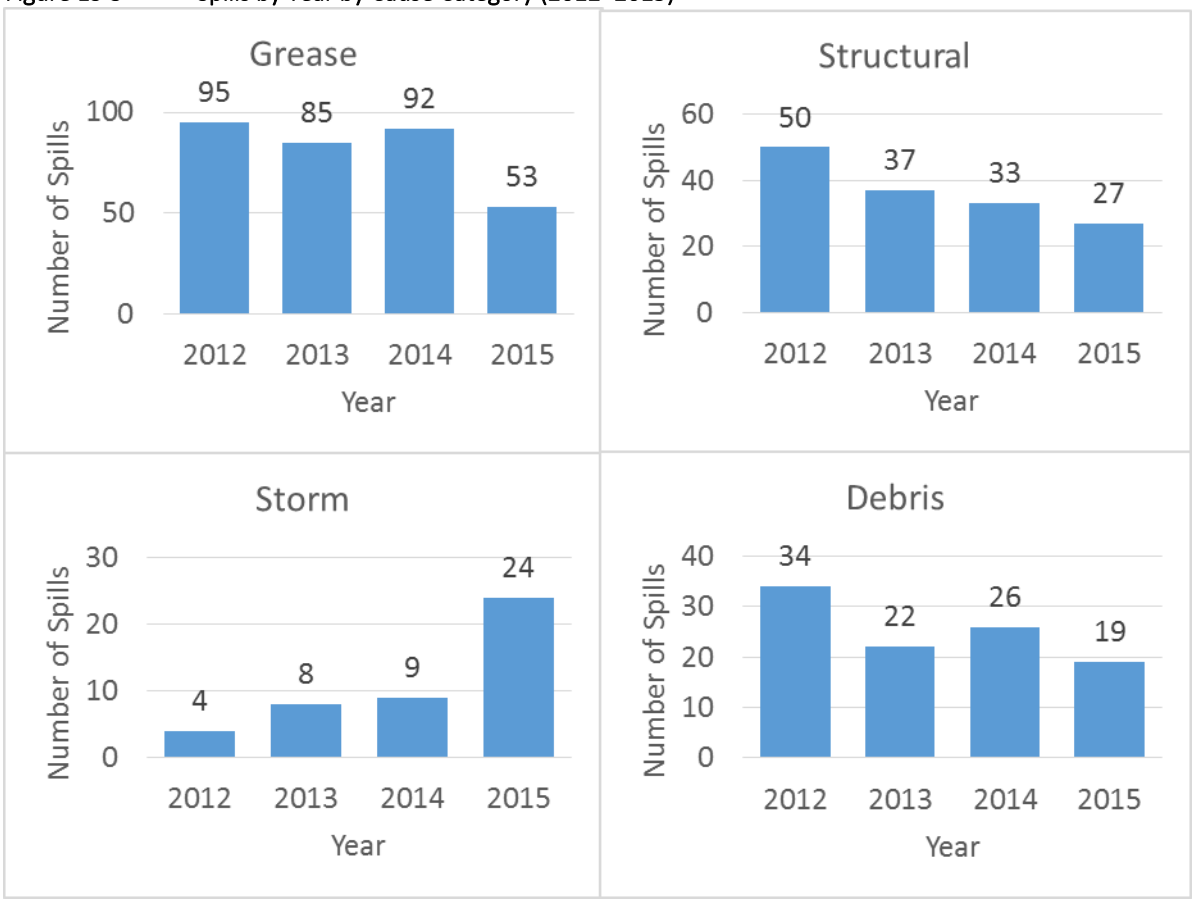


Figure ES-3 Spills by Year by Cause Category (2012–2015)



Note:
Cause Categories may include more than one cause. Some causes appear in more than one Cause Category.

1. Classification of SSO Types Causes

The Consent Decree requires a trend analysis of the prior 24-month period. As noted above, in order to gain a more comprehensive view of the revised SSO data and to correct all previously submitted trends analyses, DWM analyzed trends for the period of record with full 12 months of data (2012 through 2015).

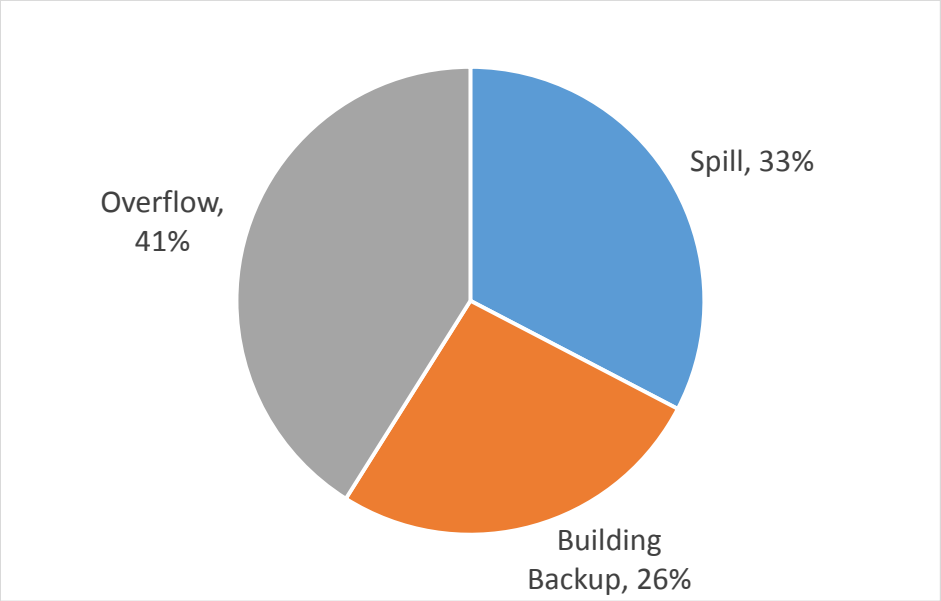
DWM categorizes each SSO that occurs as one of three types as defined in the Consent Decree. This initial categorization is based on multiple factors, including details provided by the reporting party, details provided by County response crews and reports from County labs. As details of each SSO are learned, an SSO might be recategorized accordingly. Definitions from the Consent Decree of each type of SSO are as follows:

- **Spill**: a discharge of wastewater from the wastewater collection and transmission system (WCTS), or from a wastewater treatment facility caused by problems in the WCTS, which reaches waters of the United States or the State, including a prohibited bypass, but not including other discharges from a point source that is specified in the National Pollutant Discharge Elimination System permits.
- **Overflow**: a release of wastewater from the WCTS, or from a wastewater treatment facility caused by problems in the WCTS that does not reach waters of the United States or the State.

- **Building Backup**: a wastewater backup into a building that is caused by blockages, malfunctions, or flow conditions in the WCTS; however, provided that a wastewater backup into a building that is caused by a blockage or other malfunction of a Private Lateral, or other piping or conveyance system that the County does not own or operate, is not a Building Backup.

Figure 1-1 shows the distribution of SSOs by type for the period of record.

Figure 1-1 SSOs by Type (2012–2015)



In addition to categorizing SSOs based on type, the County undertakes an investigation as to the root cause of SSOs and classifies the events accordingly. Table 1-1 lists the types of causes presently in use by DWM for the period of 2012 to 2015. This investigation and classification includes a review of the results of assessment tools such as CCTV and includes consideration of whether other sections of the WCTS might be vulnerable to a similar SSO event. In an effort to identify and prevent future SSOs, a portion of this analysis focuses on causes determined to be maintenance-related. For the purpose of this trend analysis only, the following terms are defined:

- Maintenance-Related: an SSO caused by grease, roots, debris, or any combination thereof.
- Other: an SSO caused by anything other than grease, roots, debris, or any combination thereof.

Table 1-1 lists the types of causes presently in use by DWM for the period of 2012 to 2015.

Table 1-1 SSO Causes Used by DWM

Cause Code	Cause Title	Description
BRK LN/STR	Broken line/structure	Broken pipe, manhole, force main, or other appurtenance.
CC	County contractor	Caused by a contractor performing work for the County.
CRK BRK	Creek crossing break	Structural failure of sewer infrastructure at a creek crossing.
DB	Debris	Solids that have collected in a pipe or manhole.

Table 1-1 SSO Causes Used by DWM

Cause Code	Cause Title	Description
GR	Grease	Build-up of grease in a pipe or manhole.
GRDB	Grease and debris	
GRRT	Grease and roots	
GRRTDB	Grease, roots, and debris	
LFT STN FLR	Lift station failure	
MH	Manhole	Caused by structural defect at or in manhole
OTH	Other	
OUTSIDE CON	Outside contractor	Caused by a contractor not performing work for the County.
RT	Roots	Intrusion of roots into a pipe or manhole.
RTDB	Roots and debris	
STORM	Storm	Caused by a storm. Includes wet weather capacity, failures at lift stations resulting from lightning strikes or storm-induced power outages.
TREE	Tree (fallen)	Damaged caused by falling trees.
UNK	Unknown	Used when no clear cause can be identified. Normally this cause is rarely used. The in-depth data review identified additional SSOs where the cause could not be determined retroactively.
VAND	Vandalism	Intentional damage caused by vandals.

2. Number and Volume of SSOs

As shown in Figure 2-1, the number of SSOs per year has decreased during the period of record (2012–2015). This downward trend can be attributed to maintenance programs including sewer cleaning; Fats, Oils, and Grease (FOG) Program; and extensive public education campaigns.

Figure 2-1 Reported SSOs per Year (2012–2015)

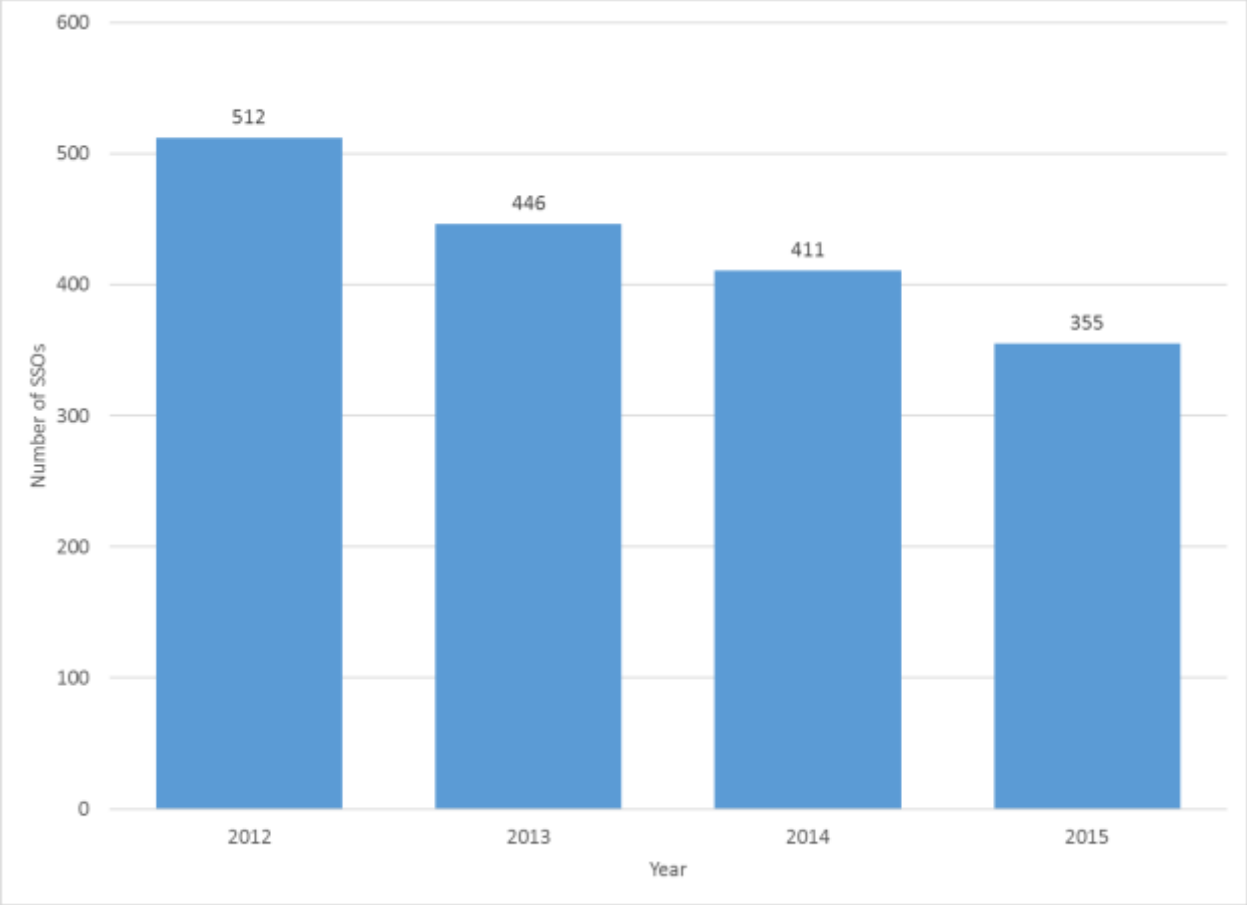


Figure 2-2 shows annual rainfall for the same period of record (2012–2015). SSOs decreased though rainfall increased in 2015.

Figure 2-3 presents the total volume (gallons) of SSOs for each year. The volume of SSOs reflects the rainfall increase from 2012 to 2013 and from 2014 to 2015, indicating that larger SSO volumes are related to storm events. A large portion of SSO volumes (55 percent) for 2015 occurred during the large storm events (rainfall totals ranging from 3 inches to 14 inches) that occurred during November and December of that year. Volume was recorded for 54 percent of the SSOs; the remainder did not have a volume recorded, as SSOs identified by the retroactive data review did not have volumes recorded or information sufficient to estimate volumes. Therefore, volumes for this portion of SSOs are not included in this analysis.

