



SANITARY SEWER OVERFLOW RESPONSE PLAN

**CITY OF HAMPTON
DEPARTMENT OF PUBLIC WORKS
WASTEWATER OPERATIONS DIVISION
HAMPTON, VIRGINIA**

December 2015



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1.0 PURPOSE

The purpose of the Sanitary Sewer Overflow Response Plan (SSORP) is to provide a structured, repeatable and effective plan and process for responding to sanitary sewer overflows (SSOs) from the Hampton sanitary sewer system. This plan is a component of Hampton's CMOM program and is a requirement of the Virginia Department of Environmental Quality (DEQ) Special Order of Consent (SOC). As part of the Capacity Assurance, Management, Operations, and Maintenance (CMOM) Program, the Division's SSORP is expected to be in alignment with its overall CMOM goals which are to:

- Manage, operate and maintain Hampton's sanitary sewer system such that there is sufficient capacity in all areas of the collection and transmission system to minimize and prevent SSOs;
- Continue to identify, evaluate and rehabilitate areas in the sewerage system in order to improve capacity, system reliability and to minimize and prevent SSOs;
- Train system personnel such that SSOs are immediately responded to and properly handled and reported;
- Protect public health, the environment and provide reliable customer service; and,
- Document CMOM program compliance to Virginia DEQ annually.

The regulatory expectations are to:

- Ensure overflow awareness;
- Ensure proper response to overflows;
- Ensure appropriate notification;
- Ensure proper staff training; and;
- Provide emergency operations.

The Hampton service area is adjacent to and surrounded by recreational and shellfish waters. These facts, together with the need to protect the public health when overflows do occur and to prevent overflows from reaching the "Waters of the Commonwealth," mean that the Division needs to have and implement a superior SSORP.

The Division considers this document to be its initial formal SSORP and that there remains a number of opportunities for improvement. These include

- Develop mutual aid agreements with HRSD and nearby communities
- Develop a definition for critical assets.
- Identify critical assets
- Develop contingency response plan addenda for critical assets that are identified as high risk assets, that is, reasonable probability of or high level of consequences of failure.

2.0 DEFINITIONS

The following terminology is used throughout this plan.

CCTV: Closed Circuit Television

CMOM: Capacity Assurance, Management, Operations, and Maintenance

DEQ: Virginia Department of Environmental Quality

I&I: Inflow and Infiltration

Reportable Release: A reportable release is any release of unrecovered waste water that may reasonably be expected to reach state waters and/or adversely impact public health and safety.

SOC: Special Order of Consent

SSO: An SSO occurs when sewage leaves the sewer system.

SSORP: Sanitary Sewer Overflow Response Plan

SSORS: Sanitary Sewer Overflow Reporting System

Stoppage: A stoppage occurs when the flow of sewage in the sewer system is blocked or impeded.

Unpermitted Discharge: An unpermitted discharge occurs whenever an SSO reaches the waters of the Commonwealth.

3.0 RESPONSIBILITIES

3.1 Wastewater Operations Division Manager

The Wastewater Operations Division Manager is responsible for ensuring that the Division has an up-to-date and compliant SSORP and that sufficient resources are available to implement it as needed.

3.2 Infiltration and Inflow (I&I) Section

3.2.1 Supervisor

The I&I Section Supervisor is responsible for:

- Developing that part of the SSORP for which the I&I Section has operational responsibility;
- Coordinating with other Sections;
- Ensuring that the SSORP is kept up-to-date;
- Ensuring that I&I personnel are trained on the SSORP; and,
- Fulfilling the duties prescribed in the SSORP.

3.2.2 Personnel

The I&I Staff are responsible for:

- Helping to improve the SSORP and keep it up to date;
- Knowing and understanding the duties prescribed by the SSORP; and,
- Fulfilling the duties prescribed in the SSORP.

3.3 Pumping Station (PS) Section

3.3.1 Supervisor

The PS Section Supervisor is responsible for:

- Developing that part of the SSORP for which the Pumping Station Section has operational responsibility;
- Coordinating with other Sections;
- Ensuring that the SSORP is kept up-to-date;
- Ensuring that PS personnel are trained on the SSORP; and,
- Fulfilling the duties prescribed in the SSORP.

3.3.2 Personnel

The Pumping Station Staff are responsible for:

- Helping to improve the SSORP and keep it up to date;

-
- Knowing and understanding the duties prescribed by the SSORP; and,
 - Fulfilling the duties prescribed in the SSORP.

4.0 PROCEDURES

4.1 Stoppage Process

ADMIN – Stoppages are called into the City’s 311 Call Center or 911 Call Center depending on time of day.

