

# Clean Water 2020 Program

## CONSENT DECREE ANNUAL REPORT

January 1, 2018 – December 31, 2018



## Table of Contents

Acronyms & Abbreviations .....	2
Section 1 Introduction .....	4
1.1 Summary of Reporting Requirements .....	4
1.2 Report Organization.....	4
Section 2 CMOM Programs Update.....	5
2.1 Sewer Overflow Response Program (SORP) .....	5
2.2 Contingency and Emergency Response Plan (CERP).....	5
2.3 WCTS Training Program .....	5
2.4 Information Management System (IMS) Program .....	6
2.5 Capacity Assurance Program (CAP).....	6
2.6 Sewer Mapping Program .....	7
2.7 Fats, Oils, and Grease (FOG) Management Program .....	7
2.8 Transmission System Operations and Maintenance Program.....	8
2.9 Gravity Sewer System Operation and Maintenance Program.....	9
2.10 Financial Analysis Program .....	10
Section 3 Capital Projects Update .....	11
3.1 Infrastructure Rehabilitation Report (IRR) Projects.....	11
Section 4 Sanitary Sewer Overflow (SSO) Trends Analysis .....	13
4.1 SSO Frequency and Volume by Cause.....	13
4.2 SSO Frequency and Volume by Month .....	15
4.3 SSO Duration .....	17
4.4 SSOs per 100 Miles of Pipe .....	17
4.5 Building Backup Frequency by Month .....	17

## List of Tables

Table 1: CY 2018 Lift Station Work Order Summary.....	8
Table 2: CY 2018 WCTS Work Order Summary.....	9
Table 3: CY 2018 WCTS Key Performance Indicators (KPIs).....	10
Table 4: IRR Projects (V.16).....	11
Table 5: SIRR Projects (V.16.c) .....	12
Table 6: Total SSO Frequency and Volume by Cause, CY 2017 & 2018 .....	13
Table 7: Monthly SSO Frequency by Cause, CY 2017 & 2018 .....	14
Table 8: Monthly Building Backup Frequency, CY 2017 & 2018.....	18

## List of Figures

Figure 1: CY 2017 SSOs by Cause .....	15
Figure 2: CY 2018 SSOs by Cause .....	15
Figure 3: SSO Frequency by Month.....	16
Figure 4: SSO Volume by Month .....	16
Figure 5: SSOs per 100 Miles of Pipe .....	17

## Acronyms & Abbreviations

- CAP** – Capacity Assurance Program
- CCTV** – Closed Circuit Television
- CD** – Consent Decree
- CE** – City Engineer
- CERP** – Contingency Emergency Response Plan
- CFO** – Chief Financial Officer
- CIP** – Capital Improvements Program
- City** – City of Columbia
- CMOM** – Capacity, Management, Operations and Maintenance
- CSAP** – Continuing Sewer Assessment Program
- CW2020** – City’s Program to Manage the Consent Decree Compliance
- CY** – Calendar Year

**DOJ** – United States Department of Justice

**DUE** – Department of Utilities and Engineering

**EACIP** – Early Action Capital Improvement Projects

**EPA** – United States Environmental Protection Agency

**ERG** – Emergency Response Guide

**FOG** – Fats, Oils and Grease

**FSE** – Food Service Establishment

**GIS** – Geographic Information System

**GLPMP** – Gravity Line Preventive Maintenance Plan

**GSOMP** – Gravity Sewer System Operation and Maintenance Program

**IMS** – Information Management System

**IR** – Infrastructure Rehabilitation [Program]

**IRR** – Infrastructure Rehabilitation Report

**LGIM** – Local Government Information Model

**MAC** – Maintenance and Compliance

**NTP** – Notice to Proceed

**PTO** – Permit to Operate

**RFP** – Request for Proposal

**SCDHEC** – South Carolina Department of Health and Environmental Control

**SMP** – Sewer Mapping Program

**SOP** – Standard Operating Procedure

**SORP** – Sewer Overflow Response Program

**SSES** – Sanitary Sewer Evaluation Survey

**SSO** – Sanitary Sewer Overflow

**TSOMP** – Transmission System Operations and Maintenance Program

**WCTS** – Wastewater Collection and Transmission System

**WMD** – Wastewater Maintenance Division

**WWTP** – Wastewater Treatment Plant

## Section 1 Introduction

### 1.1 Summary of Reporting Requirements

On May 21, 2014 the City of Columbia (City) entered into a Consent Decree (CD) with the United States Environmental Protection Agency (EPA), the United States Department of Justice (DOJ) and the South Carolina Department of Health and Environmental Control (SCDHEC). To fulfill the reporting requirements as defined in Section IX.39.c of the CD, the City has prepared this *Annual Report*, which includes the following information (as excerpted from the CD):

1. A summary of the CMOM Programs implemented pursuant to this Consent Decree, including a comparison of actual performance with any performance measures that have been established;
2. A summary of each remedial measure and capital project implemented pursuant to this Consent Decree;
3. A trends analysis of the number, volume, duration, and cause of Columbia's SSOs for the previous twenty-four (24) month period.