Figure 2-2 Annual Precipitation (inches) from 2012 through 2015

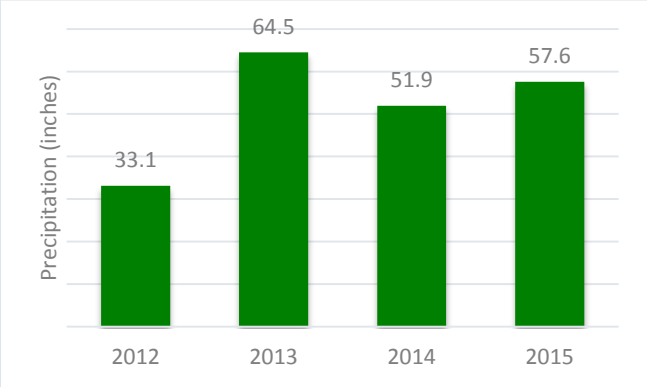
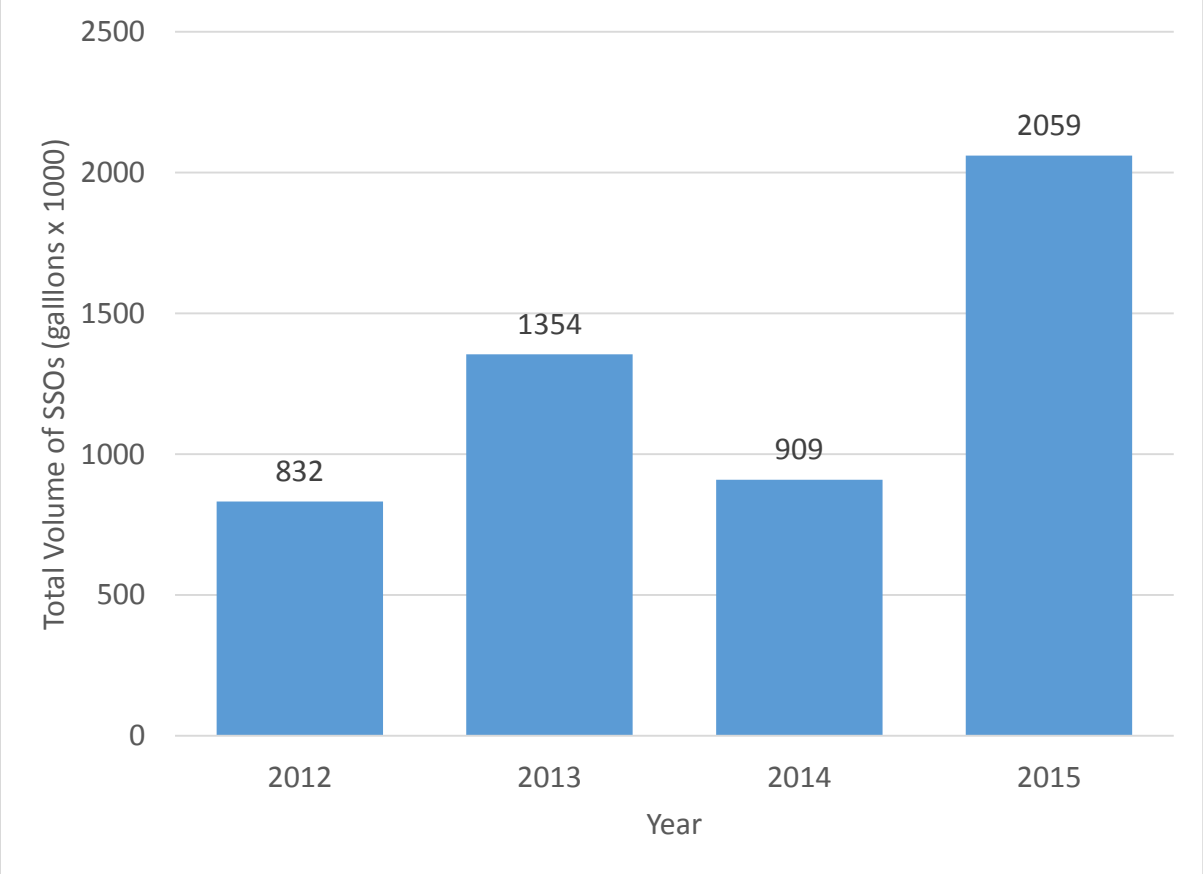


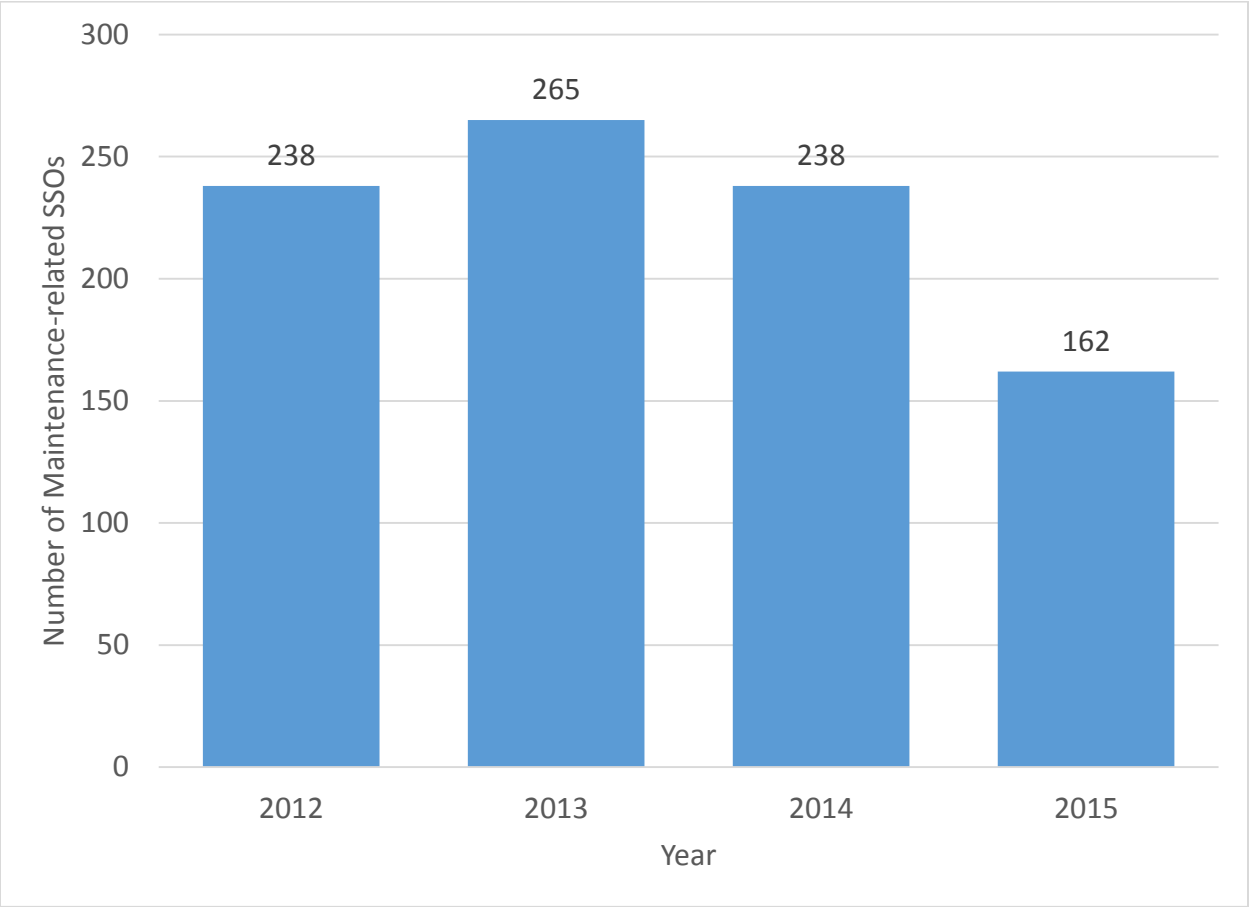
Figure 2-3 Reported Volume of SSOs per Year (2012–2015)



Note:
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.

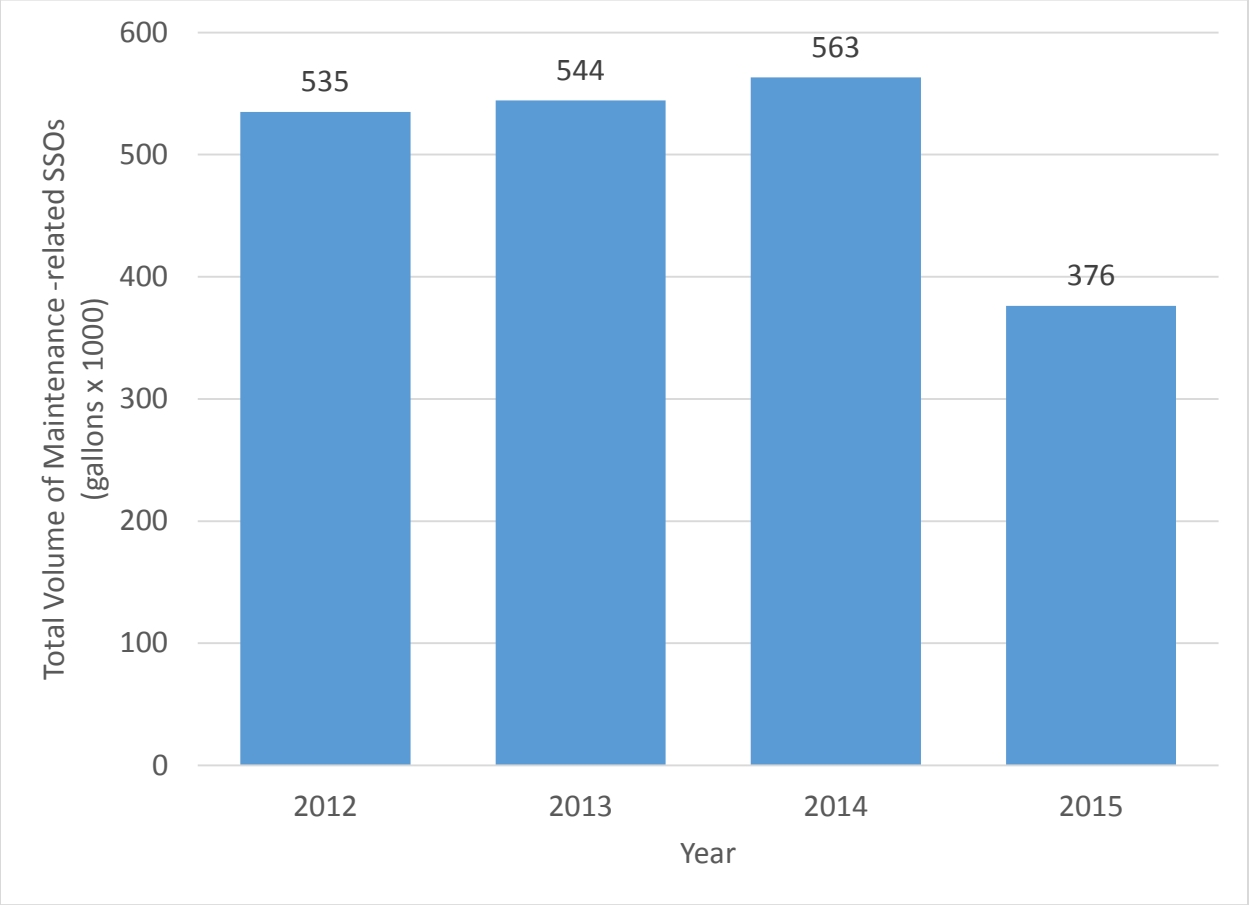
Figures 2-4 and 2-5 show the number of maintenance-related SSOs and the associated annual volumes, respectively, for the period of record (2012–2015). DWM has seen a significant decrease in the number of maintenance-related SSOs during the last 2 years. As discussed previously, DWM believes this is attributable to the amount of sewer cleaning work being performed in the sewer cleaning system, FOG Program, and public education campaigns.

Figure 2-4 Maintenance-related SSOs per Year (2012–2015)



Note:
Maintenance-related SSOs are caused by grease, roots, debris, or any combination thereof.

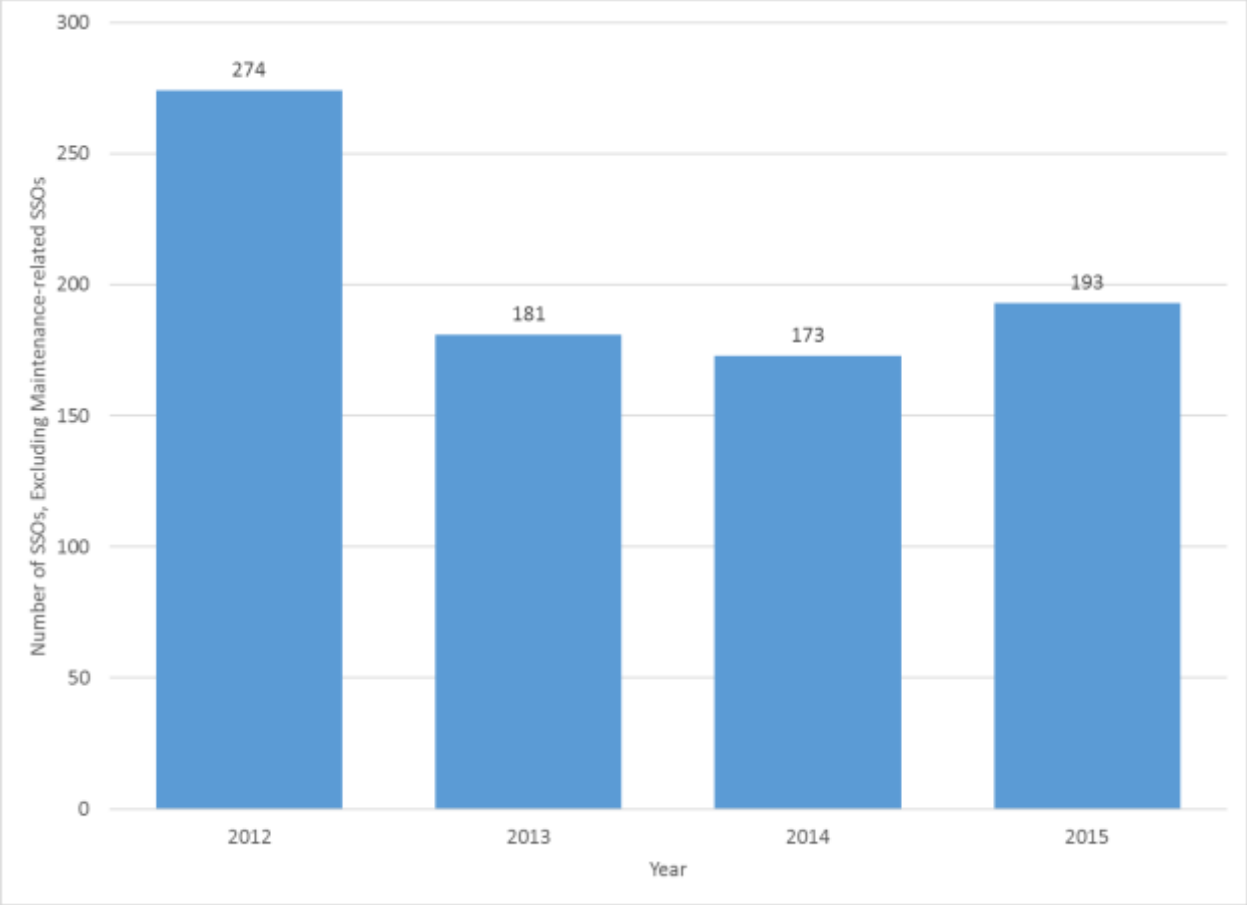
Figure 2-5 Volume of Maintenance-related SSOs per Year (2012–2015)



Notes:
Maintenance-related SSOs are caused by grease, roots, debris, or any combination thereof.
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.

