DeKalb County
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Watershed Management
1580 Roadhaven Drive
Stone Mountain, GA 30083

Via Electronic Mail and U.S. Mail

March 1, 2017

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
March 1, 2017—5th Annual Report

Dear Ms. Janovitz:

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

- **March 1, 2017—5th Annual Report and Sanitary Sewer Overflow Trends Analysis**

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 A. Towler

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, Supervising County Attorney
E. Fitzgerald Veira, Troutman Sanders

Annual Report #5

January 1, 2016, to December 31, 2016
Civil Action No. 1:10cv4039 - WSD

DeKalb County
Department of Watershed Management

March 1, 2017

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)
ECMS	Engineering and Construction Management Services
EM	emergency maintenance
FMIS	financial management information system
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
ITB	invitation to bid
KPI	key performance indicator
LF	linear feet
LS	lift station
MCA	manhole condition assessment
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
TISCIT	totally integrated sonar and camera inspection technology
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 fifth Annual Report in accordance with Section IX, Paragraph 58 of the Consent Decree (CD) (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 CMOM Programs' Implementation Activities. The second section, the Sanitary Sewer Overflow Trends Analysis, is intended to meet the County's reporting obligations as referenced above.

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 United States Environmental Protection Agency (USEPA) and Georgia Environmental Protection Division (GAEPD). 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 CD period to verify the number of SSOs reported and analyzed herein. The details of that initial review and its findings were 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 CD requirements. The details of that second review and its findings were reported in documents submitted by the County on November 1, 2016.

As a result of issues discovered through this comprehensive review, enhancements were developed for several ongoing programs, most notably Contingency Emergency Response Plan (CERP). A comprehensive review of the CERP program was undertaken and various aspects of the program were enhanced to make the overall program more robust and responsive. Other programs continue to have an expanding role in the County's compliance efforts. The Fats, Oils, and Grease (FOG) program, for example, while meeting all major program milestones, has also taken on new importance in ongoing trend analysis efforts and in identifying areas in which preventive cleaning efforts should be undertaken through the Maintenance Management System (MMS). The enhancements undertaken in the various programs and the ongoing integration of those programs during 2016 are just two examples of how the County has moved forward from the reporting discrepancies that came to light in early 2016.

During the period from January 1, 2016, to December 31, 2016, the following DWM CMOM implementation programs, reports, and deliverables were approved by or submitted to the USEPA and GAEPD, as noted in Table ES-1.

Table ES-1 Consent Decree Submittals – Schedule and Status

Consent Decree #	Title	DWM Final Submittal
IX.(56)	4th Quarterly Report 2015	1/22/16
IX.(57)	8th Semi-Annual Report	2/1/16
IX.(56)	1st Quarterly Report 2016	6/1/16[a]
IX.(56)	2nd Quarterly Report 2016	7/29/16
IX.(57)	9th Semi-Annual Report	8/1/16
IX.(58)	Annual Report #4	8/1/16
IX.(56)	Supplement to Previously Submitted Quarterly Reports	8/1/16
IX.(58)	Revised Annual Report #4	11/1/16
IX.(56)	Supplement to Previously Submitted Quarterly Reports	11/1/16
IX.(56)	Revised 1st Quarterly Report 2016	11/1/16
IX.(56)	3rd Quarterly Report 2016	11/1/16

[a] *This report was granted an extension to 6/1/2016.*

Consistent with the requirements of the CD, this document details, in narrative form, progress made in the 2016 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 2016.

Table ES-2 2016 Major Consent Decree Milestones and Accomplishment Summary

Program or Project	Milestones and Accomplishments
CERP	✓ Established a Regulatory Compliance Division to perform quality assurance/quality control (QA/QC) for SSO report submittals to regulatory agencies; to oversee activities undertaken by the lab in the sampling, monitoring, and reporting of spills; and to assist with targeted reviews and review of follow-up actions for SSOs. ✓ Trained DWM personnel and CD contractors in CERP definitions, responses, and reporting. ✓ Responded to 135 reportable spill events and performed after spill follow-up actions.
FOG Management Program	✓ Increased FOG enforcement for unregistered food service establishments (FSE) and public education of areas around grease-related spills. ✓ Performed FOG inspections, evaluations, and tracked data: – Total number of FOG inspections: 9,233 – Total number of FOG evaluations: 1,132 ✓ 2016 monthly average permitted active FSEs: 2,718.
Sewer Mapping Program	✓ Completed inventory of sewer creek crossing assessments. ✓ Developed private sewer lateral Geographic Information System (GIS) shapefile from closed-circuit television (CCTV) data. ✓ Continued development of easement mapping program.
MMS Program	✓ Implemented a work order management system for gravity system maintenance that is fully integrated with GIS. ✓ Deployed mobile work order management devices (Android tablets) to field staff (1 year ahead of schedule). ✓ Implemented a mobile work order solution (1 year ahead of schedule). ✓ Improved the quality of addresses used for service requests and work orders.
Collection and Transmission Systems Training Program	✓ Provided technical and skills training to DWM personnel related to their job responsibilities. ✓ Completed 7,830 hours of training in 2016. ✓ Generated training reports for superintendents and managers, and reports for executive management staff.

Table ES-2 2016 Major Consent Decree Milestones and Accomplishment Summary

Program or Project	Milestones and Accomplishments
System-Wide Flow and Rainfall Monitoring Program	✓ Re-evaluated and adjusted the number and placement of monitors in the collection system based on evaluation of technical specifications for placement, operational efficiencies, use in hydraulic modeling, and other purposes. ✓ Installed flow monitors for flow reduction study and other purposes.
System-Wide Hydraulic Model	✓ Completed the modeling protocol update that was used to build and calibrate the hydraulic models. ✓ Completed peak flow model setup and preliminary capacity assessment for the three major sewer basins. ✓ Completed the model documentation. ✓ Completed draft modeling reports for the three sewer basins.
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. ✓ Coordinated with the implementation of work order management system (see MMS section) to track costs of emergency, corrective, and preventive work by asset.
Infrastructure Acquisitions Program	✓ Evaluated and/or acquired 37,898 linear feet (LF) of pipe.
Priority Areas Sewer Assessment and Rehab Program (PASARP)	✓ Performed work in the PASARP areas to identify and expedite delivery of rehabilitation recommendations while making urgent point repairs and raising buried manholes to allow for asset access and maintenance. ✓ Implemented and tracked assessment projects including 10,542 manhole assessments, 2,232,369 LF (423 miles) of acoustic inspection, 2,727,515 LF (516 miles) of smoke testing, 475,468 LF (90 miles) of CCTV and associated cleaning, and 52,127 LF (10 miles) of Totally Integrated Sonar and Camera Inspection Technology (TISCIT) inspection.
Ongoing Sewer Assessment and Rehabilitation Program (OSARP)	✓ Completed CCTV and associated pipeline cleaning and manhole condition assessment (MCA) in the OSARP areas including 295,366 LF (55.9 miles) of CCTV, 274,952 LF (52.1 miles) of cleaning, and 3,844 MCAs.
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. These problems are being addressed via the assessment and rehabilitation processes under PASARP and OSARP. ✓ Enhanced the existing quarterly SSO trends analysis process to include a more robust review of historic SSOs by sewershed. The review group now includes the Office of Operations and Maintenance and the Office of Engineering and Construction Management Services (ECMS) that includes FOG, CD Program Management Team, GIS, and the Division of Regulatory Compliance.

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

1. CERP (CD VI.B.i)

DWM continued to implement the CERP in 2016 using the approved plan to mobilize labor, materials, tools, and equipment to respond to and appropriately remedy conditions that may cause or contribute to an SSO. Considerable effort was made in 2016 to train DWM personnel in the CERP CMOM document and to verify that personnel were consistently and accurately applying the policies and procedures of the document. The document has been under internal review and it is anticipated that an updated document will be submitted in 2017. Previous reports document the efforts made to review service requests and communications within and without DWM to ensure that any previously unreported SSOs were documented and properly reported in 2016. Table 1 summarizes DWM's findings during that review and corresponding corrective actions.

Table 1 Summary of Findings and QA/QC Program Implementation and Ongoing Compliance Activities

Finding	QA/QC Program Implementation and Ongoing Compliance Activities
Improper SSO identification due to incorrect training definitions	• Instituted ongoing CERP training for DWM personnel and during new employee orientation • Instituted a training tracking system where monthly "exception reports" are sent to supervisors to determine "missed" or "overdue" training by DWM personnel • Required contractor CERP training for sewer contractors (cleaning, manhole raising, stream crossing assessment, etc.)
Improper routing of SSO related complaints	• Communicated with other County departments regarding the routing of external communications (not received via the dispatch emergency telephone reporting line nor the website reporting link) to a unified DWM email address DeKalbWaterOps@dekalbcountyga.gov • Emphasize to DWM personnel that all SSO related complaints should be recorded through the dispatch process
Lack of consistency in SSOs classification	• Instituted a monthly review of specific emergency response Service Requests by the Consent Decree Administrator to independently identify SSO events • Instituted a daily review of all SSO related Service Requests by the Assistant CMOM Coordinator and the Inspector/Sewer Specialist to confirm the classification of SSOs
Potential for the improper coding of Service Requests	• Instituted a daily review of the Foreman's Report corresponding to emergency response Service Requests by the General Foremen and Assistant Superintendent to identifying possible misclassified SSOs • Instituted a daily review of all Service Requests with SSO problem codes by the Dispatch Supervisor • Commenced the replacement of the current Service Request management system with the Cityworks software whereby the current codes (e.g., "M" codes or "C" codes) used in the current Service Requests will be replaced by descriptors based on the type of issue or work to be performed (e.g., leak, overflow, odor check, backup)
Inadequate organizational structure to provide compliance oversight	• Reorganized the DWM response reporting structure to include two Assistant Superintendents positions to oversee operations and emergency response activities during the week and during the weekend • Added an Assistant CMOM Coordinator position • Planned the addition of a General Foreman position to manage SSOs response and resolution (including coordinating follow up assessments) • Established a Regulatory Compliance Division to QA/QC SSO report submittals to regulatory agencies, oversee activities undertaken by the lab in the sampling, monitoring, and reporting of spills, and assists with targeted reviews and review of follow up actions for SSOs

Table 1 Summary of Findings and QA/QC Program Implementation and Ongoing Compliance Activities

Finding	QA/QC Program Implementation and Ongoing Compliance Activities
Lack of precision in the information received during the response action	• Implemented a revised SSO Evaluation Report to collect more detailed information from response activities and to standardize the types of information gathered • Expanded the information collection process regarding issues in laterals and building backups • Required the crews to provide information on the Service Request regarding the condition of the sewer main to aid in properly differentiating public versus private events • Commenced the implementation of Cityworks which provides the solution to the lack of precision in the information received during SSO investigations by requiring a response to specific questions as a mandatory part of completing a work order
Inadequate QA/QC regarding the resolution of the issues identified in SSO related Service Requests	• Instituted a weekly review of the "M" and "C" coded Service Requests by the Dispatch Supervisor to identify Service Request with outstanding activities in need of resolution • Instituted a system where by additional investigations are performed by the General Foremen to resolve incomplete Service Requests • Commenced the installation of Cityworks which allows full integration with the County's GIS to support planning and tracking of work associated with specific assets and ultimately allows for a better QA/QC of each SSO response activity
Insufficient communication with the community affected by SSOs	• Implemented a process where the Customer Support Administrator and an office assistant would update the community member, who notified DWM of the occurrence of a SSOs, of the resulting response action • Implementing a process where updated work plans could be shared with community members and regulatory agency • Planned an expansion of public education via social media, reverse calling, and literature distribution
Limited advanced measures regarding storm related SSOs	• Began the development of an automated call system to provide alerts • Outlined the process for the future installation of flow monitors as an early alert system for storm related SSOs

Additionally, to ensure that SSOs continue to receive the highest priority response within the DeKalb County DWM operations, DWM has taken the steps listed below.

Key Accomplishments and Significant Activities:

1. Completed the following activities related to SSOs:
   a. Cleaning total 3,734,119 LF
      i. First response and follow up 22,064 LF
      ii. Contractor cleaning 3,712,055 LF
   b. Point repairs 63
   c. CCTV 21,009 LF
2. Conducted monthly SSO meetings with program area managers.
3. Distributed more than 5,000 FOG education flyers in areas where grease was identified as the cause of the spill.
4. Increased public outreach campaign for SSO reporting and FOG. Began development of a "See It, Smell It, Report It" campaign to emphasize how to report SSOs in DeKalb County. See attached flyer for campaign (Attachment A).

2. FOG Management Program (CD VI.B.ii)

The DeKalb County FOG Management Program has met all major program milestones. However, to support the County's ongoing implementation of the CD, the FOG program has taken on greater significance in the ongoing Trends Analysis efforts and in developing cleaning protocols pursuant to the MMS program. While the FOG program is designed to reduce the amount of FOG that enters the WCTS, the cleaning instituted under the MMS program is designed to remove FOG from the system. Together, these programs represent a fully integrated FOG prevention and elimination program.

In 2016 DWM further increased its enforcement of the FOG ordinance and unregistered FSE as described below. DWM also increased the amount of public education about FOG and the effects of FOG on the sewer system through social media, media advertisements, and press releases. DWM successfully continued efforts to engage the municipalities within the County to ensure implementation of the FOG Management Program throughout the County.

Key Accomplishments and Significant Activities:

1. Distributed educational materials at multi-family apartment complexes and residential neighborhoods that have been identified as located near sewer spills and investigated nearby FSE for grease violations.
2. Reviewed 5,847 pump-out manifests as part of the Hauler Company Assessment program to ensure that haulers are properly disposing of FOG.
3. Delivered 1,086 warning notices (increase of 27 percent) and 55 court summons to non-compliant FSEs (increase of 450 percent).
4. Performance Measures:
   a. Total number of FOG inspections: 9,233
   b. Total number of FOG evaluations: 1,132
   c. 2016 monthly average permitted active FSEs: 2,718
5. Issued 2,237 permits.
6. There were 13 public events in 2016 where FOG information was distributed. The estimated attendance for these events is 6,470 people. These events included community events, town hall meetings, city sponsored events, and DeKalb County sponsored events.

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

The purpose of the Sewer Mapping Program is to provide an integrated system capable of mapping, inventorying, and depicting system assets. In 2015, the Sewer Mapping Program enhancements and milestones were substantially completed, thus allowing the County in 2016 (1) to produce certain maps using GIS technology; (2) to integrate electronically sewer system locations and attribute data with the preliminary hydraulic model and the computerized maintenance management systems (CMMS); (3) to reproduce maps in a manner that will allow use by operation and maintenance crew leaders in the field; and, (4) to identify and track problems geographically.

Even though the County has achieved completion of the major components of the program, data updates to the GIS system continue for new developments or system changes that have been reported by DeKalb County personnel in the regular course of business or by non-DeKalb County personnel engaged in assessment and rehabilitation projects. Moreover, the information from the Sewer Mapping program is being used in other CD-related programs including the hydraulic model, flow and rainfall monitoring, PASARP, OSARP, CERP, FOG, Infrastructure Acquisitions, and MMS programs.

Key Accomplishments and Significant Activities:

1. Completed and compiled sewer creek crossing inventory and assessment data for use in the capital upgrade and routine maintenance/inspection program.
2. Developed private sewer lateral shapefile for use with GIS from CCTV data.
3. Continued the development of easement mapping program by identifying existing easement documents and data attributes desired for management of the program.
4. Provided ongoing verification of GIS data in the field and provide corrections to improve GIS data quality.

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 wastewater collection and transmission system (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 Systems, and Inventory Management are tools used to support maintenance activities. Gravity System Maintenance and Lift Stations, Force Mains, and air release valve (ARV) 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 – Completed the deployment of Android tablets to field staff engaged in the maintenance of the wastewater collection system. Crew supervisors, inspectors, general foremen, and the superintendent were issued tablets. The tablets are enabled for cellular data connection. This deployment of tablets to field staff was accomplished more than 1 year ahead of schedule.
2. Information Management – Several critical enhancements were completed in 2016.
    a. Integrate work orders for gravity system maintenance – DWM implemented Cityworks, a GIS-based asset and work management system for collection system maintenance. As a result of this implementation, DWM has an inventory of their collection system assets and is tracking work at the asset level. This work tracking includes date of work, work activity performed, work type (corrective, preventive, or emergency), the asset(s) on which work was done, labor, equipment, and materials.
    b. Implement mobile work order solution – DWM implemented Cityworks in a manner that fully enabled mobile work order management. The Android tablets issued to field staff have a live connection to Cityworks and field staff no longer uses paper forms for their daily work. They record their work on work orders in Cityworks using their tablets. This enhancement was completed more than 1 year ahead of schedule.
    c. Improve the quality of addresses used for service requests and work orders – Cityworks is based on DWM's GIS for sewer assets and the County's GIS parcel layer for addresses. The latter ensures addresses used are drawn from the most accurate and current address data available. Before Cityworks, users could enter any address in DWM's work tracking system and many of those turned out to be incorrect addresses. This issue has been solved with the implementation of Cityworks.

3. Inventory Management

   a. Completed a plan 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 plan calls for DWM to consider implementing Cityworks for the Central Warehouse, exploring the feasibility of an interface between Cityworks and FMIS (the County's financial management information system), regularly run replenishment reports to help identify items nearing their re-order point, and seek to improve transparency from the Purchasing and Contracting Department so that warehouse staff have current information on the status or purchase requests and purchase orders.

   b. Performed physical inventory successfully at each warehouse location. The DWM Operations warehouse location achieved outstanding audit results of a 102 percent for 2016.

   c. DWM warehouse inventory value was $6,167,211.00 for 2016.

4. Gravity System Maintenance

   a. Inspected more than 2,200 out of the 3,719 creek crossings, thus completing the baseline inspection of creek crossings.

   b. Completed a plan to set the re-inspection schedule for creek crossings based on the initial inspections completed in 2016. The plan is summarized in the table below.

Priority	Count	Percent	Re-Inspection Frequency	Year Next Inspection Due
High	661	18%	1 year	2017
Med	980	26%	2 years	2018
Low	2,078	56%	5 years	2021
Grand Total	**3,719**			

   c. Continued to input repair and maintenance data into CMMS.

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 B).

   b. Working statistics:
      i. Completed 4,485 preventive maintenance work orders (374/month).
      ii. Maintained a back log of four or less work orders per month over 30 days.
      iii. Averaged 3.2 lift stations per month with one pump out for service at some point.
      iv. Inspected 67 force main easements this year.
      v. Inspected 18 discharge manholes.
      vi. Performed force main pressure testing at 23 stations.
      vii. Inspected two ARVs.
      viii. Completed lift station work orders:
         1. 54 percent preventive maintenance
         2. 41 percent corrective maintenance
         3. 5 percent emergencies

c. Continued activity to have bypass connections installed 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.

d. DWM performed electrical ground testing at 12 lift stations where such testing is possible.

6. Tracked KPIs (see Attachment C).

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

In 2016, the County continued to deliver technical and skills training to DWM personnel related to applicable job responsibilities. The CMOM document was reviewed and is being updated to reflect program changes and upgrades. CERP training was a major focus of the year and included coordination with New Employee Orientation classes to train all new DWM personnel on CD responsibilities (in previous years, only new Operations personnel were provided CERP training).

Key Accomplishments and Significant Activities:

1. Completed 7,830 hours of training in 2016 for 587 different staff members.
2. Developed training reports for superintendents and managers, and reports for executive management staff for the second half of 2016.

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. All major milestones for this program have been completed. As a result, flow and rainfall data have been incorporated into the preliminary hydraulic model. With the delivery of the preliminary hydraulic model, the program's focus was shifted from data collection for the hydraulic model to use for capacity analysis and I/I reduction. Moreover, the County continues to use the program for SSO reduction efforts and identification of areas that could possibly lead to an SSO.

Key Accomplishments and Significant Activities:

1. Re-evaluated and adjusted the number and placement of monitors in the collection system based on evaluation of technical specifications for placement, operational efficiencies, use in hydraulic modeling, and other purposes.
2. Maintained, including calibration of, in-place monitors.
3. Installed flow monitors for flow reduction study and other purposes.
4. Established an ongoing training program for personnel to increase and maintain the skills and knowledge for accurate and correct installation of units to improve overall quality of data generated.