- *Days (7:00 am to 3:30 pm) – The 311 Call Center sends a work request via GBA, which gets printed out in Wastewater dispatch office. The wastewater administrator then calls a stoppage request over radio to the field crew.*
- *Nights (3:30pm to 11:00 pm) – The 311 Call Center sends a work request via GBA, which gets printed out in Wastewater dispatch office. The crews are called over the radio directly from 311 Call Center because there are no administration personnel on duty during the night shift.*
- *Midnights (11:00 pm to 7:00 am) - 911 Call Center sends a work request via GBA, which gets printed out in Wastewater dispatch office. The on-call crew is called via pager and/or telephone.*

FIELD – The Stoppage truck receives the call. If the call is described as an overflow, the call receives a priority designation. The crew will handle problem in accordance with overflow procedures. By checking manholes and city cleanouts, the stoppage crew determines whether problem is “On-City” or “Not on City.” When the responsibility for the stoppage is identified, the crew informs resident in-person or by a door tag. If the problem is:

- **On City –** The crew will clear stoppage and inform resident of the results.
- **Not on City –** The crew will inform resident that stoppage is on private property and that they should call a plumber to resolve the problem.

FIELD – If there is a mainline stoppage, the crew will use the stoppage truck to clear the stoppage. If the blockage can not be cleared by using the smaller truck, the crew will inform supervisor that a VacCon truck is needed to complete the job. During the day, this activity is accomplished via radio. After 3:30 pm, the on-call wash truck operator will be called. There is a wash truck operator on-call 24 hours a day. (The current on-call schedule is located in Section 6.0.)

FIELD – At the conclusion of the stoppage call, the crew will fill out the stoppage spreadsheet with the detailed description of the activities performed. A copy of a stoppage spreadsheet is contained in the Appendix. At the end of the shift, stoppage spreadsheets are turned in to the supervisor for review.

ADMIN – The supervisor reviews stoppage spreadsheets and then gives them to the data entry person

ADMIN – The data entry person enters the address, the stoppage response, and the asset number where available into GBA. The asset number is critical for future tracking of main line issues.

ADMIN – On a weekly basis, the Supervisor will run the Stoppage Follow up Report in GBA to find any stoppages that have occurred at a residence multiple times. If crews have been to an address more than twice, a follow up lateral CCTV inspection work order will be made to identify the cause of the stoppages.

FIELD – The Lateral crew is sent out to CCTV the lateral and identifies the cause of the stoppage. The following actions are taken based upon the identified cause:

- If **grease** – a work order to clean the lateral is created and literature is handed out to the resident on how to properly dispose of residential grease.
- If **roots** – a work order is created to have the roots cut. A 4” chain cutter is used with the VacCon wash truck to remove the roots.
- If **broken** – a repair work order is created for the construction crews to schedule and repair tap.

ADMIN – All work is tracked using the work orders that are filled out by the field crews and turned into their respective managers for review. Once work orders are reviewed, data entry personnel enter the data in to GBA.

4.2 Overflow Procedure

ADMIN - Overflows are typically called into the 311 call center where a request is printed out via GBA. In some instances, an over flow is found by an employee. In these cases, a supervisor is contacted and calls the crew directly. Wastewater dispatch calls in the overflow request directly to the stoppage crew. All overflows take priority over routine requests. After 3:00 pm, the stoppage night crew is called. The on-call schedule for the stoppage night crew is located in Section 6.0.

FIELD – The crews perform an assessment of the overflow stoppage request to determine the nature of the overflow. If the stoppage is found to be:

- Not an Overflow – The crew will complete stoppage request form and notes on work order the true disposition of request.
- Overflow – The crew responds to overflow. By checking maps, manholes, and cleanouts and discussing with the residents, the crew determines the location of the blockage and what structures the overflow can be cleared from. Once the location is determined, the crew will clear the blockage and stop the overflow.

FIELD – The crew clears blockage and stops overflow. A manager is called immediately for any spill greater than 100 gallons. All overflows are reported, and a note is made on the report regarding the quantity of sewage recovered and if SSO was contained or not contained.

FIELD – The crew recovers as much of the sewage spill as possible, washes down the area with fresh water, and then disinfects the area with calcium hypochlorite (HTH) and/or lime.

FIELD – The crew will fill out the overflow paper work immediately with as much detail as detailed as possible. The report should include a location map to be provided to inspection crews for follow up work. The overflow report must be turned in the same day as overflow.

ADMIN – The overflow report is turned in as soon as possible to the I&I Section Supervisor for review. The I&I Supervisor will create the appropriate work orders for the inspection to determine the overflow cause. The routing of the paper work is determined by the status of the overflow. If the overflow is:

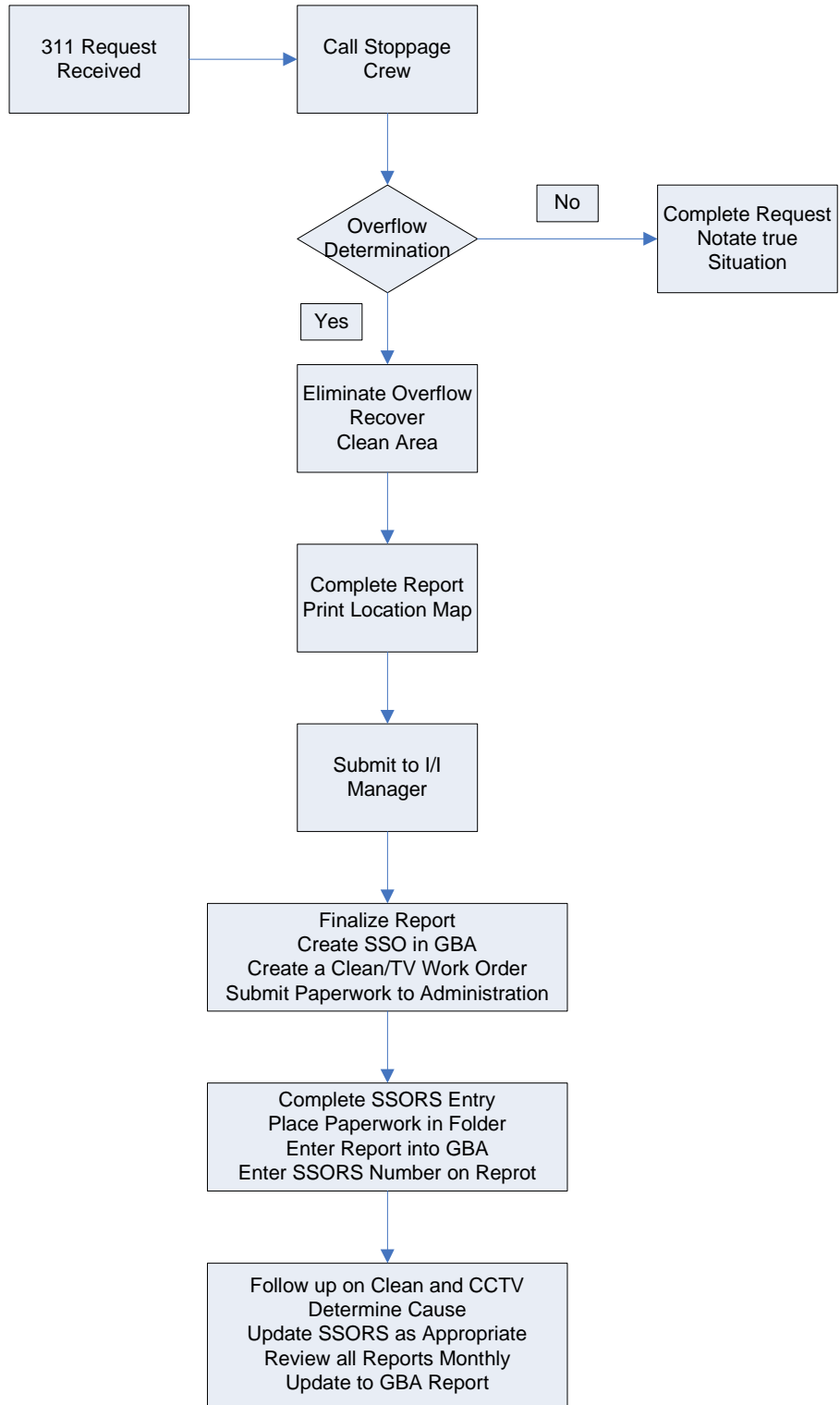
- *Contained – the report will be entered into the GBA module and the overflow will be investigated.*
- *Uncontained – the report will be entered into the GBA module and it will be entered into the (Sanitary Sewer Overflow Reporting System (SSORS,) which is the regional reporting system for DEQ.*

ADMIN - Once the overflow status has been determined, the I&I manager will update the report in the GBA overflow module. Every overflow is tracked in GBA regardless of whether it is contained or uncontained.

- *If the overflow was not contained, the report will be entered into the GBA module and also into the SSORS, which will notify DEQ and the health department of any uncontained overflows.*
- *Once the cause of the overflow is determined by field investigations including CCTV, the I&I manager will use the data to update the overflow records in GBA and SSORS.*

The overflow response procedure is depicted in Figure 1.

Figure 1 Overflow Procedure



5.0 TRAINING

The Division does not currently have a formalized SSO Response Plan training program. The Division will develop and implement a training program for this updated SSORP once it has been approved by DEQ;

6.0 REFERENCES

Table 1 Wash Truck Call Out List

Start Date		End Date	Name	Pager	Home
11/6/2015	To	11/8/2015	11/11/2015	Tony Johnson	240-9905
11/13/2015	To	11/15/2015		James Maclin	414-4072
11/20/2015	To	11/22/2015	11/26/2015	Levar Whitaker	768-1409
11/27/2015	To	11/29/2015		Jerome Pierce	719-4757
12/4/2015	To	12/6/2015		Claude Barber	952-5199
12/11/2015	To	12/13/2015		Ed Hodnett	971-7728
12/18/2015	To	12/20/2015		Leroy Wilson	751-7489
12/25/2015	To	12/27/2015		Roland Stanworth	771-5324
1/1/2016	To	1/3/2016		Jay Parkison	810-5033
1/8/2016	To	1/10/2016		Daniel Taylor	751-7491
1/15/2016	To	1/17/2016		Tony Johnson	240-9905
1/22/2016	To	1/24/2016		James Maclin	414-4072
1/29/2016	To	1/31/2016		Levar Whitaker	768-1409
11/6/2015	To	11/8/2015	11/11/2015	Tony Johnson	240-9905
11/13/2015	To	11/15/2015		James Maclin	414-4072
11/20/2015	To	11/22/2015	11/26/2015	Levar Whitaker	768-1409
11/27/2015	To	11/29/2015		Jerome Pierce	719-4757
12/4/2015	To	12/6/2015		Claude Barber	952-5199
12/11/2015	To	12/13/2015		Ed Hodnett	971-7728
12/18/2015	To	12/20/2015		Leroy Wilson	751-7489
12/25/2015	To	12/27/2015		Roland Stanworth	771-5324
1/1/2016	To	1/3/2016		Jay Parkison	810-5033
1/8/2016	To	1/10/2016		Daniel Taylor	751-7491