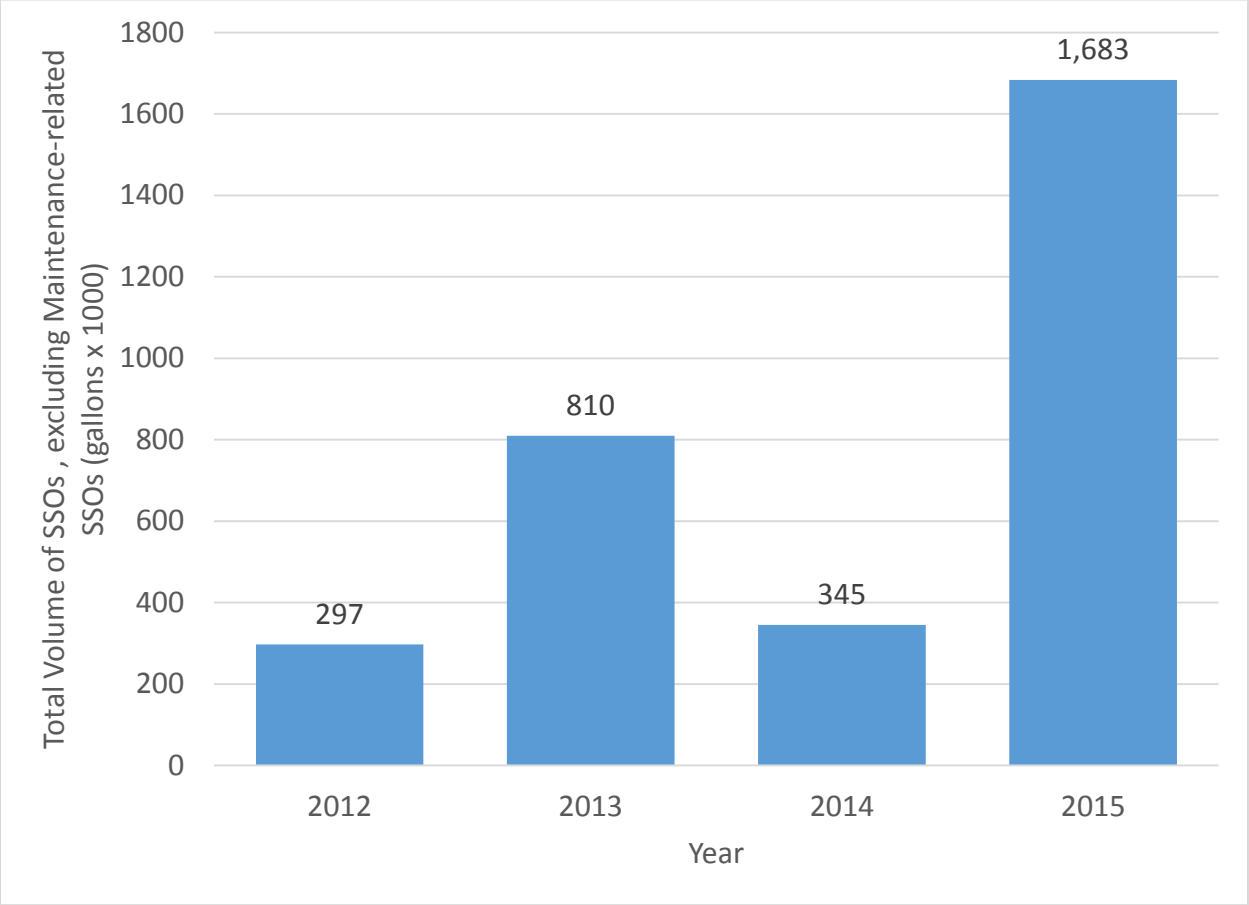
When maintenance-related SSOs are excluded, the number of SSOs decreased from 2012 to 2015 while the volume increased, as seen in Figures 2-6 and 2-7, respectively. As discussed earlier, the increased 2015 volume resulted from large rainfall events that occurred at the end of that year.

Figure 2-6 SSOs per Year, Excluding Maintenance-related Causes[1] (2012–2015)



Notes:
[1]SSOs attributed to causes other than grease, roots, debris, or any combination thereof.

Figure 2-7 SSO Volume, Excluding Maintenance-related Causes[1] (2012–2015)

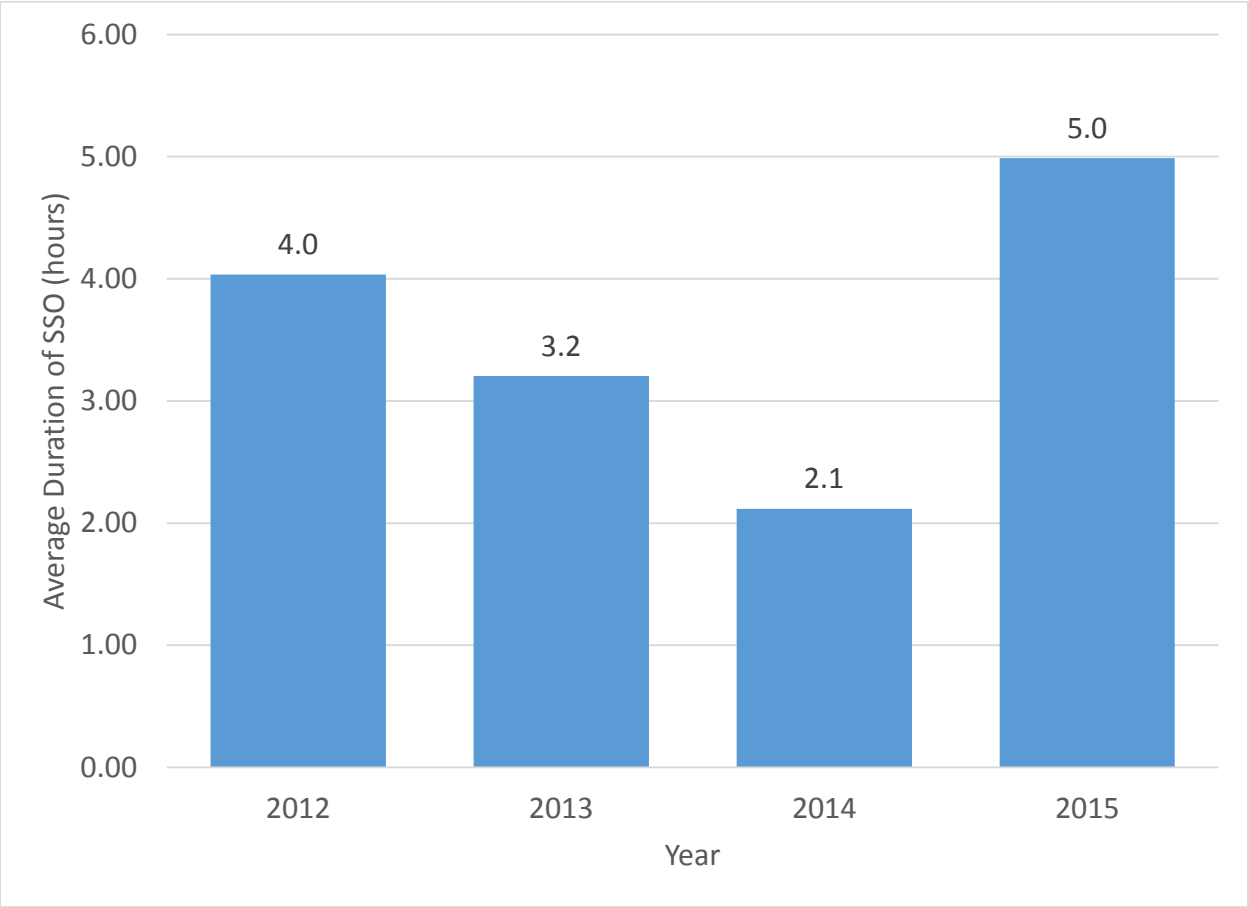


Notes:
[1]SSOs attributed to causes other than grease, roots, debris, or any combination thereof.
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.

3. Average Duration of SSOs

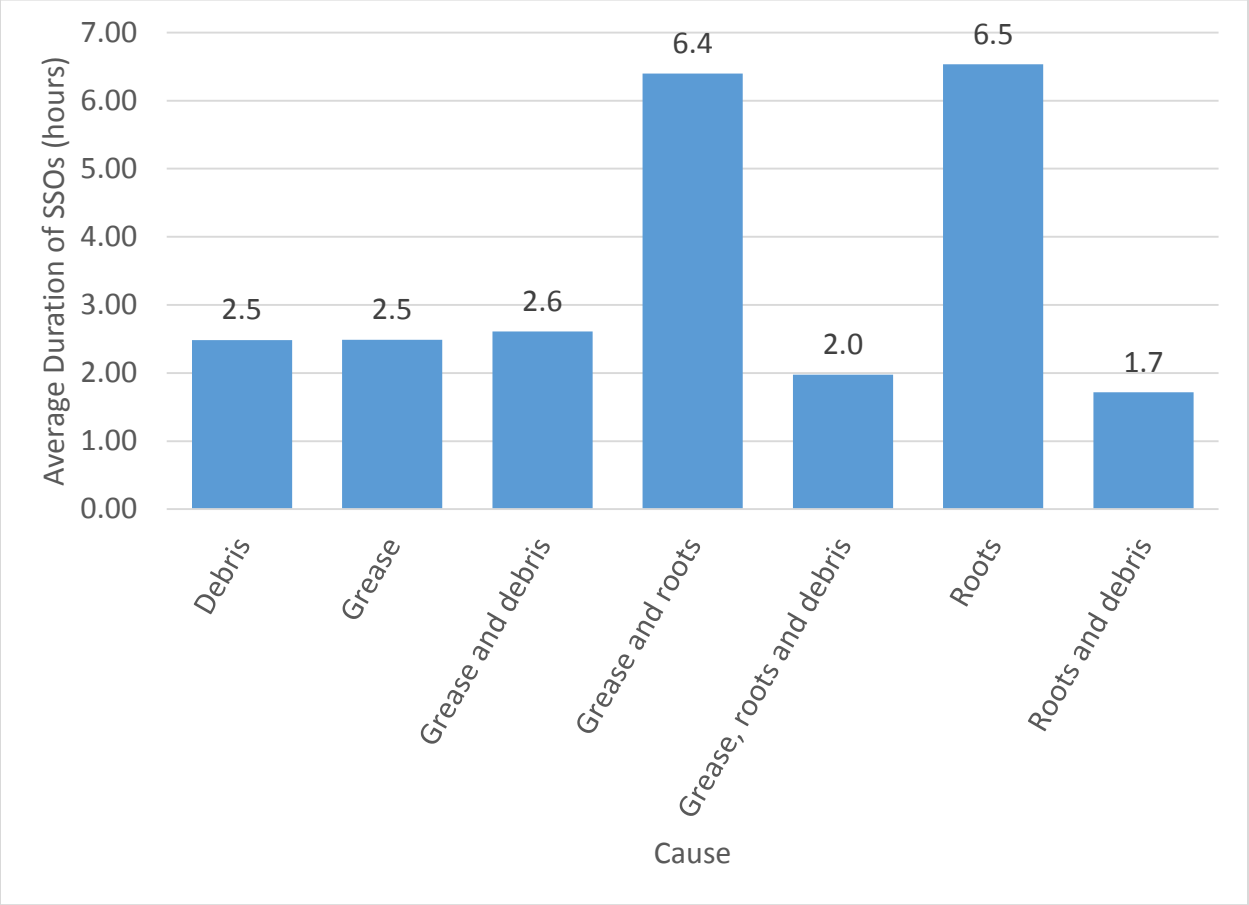
The average SSO duration during the last four years (2012–2015) is approximately 3.5 hours, as shown in Figure 3-1. The 2015 average SSO duration increase relates to major storm events at the end of that year. Figure 3-2 shows the average duration for those SSOs categorized as maintenance-related. Two of the maintenance-related SSO causes are more than the average duration for other SSOs. SSOs caused by roots or a combination of grease and roots have average durations greater than the average for other SSOs.

Figure 3-1 Average SSO Duration by Year (2012–2015)



Note:
Durations are available for 61 percent of the SSOs.

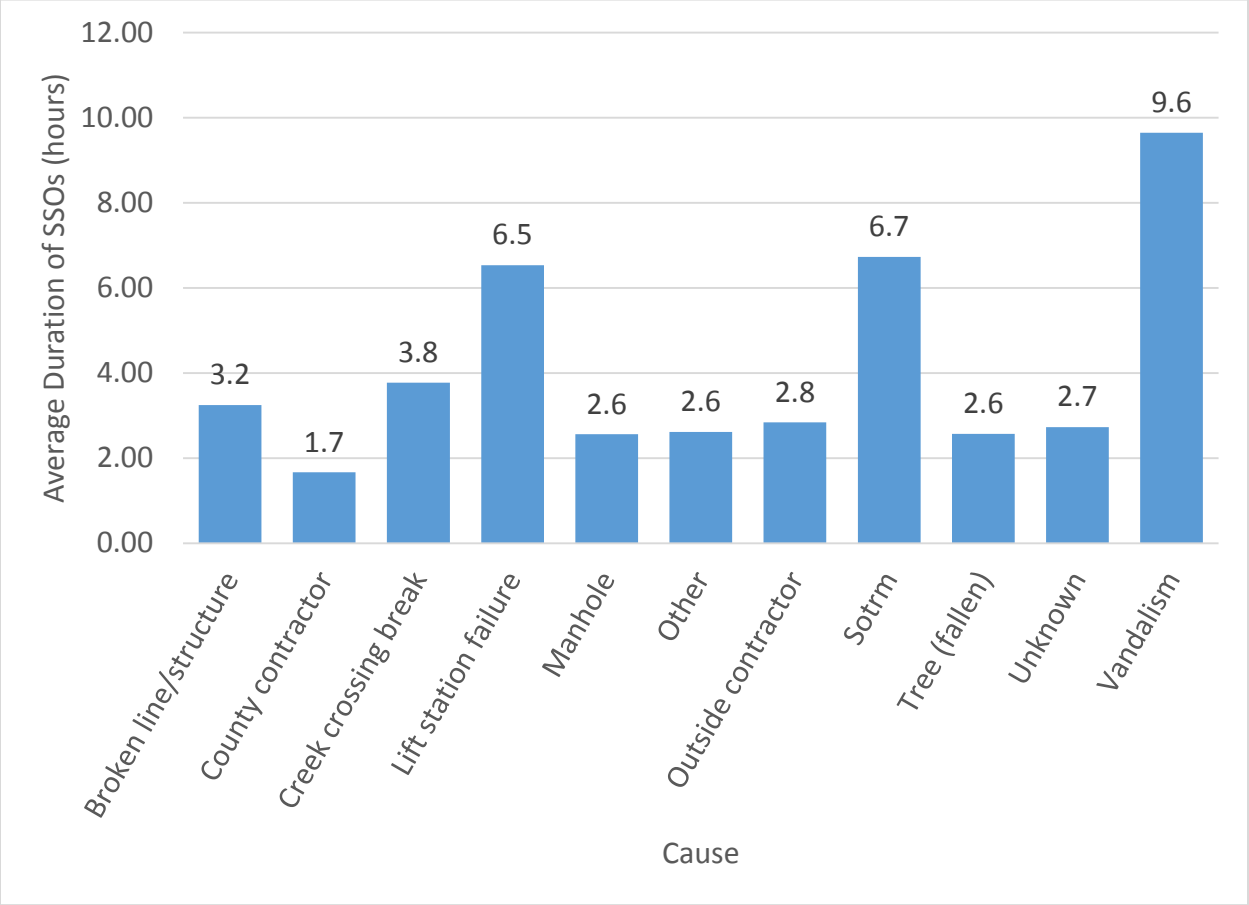
Figure 3-2 Average SSO Duration by Maintenance-related Cause (2012–2015)



Note:
Durations are available for 61 percent of the SSOs.