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

DWM has developed a preliminary computer-based hydraulic model (the Preliminary Model) for the County's WCTS. The Preliminary Model integrates data from the Sewer Mapping Program and the System-Wide Flow and Rainfall Monitoring Program. Once finalized, 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.

Key Accomplishments and Significant Activities:

1. In the development of the Preliminary Model, DWM completed the following tasks:
    a. The modeling protocol update that was used to build and calibrate the hydraulic models.
    b. Peak flow model setup for the three major sewer basins.
    c. Initial capacity assessment using the preliminary peak flow model for the three major sewer basins.
    d. Documented the model.
    e. Draft modeling reports for the three major sewer basins.
2. Performed initial debottleneck evaluation through the use of the Preliminary Model to assist in overall system assessment and model performance evaluation.

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

The 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. DWM 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. Confirmed that the 2016 year-end financial results for revenue and expense are on track.
3. Initiated the tracking of costs by work order type through the implementation of new work-order-based CMMS software in the Operations Division to track work type done on assets. The software will track costs for corrective, preventive, or emergency maintenance and track equipment, labor, and material costs.

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 2016, DWM saw a large increase in the number of development applications in the County. Additional resources were added to the program to handle the increased workload and to coordinate with the municipalities within the County. With the delivery of the Preliminary Hydraulic Model in June 2016, the information gleaned from such Preliminary Model was included as a consideration when determining capacity. Once the final hydraulic model is delivered, the process to verify capacity in the WCTS will be modified to include the final model. Capacity allotment and certification will continue to be one of the main focuses of the program going forward.

Key Accomplishments and Significant Activities:

1. Evaluated and/or acquired 37,898 LF of pipe.
2. Conducted 39 capacity model runs in conjunction with the Hydraulic Modeling Program.

3. Reviewed 1,192 plans. This is a 98-percent increase from 2015 (600).
4. Reviewed 33 plats.
5. Reviewed and approved 30 sewer action plans from private developers.

A sewer action plan details how wastewater flows will be managed and held onsite during wet weather events. An approved sewer action plan can then become the basis for a conditional sewer capacity letter. This letter can be used to obtain financing, continue the permitting process, or begin construction.

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 CD within the County WCTS. The Initial and Additional Priority Areas total approximately 776 miles of sewers (approximately 29.5 percent of the WCTS). In implementing the PASARP, the County is undertaking certain condition, structural, and hydraulic assessments within the Priority Areas 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 2016, the County ramped up the two-year condition assessment phase of the PASARP using a wide range of evaluative tools and programs including Private Lateral Investigations; Corrosion Defect Identifications; Manhole Condition Assessment; Flow Monitoring; CCTV Inspection; Gravity Sewer Line Defect Analysis; TISCIT; Acoustical Testing; and Smoke Testing. The data obtained thus far during this massive sewer system condition assessment process has been documented and archived in the County's mapping system and is being evaluated on a bi-weekly basis to identify and analyze defects. Certain defects identified during the assessment phase were scheduled for immediate rehabilitation if the defect potentially posed an immediate risk of structural failure or contributing to an SSO occurrence. Examples of immediate rehabilitation measures already undertaken by the County include making urgent point repairs and raising buried manholes to allow for asset access. In addition to identifying and analyzing defects from the assessment data, the County has begun evaluating and prioritizing cost-effective rehabilitation recommendations.

Key Accomplishments and Significant Activities:

1. Performed assessments and cleaning that included approximately:
    a. 2,232,369 LF (423 miles) of acoustic inspection
    b. 2,727,515 LF (516 miles) of smoke testing
    c. 475,468 LF (90 miles) of CCTV inspection and associated cleaning
    d. 52,127 LF (10 miles) of TISCIT inspection
    e. 10,542 manhole condition assessments
2. Performed 10 urgent/emergency point repairs.
3. Performed 190 manhole raising for access and urgent manhole repairs.
4. Corrected access to assets within Priority Areas to facilitate inspection and future maintenance as needed.
5. Developed minimum standards and guidance as related to design and construction of PASARP-driven rehabilitation work.
6. Prepared the technical documents for the initial rehabilitation package resultant of the PASARP tiered assessment.

7. Continued execution of project communications and community outreach for ongoing projects.
8. Implemented quality assurance tools and protocols and provided contractor training for the assessment contractors to screen data prior to submitting to DWM.
9. Continued the implementation and refinement of work flow and decision tools that would be applied to the results of the condition assessments.
10. Tracked KPI as shown in Table 10-1.

KPI	2016 Performance
SSOs per 100 miles of WCTS within the Priority Areas per year	11.8 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	0.30 per 100 miles per year per inch of rain within the Priority Areas
Total volume[1] of spills per 100 miles of WCTS within the Priority Areas	55,045 gallons per 100 miles within the Priority Areas
Total volume[1] of spills per 100 miles per inch of rain within the Priority Areas	1,423 gallons per 100 miles per inch of rain within the Priority Areas
Number of dry weather SSOs[2] within the Priority Areas	96 dry weather SSOs[2] within the Priority Areas

Notes:
[1]*For the year 2016 volume was recorded for 96 percent of the spills.*
[2]*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 CD is in effect, and will continue to exist after the CD expires. This program enables 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

Key Accomplishments and Significant Activities:

1. Completed CCTV and associated pipeline cleaning and MCA in the OSARP areas:
   a. 295,366 LF (55.9 miles) of CCTV
   b. 274,952 LF (52.1 miles) of cleaning
   c. 3,844 manhole condition assessments
2. Tracked KPIs as shown in Table 11-1.

KPI	2016 Performance
SSO per 100 miles of WCTS per year	9.7 per 100 miles per year
SSO per 100 miles of WCTS per year per inch of rain	0.25 per 100 miles per year per inch of rain
Total volume[1] of spills per 100 miles of WCTS	53,436 gallons per 100 miles
Total volume[1] of spills per 100 miles per inch of rain	1,381 gallons per 100 miles per inch of rain
Number of dry weather SSOs[2]	239 dry weather SSOs[2]

Notes:
[1]For the year 2016 volume was recorded for 96 percent of the spills.
[2]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
Spill Reporting
Public Information Campaign Graphic

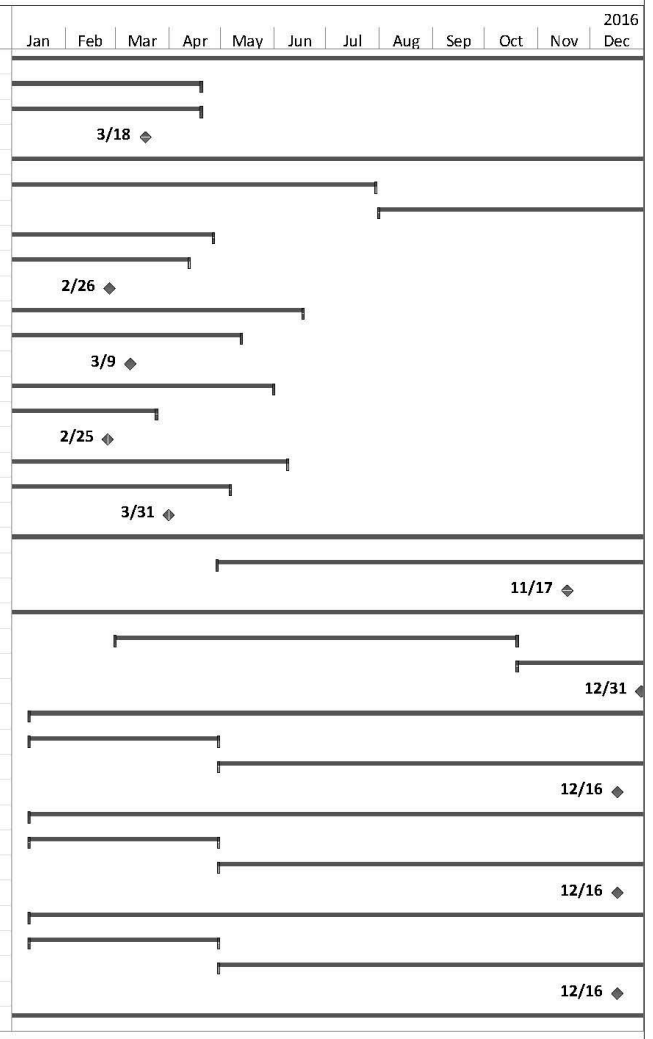

See it?
Smell it?
Report it!
DEKALB COUNTY
SEWER
GEORGIA
DeKalb County
GEORGIA
REPORT SEWAGE SPILLS ASAP
call 770.270.6243 and press 2 report
or email dekalbwaterops@dekalbcountyga.gov

Attachment B
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.
1131	**CIP Rehab/Construction Projects**	**4/1/14**	**6/14/19**	**NA**	
1133	**Superior Ave SS PH II {D/B/B}**	**3/19/15**	**4/19/16**	**NA**	**100**
1167	**Construction**	**8/14/15**	**4/19/16**	**NA**	**100**
1171	Final Completion	3/18/16	3/18/16	NA	100
1177	**Caladium Drive {D/B}**	**2/13/15**	**3/5/18**	**NA**	**3**
1180	**Field Assessment**	**12/7/15**	**7/29/16**	**NA**	**100**
1183	**Design/Build Procurement**	**8/1/16**	**3/28/17**	**NA**	**50**
1240	**Perimeter Park LS {D/B/B}**	**3/27/15**	**4/26/16**	**NA**	**100**
1265	**Construction**	**7/1/15**	**4/12/16**	**NA**	**100**
1269	Final Completion	2/26/16	2/26/16	NA	100
1274	**Royal Atlanta I LS {D/B/B}**	**3/27/15**	**6/17/16**	**NA**	**100**
1299	**Construction**	**7/1/15**	**5/12/16**	**NA**	**100**
1303	Final Completion	3/9/16	3/9/16	NA	100
1308	**Pepperwood LS {D/B/B}**	**3/27/15**	**5/31/16**	**NA**	**100**
1333	**Construction**	**7/1/15**	**3/24/16**	**NA**	**100**
1337	Final Completion	2/25/16	2/25/16	NA	100
1352	**Scarbourgh LS {D/B/B}**	**4/22/15**	**6/8/16**	**NA**	**100**
1382	**Construction**	**9/29/15**	**5/6/16**	**NA**	**100**
1386	Final Completion	3/31/16	3/31/16	NA	100
1431	**Columbia Drive LS {D/B}**	**4/3/15**	**2/27/17**	**NA**	**95**
1458	**Design/Build**	**4/29/16**	**2/27/17**	**NA**	**95**
1460	Substantial Completion	11/17/16	11/17/16	12/31/16	100
1467	**Honey Creek LS ** {D/B}**	**10/15/15**	**6/3/18**	**NA**	**15**
1468	**Design/Build Procurement**	**3/1/16**	**10/19/16**	**NA**	**100**
1485	**Design/Build**	**10/20/16**	**6/3/18**	**NA**	**15**
1487	Design Completion	12/31/16	12/31/16	12/31/16	100
1495	**Stonecrest LS (new) {D/B}**	**1/11/16**	**7/31/17**	**NA**	**95**
1496	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1513	**Design/Build**	**4/30/16**	**7/31/17**	**NA**	**95**
1515	Substantial Completion	12/16/16	12/16/16	12/31/16	100
1522	**Lithonia I LS Demo {D/B}**	**1/11/16**	**7/31/17**	**NA**	**95**
1523	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1540	**Design/Build**	**4/30/16**	**7/31/17**	**NA**	**95**
1542	Substantial Completion	12/16/16	12/16/16	12/31/16	100
1549	**Lithonia II LS Demo {D/B}**	**1/11/16**	**7/31/17**	**NA**	**95**
1550	**Design/Build Procurement**	**1/11/16**	**4/29/16**	**NA**	**100**
1567	**Design/Build**	**4/30/16**	**7/31/17**	**NA**	**95**
1569	Substantial Completion	12/16/16	12/16/16	12/31/16	100
1576	**Leeshire LS ** {D/B/B}**	**4/1/14**	**11/9/18**	**NA**	**12**



Statused thru 12/30/16

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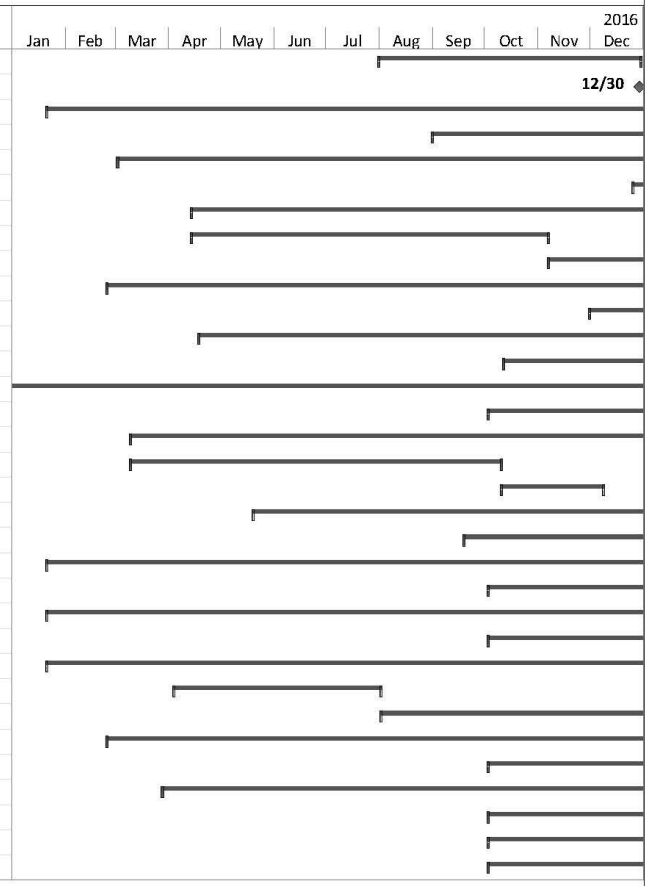
DeKalb County Department of Watershed Management

CDPMT Master Schedule
Annual Report - Consent Decree
CIP PROJECTS

ID	Task Name	Start	Finish	CD/CMOM Date	% Complete.
1579	**Design**	**8/1/16**	**12/30/16**	**NA**	**100**
1581	Design Completion	12/30/16	12/30/16	12/31/16	100
1641	**Hammer Mill I LS {D/B/B}**	**1/21/16**	**12/31/17**	**NA**	**11**
1644	**Design**	**9/1/16**	**1/6/17**	**NA**	**90**
1704	**Royal Atlanta III LS {D/B}**	**3/2/16**	**1/12/18**	**NA**	**3**
1707	**Design / Build Procurement**	**12/26/16**	**4/18/17**	**NA**	**0**
1731	**Johnson Creek LS {D/B}**	**4/14/16**	**2/26/18**	**NA**	**3**
1732	**Design/Build Procurement**	**4/14/16**	**11/6/16**	**NA**	**100**
1749	**Design/Build**	**11/7/16**	**2/26/18**	**NA**	**0**
1758	**Hearn Road LS {D/B}**	**2/25/16**	**3/26/18**	**NA**	**3**
1761	**Design/Build Procurement**	**12/1/16**	**3/20/17**	**NA**	**50**
1819	**American Fare LS {D/B/B}**	**4/18/16**	**1/28/18**	**NA**	**8**
1822	**Design**	**10/12/16**	**1/27/17**	**NA**	**60**
1883	**Lewis Way LS {D/B}**	**9/22/15**	**2/17/19**	**NA**	**8**
1884	**Design/Build Procurement**	**10/3/16**	**2/6/17**	**NA**	**60**
1910	**Heritage Heights {D/B/B}**	**3/10/16**	**11/4/18**	**NA**	**15**
1911	**Design Procurement**	**3/10/16**	**10/10/16**	**NA**	**100**
1913	**Design**	**10/11/16**	**12/8/16**	**NA**	**100**
1973	**I85 / Oakcliff Rd {D/B/B}**	**5/20/16**	**1/31/19**	**NA**	**11**
1976	**Design**	**9/19/16**	**1/31/17**	**NA**	**90**
2036	**Stone Mill I LS {D/B}**	**1/21/16**	**2/17/19**	**NA**	**3**
2037	**Design/Build Procurement**	**10/3/16**	**2/6/17**	**NA**	**70**
2063	**Stone Mill II LS {D/B}**	**1/21/16**	**2/17/19**	**NA**	**3**
2064	**Design/Build Procurement**	**10/3/16**	**2/6/17**	**NA**	**70**
2090	**Camp Creek LS {D/B}**	**1/21/16**	**10/10/18**	**NA**	**3**
2091	**Design/Build Procurement**	**4/4/16**	**8/1/16**	**NA**	**100**
2106	**Design/Build**	**8/2/16**	**10/10/18**	**NA**	**5**
2117	**Pennybrook LS {D/B}**	**2/25/16**	**2/21/19**	**NA**	**3**
2118	**Design/Build Procurement**	**10/3/16**	**2/6/17**	**NA**	**70**
2144	**Fourth St LS {D/B}**	**3/28/16**	**2/17/19**	**NA**	**3**
2145	**Design/Build Procurement**	**10/3/16**	**2/6/17**	**NA**	**70**
2172	**New Gibraltar LS {D/B/B}**	**10/3/16**	**1/24/19**	**NA**	**3**
2173	**Design Procurement**	**10/3/16**	**2/6/17**	**NA**	**70**



Statused thru 12/30/16

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Attachment C
MMS KPIs

KPI	Formula	2016 Results
Communication System Program-data is from available data March 2016-December 2016		
Landline dropped calls	Number of dropped calls	Average of 0 dropped calls per month
Landline missed calls	Number of missed calls	Average of 32 missed calls per month
Call Duration	Duration of calls in minutes divided by the number of calls	Average duration of call: 2 minutes 15 seconds Total number of calls: 5,306
Information Management		
Active SSO-Driven Sewer Service Request Percentage	Number of active SSO-driven sewer service requests ÷ number of completed sewer service requests in the reporting period x 100	<1% SSO-driven sewer service requests 19 active, 42,727 completed
Inventory Management		
Percentage of out-of-stock items	For the reporting period, the number of parts out of stock when requested ÷ total number of parts requested x 100	1.6% of out-of-stock items
Percentage of Physical Inventory Performance	The percentage of items whose quantity on hand does match the quantity in Oracle WAM	102% of items match the quantity in Oracle WAM (found additional items)
Percentage of Physical Inventory Audit	The net cost difference in the value of the physical count vs. the value of inventory shown in Oracle WAM	2.3% net cost difference
Gravity System		
Percentage of Preventive Maintenance (PM): CCTV Inspection of Sewer Lines, Operations and Contractors	Number of miles inspected ÷ total miles of sewer line x 100	5.9% sewer lines CCTV'd
PM: Percentage of Sewer Lines Cleaned	Number of miles cleaned ÷ total miles x 100	31% sewer lines cleaned
PM: Linear feet of 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	<1% of system (5,241 LF of root treatment)
PM: Percentage of manholes inspected per year	Number manholes inspected ÷ total number of manholes in system x 100	22% manholes inspected

KPI	Formula	2016 Results
Percentage of Emergency Maintenance (EM): Number of SSOs per mile of gravity sewer line	Number of SSOs ÷ WCTS total miles of gravity lines x 100	9.2% SSOs per mile of gravity sewer line
Lift Stations, Force Mains, and Appurtenances		
PM: Percentage of 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 54% CM: 46%
PM:Percentage of Backlogged PM Work Orders	Number of work order not completed ÷ total number of work orders (x 100)	1.1% backlogged PM work orders
PM: Percentage of completed PM Work Orders (based on timeframe specified)	Number of work orders completed by timeframe	>60 days – 12
CM: Percentage of lift stations with pumps out of service	Percent Value. number of stations with pumps out of service ÷ total number of stations (x 100)	3.2% lift stations with pumps out of service
PM: Percent of ARVs inspected, flushed, and serviced	Number of ARVs inspected, flushed, and serviced per year ÷ total number of ARVs (x 100)	3.2% ARVs inspected, flushed, and serviced

Part II Sanitary Sewer Overflow Trends Analysis

Executive Summary

As required by Section IX, Reporting Requirements 58(b) of the CD, the following trends analysis is submitted for the 24-month period to include calendar years 2015 and 2016.