### 1.2 Report Organization

This Annual Report is organized as follows:

#### **Section 1 – Introduction**

This section includes a summary of the reporting requirements and describes the report organization.

#### **Section 2 – CMOM Programs Update**

This section addresses the requirements of Section IX.39.c.(i) of the CD. The section provides a summary and update on the implementation of the specific Management, Operations, and Maintenance (MOM) Programs included in Section V.12 of the CD.

#### **Section 3 – Capital Projects Update**

This section addresses the requirements of Section IX.39.c.(ii) of the CD. The section provides a summary and update on the remedial measures and capital projects implemented as a part of the CD. The remedial measures and capital projects noted in this report have been identified by the City in the course of the assessment of the Wastewater Collection and Transmission System (WCTS) and may be included in the IR Report required under Section V.16 of the CD.

#### **Section 4 – Sanitary Sewer Overflow (SSO) Trends Analysis**

This section addresses the requirements of Section IX.39.c.(iii) of the CD. The section provides information on the number, volume, duration, and cause of the City's SSOs for the previous twenty-four month period.

## Section 2 CMOM Programs Update

In accordance with Section IX.39.c.(i) of the CD, this section provides a summary and update on the implementation of the specific CMOM Programs included in Section V.12 of the Consent Decree. The Program elements addressed in this section provide information regarding activities involving the Metro Wastewater Treatment Plant (WWTP) as well as the City's WCTS.

### 2.1 Sewer Overflow Response Program (SORP)

The City continues to implement the SORP as required under Section V.12.a of the CD.

Projects and significant activities completed during the current reporting period:

- Trained new hires and existing personnel on the use of the SORP (completed December 2018).

### 2.2 Contingency and Emergency Response Plan (CERP)

In consultation with SCDHEC, the City developed and submitted to EPA and SCDHEC a CERP within 18 months of the Date of Entry of the CD. The City received final approval of the CERP from EPA and SCDHEC on May 23, 2016. As of March 6, 2017, all implementation items associated with the CERP were completed.

Projects and significant activities completed during the current reporting period:

- Updated Emergency Response Guide (ERG) Maps for use by personnel.
- Implemented CERP procedures prior to and during major weather events using the Incident Command System (ICS).

### 2.3 WCTS Training Program

In accordance with the requirements of the CD, the City submitted a WCTS Training Program to EPA and SCDHEC by January 5, 2016. The City received final approval of the WCTS Training Program from EPA and SCDHEC on May 23, 2016. As of November 20, 2017, all implementation items associated with the WCTS Training Program were completed.

Projects and significant activities completed during the current reporting period:

- Implementation of General Training Program
  - Orientation and general training for new employees
  - Apprenticeship training
- Position Specific Training Program
  - Task training of Wastewater Collection and Transmission System (WCTS) Staff
- Tracking of Training
  - Training is tracked through the City's training software, Target Solution.

## 2.4 Information Management System (IMS) Program

In accordance with the requirements of the CD, the City submitted an Information Management System (IMS) Program to EPA and SCDHEC by January 5, 2016. The City received final approval of the IMS Program from EPA and SCDHEC on May 23, 2016.

Projects and significant activities completed during the current reporting period:

- The City continues to use Cityworks as their Computerized Maintenance Management System (CMMS) for service request and work order management for corrective and preventive maintenance activities.
- The City continues to use a series of Microsoft Excel spreadsheets, as well as IFAS and P6, to track its CIP throughout the lifecycle of the project.
- The City continues to use the Storeroom module as part of the Cityworks software. As of September 30, 2018, 100% implementation of the Storeroom component was achieved.
- The City continues to obtain metrics and reports directly from their CMMS regarding the frequency of work performed on the WCTS.
  - In addition, the City has implemented a prototype business intelligence system utilizing dashboard technology that integrates Cityworks, SCADA, financial information and GIS into a reporting dashboard. City staff are currently reviewing and testing the new system.
- Sewer basin electronic mapping has continued to be implemented in accordance with the submitted and EPA approved Sewer Mapping Plan (SMP). As of December 31, 2018, 78% implementation of the SMP was achieved.

## 2.5 Capacity Assurance Program (CAP)

In accordance with the requirements of the CD, the City is to submit to EPA and SCDHEC a CAP within 180 days after approval of the Hydraulic Model Report. Additionally, within 90 days after the Date of Entry of the CD, Columbia was required to establish a list of all authorized new sewer service connections or increases in flow from existing service connections, which flows have not yet been introduced into the WCTS. Columbia is required to update and maintain this list as necessary until full implementation of the CAP, as approved by EPA. In addition, upon execution of the CD and until EPA approves the CAP as required by Section 12.e, Columbia agreed to continue to implement its current capacity program.

Projects and significant activities completed during the current reporting period:

- Updated the existing CAP SOP document to define “minor sewer connections”.
- Continued to collect and process CAP requests received from developments within the City’s Service Area in accordance with the current capacity program.
- Continued to test and refine the CAP Tool to be utilized upon approval of the CAP by EPA.