Figure 3-3 presents average durations for other SSOs, excluding maintenance-related SSOs. Three causes have durations above average: vandalism, storm, and lift station failure. These higher response times may be attributed to difficulty in removal of debris or equipment repair/replacement generally associated with vandalism and lift station failures and the need to wait until storms and/or flood water recede to protect worker safety.

Figure 3-3 Average SSO Duration, Excluding Maintenance-related Causes (2012–2015)

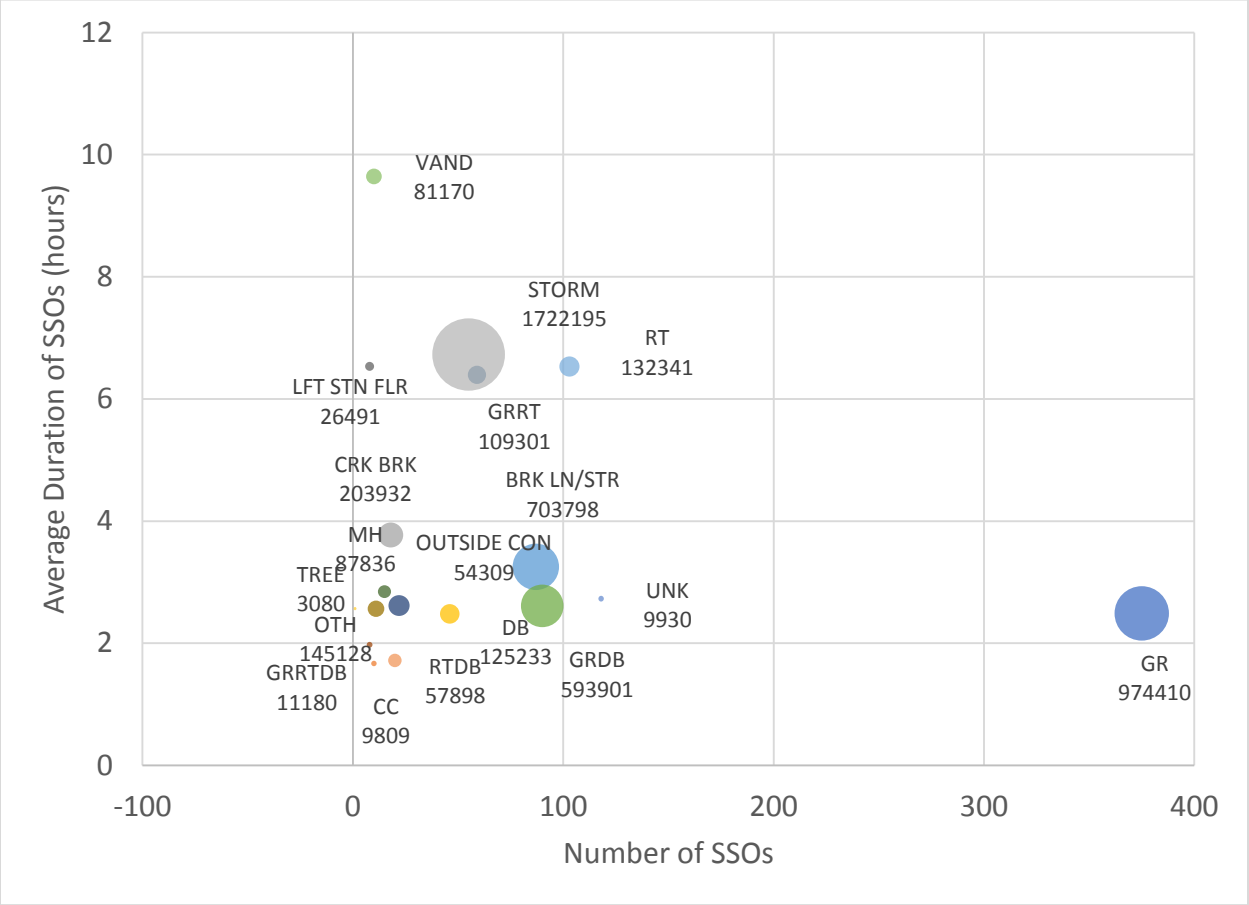


Note:
Durations are available for 61 percent of the SSOs.

The scatter plot shown in Figure 3-4 shows the average SSO duration by cause. The relative SSO volume is depicted by bubble size. While grease is the most common cause of SSOs (during the 4-year period), the average duration of grease-induced SSOs is low and the volume from grease is moderate. SSOs caused by storms happen infrequently but have larger average durations than other types of SSOs. This is attributable to difficulty in conducting repairs/bypasses during storms and, in some cases, the need to wait for flood waters to recede. Additionally, storm-induced SSOs account for the greatest volume of SSOs when compared to the other causes.

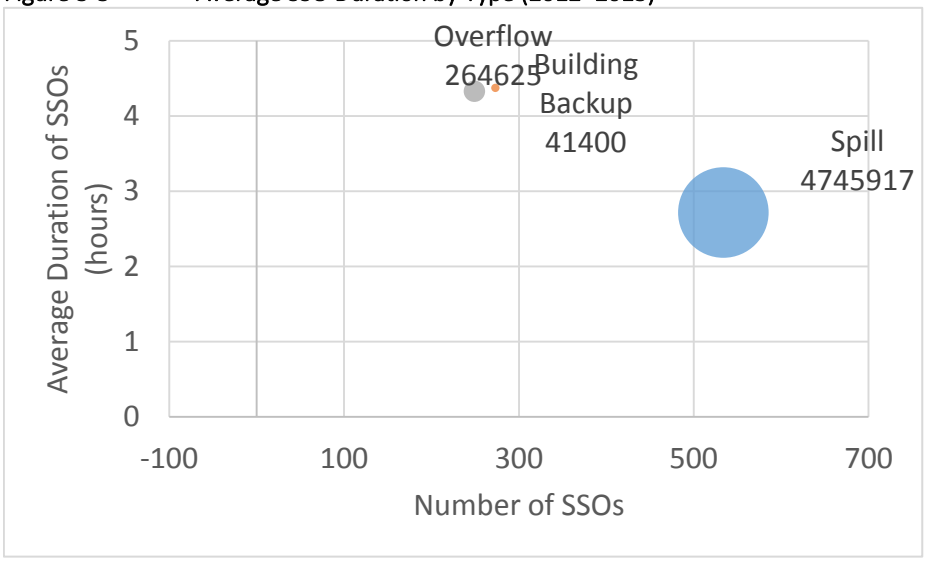
Figure 3-5 shows the average duration for SSOs by type (spill, overflow, and building backup). It is interesting to note that spills, reaching waters of the U.S. or the State, account for most of the volume but have much lower average duration than for building backups SSOs or overflow SSOs, which are contained on land. Building backups have the longest average duration of the three types but occur less frequently than the two other types.

Figure 3-4 Average SSO Duration with Count by Cause **(2012–2015)**



Notes:
Durations are available for 61 percent of the SSOs.
Bubble size indicates volume in gallons.
Bubbles are labeled with cause and volume (in gallons).
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.

Figure 3-5 Average SSO Duration by Type (2012–2015)



Notes:
Durations are available for 61 percent of the SSOs.
Bubble size indicates volume in gallons.
Bubbles are labeled with type and volume (in gallons).
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.

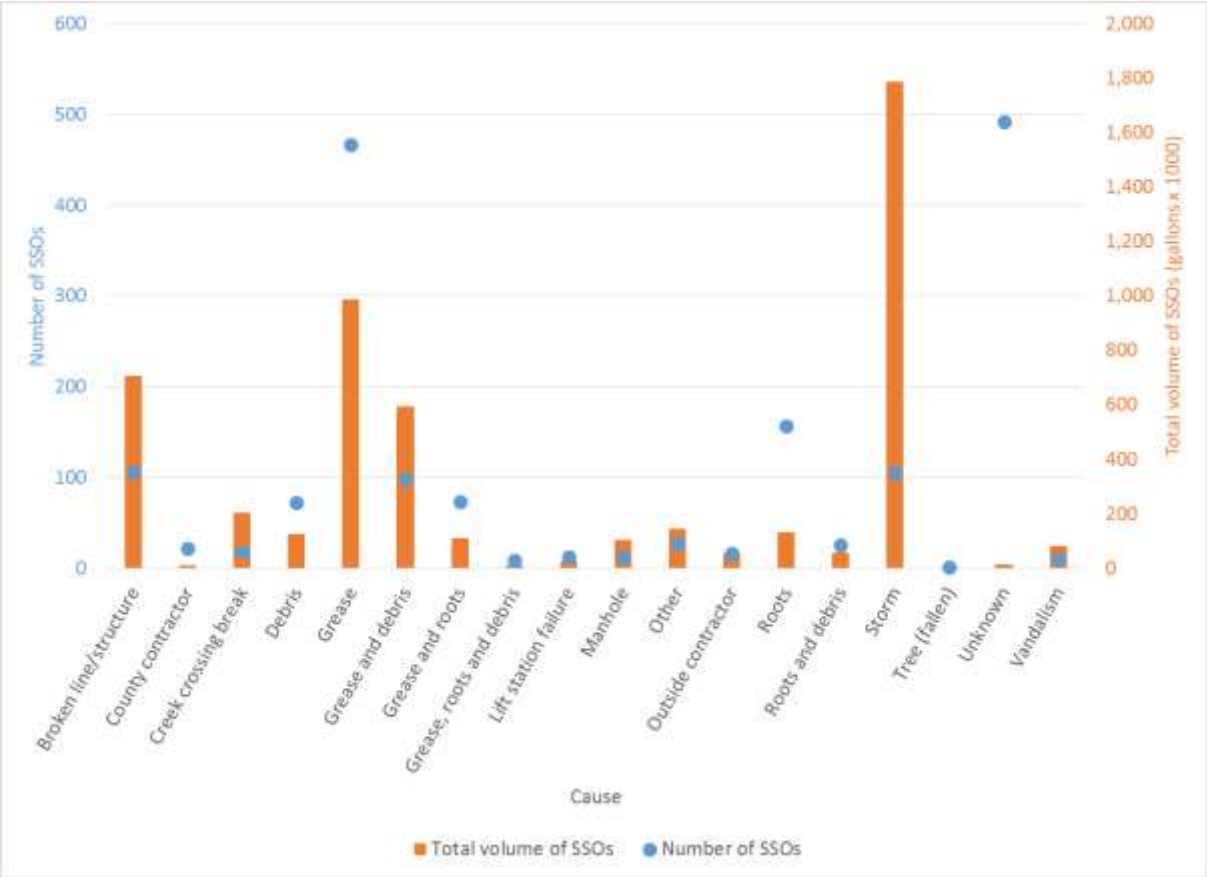
4. Causes of SSOs

While grease-related SSOs have decreased likely from sewer cleaning and the County's commercial FOG Management Program and Public Education Programs, grease accounts for more SSOs than any other cause and contributes to a significant portion of the SSO total volume (see Figure 4-1). Storm-induced SSOs account for more volume than any other cause but happen infrequently.

Figure 4-2 shows the number of SSOs by cause by year for the period of record. SSOs caused by grease are declining, while SSOs related to storms are increasing. From 2014 to 2015, there was a decline in the number of SSOs attributable to roots. The number of SSOs resulting from cracked or broken pipe has remained constant.

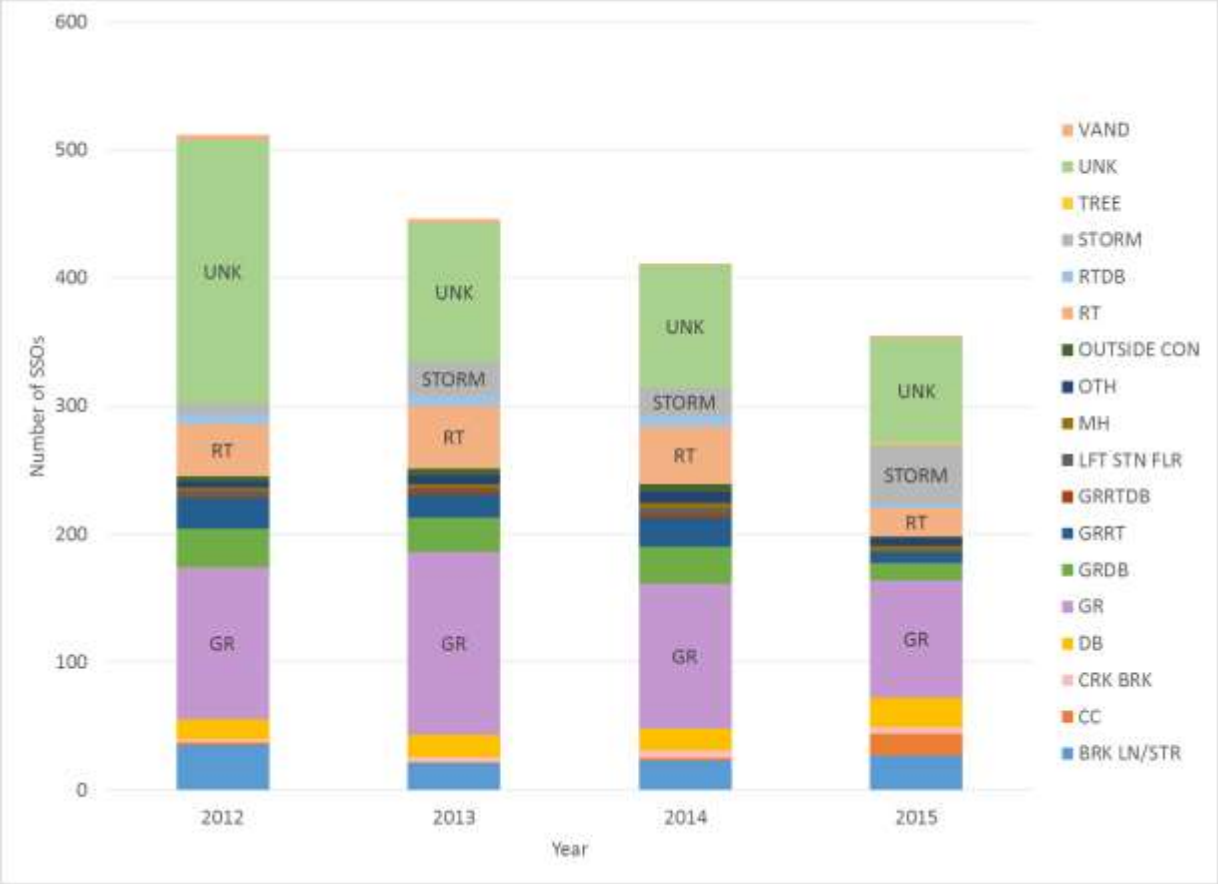
Figure 4-3 shows SSO volume by cause by year from 2012 through 2015. As noted above, SSO volume from grease is decreasing, while the volume from storms is increasing. It is worth noting that if rainfall in 2015 would have been more of an average year, the total volume of SSOs in 2015 would have likely decreased.