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

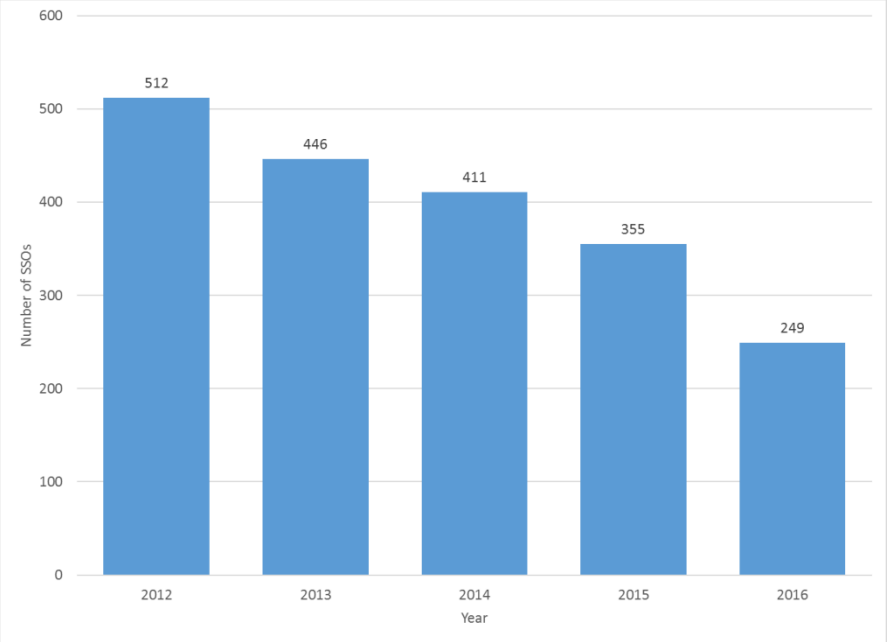
> *"A trends analysis of the number, volume, average duration, and cause of the County's Sanitary Sewer Overflows (SSOs) for the previous twenty-four (24) month period."*

This report meets the requirements of the annual Trends Analysis in that it looks back at the 24-month period to include calendar years 2015 and 2016, including data from 2012, 2013, and 2014 for reference. As required by the CD, the report addresses SSO types (spills, overflows, and building backups) as applied to the various data and trends. This report consists of the following sections:

- Section 1 – Classification of SSO Types and Causes
- Section 2 – Number and Volume of SSOs
- Section 3 – Average Duration of SSOs
- Section 4 – Causes of SSOs
- Section 5 – Other Trends

The overall number of SSOs per year has decreased by more than 50 percent since 2012, with the greatest annual reduction occurring from 2015 to 2016. This downward trend can be attributed to maintenance programs including sewer cleaning, the FOG Program, and extensive public education campaigns. Additionally, the County has likely been over-inclusive in reporting the number of building back-ups from 2012-2016. 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 was 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 has retrained 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 the necessary information to accurately track building back-ups moving forward.

Figure ES-1 Reported SSOs per Year (2012–2016)



As to spills specifically, the number of spills has decreased approximately 15 percent from 2012 to 2016 (see Figure ES-2). The overall trend continues downward for spills, but spills increased approximately 6 percent from 2015 to 2016. This increased number of overall spills can be directly attributed to the County's increased accuracy in discovering SSOs in general. As the County's assessment work progresses and new stream sampling protocols and other measures are put in place, the County is in a position to more readily identify issues and discover SSOs.

Despite the increased accuracy of the County's reporting efforts, the overall number of spills attributable to the categories of grease, debris, and structural causes has decreased (see Figure ES-3). The decrease in spills causes by grease and debris is a positive trend and directly correlates to the increased field activity undertaken by DWM to expand its public education program relative to FOG, to expand the preventive maintenance cleaning program, and to use CCTV more extensively to check for structural defects. Spills attributed to storms decreased 83 percent from 2015 to 2016. The primary cause for this decrease is the much lower rainfall totals for 2016 compared to 2015. In 2016, the rainfall total in the County was less than half the amount that fell in 2015.

Spills attributable to structural issues were trending downward until 2016. However, due to the County's ongoing assessment work and increased accuracy in discovering and reporting SSOs of every type, there was nearly a 100 percent increase in the number of spills from 2015 to 2016 resulting from structural causes. DWM commissioned more inspection and assessment work in the WCTS in 2016 than before. The increased number of inspections put resources into the field in remote places such as along streams and in ravines that are generally out of sight. When problems were found, DWM subsequently reported the findings appropriately.

The effectiveness of the increased stream sampling protocol is also apparent from just one example. The spill in question was first discovered on December 19th. While performing field sampling work for a separate spill, DWM noted high fecal coliform counts in a sample upstream of where the spill occurred that prompted the initiation of source tracking to determine the source of high fecal counts. The source turned out to be a clogged 8-inch-diameter sewer line. This single incident accounted for 36 percent (estimated 210,600 gallons) of the total volume of maintenance-related SSOs in 2016, but could have

gone undetected or spilled for a longer period of time without DWM's proactive work in interpreting sampling data.

Figure ES-2 Spills by Year (2012–2016)

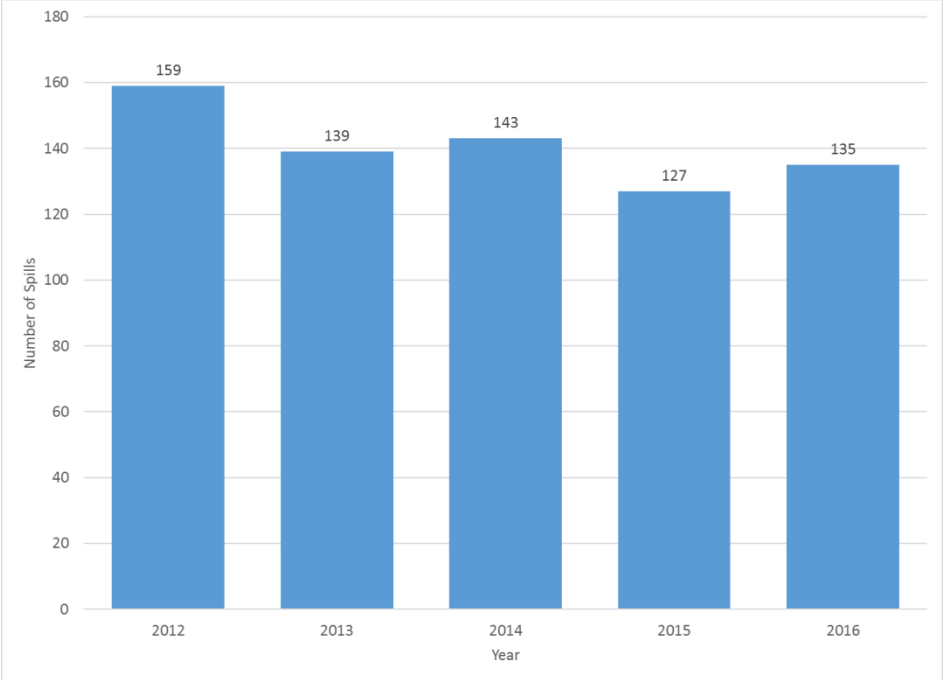
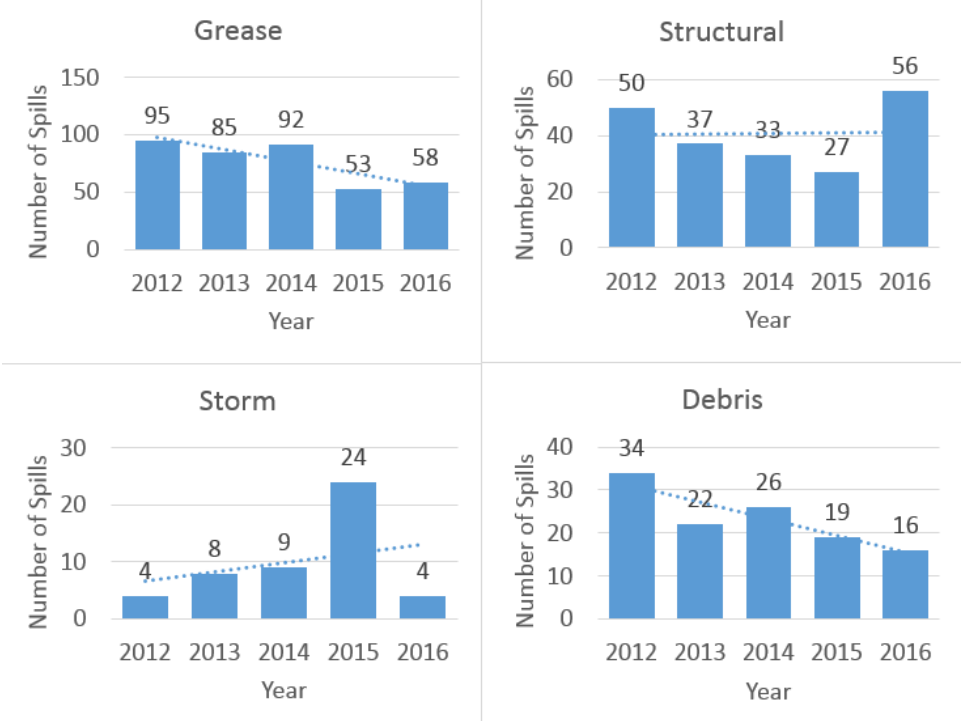


Figure ES-3 Spills by Year by Cause Category (2012–2016)



Notes: Cause Categories may include more than one cause. Some spills appear in more than one Cause Category.
Dashed line is the linear trend line for each graph.

1. Classification of SSO Types and Causes

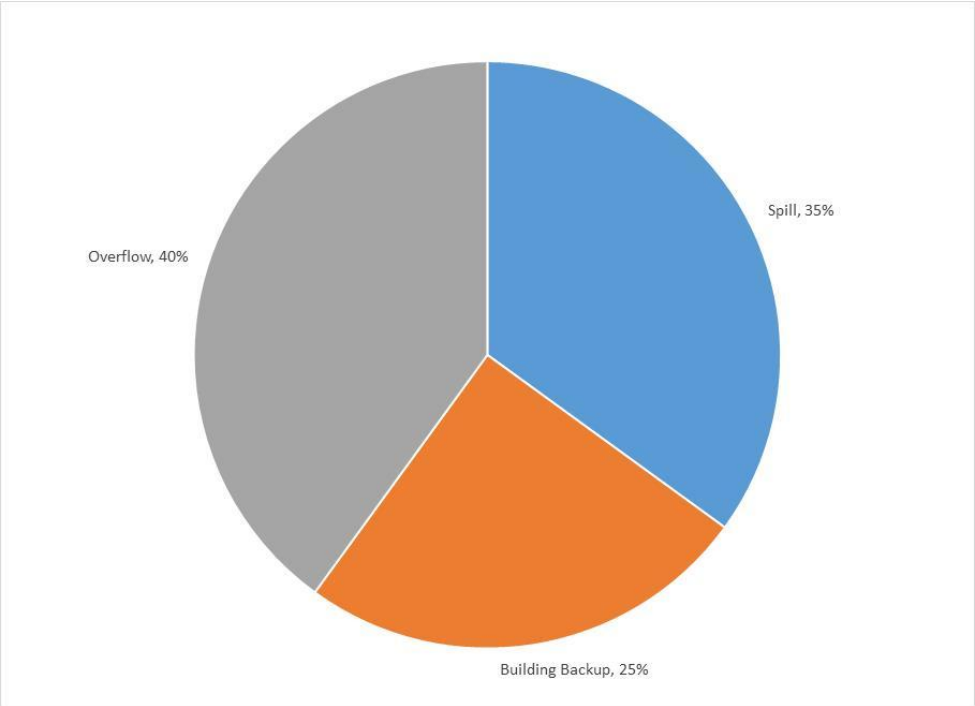
The CD requires a trend analysis of the prior 24-month period. To gain a more comprehensive view of the revised SSO data, DWM analyzed trends for the period from 2012 through 2016.

DWM categorizes each SSO that occurs as one of three types as defined in the CD. 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 re-categorized accordingly. Definitions from the CD 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. Spills account for approximately 36 percent of the SSOs, overflows account for approximately 40 percent of the SSOs and building backups account for approximately 25 percent of the SSOs.

Figure 1-1 SSOs by Type (2012–2016)



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 2016. 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. 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, 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 used by DWM for the period of 2012 to 2016.

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.
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	Use of this code requires a detailed description
OUTSIDE CON	Outside contractor	Caused by a contractor not performing work for the County.
PMP FLR	Pump failure	
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 conducted in 2016 identified additional SSOs where the cause could not be determined retroactively. For those instances, the UNK code was used.
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–

2016). DWM has reduced the number of SSOs by more than 50 percent since 2012, with the greatest annual reduction occurring from 2015 to 2016.This downward trend can be attributed to maintenance programs including sewer cleaning; FOG Program; and extensive public education campaigns.

Figure 2-1 Reported SSOs per Year (2012–2016)

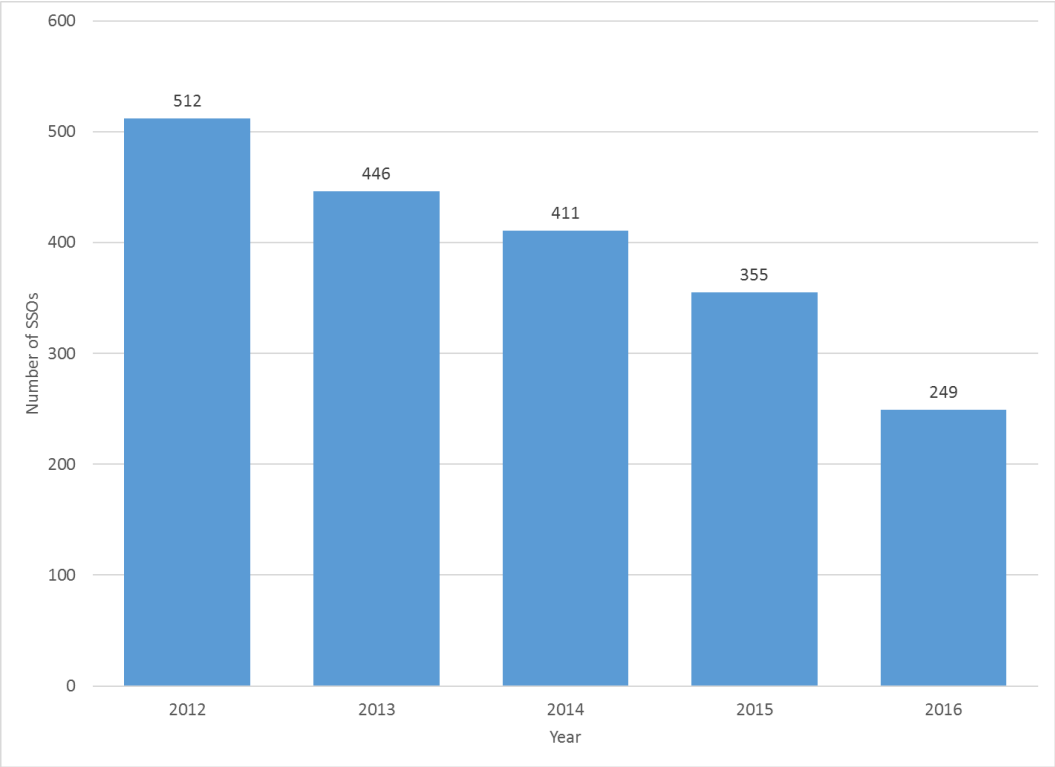


Figure 2-2 shows annual rainfall for the same period of record (2012–2016). Both rainfall and SSOs decreased in 2016. Rainfall was the lowest in the last 5 years, and approximately half of what was recorded in 2015.

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. Similarly, rainfall decreased from 2013 to 2014 and again from 2015 to 2016 as did the volume of SSOs in those periods.

Volume was recorded for 57 percent of the SSOs that occurred in 2012–2016; 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. For 2016, 71 percent of the SSOs have a volume recorded.

Figure 2-2 Annual Precipitation (inches) (2012–2016)

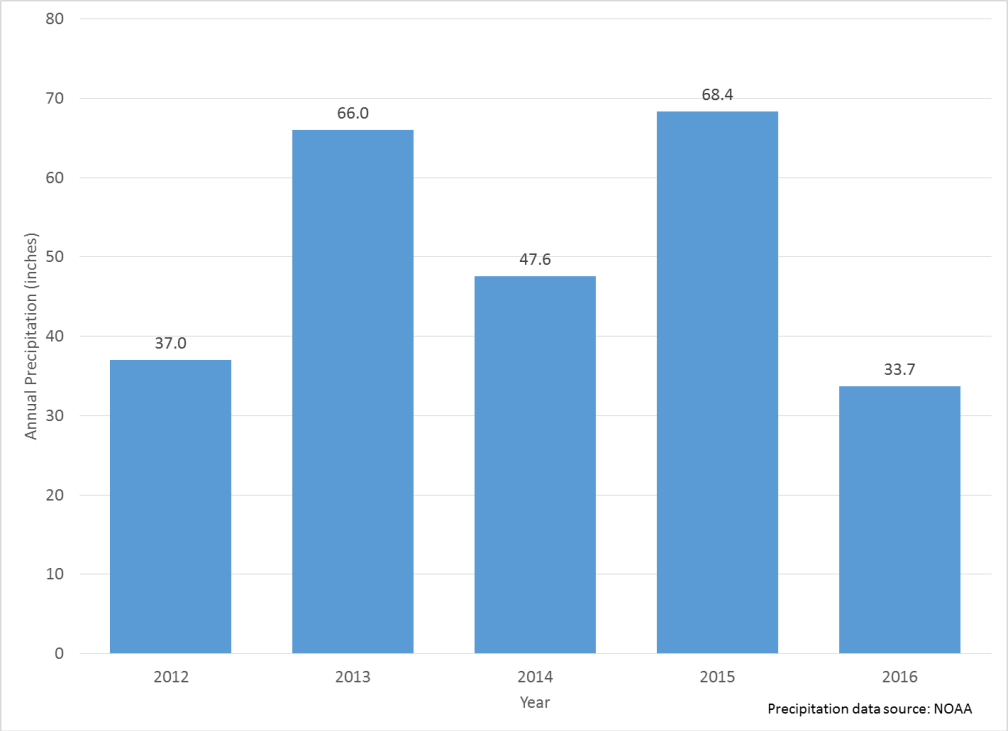
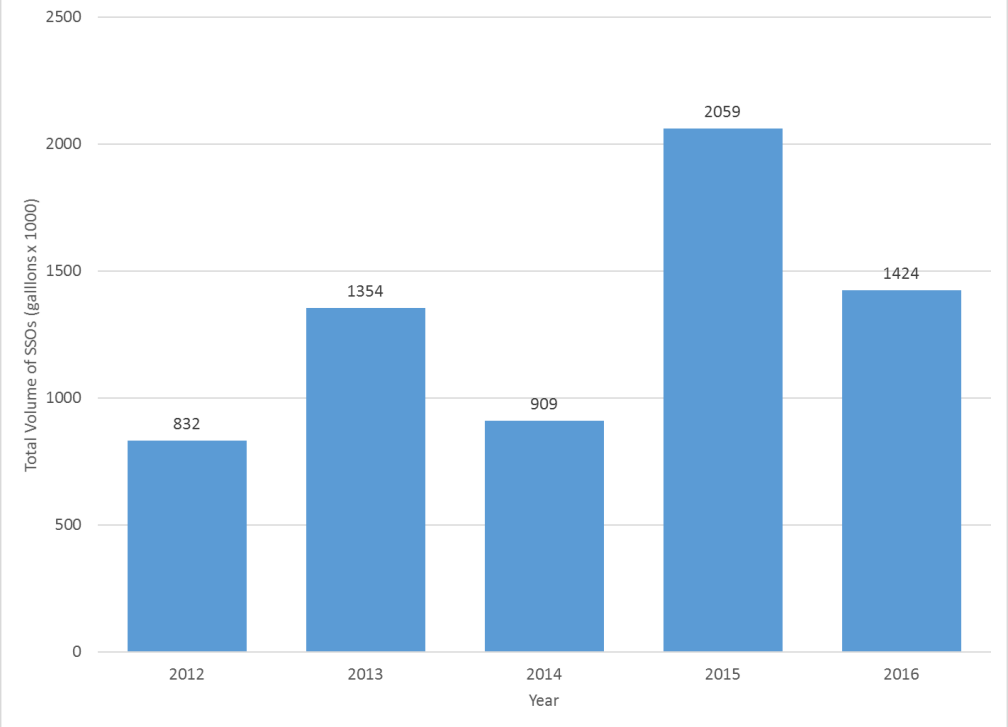