## 2.6 Sewer Mapping Program

In accordance with the requirements of the CD, the City submitted a Sewer Mapping Program (SMP) to EPA and SCDHEC within 60 days of the date of entry of the CD. The City received final approval of the SMP from EPA and SCDHEC on December 9, 2014.

Projects and significant activities completed during the current reporting period:

- The City continues to complete the electronic mapping of each Sewer Basin in accordance with the approved SMP implementation plan. Progress for each WCTS Minor Gravity Mapping basin is as follows:
  - West Columbia Basin – 95% complete
  - Smith Branch Basin – 82% complete
  - Saluda River Basin – 88% complete
  - Rocky Branch Basin – 49% complete
  - Mill Creek Basin – 28% complete
  - Gills Creek Basin – 37% complete
  - Crane Creek Basin – 67% complete
  - Broad River Basin – 27% complete
  
- Progress for each WCTS Major Gravity Mapping basin is as follows:
  - West Columbia Basin – 100% complete (Mapping complete as of November 20, 2017.)
  - Smith Branch Basin – 100% complete (Mapping complete as of November 20, 2017.)
  - Saluda River Basin – 100% complete (Mapping complete as of May 23, 2018.)
  - Rocky Branch Basin – 100% complete (Mapping complete as of May 23, 2018.)
  - Mill Creek Basin – 100% complete (Mapping complete as of November 23, 2018.)
  - Gills Creek Basin – 100% complete (Mapping complete as of November 23, 2018.)
  - Crane Creek Basin – 100% complete (Mapping complete as of November 23, 2018.)
  - Broad River Basin – 100% complete (Mapping complete as of November 23, 2018.)

As of November 23, 2018, all WCTS Major Gravity Mapping requirements associated with the SMP have been completed.

## 2.7 Fats, Oils, and Grease (FOG) Management Program

The City continues to implement its FOG Management Program. The FOG Management Program was submitted to the EPA on July 2, 2013 and incorporated into the CD as Appendix G.

Projects and significant activities completed during the current reporting period:

- Public education program and website information are available to the public to promote FOG awareness throughout the City of Columbia.

- The City continues to implement the existing FOG Program to include quarterly inspections of Food Service Establishments (FSEs) and Public Outreach Programs.

## 2.8 Transmission System Operations and Maintenance Program

In accordance with the requirements of the CD, the City submitted to EPA and SCDHEC a Transmission System Operations and Maintenance Program (TSOMP) within one year after the Date of Entry of the CD. The City received final approval of the TSOMP from EPA and SCDHEC on September 2, 2016.

Projects and significant activities completed during the current reporting period:

- Recommended SCADA Improvements design has been completed by an outside Engineering Firm. Contract bid documents were completed and the project was bid in March 2018. Construction NTP was issued in June 2018 and the construction contract is on schedule to be complete in June 2019.
- Force Main and Easement Maintenance is currently underway with surveying the limits of these easements and initial clearing. Project is on schedule.
- Corrosion Control to evaluate and develop findings and recommendations, cost estimates and implementation schedule for mitigation measures was completed in November 2018. Program is currently being implemented by WCTS staff.

The Key Performance Indicators (KPIs) that are tracked by the City to measure the performance of the WCTS include the number of Force Main related SSOs per mile of Force Main and/or number of SSOs per number of Pump Stations; and maintenance activities tracked by type (corrective, preventive, and emergency).

**Table 1: CY 2018 Lift Station Work Order Summary**

Wastewater Collection System (WCTS) Maintenance	Percentage of Work Orders
Corrective Maintenance	6.2%
Preventive Maintenance	93.6%
Emergency Maintenance	0.2%
Total	100%

SSO KPIs related to Force Main and/or SSOs per number of Pump Stations are provided under Section 4 Sanitary Sewer Overflow (SSO) Trends Analysis.

## 2.9 Gravity Sewer System Operation and Maintenance Program

In accordance with the requirements of the CD, the City submitted to EPA and SCDHEC a Gravity Sewer System Operation and Maintenance Program (GSOMP) within 18 months of the Date of Entry of the CD. The City received final approval of the GSOMP from EPA and SCDHEC on May 23, 2016.

Projects and significant activities completed during the current reporting period:

- Development of Gravity Line Preventive Maintenance Plan (GLPMP) was finalized and is currently being implemented by WCTS staff.
- Revisions to the GSOMP were initiated in late-2018 and it is anticipated that the revised GSOMP will be put on Public Notice in March 2019. At the end of the public comment period, the City will consider any comments received and submit the revised GSOMP to EPA for approval pursuant to Paragraph 23.b of the CD.
- Gravity Main and Easement Maintenance is currently underway with surveying the limits of these easements and initial clearing. Project is on schedule.
- Corrosion Control to evaluate and develop findings and recommendations, cost estimates and implementation schedule for mitigation measures was completed in November 2018. Program is currently being implemented by WCTS staff.
- Evaluation of crossings and stream bank encroachment was completed in November 2018 and correction of the identified deficiencies is currently being implemented by WCTS staff.