Figure 4-1 SSOs by Count, Volume, and Cause (2012–2015)



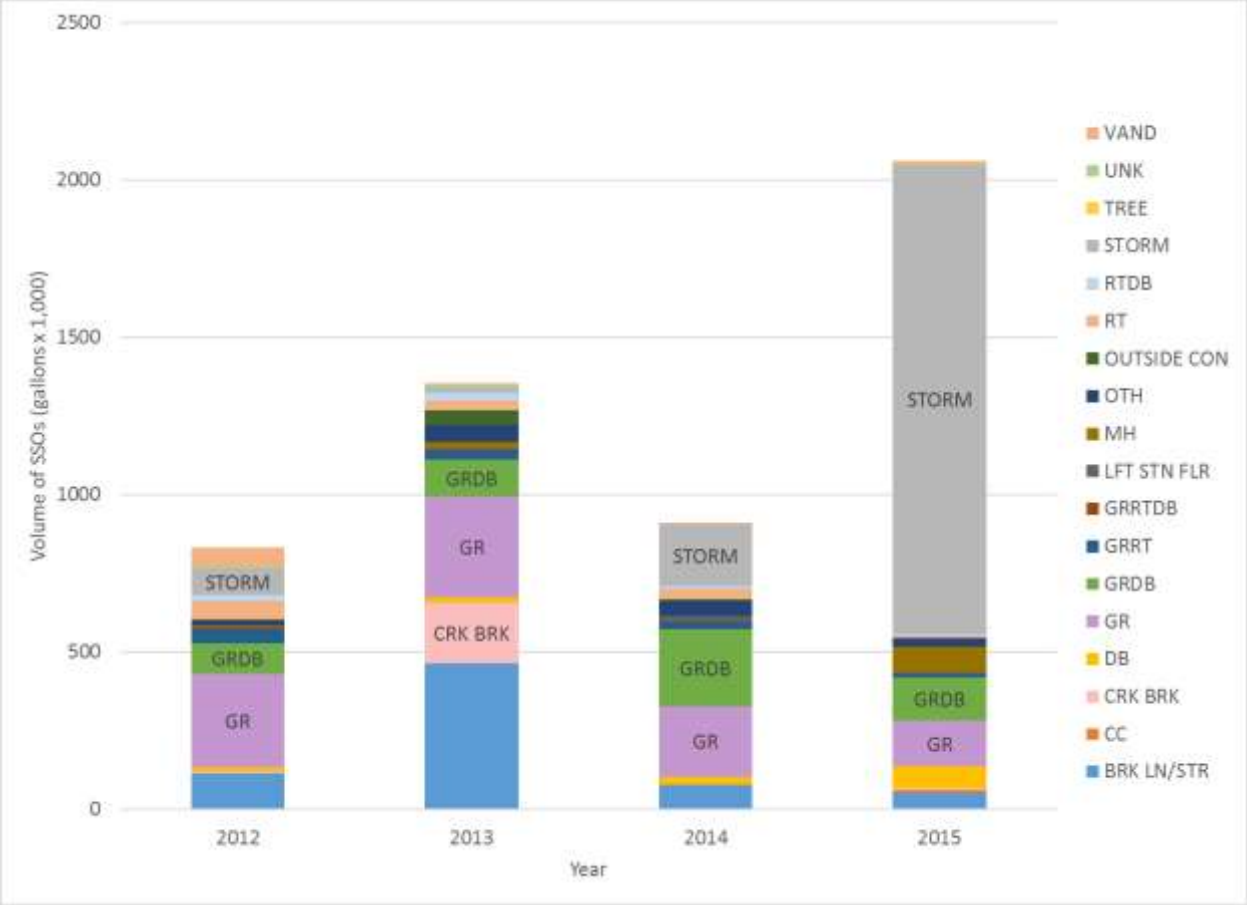
Note:
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.
The relatively high percentage of causes listed as unknown (UNK) is because of the retroactive data review. The cause of many of the SSOs could not be determined from the information recorded about the event

Figure 4-2 SSOs by Year by Cause (2012–2015)



Note:
The relatively high percentage of causes listed as unknown (UNK) is because of the retroactive data review. The cause of many of the SSOs could not be determined from the information recorded about the event.

Figure 4-3 SSO Volume by Year by Cause (2012–2015)



Notes:
A total of 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.
The large volume resulting from SSOs caused by storms in 2015 is attributed to the extreme rainfall events that occurred in December 2015.

Selected causes can be grouped into categories that help assess the effectiveness of DWM's efforts to reduce SSOs. These broader categories are grease, structural, storm, and debris. Table 4-1 lists the causes assigned to each category. As shown in Figure 4-4, the number of SSOs has decreased for the categories of grease, structural, and debris. This is a positive trend and directly correlates to the increased field activity undertaken by DWM to clean pipe and CCTV pipe to check for structural condition. SSOs attributed to storms are increasing. This results primarily from the extreme rainfall events in November and December 2015. DWM is working on a hydraulic model of the collection system to help better assess wet weather performance.

These same cause categories, when applied specifically to spills, show the same trends (see Figure 4-5). Figure 4-6 presents the number of spills by year. The number of spills per year decreased approximately 20 percent from 2012 to 2015.

Table 4-1 Mapping Cause to Cause Categories

Cause	Grease	Structural	Storm	Debris
BRK LN/STR		STRUC		
CC				
CRK BRK		STRUC		
CRK BRN		STRUC		
DB				DB
GR	GR			
GRDB	GR			DB
GRRT	GR	STRUC		
GRRTDB	GR	STRUC		DB
LFT STN FLR				
MH				
OTH				
OUTSIDE CON				
RT		STRUC		
RTDB		STRUC		DB
STORM			STORM	
TREE				
UNK				
VAND				

Figure 4-4 SSOs by Year by Cause Category (2012–2015)

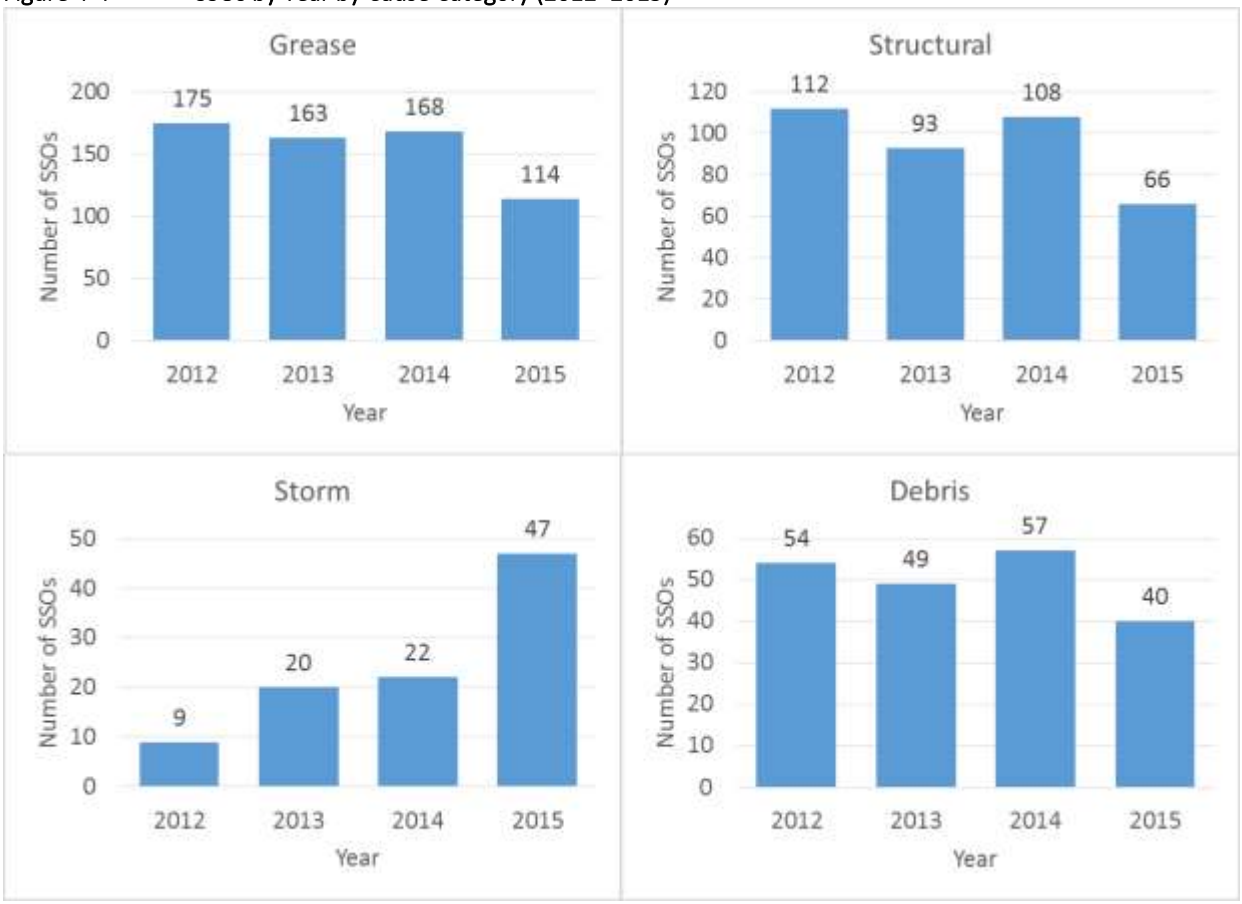


Figure 4-5 Spills by Year by Cause Category (2012–2015)

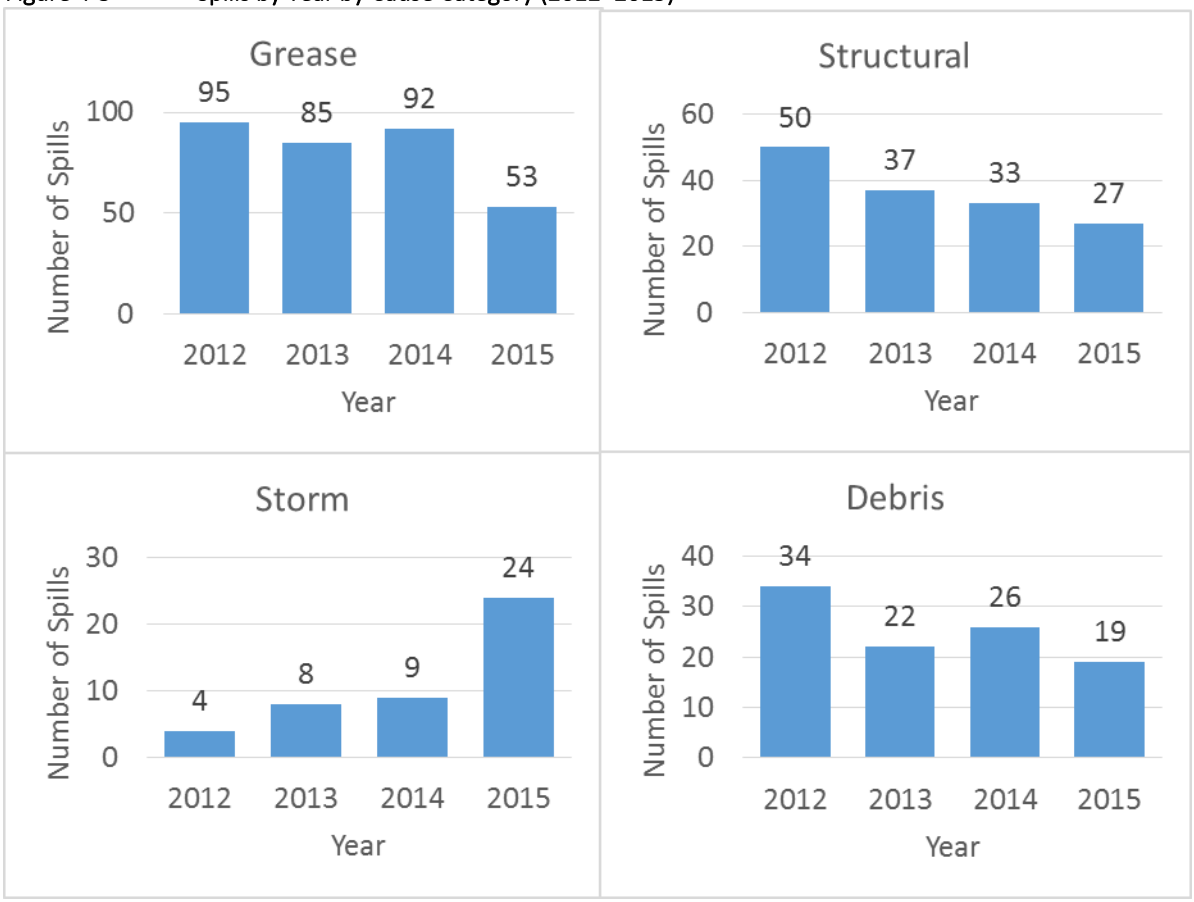
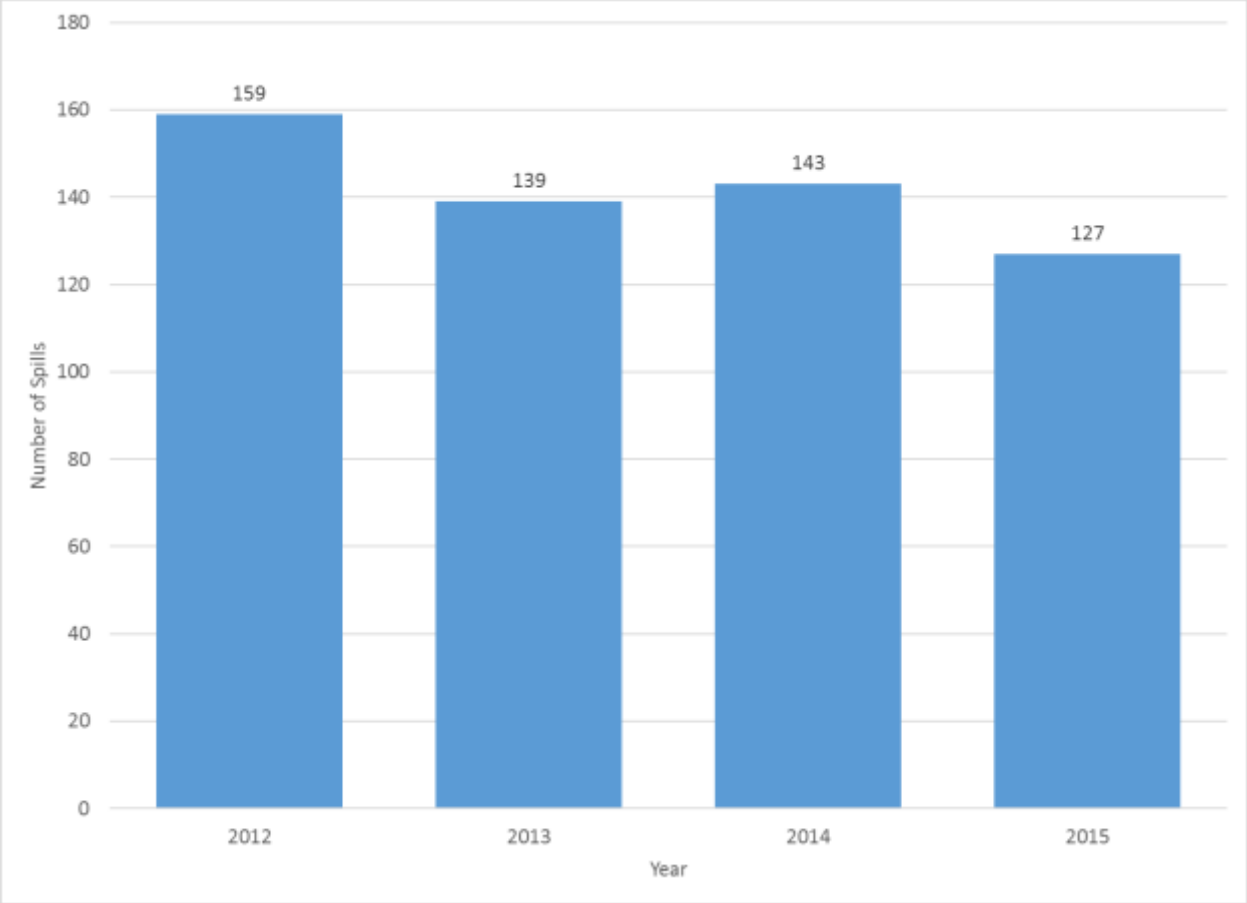