Figure 2-3 Reported Volume of SSOs per Year (2012–2016)



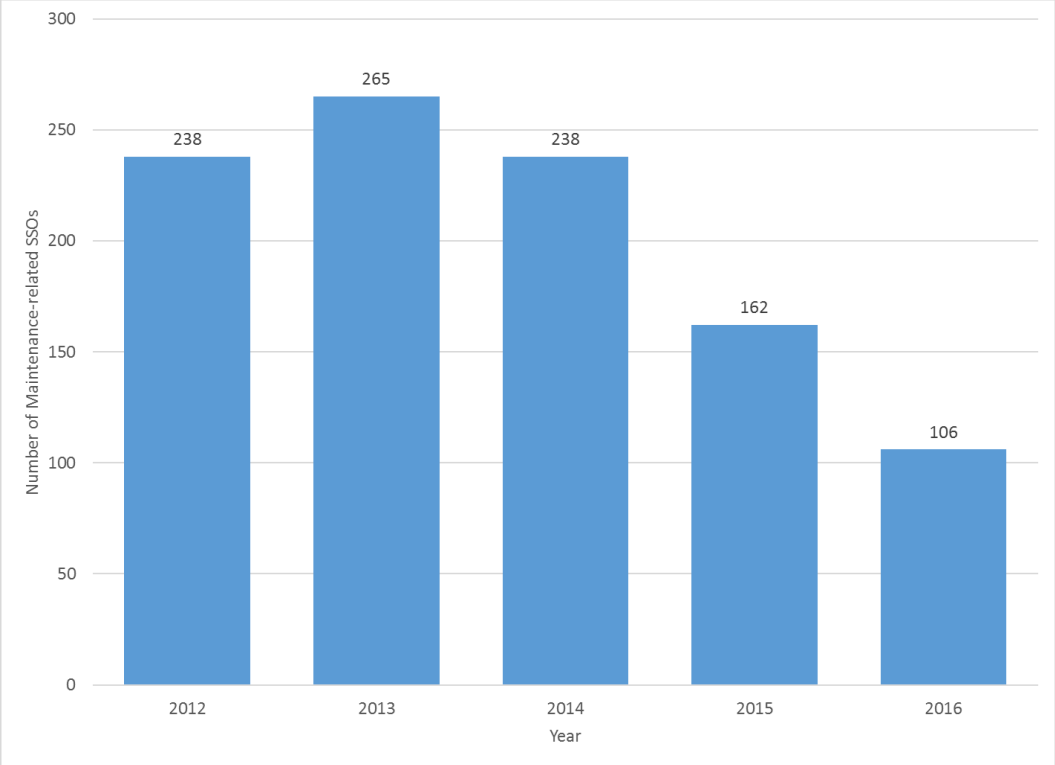
Notes:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion. For 2016, only 29 percent did not have a volume recorded.

Figures 2-4 and 2-5 show the number of maintenance-related SSOs and the associated annual volumes, respectively, for the period of record (2012–2016). DWM has seen a significant decrease in the number of maintenance-related SSOs during the last 3 years, with reductions of 32 percent and 35 percent in 2015 and 2016, respectively. From the peak of 265 maintenance-related SSOs in 2013 to 106 maintenance-related SSOs in 2016, DWM reduced this category of SSOs by 60 percent. 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.

The volume of maintenance-related SSOs increased from 2015 to 2016, though the number of SSOs decreased by 35 percent. The volume of maintenance-related SSOs for 2016 was higher than other years from 2012–2016. However, if not for one specific maintenance-related SSO, the volume for 2016 would have been the lowest of any year from 2012–2016. That SSO was the December 19th SSO discovered by source tracking previously presented. While performing field sampling work for a separate SSO, DWM noted high fecal coliform counts in a sample upstream of where the SSO occurred that prompted the field sampling to initiate source tracking to determine the source of high fecal counts.

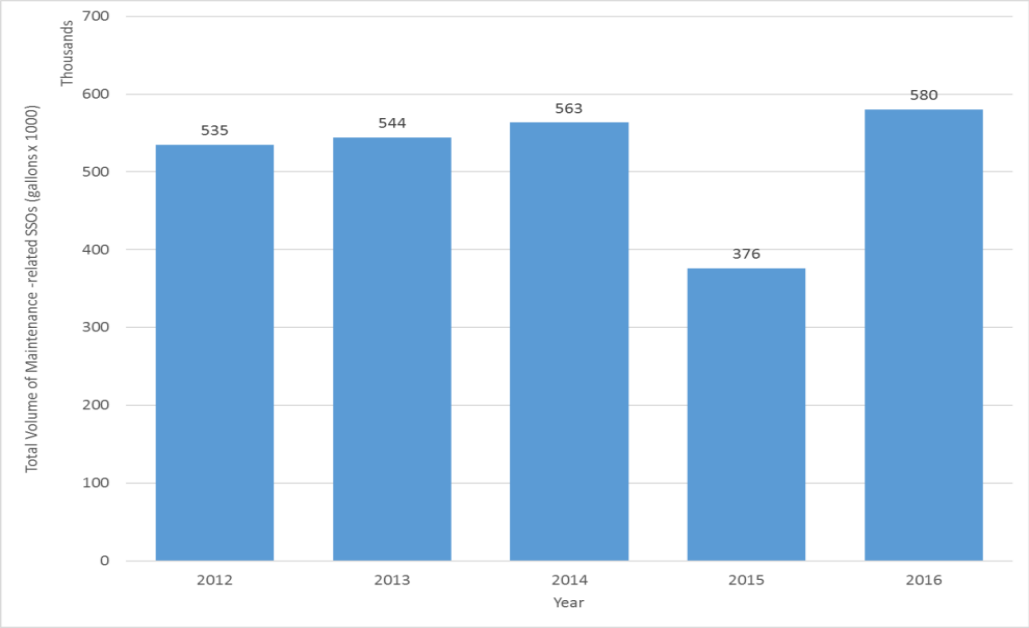
This single incident accounted for 36 percent (estimated 210,600 gallons) of the total volume of maintenance-related SSOs in 2016. This spill was found through DWM's proactive work in interpreting sampling data. DWM has an award-winning FOG program and is seeing a steady decrease in the number of grease-induced SSOs. This one incident is an anomaly that masks the true effectiveness of DWM's maintenance activities and FOG program. Figure 2-6 shows the volume of SSOs in 2016 with this particular spill event excluded.

Figure 2-4 Maintenance-related SSOs per Year (2012–2016)



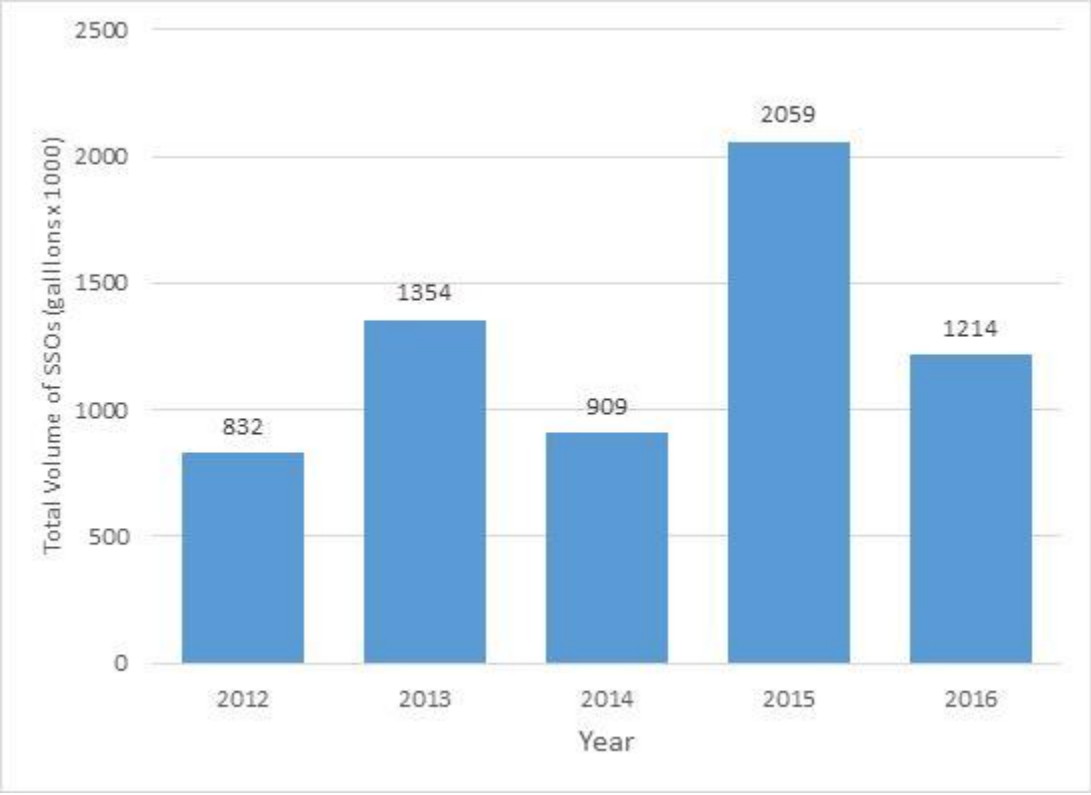
Note:
Maintenance-related SSOs are caused by grease, roots, debris, or any combination thereof.

Figure 2-5 Volume of Maintenance-related SSOs per Year (2012–2016)



Notes:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.
For 2016, only 29 percent did not have a volume recorded.

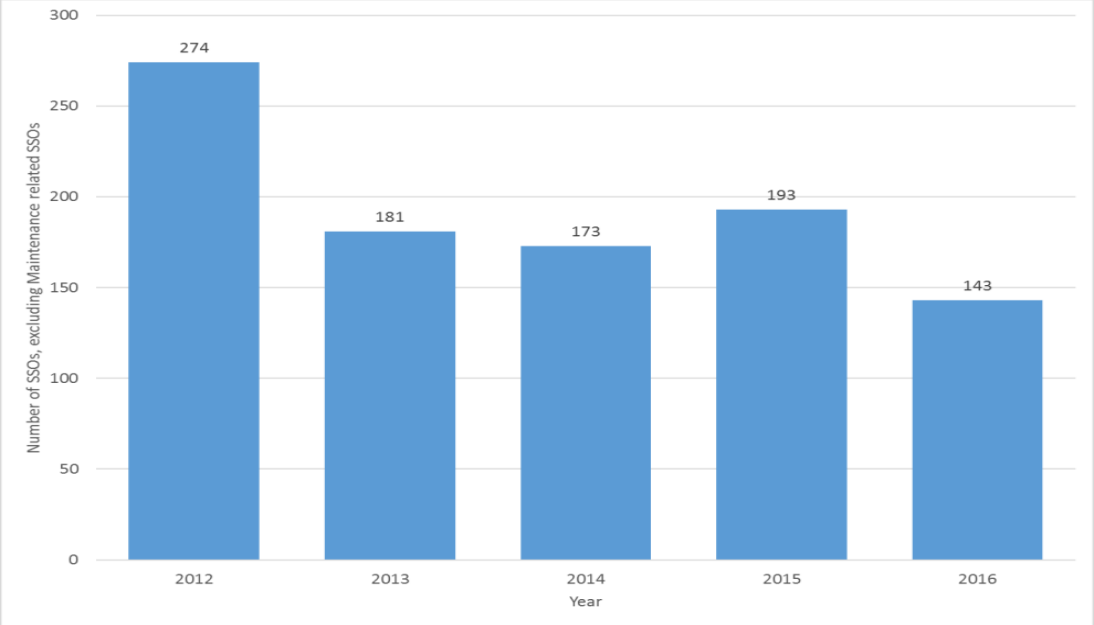
Figure 2-6 Reported Volume of SSOs per Year (2012-2016) Excluding December 2016 Grease Spill



Notes:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.
For 2016, only 29 percent did not have a volume recorded.

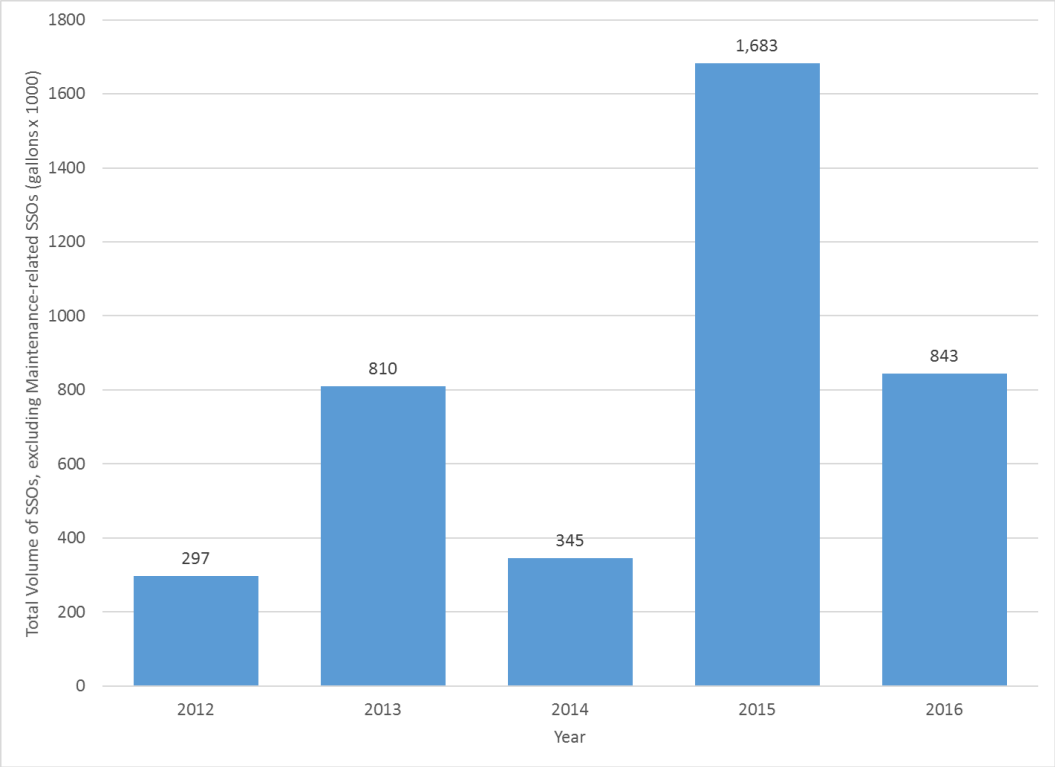
When maintenance-related SSOs are excluded, the number of SSOs decreased from 2012 to 2016 while the volume increased, as seen in Figures 2-7 and 2-8, respectively. As discussed earlier, the increased 2015 volume resulted from large rainfall events that occurred at the end of that year. The number of non-maintenance-related overflows decreased by 26 percent and the volume decreased by 50 percent from 2015 to 2016, most likely because 2016 experienced far less rainfall than 2015.

Figure 2-7 SSOs per Year, Excluding Maintenance-related Causes[1] (2012–2016)



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

Figure 2-8 SSO Volume, Excluding Maintenance-related Causes (2012–2016)



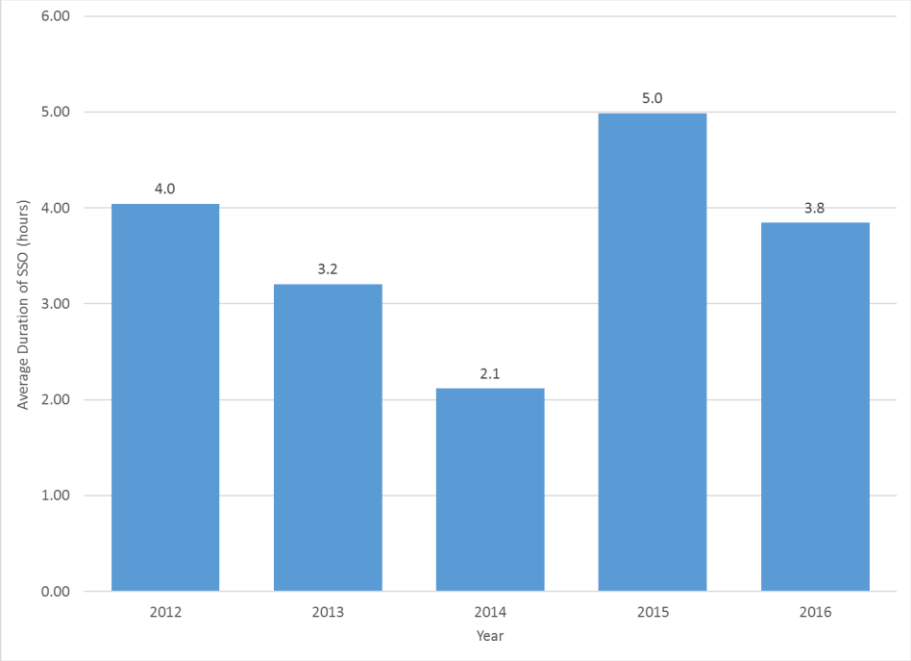
Notes:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion. For 2016, only 29 percent did not have a volume recorded.

3. Average Duration of SSOs

The average SSO duration during the last 5 years (2012–2016) is approximately 3.6 hours, as shown in Figure 3-1. The 2016 average SSO duration decreased by 24 percent from 2015. 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.