The Key Performance Indicators (KPIs) that are tracked by the City to measure the performance of the WCTS include the linear footage of Gravity Sewer inspected, the linear footage of Gravity Sewer cleaned, the number of manholes inspected, the number of manholes cleaned/maintained, the number of inverted siphons inspected, the number of inverted siphons cleaned/maintained, the number of SSOs per mile of Gravity Sewer, and maintenance activity tracked by type (corrective, preventive, and emergency).

**Table 2: CY 2018 WCTS Work Order Summary**

Wastewater Collection System (WCTS) Maintenance	Percentage of Work Orders
Corrective Maintenance	15%
Preventive Maintenance	83%
Emergency Maintenance	2%
Total	100%

**Table 3: CY 2018 WCTS Key Performance Indicators (KPIs)**

<b>Reportable Consent Decree Key Performance Indicators (KPIs) for Wastewater Collection System (WCTS)</b>	<b>Annual Projection</b>	<b>As of 12/31/18</b>	<b>% Completed vs Projected</b>
Linear footage of gravity sewer inspections (linear feet)	564,960	998,891	176.8%
Linear footage of gravity sewers cleaned (linear feet)	1,129,920	825,910	73.1%
Number of manholes inspected (each)	2,799	7,948	284.0%
Number of manholes cleaned/maintained (each)	2,799	2,037	72.8%
Number of inverted siphons inspected (each)	2	1	50.0%
Number of inverted siphons cleaned/maintained (each)	2	1	50.0%

SSO KPIs related to WCTS are provided under Section 4 Sanitary Sewer Overflow (SSO) Trends Analysis.

## 2.10 Financial Analysis Program

In accordance with the requirements of the CD, the City submitted a Financial Analysis Program to EPA and SCDHEC by January 5, 2016. The City received final approval of the FAP from EPA and SCDHEC on May 23, 2016.

Projects and significant activities completed during the current reporting period:

- Continued assessing staffing impacts connected to CD programs and included needs and levels in both FY18/19 and FY19/20 budget plans.
- Continued planning for costs of equipment and materials needed for the proper management, operation and maintenance of the WCTS and WWTP (based on an evaluation of past needs, recent budgeting levels and costs, and projected needs) and for implementing CD programs.
- Continued planning for outsourcing needs based on past budgeting levels and costs, and on specific requirements for implementing CD programs.
- A rate study update was presented to City Council on February 20, 2018 and April 17, 2018. The next rate study update started in January 2019.
- IFAS (Integrated Financial and Administrative Solution) continues to be in use and can now track and report capital improvement costs as well as third-party contracts by O&M category.
- Continued assessment of an updated/rolling 5-year CIP plan.
- Created business cases for projects for the FY18/19 Capital Projects Budget.

## Section 3 Capital Projects Update

In accordance with Section IX.39.c.(ii) of the CD, the following section provides a summary and update on the remedial measures and capital projects implemented as a part of the Consent Decree.

### 3.1 Infrastructure Rehabilitation Report (IRR) Projects

In accordance with Section V.16 of the CD, the City shall submit an IRR to EPA and SCDHEC summarizing the results of the Continuing Sewer Assessment Program (CSAP) of the major components of the WCTS and a description of proposed rehabilitation projects, including rehabilitation projects currently underway. As rehabilitation projects are identified through the CSAP and in the normal course of operations and maintenance, the City is proceeding with those projects. The following projects have already been identified and are currently in progress.

**Table 4: IRR Projects (V.16)**

<b>CIP #</b>	<b>Project Name</b>	<b>Project Status/Summary</b>
SS7261	Lake Katherine Sewer Line Capacity Enhancement	Design 100% complete in February 2018. Construction anticipated to begin in 2019.
SS7301	Bull Street	City Council approved project on April 21, 2015. Construction ongoing throughout 2018.
SS7389	Crane Creek and Smith Branch Manhole Repair and Mitigation	Construction NTP issued on August 20, 2018. Construction ongoing throughout remainder of 2018.

In accordance with Section V.16.c of the CD, the City shall submit a Supplemental Infrastructure Rehabilitation Report (SIRR) to EPA and SCDHEC which shall update all portions of the IRR to reflect additional information developed by the City through completion of the CSAP of the minor components of the WCTS. As rehabilitation projects are identified through the CSAP and in the normal course of operations and maintenance, the City is proceeding with those projects. The following projects have already been identified and are currently in progress.