Revised 8/1/08

Table 2 Stoppage Crew Night Shift Call Out List

Start	End	Name	Pager	Home	Cell	
Monday	to	Wednesday	Jimmie Little	NA	593-4415	751-7490
Monday	to	Wednesday	Andre Bradshaw	NA	506-2358	751-7490
Thursday	to	Sunday	Brian Saburn	NA	575-2024	751-7486
Thursday	to	Sunday	Gerald Brinson	NA	268-9810	751-7486
If the designated personnel cannot be reached contact one of the personnel listed below in the following order						
Supervisor		Robert Isom	NA	851-6667	810-2555	
Manager		Kevin Jackson	NA	715-3846	876-7709	
Superintendent		Barry Dobbins	NA	599-1399	810-4397	

Table 3 Pump Station Call Out list

Start Date		End Date	Discipline	Name	Home	Cell
11/27	to	12/3	Mechanic	K Light		660-1593
11/27	to	12/03	Electrician	C. Burke	766-3018	870-2058
12/04	to	12/10	Mechanic	C Newell	722-6743	876-2121
12/04	to	12/10	Electrician	H. Culbreth	867-8871	810-4501
12/11	to	12/17	Mechanic	C. Reese		713-7688
12/11	to	12/17	Electrician	C. Burke	766-3018	870-2058
12/18	to	12/24	Mechanic	B Dobbins		672-2736
12/18	to	12/24	Electrician	H. Culbreth	867-8871	810-4501
12/25	to	01/01	Mechanic	M. Waldron		869-0476
12/25	to	01/01	Electrician	C. Burke	766-3018	870-2058
01/02	to	01/08	Mechanic	P Angad		817-1866
01/02	to	01/08	Electrician	H. Culbreth	867-8871	810-4501
01/09	to	0/15	Mechanic	K Light		660-1593
01/09	to	01/15	Electrician	C. Burke	766-3018	870-2058
01/16	to	01/22	Mechanic	C Newell	722-6743	876-2121
01/16	to	01/22	Electrician	H. Culbreth	867-8871	810-4501
01/23	to	01/29	Mechanic	C Reese		713-7688
01/23	to	01/29	Electrician	C. Burke	766-3018	870-2058
If the designated pump station personnel cannot be reached either by pager or by telephone, contact:						
				Kevin Jackson	876-7709	715-3846

APPENDIX A
STOPPAGE SPREADSHEET
AND
SSORS REPORT

Stoppage Crew Work Order Summary

Date:
 Team Member:
 Team Member:

***Note Gallons Overflowed,MAKE FOLLOW UP TV INSPECT AFTER EVERY OVERFLOW.

Shift:	TIME		LOG LATERAL MAINTENANCE						GRAVITY MAIN			MISC ITEMS			EQUIP	
	Time Started	Time Ended	Unable to locate Tap (79012.00)	Stoppage On City (79001.00)	Stoppage NOT on City (79002.00)	Stoppage Private (Fee) (79003.00)	Replace Cleanout Housing/Cap (79010.00)	Install Cleanout Box (79007.00)	Stoppage - On City (79001.00)	Stoppage - On City w/Overflow (79001.00)	Install Manhole Insert (79008.00)	Ck Missing/Loose MH Top (79011.00)	Support Others (Task Varies)			Equipment used
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																

Enter comments on back of form with corresponding line number

Total Hours Worked:

SSORS Database – Spill Report Report Dates 7/1/14 through 6/30/15

Jurisdiction: Hampton

Possible Receptors	Site Address	SSO Classification	Description of Incident	Date of Incident	Spill Duration	Corrective Action	Quantity	Amount Recovered	Amount Reaching State Waters
CHESAPEAKE BAY	532 LASALLE AVE	Other	SSO FROM USMH 208-1154 INTO STORM DRAIN.	7/8/2014 17:55	0 hour(s) 33 minute(s)	CLEARED BLOCKAGE FROM DSMH 208-999 AND CLEANED GRAVITY MAIN. -----July 9, 2014 07:29 AM-----	65	0	65
New Market Creek	328 Joynes Road	Capacity-Weather Related	Overflow due to heavy rain	9/9/2014 7:00	7 hour(s) 0 minute(s)	Collection system caught back up due to heavy rains and overflow stopped. Area was washed down and limed. -----September 9, 2014 05:09 PM--- ---	31,500	0	31,500
Hampton River	536 Settlers landing Road	Capacity-Weather Related	Overflows due to heavy rains.	9/9/2014 7:00	7 hour(s) 0 minute(s)	Collection system caught back up after rain stopped. Area was washed down and lime was put down. -----September 9, 2014 05:18 PM-----	31,500	0	31,500
NewMarket Creek	4124 Candlewood Drive	Capacity-Weather Related	Overflows due to heavy rains	9/9/2014 7:00	9 hour(s) 0 minute(s)	Collection system caught back up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:24 PM-----	13,500	0	13,500
Hampton River	1 South Armistead Ave	Capacity-Weather Related	Overflow due to heavy rain	9/9/2014 7:00	6 hour(s) 0 minute(s)	Collection system caught back up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:33 PM-----	27,000	0	27,000
Hampton River	Congress Ave and Ericson Drive	Capacity-Weather Related	Overflow due to heavy rains	9/9/2014 7:00	4 hour(s) 0 minute(s)	Collection system caught back up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:36 PM-----	6,000	0	6,000
Hampton River	148 Lasalle	Capacity-	Overflow due to	9/9/2014	4 hour(s)	Collection system caught back	6,000	0	6,000