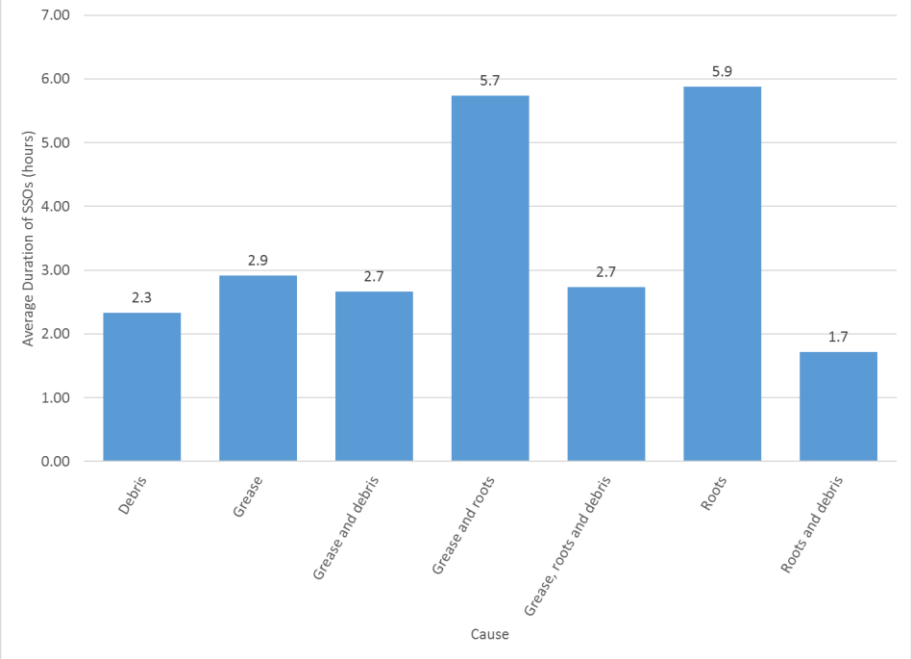
Figure 3-3 presents average durations for other SSOs, excluding maintenance-related SSOs. Three causes have durations above average: vandalism, storm, and lift station failure. These higher response times may be attributed to difficulty in removal of debris or equipment repair/replacement generally associated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

Figure 3-1 Average SSO Duration by Year (2012–2016)



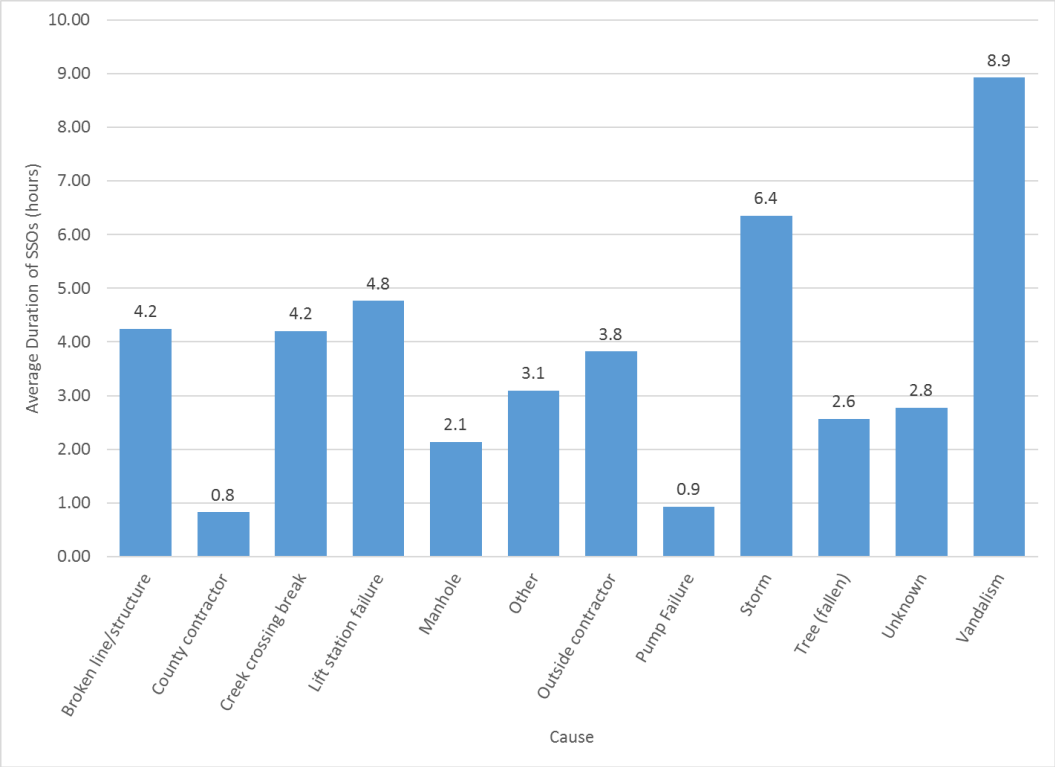
Note:
Durations are available for 67 percent of the SSOs.

Figure 3-2 Average SSO Duration by Maintenance-related Cause (2012–2016)



Note:
Durations are available for 67 percent of the SSOs.

Figure 3-3 Average SSO Duration, Excluding Maintenance-related Causes (2012–2016)

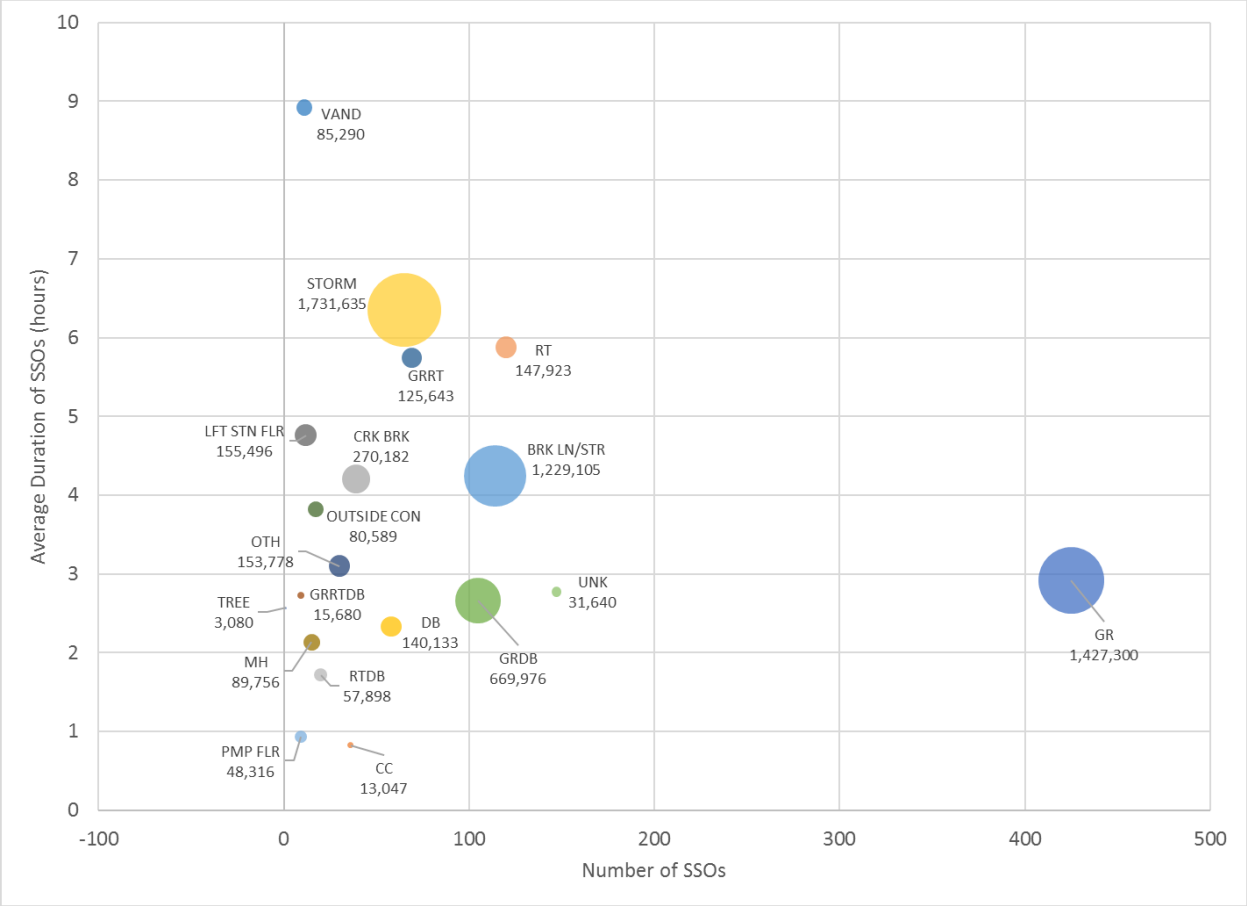


Note:
Durations are available for 67 percent of the SSOs.

The scatter plot shown in Figure 3-4 shows the average SSO duration and number of SSOs by cause. The relative SSO volume is depicted by bubble size. While grease is the most common cause of SSOs (during the 5-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 have higher volume per SSO when compared to the volume for other causes of SSOs.

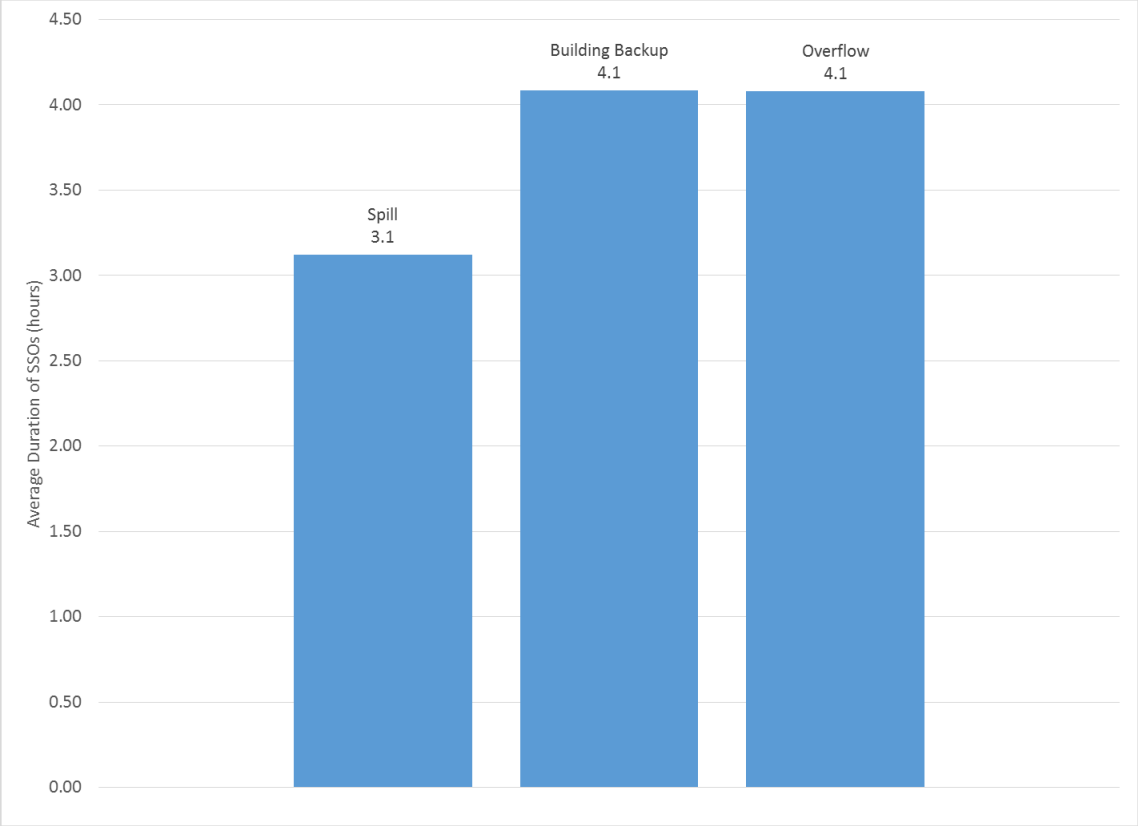
Figure 3-5 shows the average duration for SSOs by type (spill, overflow, and building backup). Spills account for most of the volume but have much lower average duration than for building backup or overflow, which are contained on land. The duration of building backups and overflows are approximately the same.

Figure 3-4 Average SSO Duration with Count by Cause (2012–2016)



Notes:
Durations are available for 67 percent of the SSOs.
Bubble size indicates volume in gallons – a larger bubble indicates more volume, a smaller bubble indicates less volume.
Bubbles are labeled with cause and volume (in gallons).
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion.
For 2016, only 29 percent did not have a volume recorded.

Figure 3-5 Average SSO Duration by Type (2012–2016)



Notes:
Durations are available for 67 percent of the SSOs.

4. Causes of SSOs

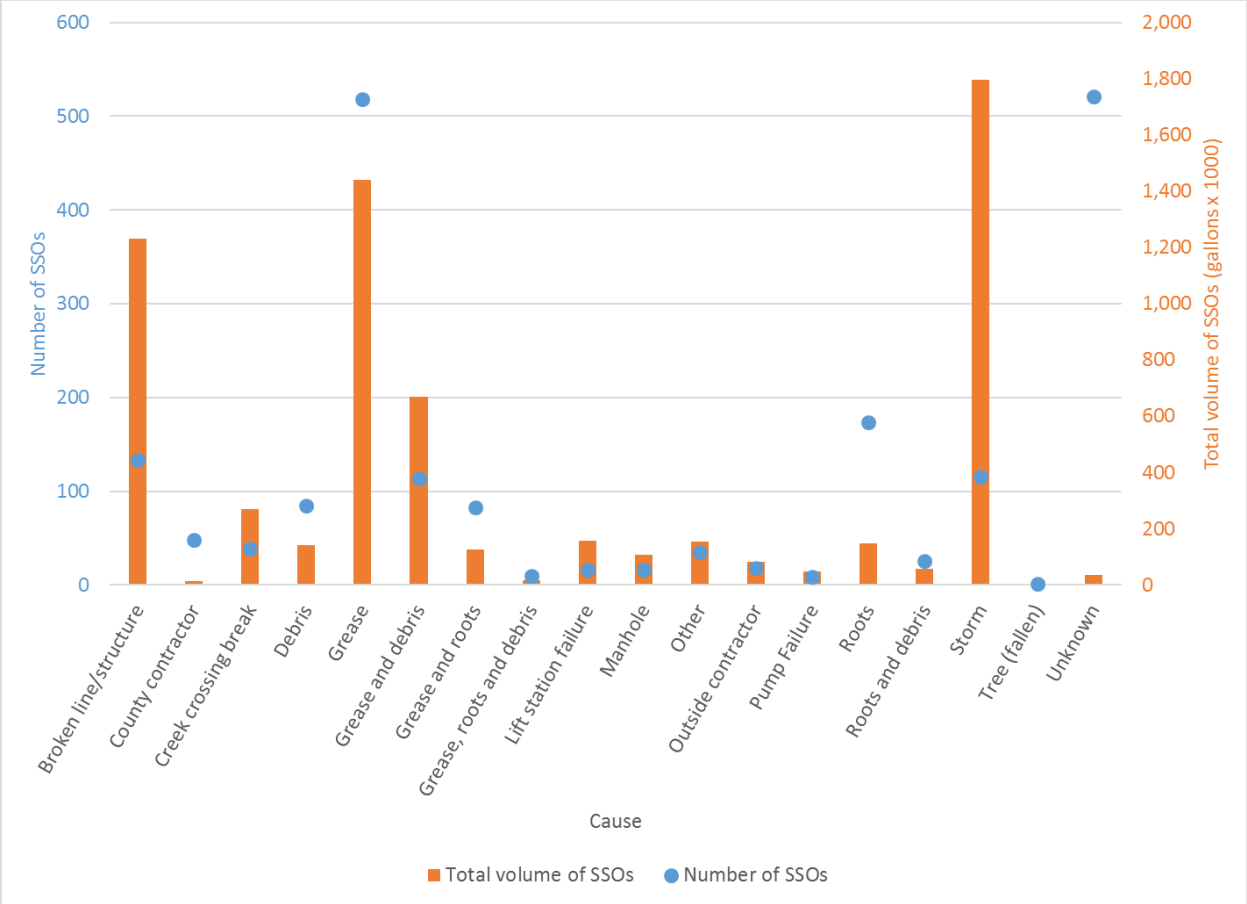
While grease-related SSOs have decreased from 2012 to 2016 by 56 percent likely from sewer cleaning and the County's commercial FOG Management Program and Public Education Programs, grease accounts for more SSOs than any other cause and contributes to a significant portion of the SSO total volume (see Figure 4-1). Storm-induced SSOs account for more volume than any other cause but happen infrequently. Despite this infrequency, the County has taken steps to address impacts from storm-related events. Specifically, follow up and corrective action for private laterals and stormwater connections to the sanitary sewer has been undertaken in the Priority Area and is ongoing. In 4th Quarter 2016, 2,051 notices were sent to private owners or other incorporated cities (3) to correct violations that may have allowed stormwater to enter the sewer infrastructure.

Figure 4-2 shows the number of SSOs by cause by year for the period of record. SSOs caused by grease are declining. The number of SSOs listed as unknown are also declining because of improved investigations and recordkeeping. From 2014 to 2016, there was a decline in the number of SSOs attributable to roots. The number of SSOs resulting from cracked or broken pipe has remained relatively constant. The number of SSOs at creek crossings (cause CRK BRK) rose sharply in 2016. This is because

more than 2,200 creek crossings were inspected in 2016, resulting in the discovery of SSOs at creek crossings.

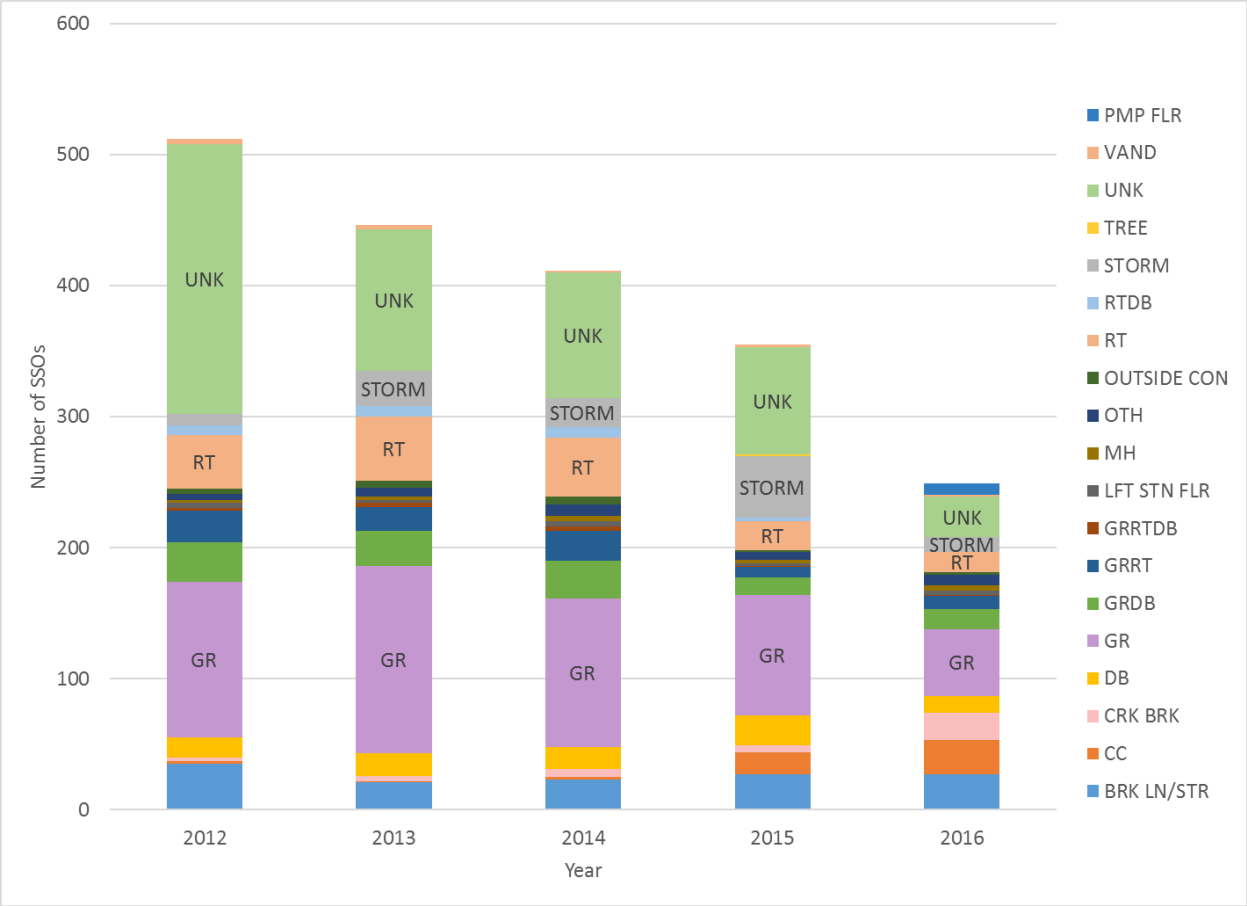
Figure 4-3 shows SSO volume by cause by year from 2012 through 2016. As noted above, SSO volume from grease has been decreasing each year, and would have decreased in 2016 had it not been for the December 19th SSO previously described. The volume from storms was minimal in 2016 because of less rainfall. The volume from broken pipe or other structural failure increased significantly in 2016, primarily as a result of the discovery of two broken sewer mains located adjacent to streams. The estimated volumes for these spills were 181,760 gallons and 150,255 gallons. Together, these two events account for 63 percent of the volume for this type of SSO cause.