Table 5: SIRR Projects (V.16.c)

CIP #	Project Name	Project Status/Summary
SS6786	Annual Sanitary Sewer Manhole Rehabilitation	Construction to be performed in FY 2018 was completed in June 2018. Construction for projects to be performed in FY 2019 began in July 2018 and was ongoing throughout remainder of 2018.
SS6966	Annual Rehab on Lines less than 15"	Construction to be performed in FY 2019 is anticipated to begin in 2019.
SS7060	Pump Station Improvements at 6 Sites	Construction NTP issued on June 7, 2016. Construction was completed in January 2018.
SS7172	Rehabilitation/Replacement Harbison #2, Mallard Point and Animal Shelter PS	Design 100% complete in January 2018. Construction NTP issued on October 15, 2018. Construction ongoing throughout remainder of 2018.
SS7208	Saluda River Basin SSES and Rehabilitation for SR-03, 10, & 12	Construction NTP issued on August 19, 2014. Construction ongoing throughout 2018.
SS7262	Flow Study/Rehabilitation/Replacement of Three Rivers and Colonial Life PS	Construction NTP issued on May 16, 2016. Construction completed in early 2018 (PTO issued in October 2017).
SS7279	Smith Branch-02 SSES and Rehabilitation	Construction NTP issued on November 17, 2016. Construction ongoing throughout 2018.
SS7280	Rocky Branch-01 SSES and Rehabilitation	Construction NTP issued on August 22, 2016. Construction ongoing throughout 2018.
SS7324	Bendale PS Improvements	Construction NTP issued on June 19, 2017. Construction was completed in January 2018.
SS7362	Smith Branch 01 SSES	Construction NTP issued on June 1, 2018. Construction ongoing throughout remainder of 2018.
SS7363	Smith Branch 03 SSES	Design 100% complete in May 2018. Construction anticipated to begin in 2019.

## Section 4 Sanitary Sewer Overflow (SSO) Trends Analysis

In accordance with Section IX.39.c.(iii) of the CD, the following section provides a trends analysis of the number, volume, duration, and cause of the City's Sanitary Sewer Overflows (SSOs) for the previous twenty-four month period.

Items required include the detailed number (frequency) and volume, by cause, of reportable spills as well as a trend analysis of the number, volume, and cause of the City's SSOs, by month, for the previous twenty-four month period.

### 4.1 SSO Frequency and Volume by Cause

The detailed number and volume, by cause, for reportable spills is presented for review. The following table represents the SSO volume spilled by cause, frequency and volume for calendar years 2017 and 2018.

**Table 6: Total SSO Frequency and Volume by Cause, CY 2017 & 2018**

SSO Cause	Frequency	Volume (gal)
Collapsed Line	78	2,312,421
Grease	23	31,335
3 <sup>rd</sup> Party	27	66,500
Pump Station Failure	3	19,230
Roots	100	57,940
Debris	75	40,061
Wet Weather	41	619,903
Force Main	1	1
Equipment Failure	25	54,463
Wastewater Treatment Plant	5	3,677

The following table shows the SSO category (cause), number of SSOs of that category by month, and the total for each month in CY 2017 and CY 2018. The total number of SSOs by category is then calculated as a percentage of all SSOs for the overall time period.

Table 7: Monthly SSO Frequency by Cause, CY 2017 & 2018

Month / Year	Collapsed Line	Grease	3rd Party	Pump Station Failure	Roots	Debris	Wet Weather	Force Main	Equipment Failure	Wastewater Treatment Plant	Total
Jan-17	3	2	1	0	7	3	2	0	0	0	18
Feb-17	5	1	1	0	2	4	0	0	0	0	13
Mar-17	5	0	1	0	3	1	4	0	0	1	15
Apr-17	1	3	0	1	4	4	10	0	5	0	28
May-17	1	1	1	1	1	2	0	0	4	0	11
Jun-17	2	1	3	0	2	1	0	0	1	0	10
Jul-17	2	0	1	0	1	1	8	0	1	0	14
Aug-17	1	0	1	0	0	0	0	0	2	0	4
Sep-17	1	0	1	0	1	2	0	0	8	0	13
Oct-17	6	1	1	0	9	3	0	1	2	0	23
Nov-17	7	1	0	0	1	2	0	0	0	0	11
Dec-17	5	2	0	0	6	2	0	0	0	0	15
<b>CY 2017 Total</b>	<b>39</b>	<b>12</b>	<b>11</b>	<b>2</b>	<b>37</b>	<b>25</b>	<b>24</b>	<b>1</b>	<b>23</b>	<b>1</b>	<b>175</b>
Jan-18	1	3	1	0	3	1	0	0	0	0	9
Feb-18	7	2	4	0	6	6	0	0	0	0	25
Mar-18	3	1	3	0	10	9	0	0	0	0	26
Apr-18	2	2	0	0	6	5	0	0	0	0	15
May-18	3	0	0	0	5	3	0	0	0	0	11
Jun-18	1	1	0	0	8	3	0	0	1	0	14
Jul-18	0	0	3	1	4	3	0	0	0	0	11
Aug-18	3	0	1	0	4	2	0	0	0	1	11
Sep-18	5	0	1	0	4	1	1	0	0	0	12
Oct-18	7	0	2	0	5	5	7	0	0	0	26
Nov-18	2	0	1	0	1	7	7	0	0	3	21
Dec-18	5	2	0	0	7	5	2	0	1	0	22
<b>CY 2018 Total</b>	<b>39</b>	<b>11</b>	<b>16</b>	<b>1</b>	<b>63</b>	<b>50</b>	<b>17</b>	<b>0</b>	<b>2</b>	<b>4</b>	<b>203</b>
<b>Grand Total</b>	<b>78</b>	<b>23</b>	<b>27</b>	<b>3</b>	<b>100</b>	<b>75</b>	<b>41</b>	<b>1</b>	<b>25</b>	<b>5</b>	<b>378</b>
<b>% of Total</b>	<b>20.6%</b>	<b>6.1%</b>	<b>7.1%</b>	<b>0.8%</b>	<b>26.5%</b>	<b>19.8%</b>	<b>10.8%</b>	<b>0.3%</b>	<b>6.6%</b>	<b>1.3%</b>	