Possible Receptors	Site Address	SSO Classification	Description of Incident	Date of Incident	Spill Duration	Corrective Action	Quantity	Amount Recovered	Amount Reaching State Waters
	Ave	Weather Related	heavy rains	7:00	0 minute(s)	up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:39 PM-----			
James River	2111 Shell Road	Capacity-Weather Related	Overflows due to heavy rains	9/8/2014 20:00	18 hour(s) 0 minute(s)	Collection system caught back up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:50 PM-----	97,200	0	97,200
Newmarket Creek	1615 Victoria Blvd	Capacity-Weather Related	Overflows due to heavy rains	9/8/2014 20:00	18 hour(s) 0 minute(s)	Collection system caught back up as rain stopped. Washed down spill area and put down lime. -----September 9, 2014 05:55 PM-----	27,000	0	27,000
Hampton River	949 N Mallory St	Maintenance-Roots	Main line backed up and coming out of manhole at 949 N Mallory St.	9/10/2014 14:55	0 hour(s) 10 minute(s)	Cleared blockage to stop overflow. At the direction of I&I Manager main was cleaned so that CCTV work could be completed in the a.m to investigate the cause of the overflow. -----September 11, 2014 07:24 AM----- CCTV inspection found roots to be the problem. A work order has been issued to have the roots removed. -----September 12, 2014 11:29 AM-----	100	50	50
Newmarket Creek	70 lakeshore Drive, Hampton, VA.	Maintenance-Debris	Private sewer overflow cleared from manhole on City side of the services line.	1/13/2015 14:30	0 hour(s) 53 minute(s)	Cleared blockage gravity mainline between USMH 127P-0260 and DSMH 128-0239 form the DSMH. Washed gravity mainline and notified sewer system owner as of	260	0	260

Possible Receptors	Site Address	SSO Classification	Description of Incident	Date of Incident	Spill Duration	Corrective Action	Quantity	Amount Recovered	Amount Reaching State Waters
						issue. -----January 14, 2015 07:45 AM-----			
Chesapeake Bay	1530 PRINCE PHILLIP ST HAMPTON, VA	Infrastructure	Force main suffered a circumference break under ground.	1/22/2015 12:31	1 hour(s) 29 minute(s)	Pumps at pump station were shutdown and the force main was repaired. Pumps were placed back online after repairs were completed. -----January 23, 2015 09:13 AM-----	325	200	125
BACK RIVER	1 SALT POND, HAMPTON, VA	Maintenance-Other	WATER COMING OUTOF MANHOLE AT ABOUT 50GPM	3/3/2015 19:00	0 hour(s) 10 minute(s)	CLEARED BLOCKAGE AND WASHED GRAVITY MAIN FROM DSMH 204-0138 -----March 4, 2015 06:14 AM-----	500	0	500
CHESAPEAKE BAY	514 OLD BUCKROE RD HAMPTON, VA	Maintenance-Other	GRAVITY MAIN STOPPAGE CAUSING SSO FRON MANHOLE	3/9/2015 10:50	0 hour(s) 15 minute(s)	CLEARED BLOCKAGE AND WASHED GRAVITY MAIN FROM USMH 225-0221 -----March 9, 2015 04:42 PM----- March 10, 2015: CCTV inspection of gravity main showed heavy corrosion. Scaled some of the corrosion out of gravity main, but the line will be put on the list to be rehabbed. -----March 30, 2015 10:57 AM-----	200	0	200
NEWMARKET CREEK	35 JORDAN DRIVE HAMPTON, VA	Maintenance-Grease	SSO FROM MANHOLE INTO DRAINAGE DITCH	3/9/2015 16:32	0 hour(s) 28 minute(s)	CLEARED BLOCKAGE WITH STOPPAGE TRUCK. GRAVITY MAIN WILL BE HEAVY CLEANING AND CCTV INSPECTED. ----- March 10, 2015 06:03 AM----- April 06, 2015. Completed heavy cleaning and televising	225	0	225