Figure 4-1 SSOs by Count, Volume, and Cause (2012–2016)



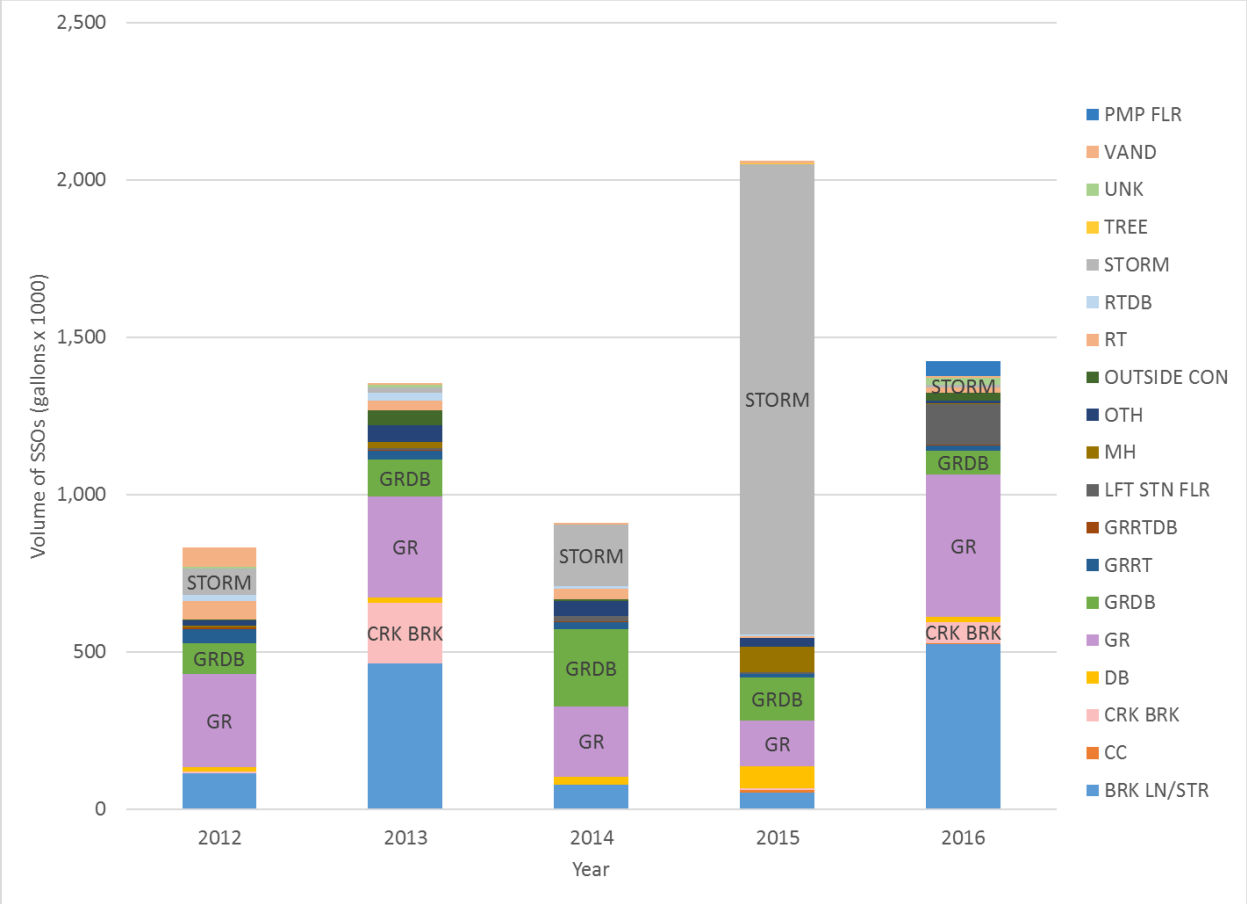
Note:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion. For 2016, only 29 percent did not have a volume recorded.
The relatively high percentage of causes listed as unknown (UNK) is because of the retroactive data review. The 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 (2012–2016)



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 (2012–2016)



Notes:
For the period 2012–2015, 47 percent of the SSOs did not have a volume recorded because of retroactive review and inclusion. For 2016, only 29 percent did not have a volume recorded.
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 by the dashed trend line in Figure 4-4, the number of SSOs has decreased from 2012–2016 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. Because 2016 was a year of drought, there were fewer SSOs resulting from storms in 2016. However, over the long term the general trend shows the number of SSOs resulting from storms to be increasing.

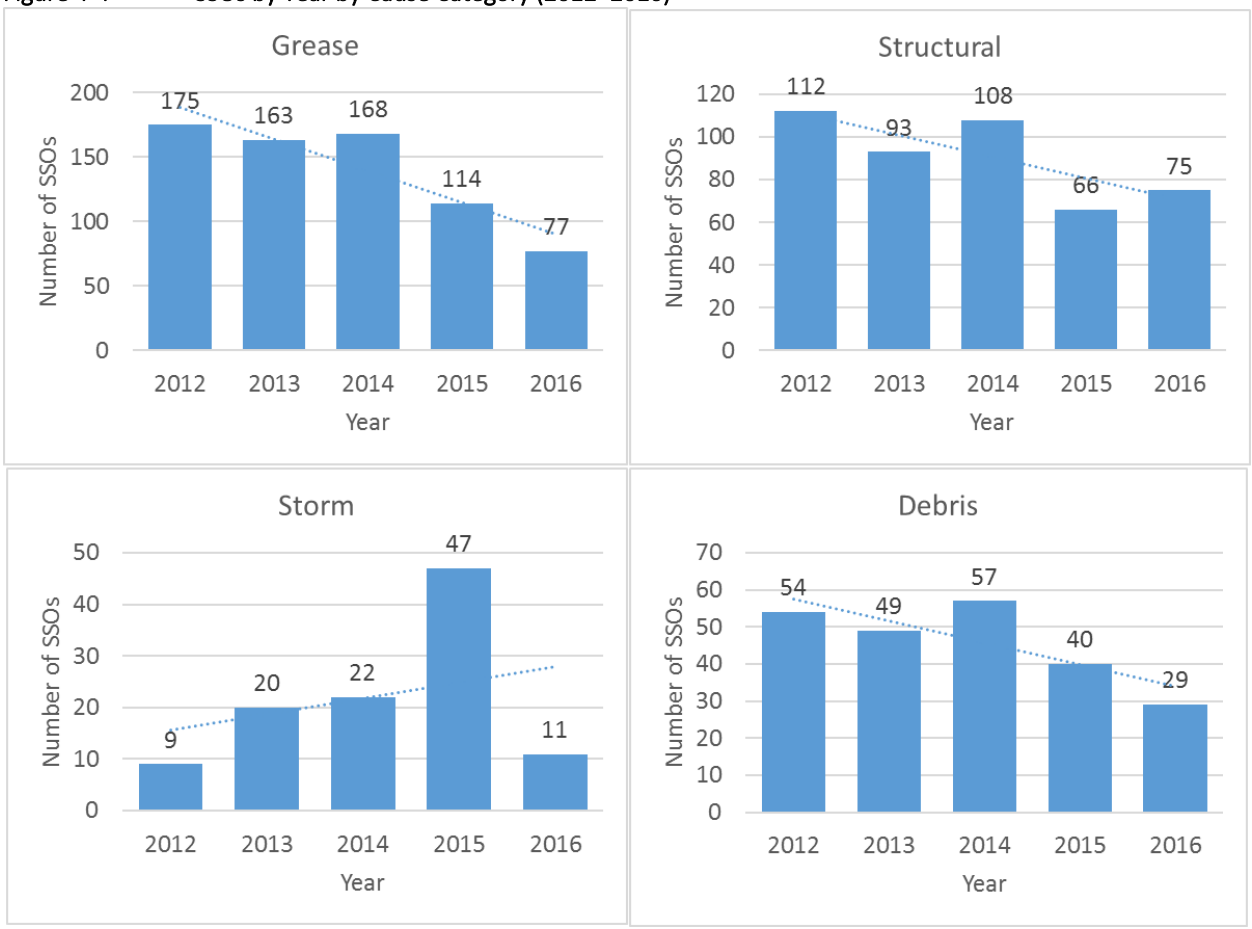
These same cause categories, when applied specifically to spills, show the same trends except those for structural causes (see Figure 4-5). DWM's increased field presence in 2016 resulted in the discovery of more broken mains than any other year from 2012–2016. While the increase in spills from structural causes is undesirable, it is a positive indicator of the effectiveness of the field inspections occurring in 2016.

Figure 4-6 presents the number of spills by year. The number of spills per year decreased approximately 15 percent from 2012 to 2016. There was an increase in spills from 2015 to 2016 of 6 percent, this may be attributable to the increased field inspections in 2016.

Table 4-1 Mapping Cause to Cause Categories

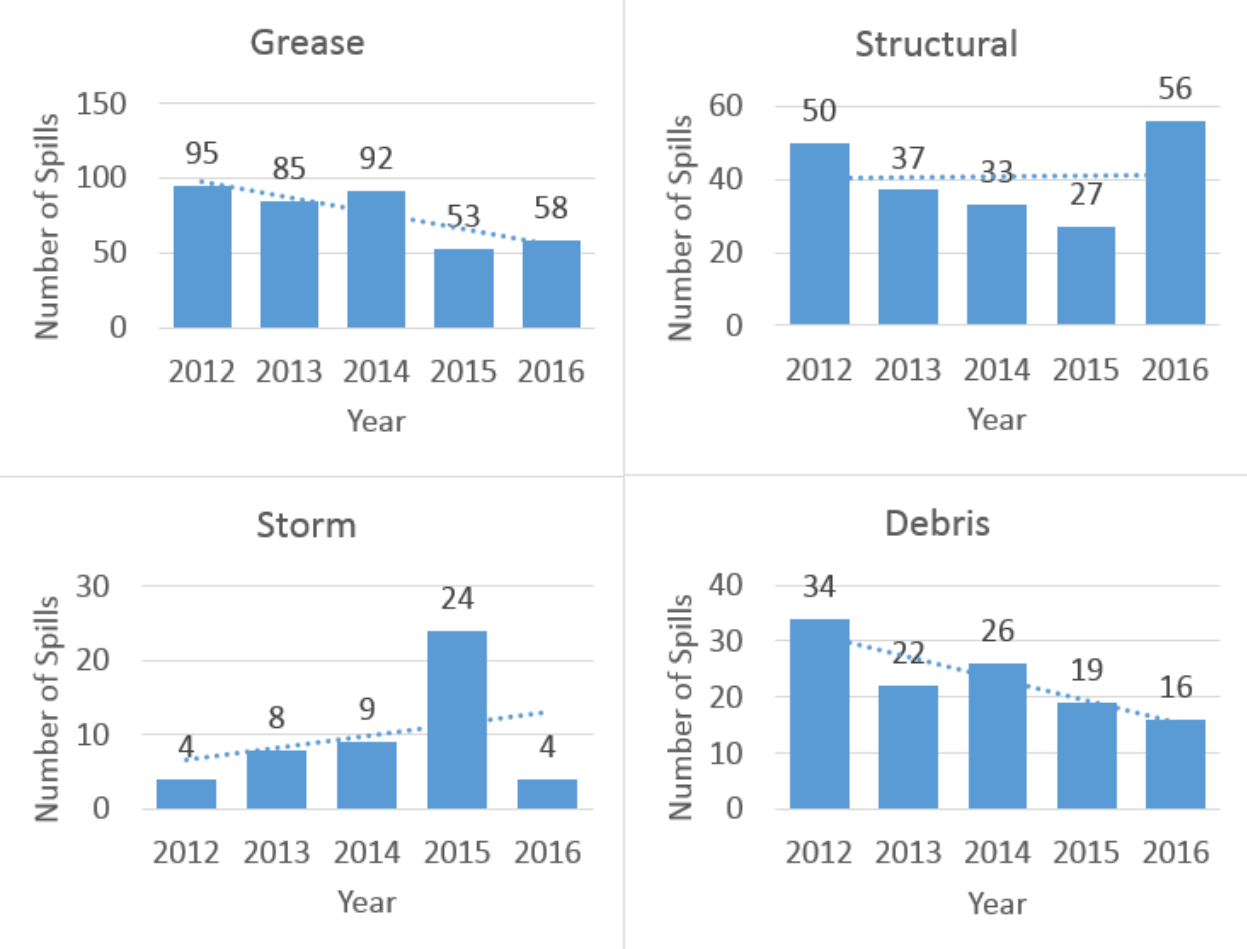
Cause	Grease	Structural	Storm	Debris
BRK LN/STR		STRUC		
CC				
CRK BRK		STRUC		
CRK BRN		STRUC		
DB				DB
GR	GR			
GRDB	GR			DB
GRRT	GR	STRUC		
GRRTDB	GR	STRUC		DB
LFT STN FLR				
MH				
OTH				
OUTSIDE CON				
PMP FLR				
RT		STRUC		
RTDB		STRUC		DB
STORM			STORM	
TREE				
UNK				
VAND				

Figure 4-4 SSOs by Year by Cause Category (2012–2016)



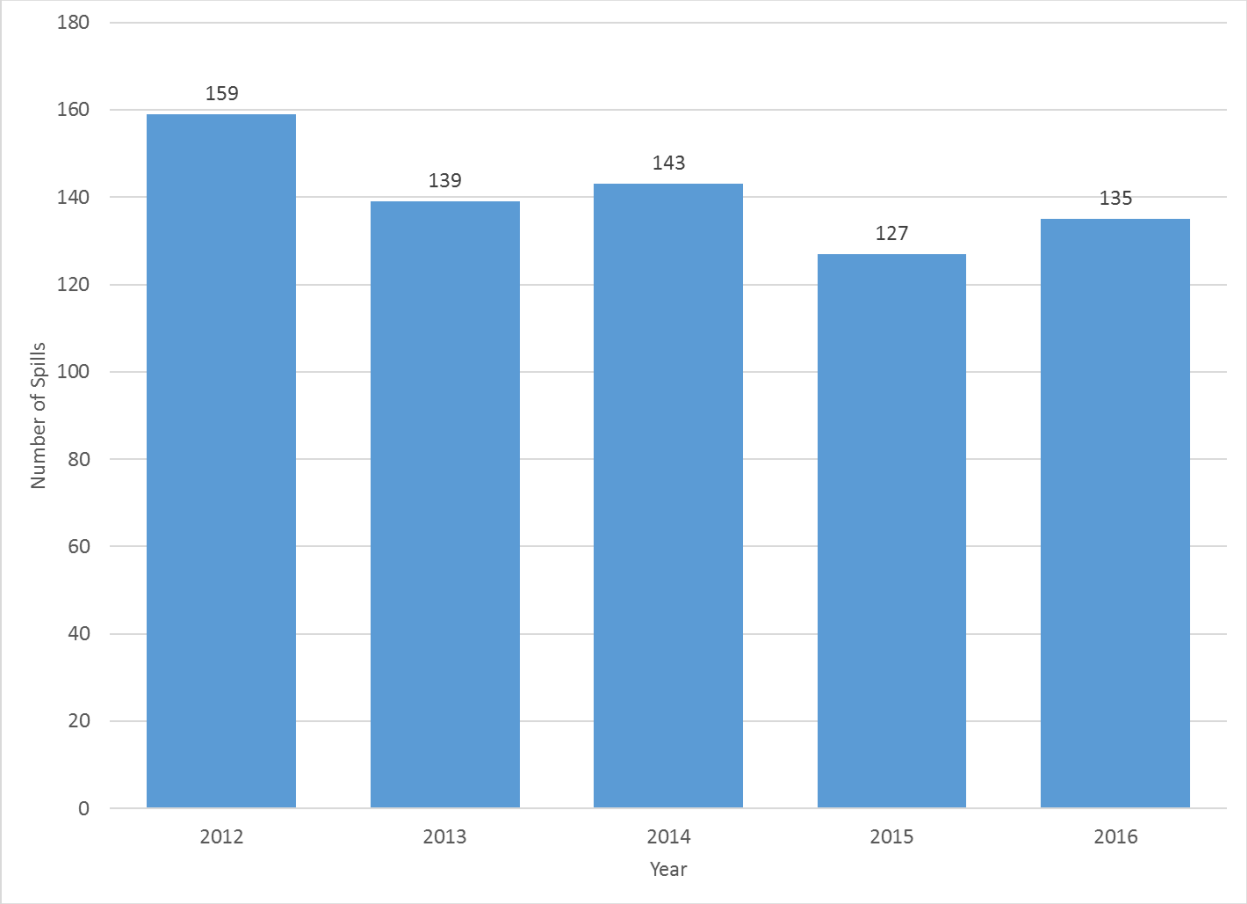
Notes:
Cause Categories may include more than one cause. Some SSOs appear in more than one Cause Category.
Dashed line is the linear trend line for each graph.

Figure 4-5 Spills by Year by Cause Category (2012–2016)



Note:
Cause Categories may include more than one cause. Some SSOs appear in more than one Cause Category.
Dashed line is the linear trend line for each graph.

Figure 4-6 Spills by Year (2012–2016)



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.