In CY 2017, the highest number of reportable spills were due to collapsed lines (22%) and roots (21%). The next highest areas of reportable spills were attributable to debris and wet weather (14% each). In CY 2018, the highest number of reportable spills were due to roots (31%). The next highest areas of reportable spills were attributable to debris (25%) and collapsed lines (19%). Overall, collapsed lines, roots, wet weather, and debris combined to represent a significant majority (78%) of the reportable spills for the period.

Figure 1: CY 2017 SSOs by Cause

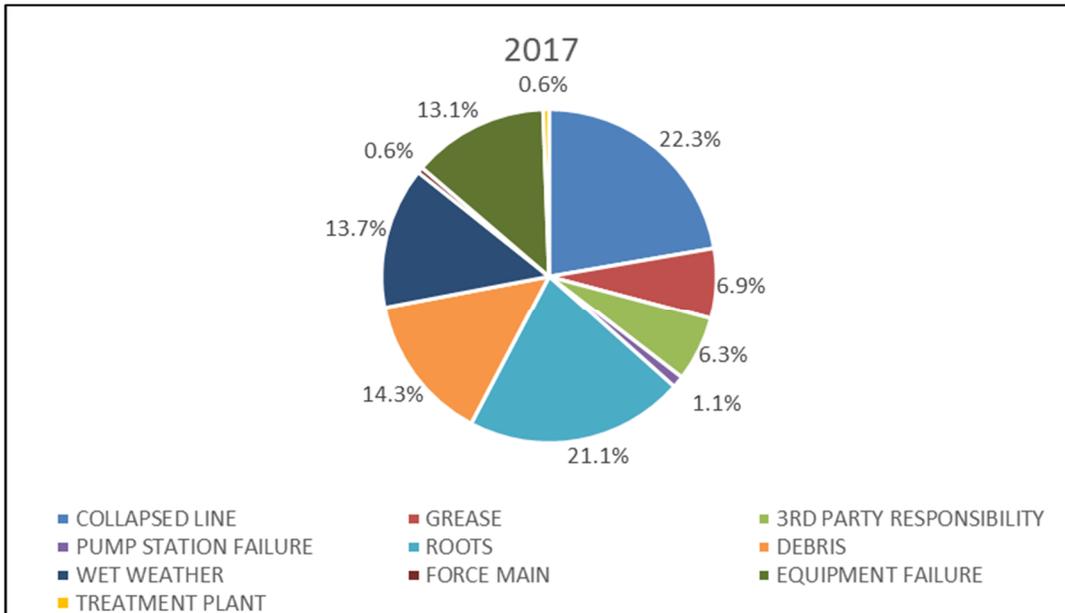
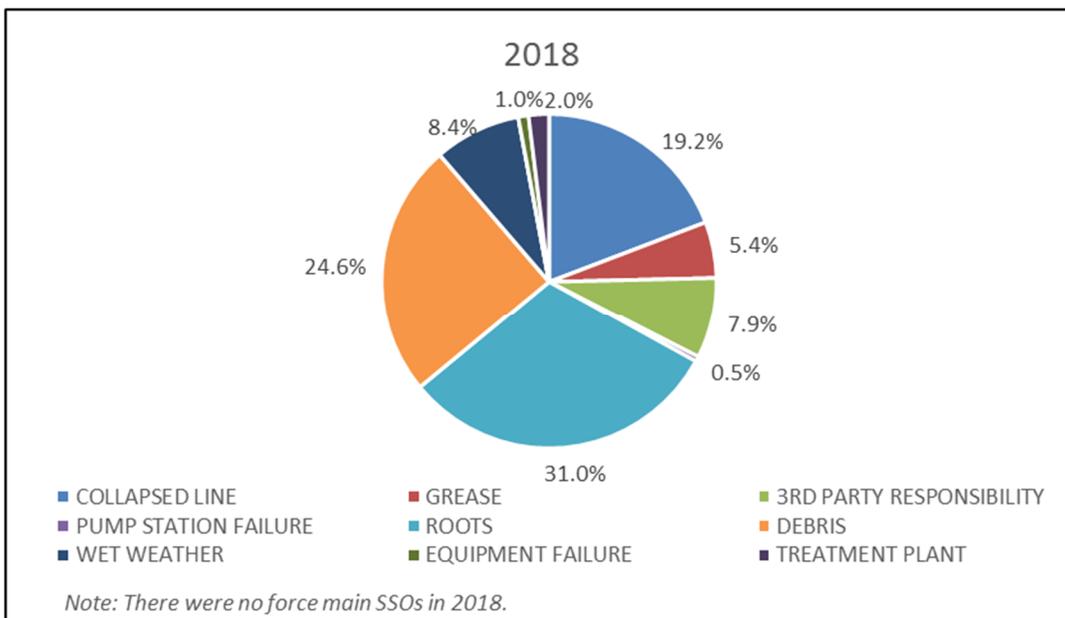