Possible Receptors	Site Address	SSO Classification	Description of Incident	Date of Incident	Spill Duration	Corrective Action	Quantity	Amount Recovered	Amount Reaching State Waters
						of gravity main. Mainline contained corrosion and grease deposits. -----April 7, 2015 07:47 AM-----			
						Capacity Weather Related SSOs	239,700		

APPENDIX B

SSO FLOW ESTIMATION PROCEDURE FROM OCSD

6. SSO Flow Estimation Chart

TABLE 1									
ESTIMATED SSO FLOW OUT OF MH WITH COVER IN PLACE									
24" COVER					36" COVER				
Height of spout above M/H rim	S S O	FLOW	Min. Sewer size in which these flows are possible						
H in inches	Q in gpm	Q in MGD		H in inches	Q in gpm	Q in MGD	H in inches	Q in gpm	Q in MGD
1/4	1	0.001				1/4	1	0.002	
1/2	3	0.004				1/2	4	0.006	
3/4	6	0.008				3/4	8	0.012	
1	9	0.013				1	13	0.019	
1 1/4	12	0.018				1 1/4	18	0.026	
1 1/2	16	0.024				1 1/2	24	0.035	
1 3/4	21	0.030				1 3/4	31	0.044	
2	25	0.037				2	37	0.054	
2 1/4	31	0.045				2 1/4	45	0.065	
2 1/2	38	0.054				2 1/2	55	0.079	
2 3/4	45	0.065				2 3/4	66	0.095	
3	54	0.077				3	78	0.113	
3 1/4	64	0.092				3 1/4	93	0.134	
3 1/2	75	0.107				3 1/2	109	0.157	
3 3/4	87	0.125				3 3/4	127	0.183	
4	100	0.145				4	147	0.211	
4 1/4	115	0.166				4 1/4	169	0.243	
4 1/2	131	0.189				4 1/2	192	0.276	
4 3/4	148	0.214				4 3/4	217	0.312	6"
5	166	0.240				5	243	0.350	
5 1/4	185	0.266				5 1/4	270	0.389	
5 1/2	204	0.294				5 1/2	299	0.430	
5 3/4	224	0.322	6"			5 3/4	327	0.471	
6	244	0.352				6	357	0.514	
6 1/4	265	0.382				6 1/4	387	0.558	8"
6 1/2	286	0.412				6 1/2	419	0.603	
6 3/4	308	0.444				6 3/4	451	0.649	
7	331	0.476				7	483	0.696	
7 1/4	354	0.509				7 1/4	517	0.744	
7 1/2	377	0.543				7 1/2	551	0.794	
7 3/4	401	0.578	8"			7 3/4	587	0.845	10"
8	426	0.613				8	622	0.896	
8 1/4	451	0.649				8 1/4	659	0.949	
8 1/2	476	0.686				8 1/2	697	1.003	
8 3/4	502	0.723				8 3/4	734	1.057	
9	529	0.761				9	773	1.113	

Disclaimer:

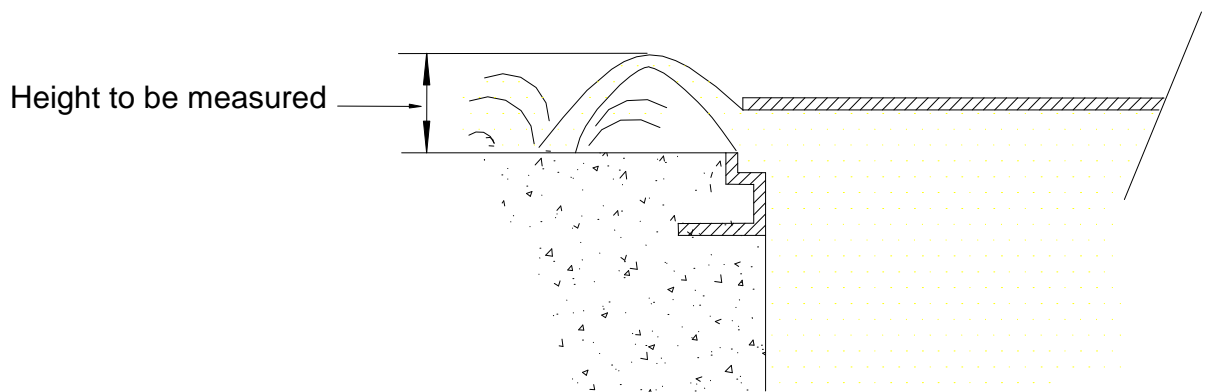
This sanitary sewer overflow table was developed by Ed Euyen, Civil Engineer, P.E. No. 33955, California, for Sacramento County Sanitation District 1. This table is provided as an example. Other Agencies may want to develop their own estimating tables.

The formula used to develop Table 1 measures the maximum height of the water coming out of the maintenance hole above the rim. The formula was taken from hydraulics and its application by A.H. Gibson (Constable & Co. Limited).

Example Overflow Estimation:

The maintenance hole cover is unseated and slightly elevated on a 24" casting. The maximum height of the discharge above the rim is 5 ¼ inches. According to Table 1, these conditions would yield an SSO of 185 gallons per minute.