Figure 4-6 Spills by Year (2012–2015)



5. Other Trends

DWM evaluated other potential trends including those based on pipe size and rainfall.

Pipe Size

The most common pipe size in the collection system is 8 inches in diameter, as shown in Figure 5-1. Pipes with a diameter of 8 inches account for 85 percent of the total number of pipes and 83 percent of the total length of pipe. Likewise, most spills are associated with pipes of 8 inches in diameter, as shown in Figure 5-2. The number of spills for this size pipe is decreasing as is the overall number of spills. This indicates that focused maintenance activities in the smaller-diameter pipe can decrease maintenance-related SSOs.

Figure 5-1 Sewer Gravity Main Pipe Count and Length by Diameter (2012–2015)

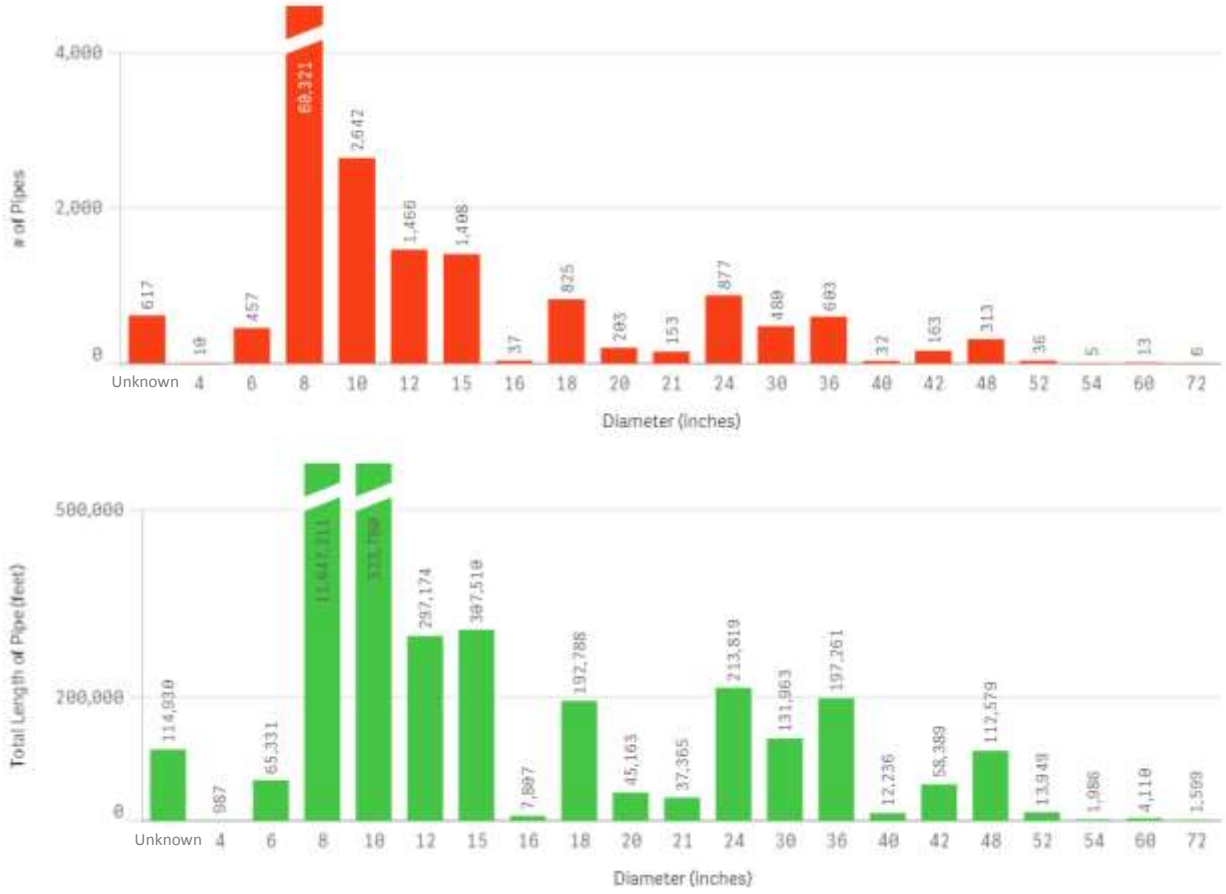
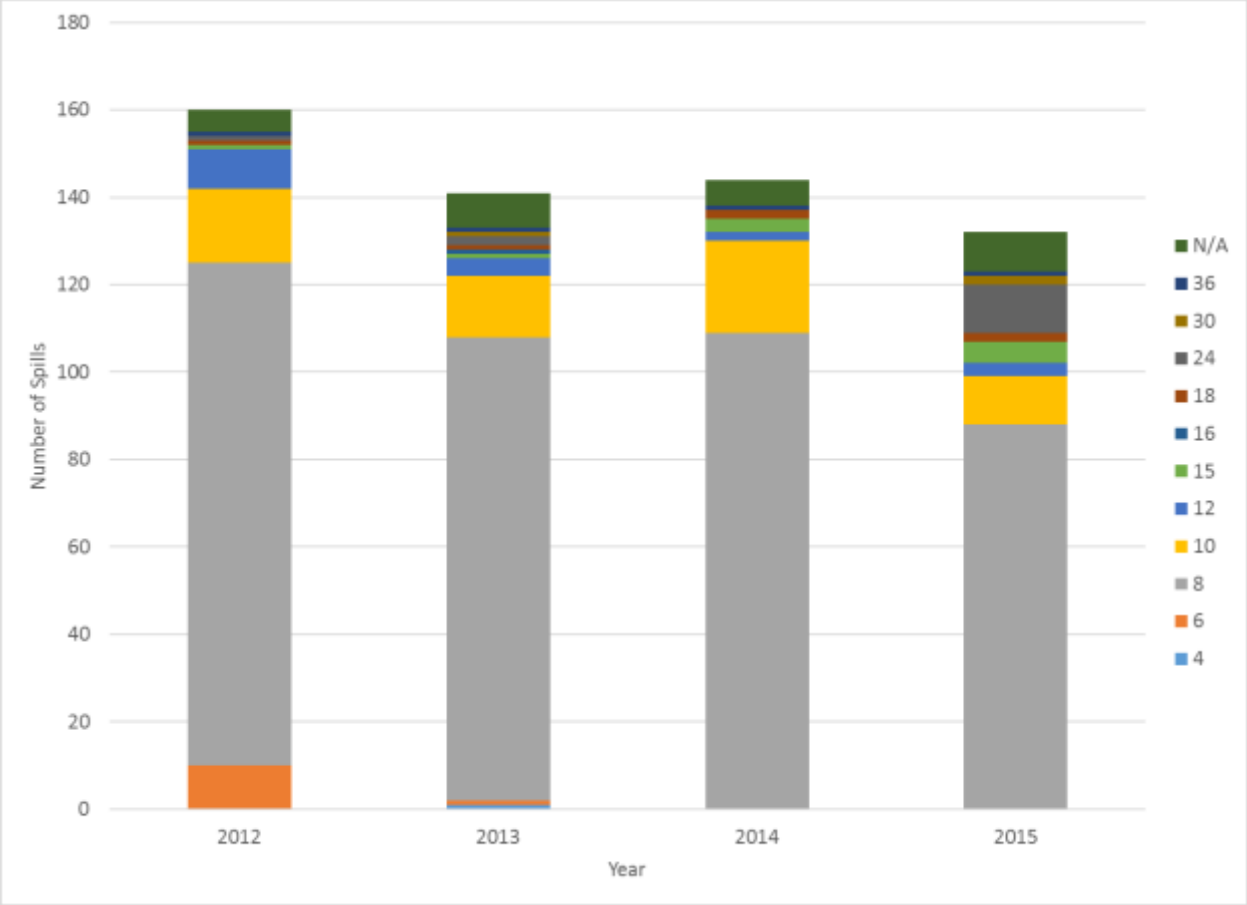


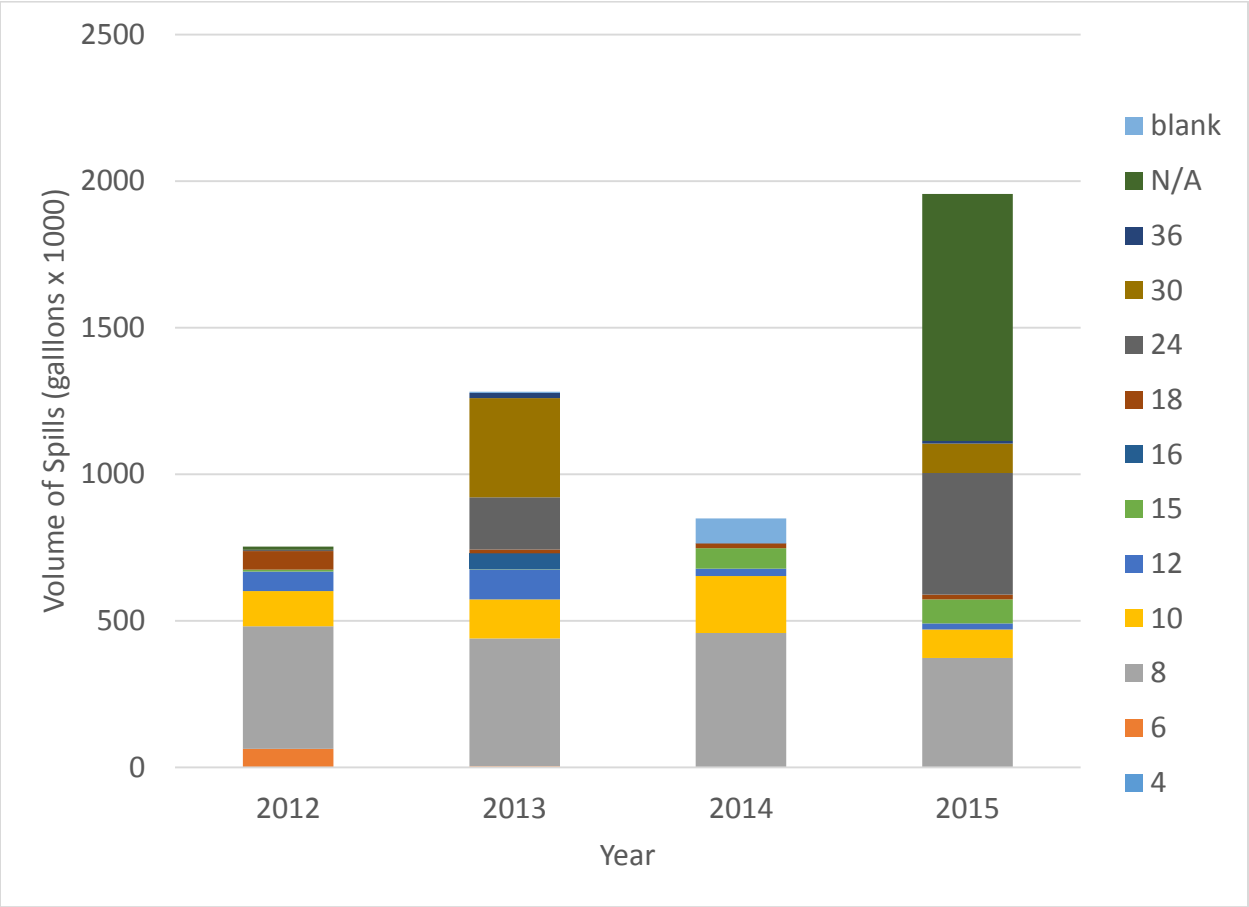
Figure 5-2 Spills by Year by Pipe Size (inches) (2012–2015)



Notes:
Only spills have an associated pipe size linked to an SSO, so only spills are included in this figure. DWM has other, larger, pipe sizes that are not shown in this figure. SSOs did not occur in pipes larger than 36 inches during the period 2012–2015.

Figure 5-3 shows the volume of spills by pipe size. In general, larger-diameter pipes account for a higher proportion of volume than smaller pipe, though there are fewer spills from larger pipes.