Figure 5-1 Sewer Gravity Main Pipe Count and Length by Diameter

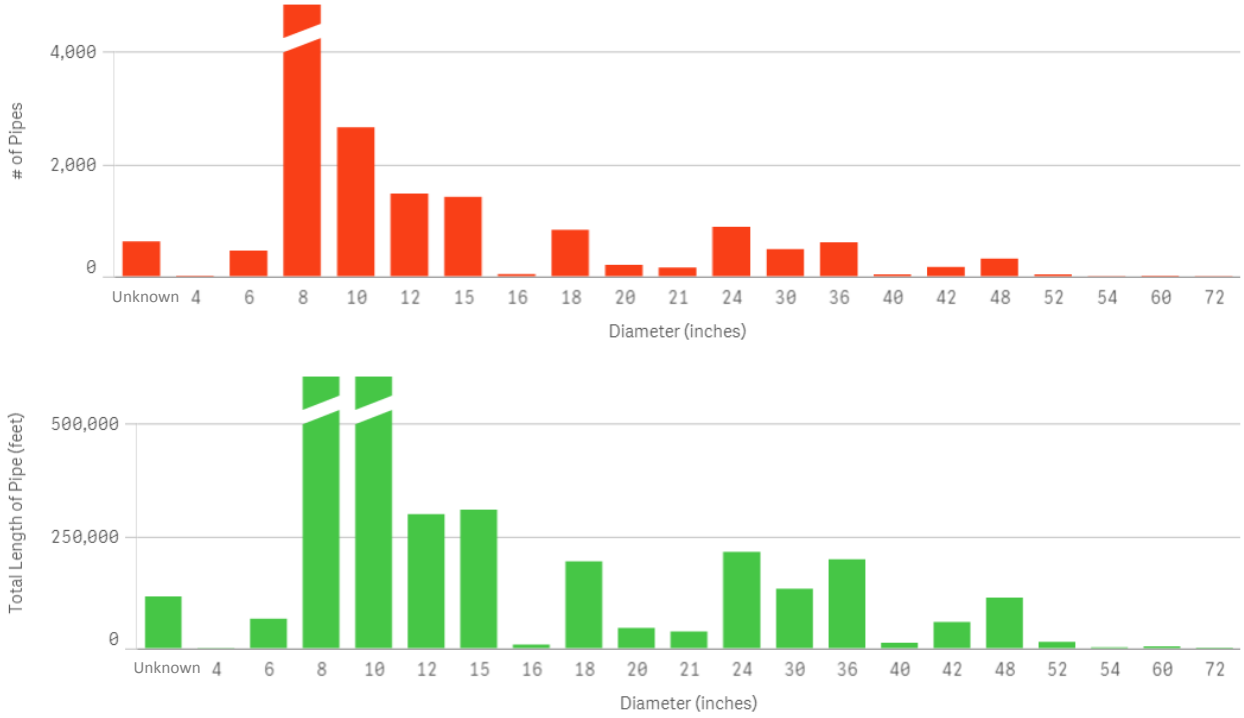
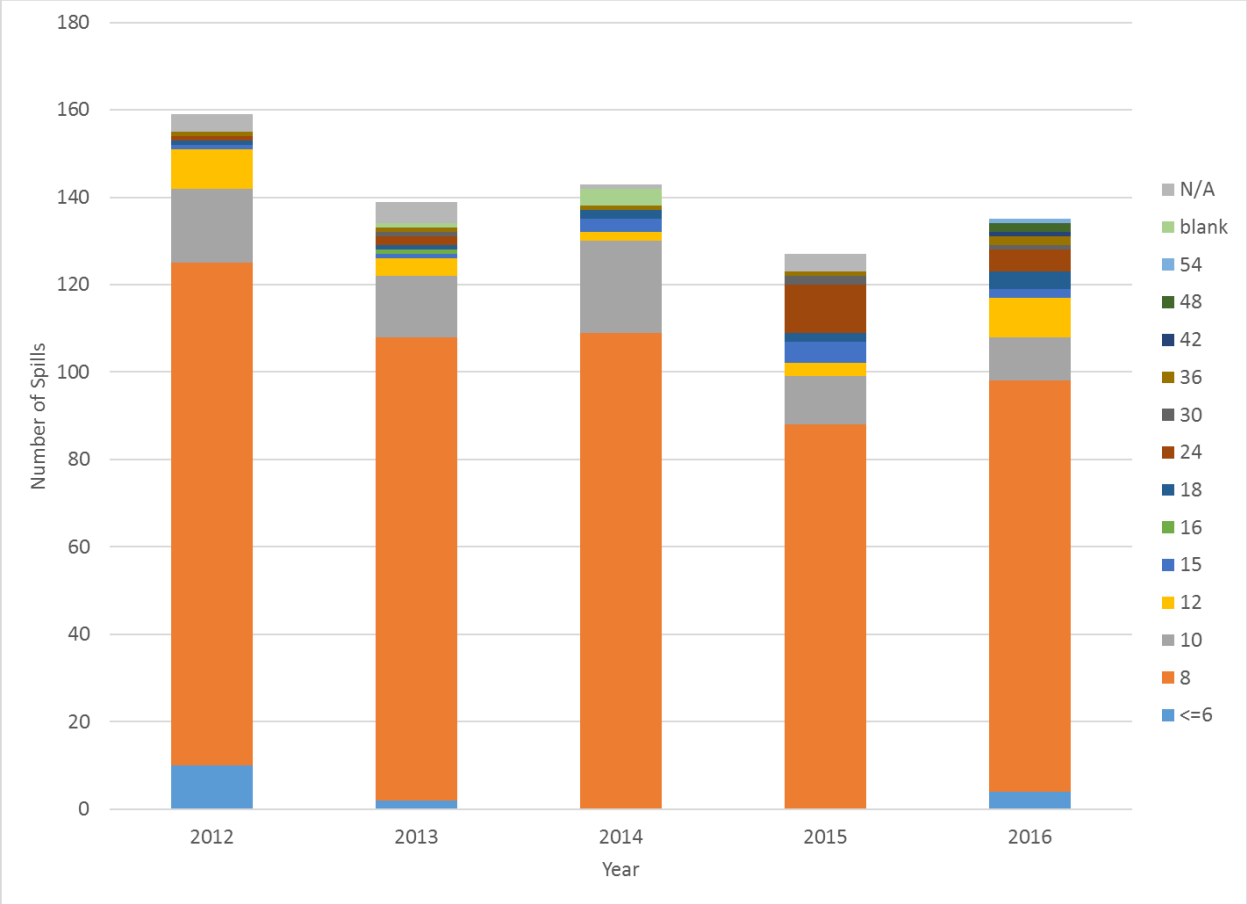


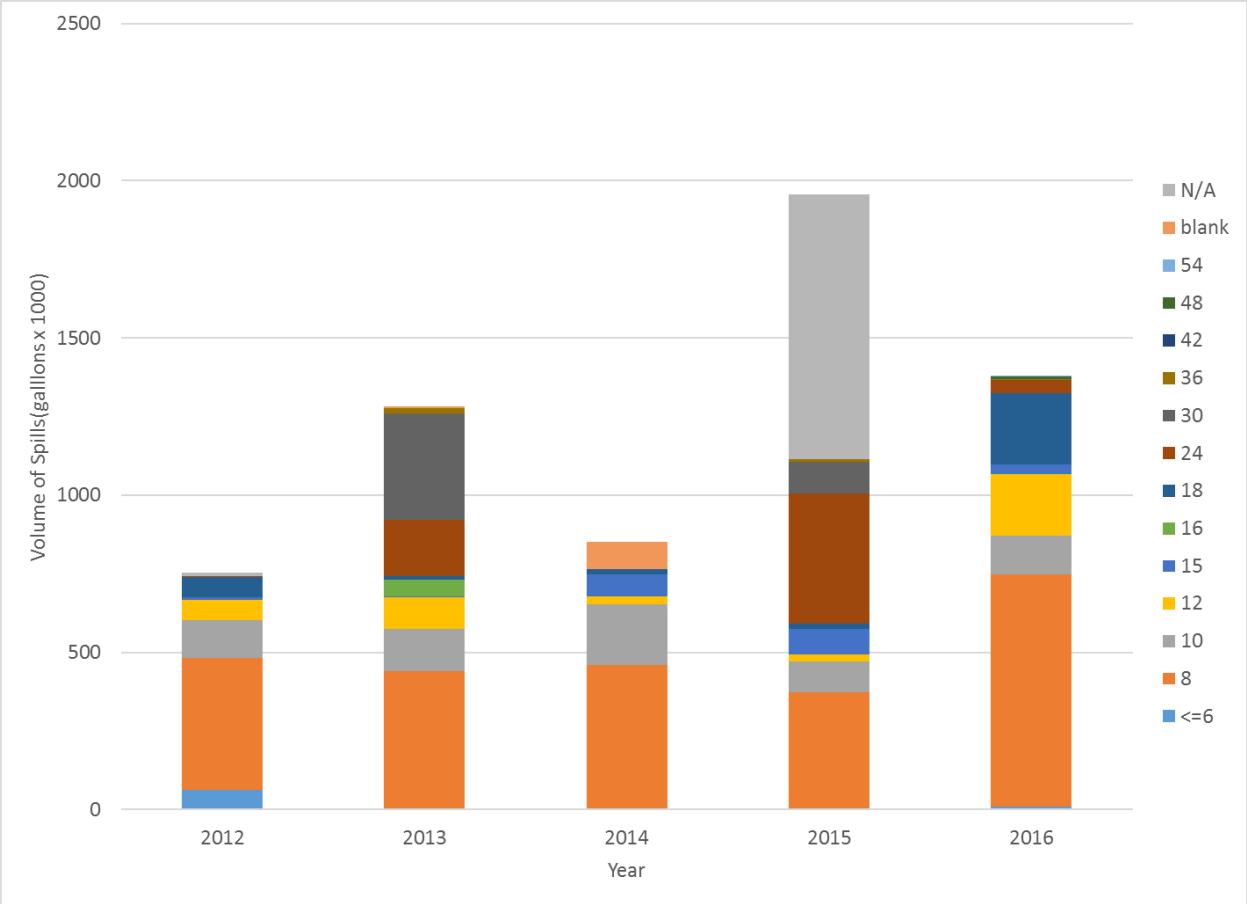
Figure 5-2 Spills by Year by Pipe Size (inches) (2012–2016)



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 54 inches during the period 2012–2016.

Figure 5-3 shows the volume of spills by pipe size. Through 2015, the data clearly showed larger-diameter pipes account for a higher proportion of volume than smaller pipe, though there are fewer spills from larger pipes. This was not the case in 2016 because pipes 8 inches in diameter accounted for more than half the volume of spills. This result is in part from the large grease-induced spill discussed in Section 2 with an estimated volume of 210,600 gallons. The three largest spills from 8-inch-diameter pipes in 2016 account for more than half of the volume (409,585 gallons) of spills from 8-inch-diameter pipes and almost 30 percent of the total spill volume from all pipe sizes in 2016.

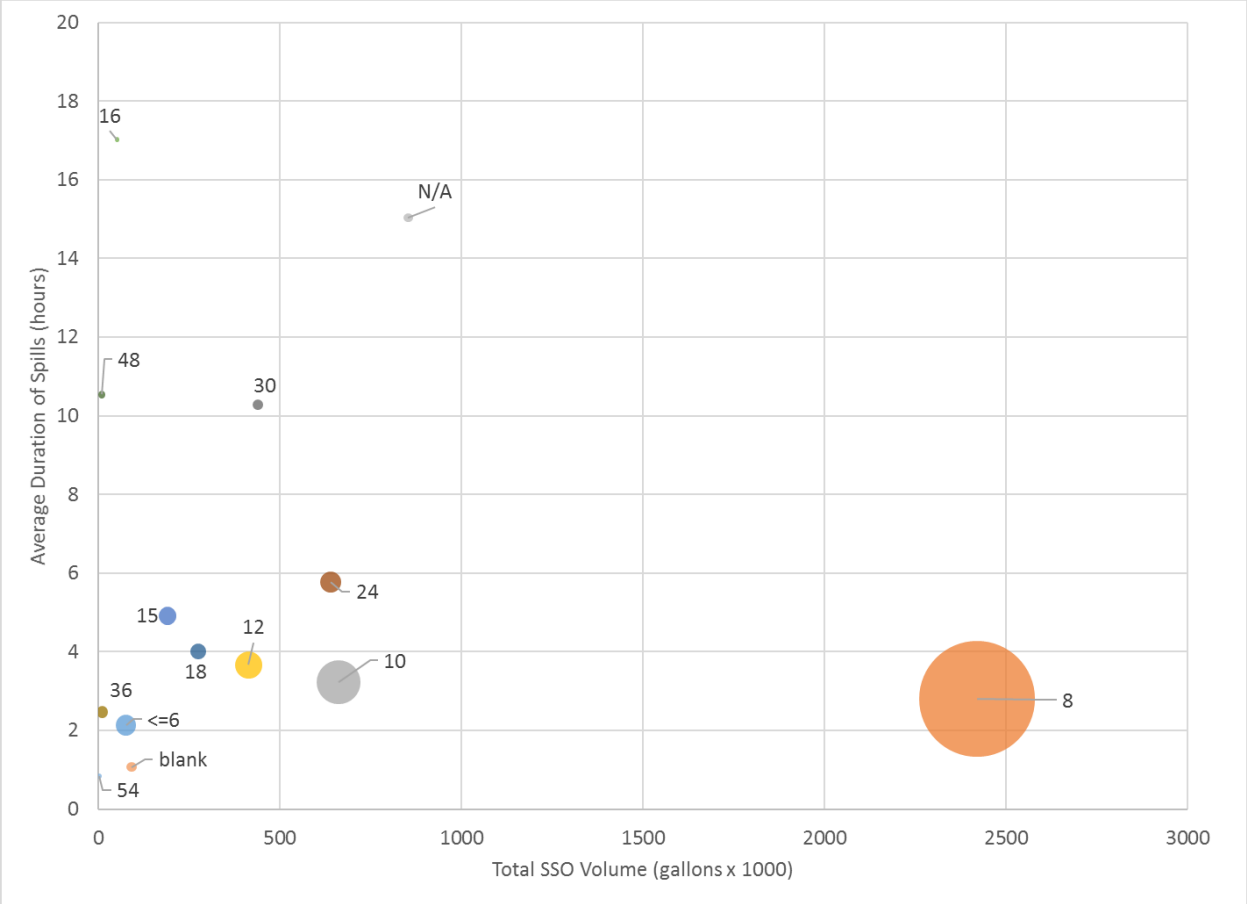
Figure 5-3 Spill Volume by Year by Pipe Size (2012–2016)



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 54 inches during the period 2012–2016.
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 2016

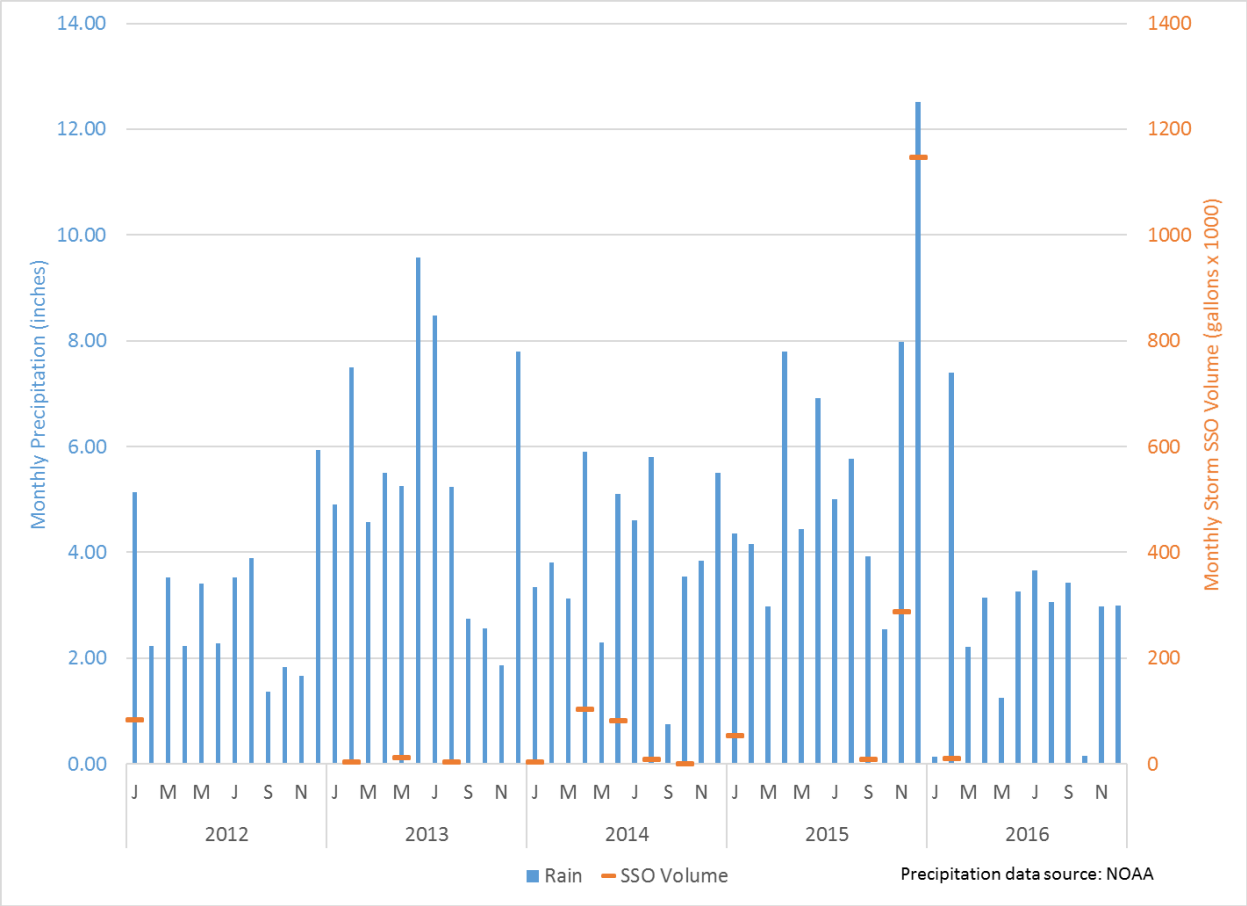


Notes:
Bubble size indicates relative number of SSOs.
Bubbles are labeled with pipe diameter, in inches.
Pipe diameter was not always recorded, thus some are blank or N/A.

Rainfall

The 30-year average annual rainfall for Atlanta is 50 inches. The rainfall total for 2016 was 39 inches, approximately 11 inches below normal. The rainfall in 2015 was 69 inches, more than 18 inches above normal. Rainfall was 29 inches less in 2016 than in 2015. This dramatic difference in rainfall is reflected in the data for SSOs and spills caused by storms. In 2016 only 4 spills were attributed to storms whereas in 2015 there were 24. The volume for spills caused by storms was 4,440 gallons in 2016 but more than 1,400,000 gallons in 2015. Similarly, there were 13 overflows caused by storms in 2015 but only 6 in 2016. There were 10 building backups in 2015 caused by storms but none in 2016. Rainfall and SSO volume are shown in Figure 5-5.

Figure 5-5 Monthly Precipitation and Storm-induced SSO Volume (2012–2016)



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.

DWM tallied the repeat SSO locations by basin (see Figure 5-6). The North Fork Peachtree Creek and South Fork Peachtree Creek 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. These same two basins, North Fork Peachtree Creek and South Fork Peachtree Creek, had the highest number of repeat spills (see Figure 5-8). The most common cause of repeat spills is grease (see Figure 5-9).

The spatial distribution of repeat SSOs and repeat spills are shown in Figures 5-10 and 5-11, respectively.