FLOW OUT OF MH WITH COVER IN PLACE



This sanitary sewer overflow drawing was developed by Debbie Myers, Principal Engineering Technician, for Ed Euyen, Civil Engineer, P.E. No. 33955, California, of County Sanitation District 1.

TABLE 2							
ESTIMATED SSO FLOW OUT OF MH WITH COVER REMOVED							
24" FRAME				36" FRAME			
Water Height above M/H frame	S S O	FLOW	Min. Sewer size in which these flows are possible	Water Height above M/H frame	S S O	FLOW	Min. Sewer size in which these flows are possible
H in inches	Q in gpm	Q in MGD		H in inches	Q in gpm	Q in MGD	
1/8	28	0.04		1/8	49	0.07	
1/4	62	0.09		1/4	111	0.16	
3/8	111	0.16		3/8	187	0.27	6"
1/2	160	0.23		1/2	271	0.39	
5/8	215	0.31	6"	5/8	361	0.52	8"
3/4	354	0.51	8"	3/4	458	0.66	
7/8	569	0.82	10"	7/8	556	0.8	10"
1	799	1.15	12"	1	660	0.95	12"
1 1/8	1,035	1.49		1 1/8	1,035	1.49	
1 1/4	1,340	1.93	15"	1 1/4	1,486	2.14	15"
1 3/8	1,660	2.39		1 3/8	1,951	2.81	
1 1/2	1,986	2.86		1 1/2	2,424	3.49	18"
1 5/8	2,396	3.45	18"	1 5/8	2,903	4.18	
1 3/4	2,799	4.03		1 3/4	3,382	4.87	
1 7/8	3,132	4.51		1 7/8	3,917	5.64	21"
2	3,444	4.96	21"	2	4,458	6.42	
2 1/8	3,750	5.4		2 1/8	5,000	7.2	24"
2 1/4	3,986	5.74		2 1/4	5,556	8	
2 3/8	4,215	6.07		2 3/8	6,118	8.81	
2 1/2	4,437	6.39		2 1/2	6,764	9.74	
2 5/8	4,569	6.58	24"	2 5/8	7,403	10.66	
2 3/4	4,687	6.75		2 3/4	7,972	11.48	30"
2 7/8	4,799	6.91		2 7/8	8,521	12.27	
3	4,910	7.07		3	9,062	13.05	
				3 1/8	9,604	13.83	
				3 1/4	10,139	14.6	
				3 3/8	10,625	15.3	36"
				3 1/2	11,097	15.98	
				3 5/8	11,569	16.66	
				3 3/4	12,035	17.33	
				3 7/8	12,486	17.98	
				4	12,861	18.52	
				4 1/8	13,076	18.83	
				4 1/4	13,285	19.13	
				4 3/8	13,486	19.42	

Disclaimer:

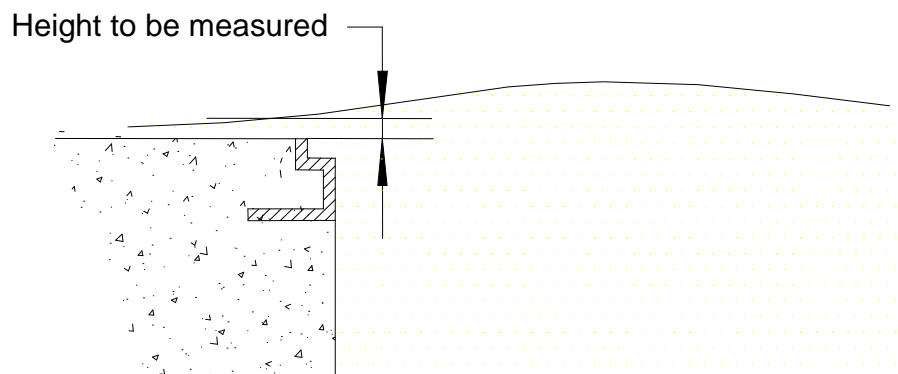
This sanitary sewer overflow table was developed by Ed Euyen, Civil Engineer, P.E. No. 33955, California, for County Sanitation District 1. This table is provided as an example. Other Agencies may want to develop their own estimating tables.

The formula used to develop Table 2 for estimating SSO's out of maintenance holes without covers is based on discharge over curved weir -- bell mouth spillways for 2" to 12" diameter pipes. The formula was taken from hydraulics and its application by A.H. Gibson (Constable & Co. Limited).

Example Overflow Estimation:

The maintenance hole cover is off and the flow coming out of a 36" frame maintenance hole at one inch (1") height will be approximately 660 gallons per minute.

FLOW OUT OF MH WITH COVER REMOVED (TABLE 2)



This sanitary sewer overflow drawing was developed by Debbie Myers, Principal Engineering Technician, for Ed Euyen, Civil Engineer, P.E. No. 33955, California, of County Sanitation District 1.