Figure 2: CY 2018 SSOs by Cause

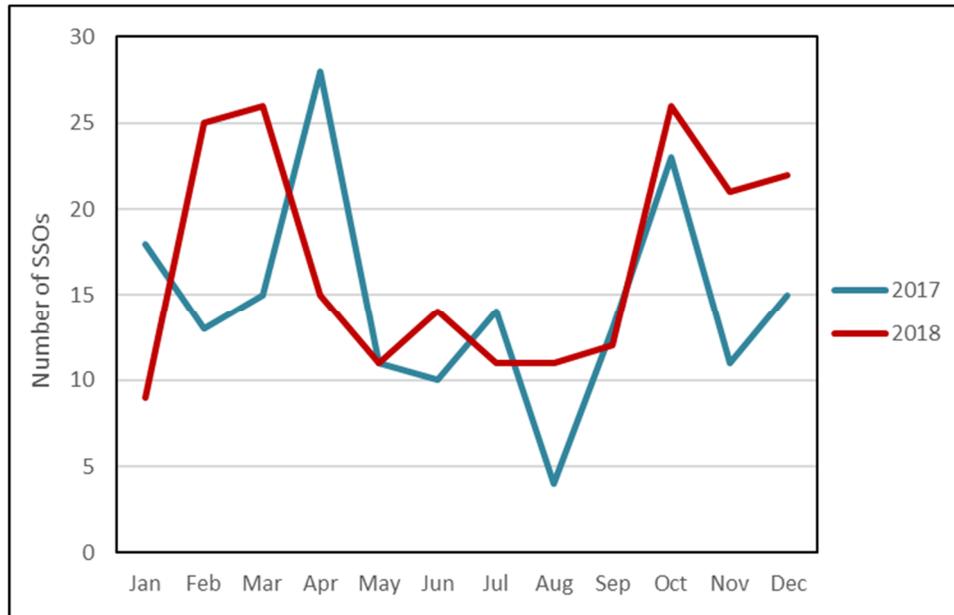


## 4.2 SSO Frequency and Volume by Month

As shown in the tables above, the City experienced a total of 175 SSOs in CY 2017. In CY 2018, the City experienced a total of 203 SSOs for a combined total of 378 SSOs. This number was greater than the previous two-year total of 330, an increase of 15%. The average number of SSOs per month during CY 2017 was 14.6, and 16.9 in CY 2018. The fluctuation in SSOs monthly is caused by a combination of wet weather, roots, debris, and collapsed lines. During CY 2017, April and October averaged 25.5 SSOs per

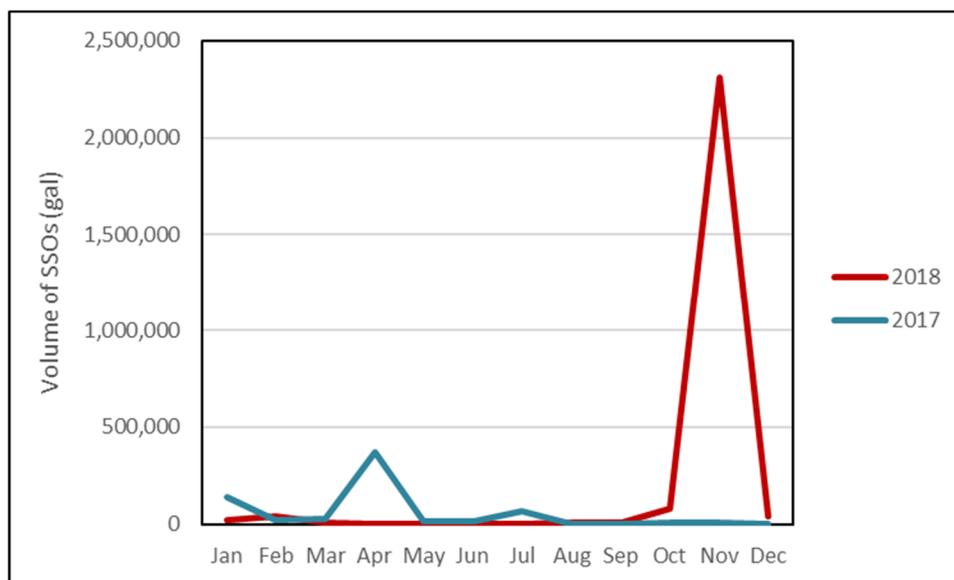
month, above the annual average of 14.6. In CY 2018, March and October averaged 26.0 SSOs per month, once again well above the annual average of 16.9.