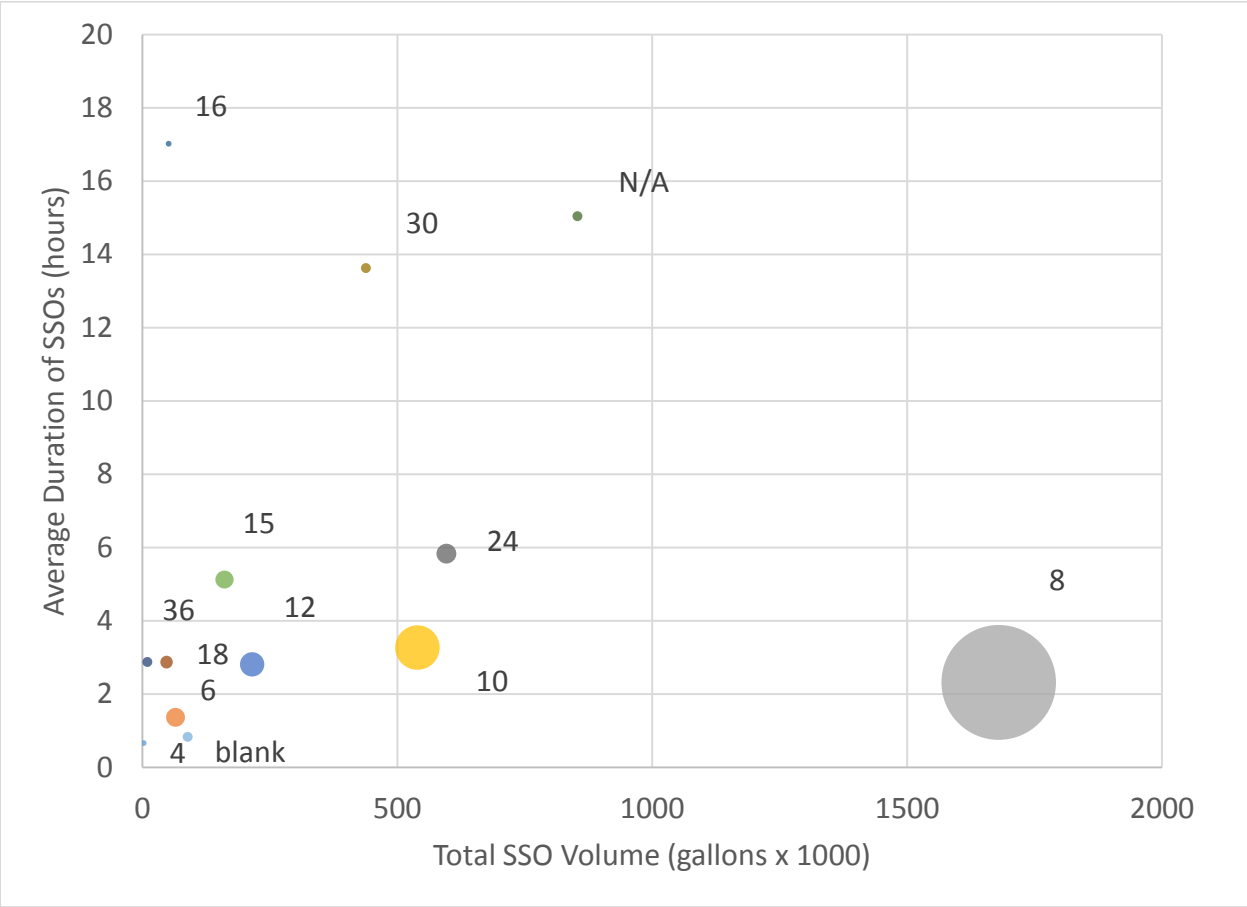
Figure 5-3 Spill Volume by Year by Pipe Size (2012–2015)



Notes:
Only spills have an associated pipe size linked to an SSO, so only spill SSOs are included in this figure. DWM has other, larger, pipe sizes that are not shown in this figure. SSOs did not occur in pipes larger than 36 inches during the period 2012–2015
Pipe diameter was not always recorded, thus some are blank or N/A

Figure 5-4 shows the average duration of spills by pipe size, volume, and number. As expected, larger-diameter pipes generally have longer average spill durations than smaller pipes. Spills from 8-inch-diameter pipe account for most of the number and volume of spills, but have a relatively low average duration.

Figure 5-4 Spill Average Duration and Volume by Pipe Size, 2012 to 2015



Notes:
Bubble size indicates relative number of SSOs.
Bubbles are labeled with pipe diameter, in inches.
Pipe diameter was not always recorded, thus some are blank or N/A.

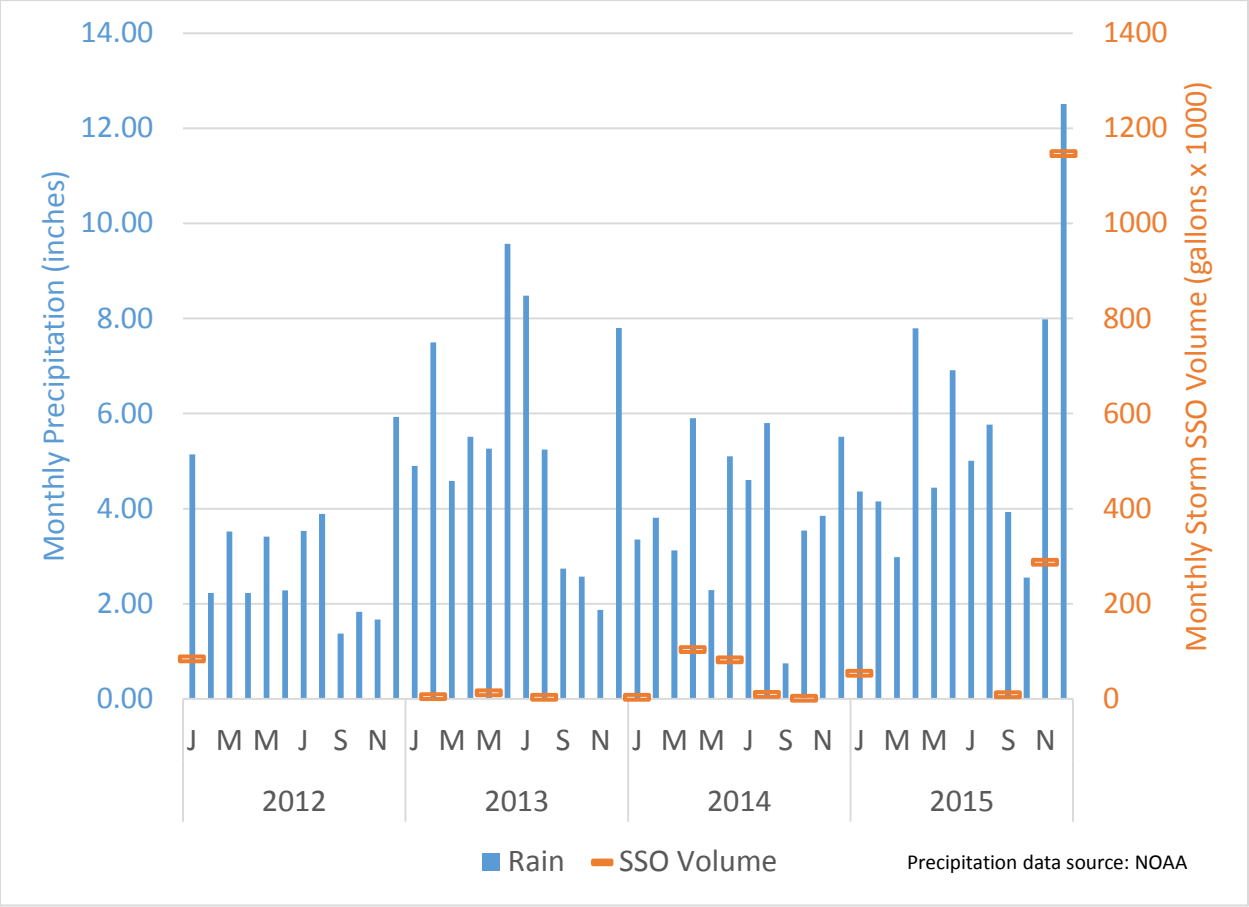
Rainfall

As noted earlier, there were several large storms in December 2015 that caused numerous SSOs, several with large volumes. A total of 13 of the 24 storm-related spills in 2015 occurred during December. The impact of the extreme rainfall events in December 2015 can be seen in Figure 5-5. The total volume of SSOs caused by storms was the highest during this same month, December 2015. These rain events and the 13 referenced spills accounted for 55 percent of the total spill volume for 2015 and 76 percent of the total storm-related spill volume for 2015.

While each spill was initially attributed to the coinciding storm event for purposes of this report, the majority of these spills seem to be the result of multiple factors, such as broken pipe; presence of roots, grease, or debris in the system; or potential capacity issues that were exacerbated by the historical rains and were not apparent upon initial review. Each line has been cleared and continues to function as further investigation into the root cause of the spill and most effective, efficient path of preventing future spills is investigated. Root cause analysis of the system is conducted with an overall analysis of the system as part of the Priority Areas Sewer Assessment and Rehabilitation Program (PASARP) or Ongoing Sewer Assessment and Rehabilitation Program (OSARP) programs, a prioritized special project request based on field analysis, and/or inclusion in one of the major evaluation contracts. This also can

include assignment to a manhole rehabilitation contractor, creation of a special scope of services for a larger field repair, assignment to computer modeling, or similar work requests.

Figure 5-5 Monthly Precipitation and Storm-induced SSO Volume



Note: Only spills with a cause of STORM are represented in this figure.

Repeat SSOs

DWM reviewed SSOs in their spatial context to identify repeat SSO locations. These locations were recorded and prioritized for further investigation to define permanent solutions to prevent future recurrence of SSOs. Table 5-1 lists the repeat SSO locations by basin.

DWM tallied the repeat SSO locations by Basin (see Figure 5-6). The Upper Snapfinger Creek and Nancy Creek basins have the highest number of repeated SSO locations. The most common cause of repeat SSOs is grease (see Figure 5-7).

Similarly, DWM analyzed only those SSOs that are spills. The South Fork Peachtree Creek and Nancy Creek basins had the highest number of repeat spills (see Figure 5-8). The most common cause of repeat spills is grease (see Figure 5-9).

Table 5-1 Recurring SSO Locations by Basin

Basin	Spill Causes by Basin					SSOs Causes by Basin							Total	Notes
	Grease	Structural	Storm	Roots	Debris	Grease	Structural	Storm	Root	Debris	Unknown	Vandalism		
Ball Mill Creek						0	0	0	0	0	0	0	**0**	
Barbashela Creek	1			1		1	0	0	1	0	0	0	**2**	
Blue Creek						1	0	0	0	0	0	0	**1**	1
Camp Creek						0	1	0	0	0	0	0	**1**	
Cobb Fowler Creek	1					2	0	0	1	1	0	0	**4**	
Conley Creek	1	1				3	1	0	0	0	0	0	**4**	
Constitution Area						0	0	0	0	0	0	0	**0**	
Corn Creek						0	0	0	0	0	0	0	**0**	
Crooked Creek	1					1	0	0	0	0	0	0	**1**	
Dolittle Creek	1					6	0	1	4	0	3	0	**14**	
Honey Creek	1					1	0	0	0	0	0	0	**1**	
Indian Creek	1					4	0	0	0	0	1	1	**6**	
Intrenchment Creek	1		2		1	3	2	5	0	1	0	0	**11**	4
Johnson Creek						0	0	0	0	0	0	0	**0**	
Lower Snapfinger Creek						5	1	1	4	1	2	0	**14**	
Lower Crooked Creek	2					2	0	0	0	0	0	0	**2**	

Table 5-1 Recurring SSO Locations by Basin

Basin	Spill Causes by Basin					SSOs Causes by Basin							Total	Notes
	Grease	Structural	Storm	Roots	Debris	Grease	Structural	Storm	Root	Debris	Unknown	Vandalism		
Lower Stone Mountain Creek						0	0	0	0	0	0	0	**0**	
Lucky Shoals Creek						1	0	1	0	1	0	0	**3**	
Marsh Creek						2	0	0	0	0	1	0	**3**	
Nancy Creek	3	1		1		17	3	0	4	2	3	0	**29**	1, 2, 3
Northeast Creek						0	0	0	0	0	0	0	**0**	
North Fork Peachtree Creek		1		1		4	4	0	2	1	1	0	**12**	
Peavine Creek						3	1	0	0	0	2	0	**6**	
Pine Mountain Creek						1	0	0	1	0	0	0	**2**	
Plunket Creek						0	0	0	0	0	0	0	**0**	
Polebridge Creek	2					6	1	0	0	0	4	0	**11**	
Shoal Creek	1		1			6	0	2	1	0	5	0	**14**	
South Fork Peachtree Creek	3	1			1	3	1	1	1	1	0	0	**7**	
South River						0	0	0	0	0	0	0	**0**	
Sugar Creek	1					5	0	0	0	1	3	0	**9**	
Swift Creek						1	0	0	0	0	2	0	**3**	

Table 5-1 Recurring SSO Locations by Basin

Basin	Spill Causes by Basin					SSOs Causes by Basin							Total	Notes
	Grease	Structural	Storm	Roots	Debris	Grease	Structural	Storm	Root	Debris	Unknown	Vandalism		
Upper Crooked Creek	1					2	0	0	1	0	0	0	**3**	
Upper Snapfinger Creek	2	1				8	1	0	6	1	9	0	**25**	
Upper Stone Mountain Creek						0	0	0	0	0	0	0	**0**	
Yellow River						0	0	0	0	0	0	0	**0**	
TOTAL	**23**	**5**	**3**	**3**	**2**	**88**	**16**	**11**	**26**	**10**	**36**	**1**	**188**	

Notes:
1=Multiple repeat grease caused SSOs in proximity counted as 1 SSO repeat event
2=Multiple repeat root caused SSOs in proximity counted as 1 SSO repeat event
3=Multiple repeat debris caused SSOs in proximity counted as 1 SSO repeat event
4=Multiple repeat storm caused SSOs in proximity counted as 1 SSO repeat event