TABLE 3					
ESTIMATED SSO FLOW OUT OF MH PICK HOLE					
Height of spout above M/H cover		SSO FLOW Q	Height of spout above M/H cover		SSO FLOW Q
H in inches		in gpm	H in inches		in gpm
1/8		1.0	5 1/8		6.2
1/4		1.4	5 1/4		6.3
3/8		1.7	5 3/8		6.3
1/2		1.9	5 1/2		6.4
5/8		2.2	5 5/8		6.5
3/4		2.4	5 3/4		6.6
7/8		2.6	5 7/8		6.6
1		2.7	6		6.7
1 1/8		2.9	6 1/8		6.8
1 1/4		3.1	6 1/4		6.8
1 3/8		3.2	6 3/8		6.9
1 1/2		3.4	6 1/2		7.0
1 5/8		3.5	6 5/8		7.0
1 3/4		3.6	6 3/4		7.1
1 7/8		3.7	6 7/8		7.2
2		3.9	7		7.2
2 1/8		4.0	7 1/8		7.3
2 1/4		4.1	7 1/4		7.4
2 3/8		4.2	7 3/8		7.4
2 1/2		4.3	7 1/2		7.5
2 5/8		4.4	7 5/8		7.6
2 3/4		4.5	7 3/4		7.6
2 7/8		4.6	7 7/8		7.7
3		4.7	8		7.7
3 1/8		4.8	8 1/8		7.8
3 1/4		4.9	8 1/4		7.9
3 3/8		5.0	8 3/8		7.9
3 1/2		5.1	8 1/2		8.0
3 5/8		5.2	8 5/8		8.0
3 3/4		5.3	8 3/4		8.1
3 7/8		5.4	8 7/8		8.1
4		5.5	9		8.2
4 1/8		5.6	9 1/8		8.3
4 1/4		5.6	9 1/4		8.3
4 3/8		5.7	9 3/8		8.4
4 1/2		5.8	9 1/2		8.4
4 5/8		5.9	9 5/8		8.5
4 3/4		6.0	9 3/4		8.5
4 7/8		6.0	9 7/8		8.6
5		6.1	10		8.7

Note: This chart is based on a 7/8 inch diameter pick hole

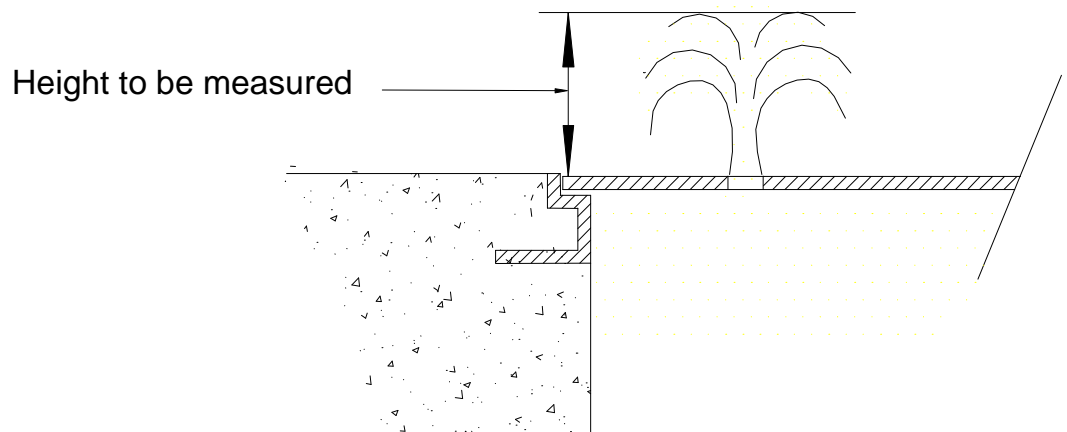
Disclaimer: This sanitary sewer overflow table was developed by Ed Euyen, Civil Engineer, P.E. No. 33955, California, for County Sanitation District 1. This table is provided as an example. Other Agencies may want to develop their own estimating tables.

The formula used to develop Table 3 is $Q=CcVA$, where Q is equal to the quantity of the flow in gallons per minute, Cc is equal to the coefficient of contraction (.63), V is equal to the velocity of the overflow, and A is equal to the area of the pick hole.¹ If all units are in feet, the quantity will be calculated in cubic feet per second, which when multiplied by 448.8 will give the answer in gallons per minute. (One cubic foot per second is equal to 448.8 gallons per minute, hence this conversion method).

Example Overflow Estimation:

The maintenance hole cover is in place and the height of water coming out of the pick hole seven-eighths of an inch in diameter (7/8") is 3 inches (3"). This will produce an SSO flow of approximately 4.7 gallons per minute.

FLOW OUT OF VENT OR PICK HOLE (TABLE 3)



This sanitary sewer overflow drawing was developed by Debbie Myers, Principal Engineering Technician, for Ed Euyen, Civil Engineer, P.E. No. 33955, California, of County Sanitation District 1.

¹ Velocity for the purposes of this formula is calculated by using the formula $h = v^2 / 2G$, where h is equal to the height of the overflow, v is equal to velocity, and G is equal to the acceleration of gravity.

7. SSO Flow Estimation Pictures

Reference Sheet for Estimating Sewer Spills
from Overflowing Sewer Maintenance Holes
**All estimates are calculated in gallons per minute
(gpm)**



5 gpm



100 gpm



225 gpm



25 gpm



150 gpm



250 gpm



50 gpm



200 gpm



275 gpm