Figure 3: SSO Frequency by Month



During CY 2017, total known volume spilled represented approximately 0.67 million gallons; in CY 2018, total known volume spilled represented approximately 2.53 million gallons, for an estimated combined total known volume of 3.20 million gallons. Wet weather events accounted for 72.3 percent of the known volume spilled in CY 2017 and 5.2 percent of the known volume spilled in CY 2018.

Figure 4: SSO Volume by Month



Based on an analysis of the wet weather SSO events, there is an identifiable correlation between spill volume and rainfall. Although wet weather volume decreased in 2018 compared to 2017, the City still experienced significant volume of SSOs related to wet weather during major rainfall events.

### 4.3 SSO Duration

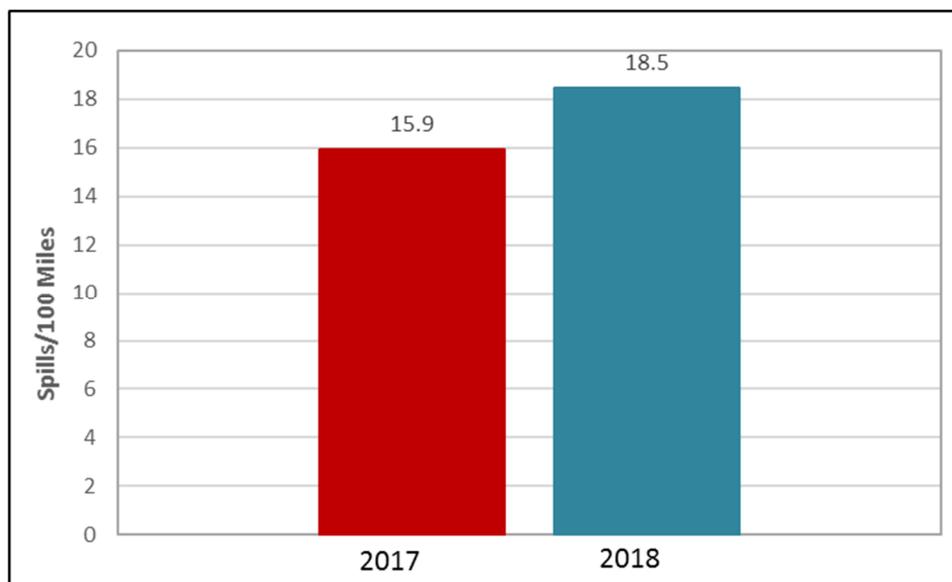
The documented duration of an SSO is the amount of time between the estimated start time of the SSO event (observed) and the estimated end time of the SSO event (observed). In CY 2017, non-wet weather SSOs represented an average duration of 80 minutes per SSO. Wet weather SSOs represented an average duration of 301 minutes per SSO. In CY 2018, non-wet weather SSOs represented an average duration of 70 minutes. Wet weather SSOs represented an average duration of 131 minutes.

Of all SSOs in CY 2017 and 2018, 26 percent of the non-wet weather SSO durations and 17 percent of the wet weather SSO durations were reported as unknown or undetermined due to overflow being unobserved.

### 4.4 SSOs per 100 Miles of Pipe

The City currently operates and maintains 1,100 miles of pipe. In CY 2017 the number of SSOs per 100 miles equaled 15.9 and in CY 2018 18.5. This is an increase of 2.6 SSOs per 100 miles of pipe.

Figure 5: SSOs per 100 Miles of Pipe



### 4.5 Building Backup Frequency by Month

As noted in Section IV.8.a of the CD, a Building Backup is defined as a release of wastewater into a building or onto private property that is caused by blockages, flow conditions, or other malfunctions in the WCTS.

Separate from the SSO data noted above in Sections 4.1 through 4.4, the following table represents the frequency of building backups within the City’s system for each month in CY 2017 and CY 2018. Building backup claims are investigated by the City in order to determine whether the cause of the building backup is a condition within the City’s system. If so, the City corrects the problem in the City’s WCTS. Issues on private property are documented for the City by a third-party administrator. Through May 2017, neither the City nor the third-party administrator-maintained records on volume, duration, or specific root causes of building backups. In June 2017, the City developed a new Standard Operating Procedure (SOP) for Building Backup data collection and documentation. As of July 2017, additional information on building backups is being collected. While only frequency information is provided in this report, additional analysis regarding building backups over the two-calendar-year reporting period will be included in the 2019 Annual Report once data is available for the entire two-calendar-year period.

**Table 8: Monthly Building Backup Frequency, CY 2017 & 2018**

Month	2017	2018
January	4	2
February	1	1
March	1	0
April	2	0
May	1	1
June	2	0
July	0	0
August	1	0
September	2	0
October	0	0
November	0	0
December	4	0
<b>Total</b>	<b>18</b>	<b>4</b>