Figure 5-6 Number of Repeat SSO Locations by Basin

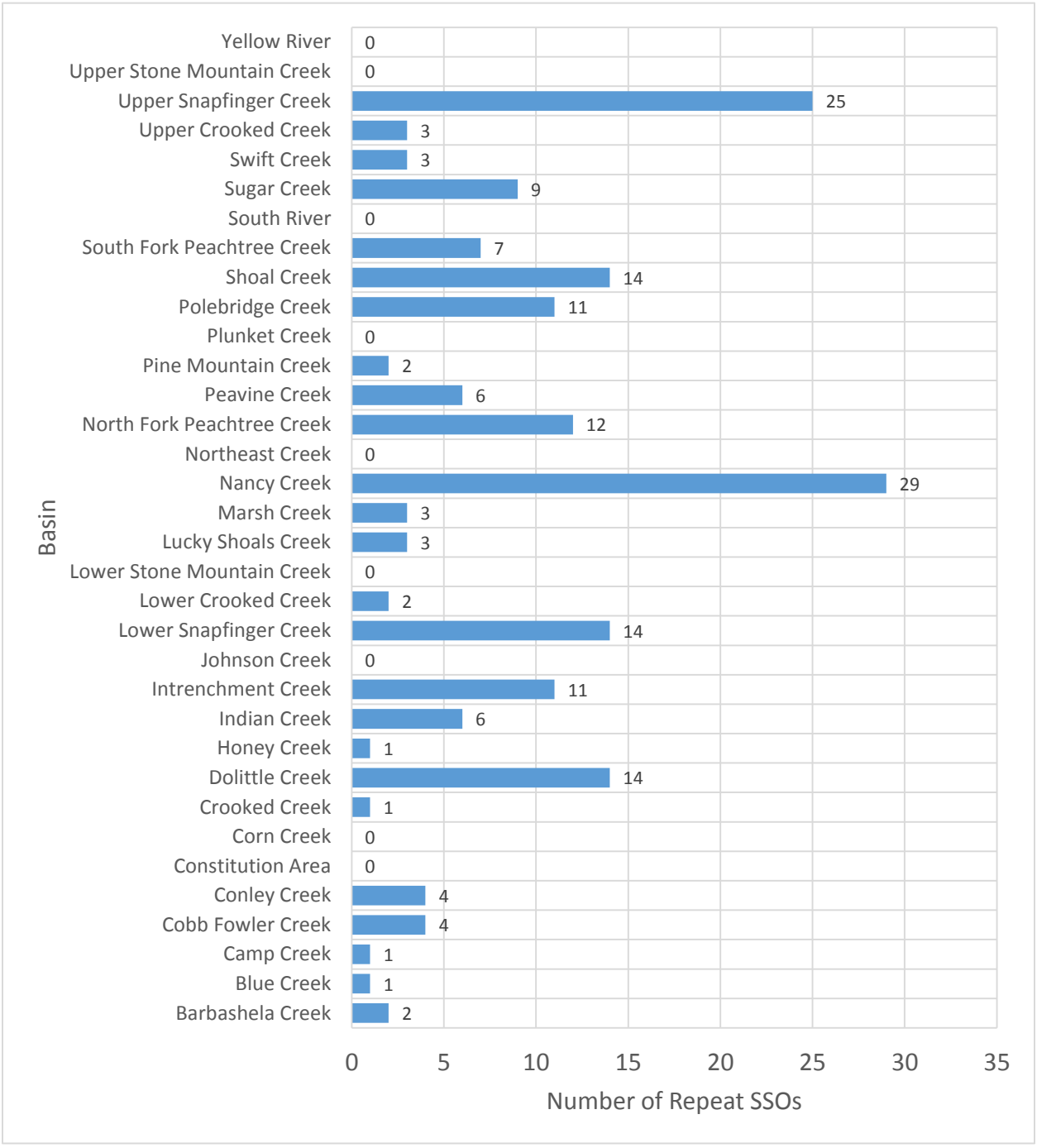


Figure 5-7 Number of Repeat SSO Locations by Cause

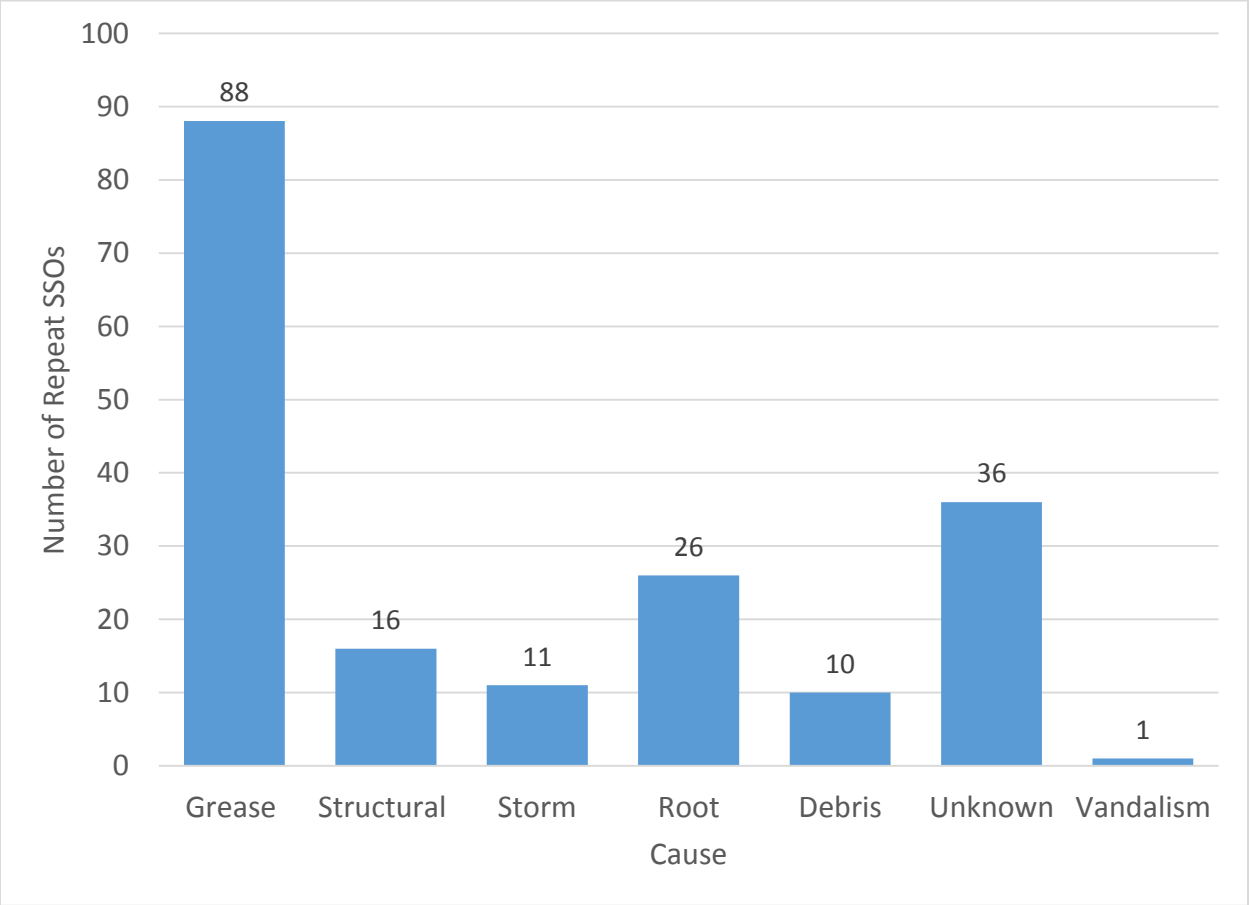


Figure 5-8 Number of Repeat Spill SSO Locations by Basin

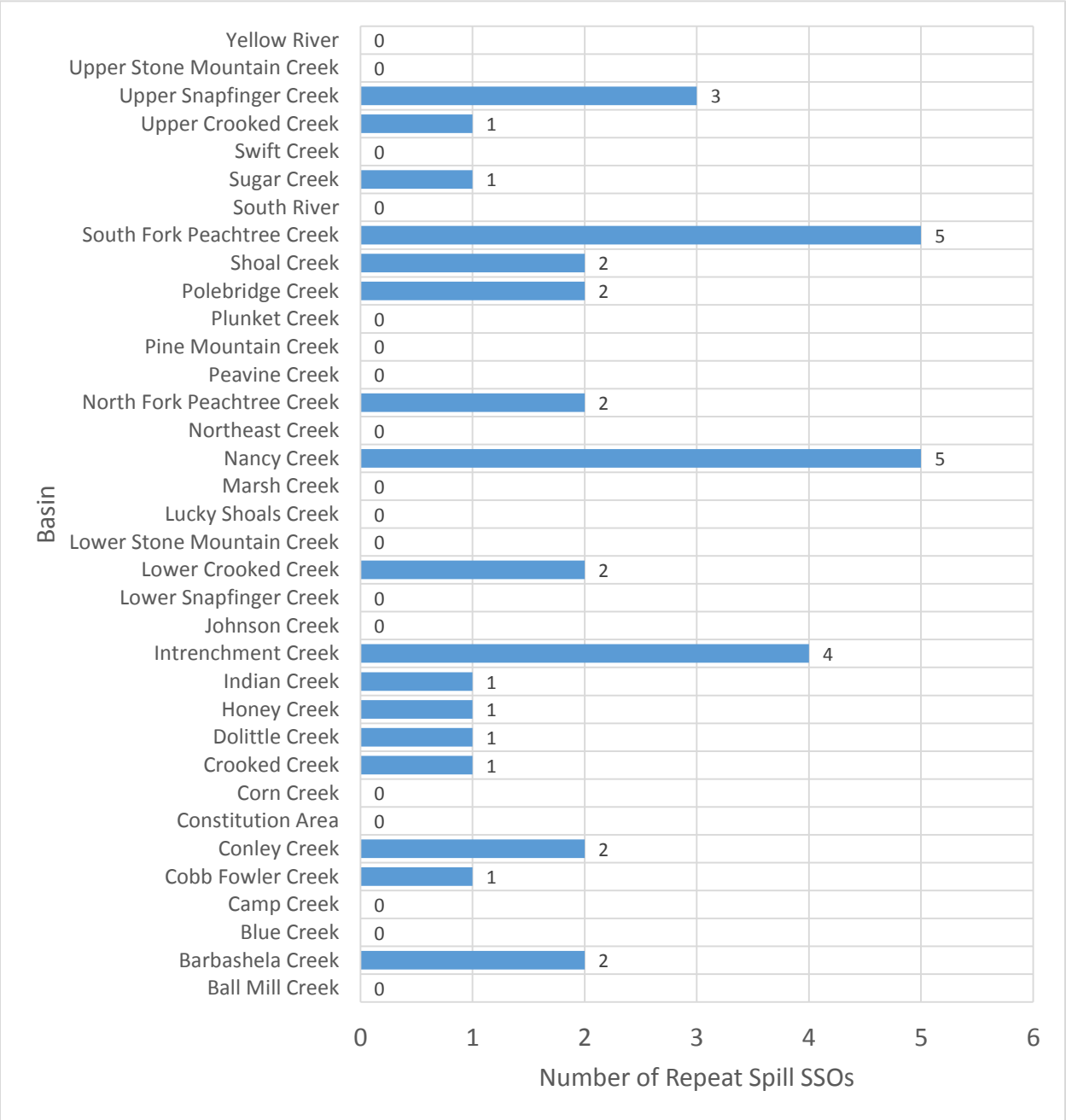
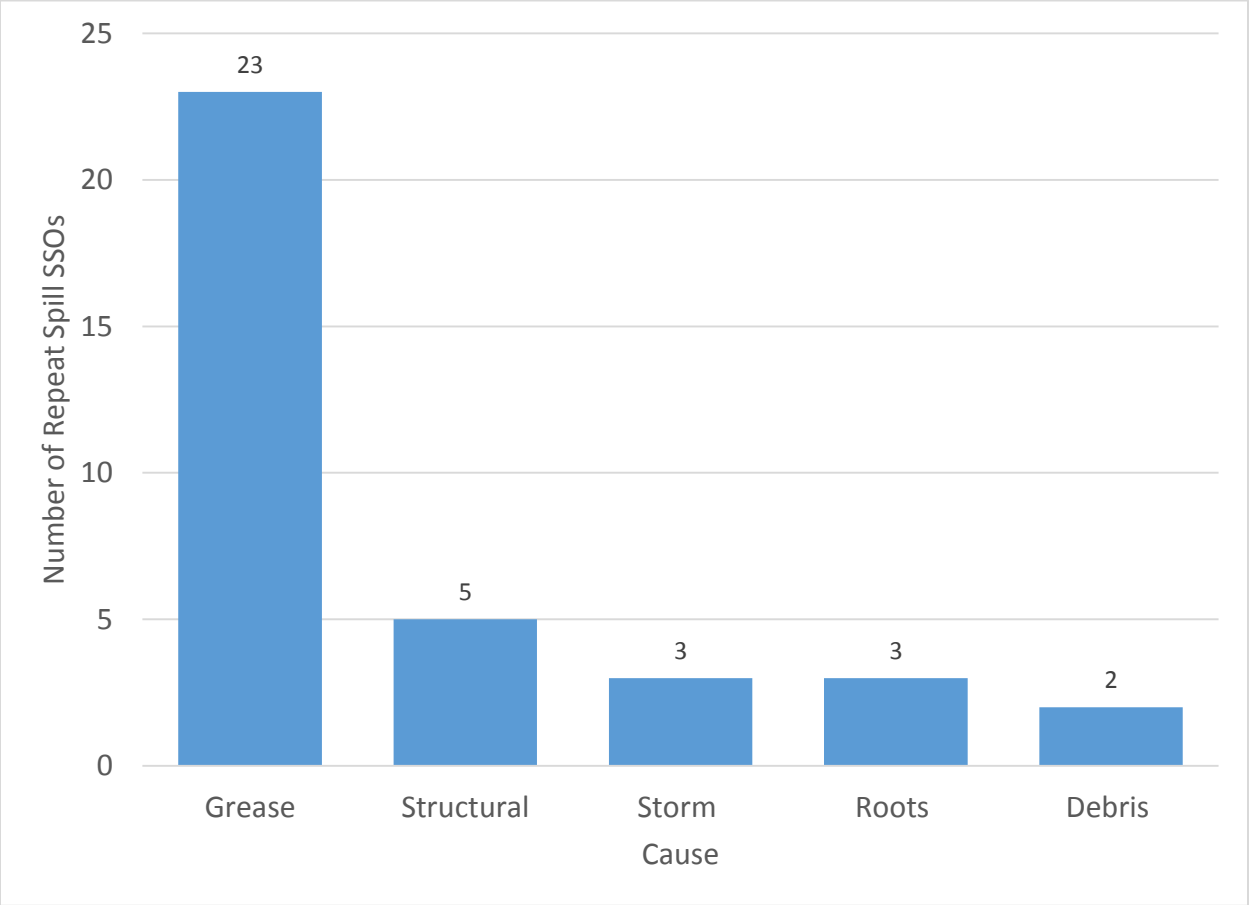


Figure 5-9 Number of Repeat Spill SSO Locations by Cause



6. Summary

A summary of the trend analysis presented in this report is provided below:

- The number of SSOs per year is decreasing with noticeable reductions in each of the last 2 years (2014 and 2015). This downward trend can be attributed to the amount of preventive maintenance and sewer cleaning work being performed in the collection system, FOG Program, and the public education campaigns.
- The average SSO duration over the last 4 years is approximately 3.5 hours. The 2015 average SSO duration is higher than the 4-year average, and relates to major storm events at the end of that year.
- Grease accounts for more SSOs than other causes and contributes to a significant portion of the SSO total volume. Storm-induced SSOs account for more volume than other causes but happen less often.
- SSOs caused by grease are declining while the number resulting from storms is increasing. However, the overall numbers are decreasing.
- SSOs volume resulting from grease is decreasing while the volume from storms is increasing.