Figure 5-6 Number of Repeat SSO Locations by Basin

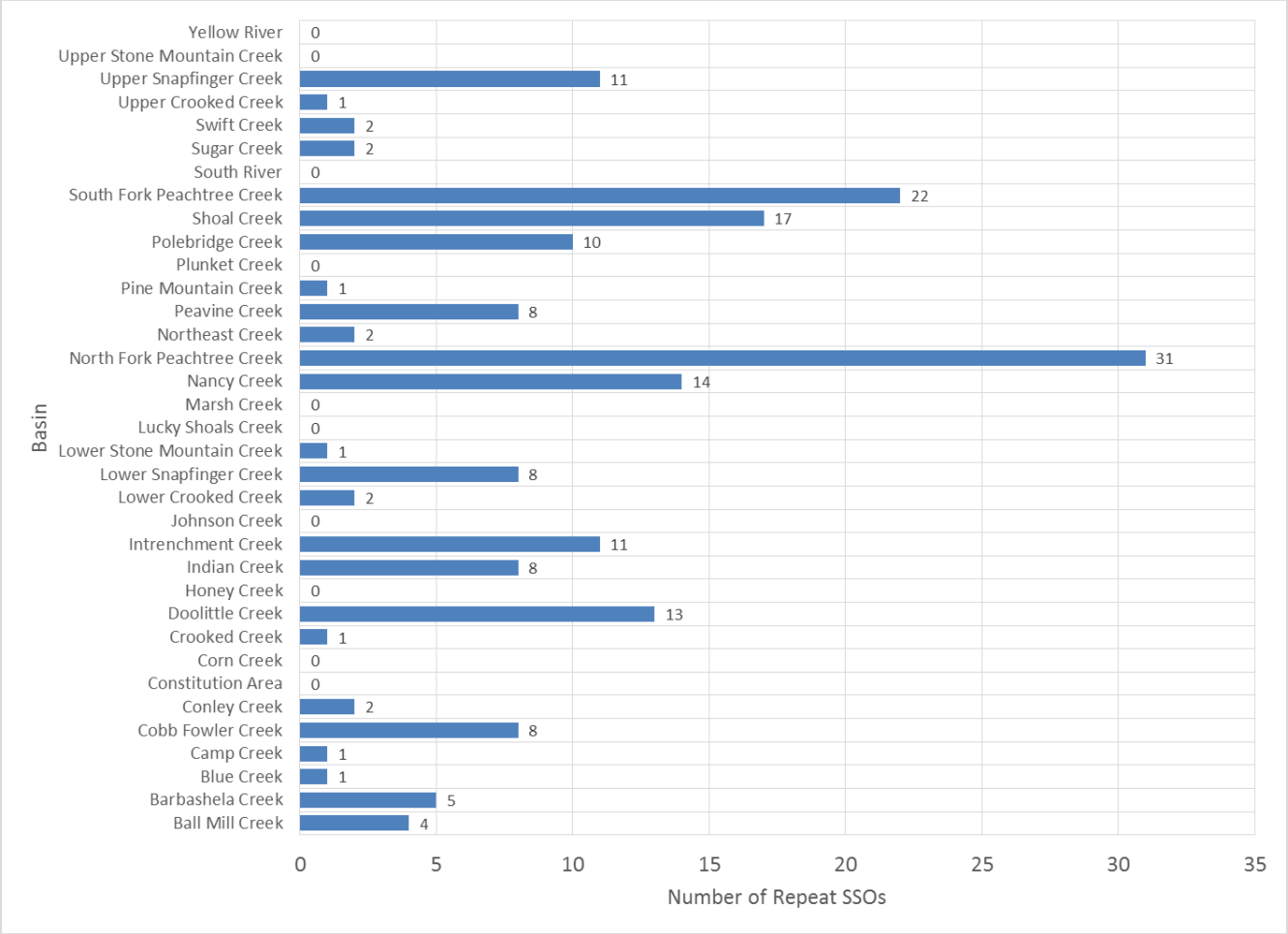


Figure 5-7 Number of Repeat SSO Locations by Cause

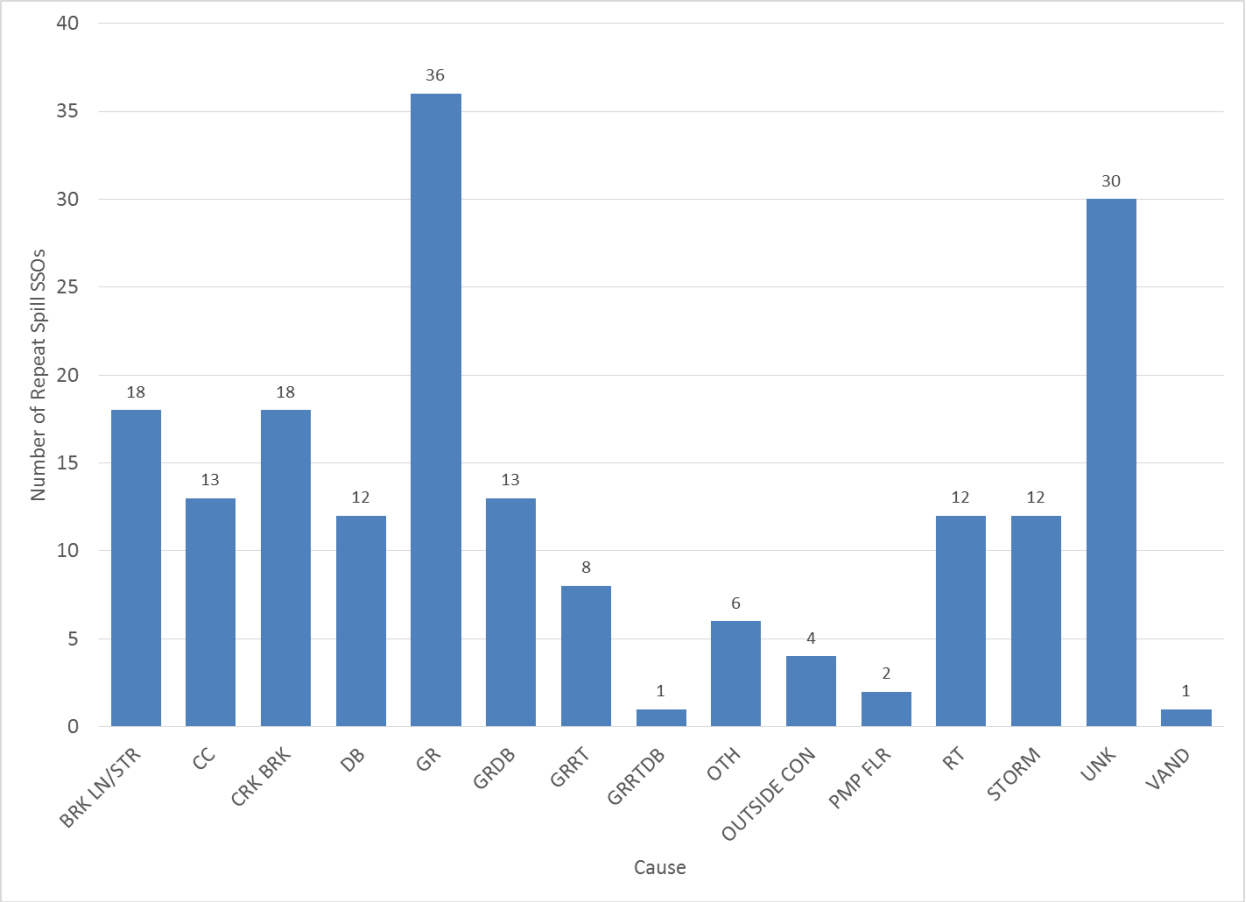


Figure 5-8 Number of Repeat Spill SSO Locations by Basin

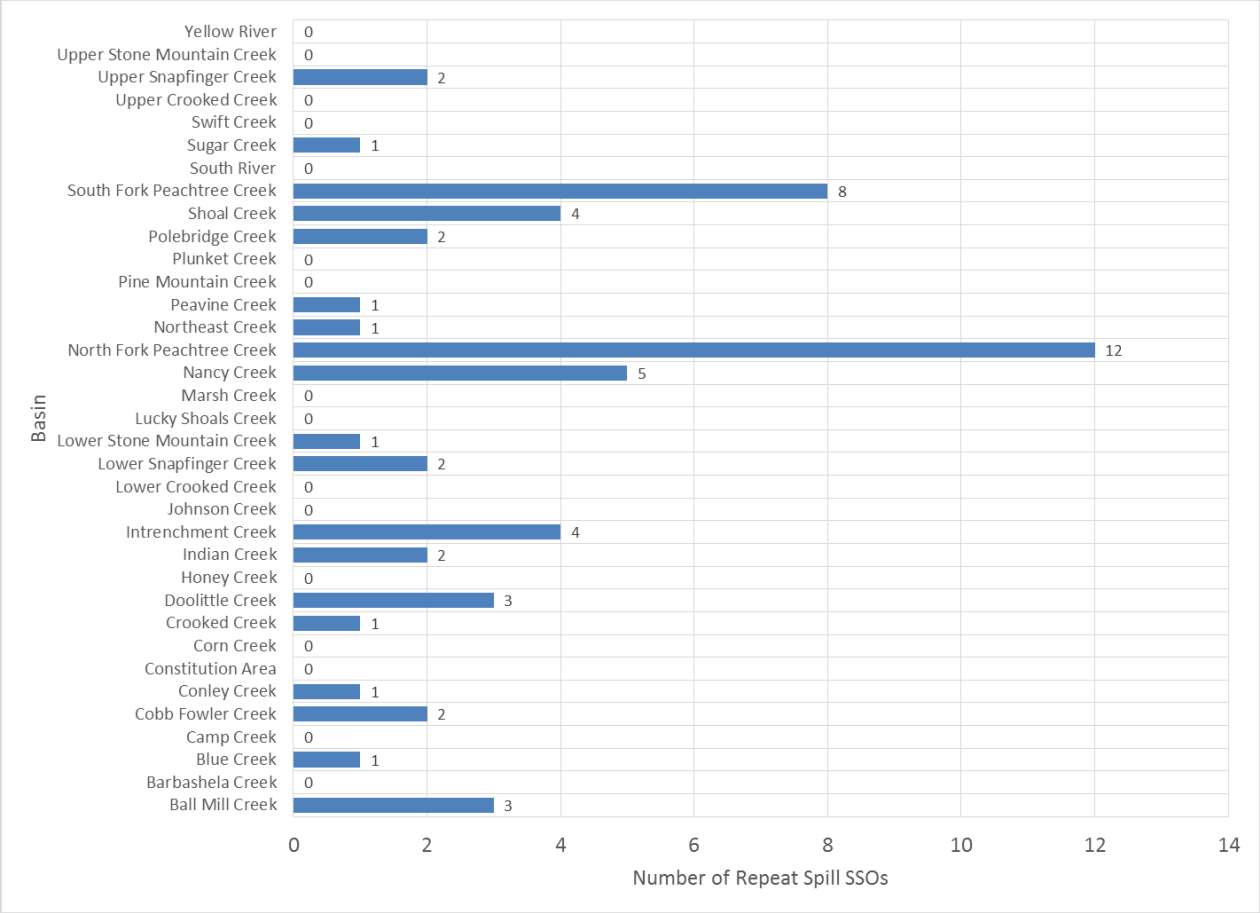


Figure 5-9 Number of Repeat Spill SSO Locations by Cause

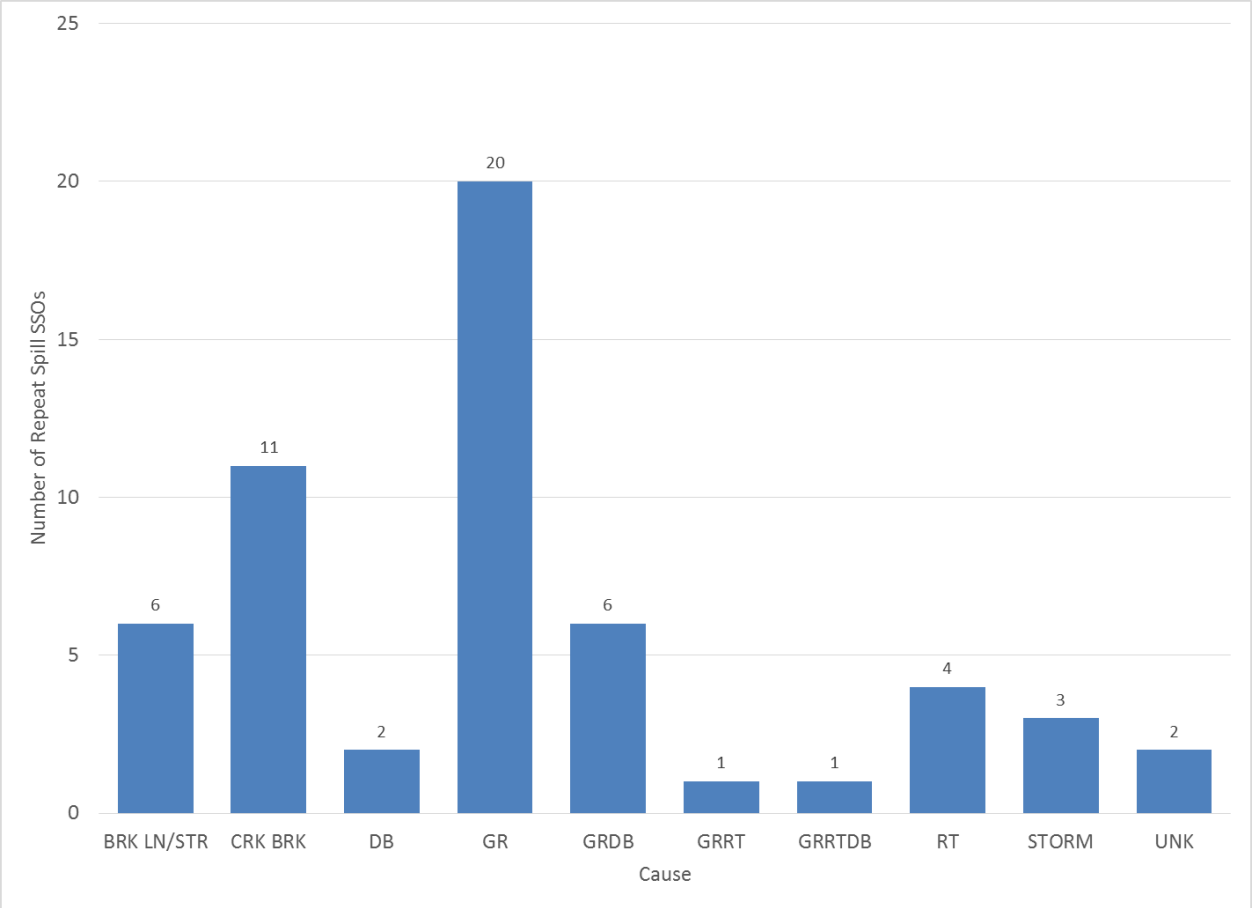


Figure 5-10 Repeat SSOs

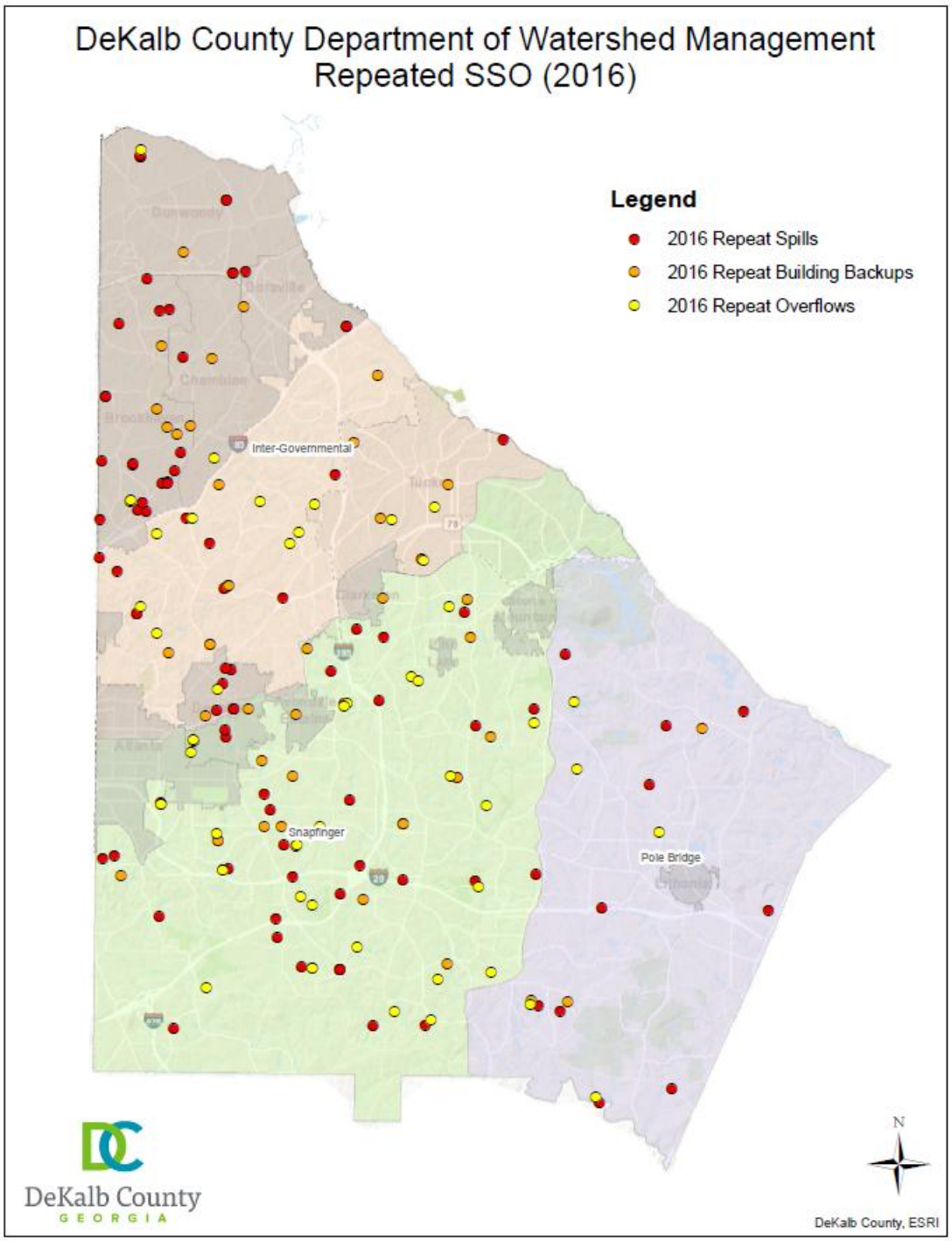
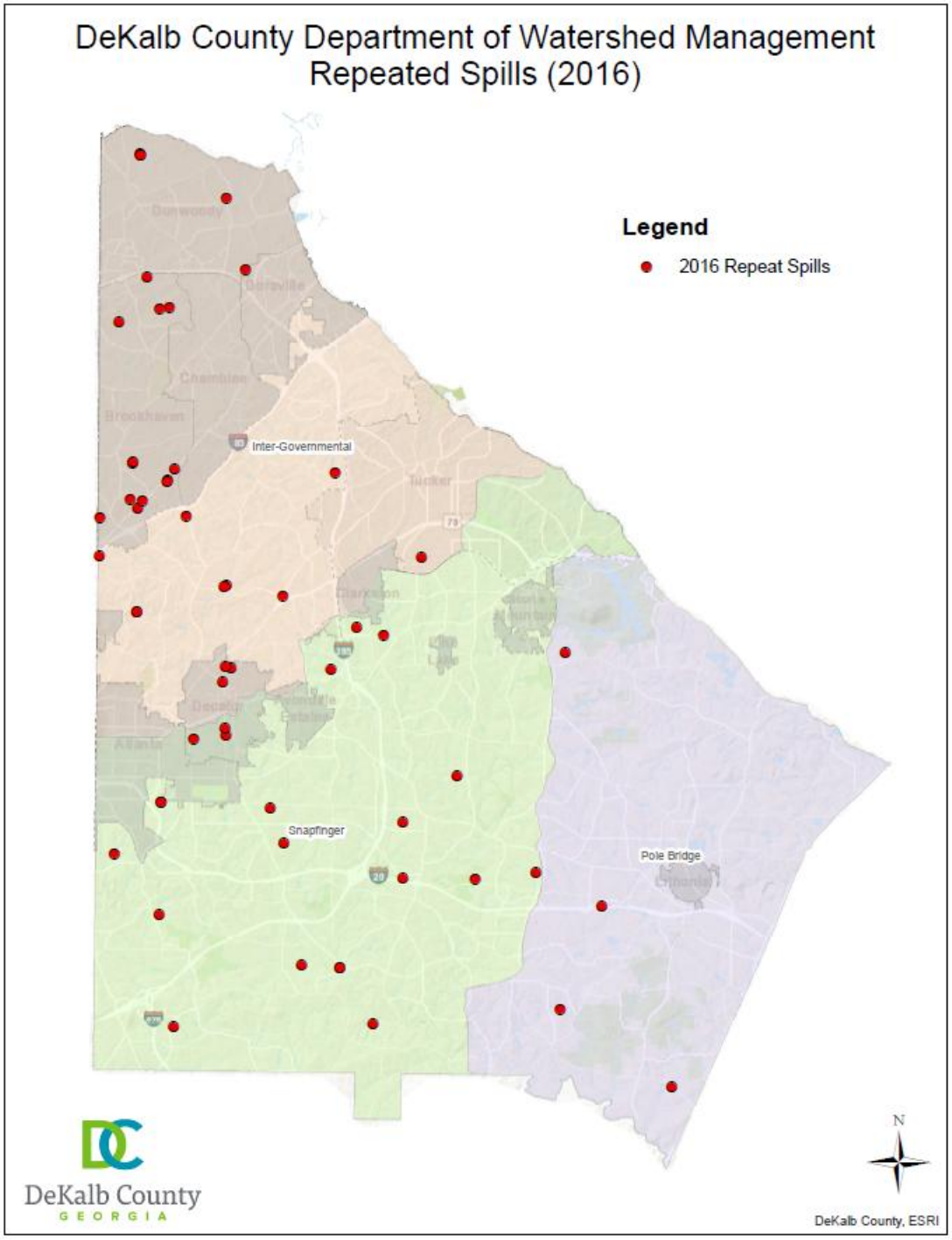


Figure 5-11 Repeat Spills



6. Summary

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

- The number of SSOs per year continues to decrease, with the largest reduction seen in 2016. This downward trend can be attributed to the amount of preventive maintenance and sewer cleaning work being performed in the collection system, the FOG Program, and the public education campaigns.
- The average SSO duration for the last 5 years is approximately 3.5 hours.
- Grease is the most common cause of SSOs and accounts for 35 percent of the SSOs occurring from 2012 to 2016. During this same period, grease accounted for 34 percent of the estimated volume of SSOs. Storm-induced SSOs account for more volume than other causes but happen less often, especially in 2016 because of drought conditions.
- The number of SSOs caused by grease has declined from 175 in 2012 to 77 in 2016.
- The number of SSOs caused by storms was 77 percent less in 2016 than in 2015 because of drought conditions in 2016.