

**Table A-1: CSO Outfall 019, Pendleton Street
2023 Rainfall and Overflow Model Summary**

Date of Overflow Started	Storm Total (in.)	Duration of Storm (hrs)	Maximum Storm Intensity (in/hr)	Volume of Overflow (MG)	Duration of Overflow (hrs)
2/15/2023	1.02	13.8	0.2	0.02	0.25
2/20/2023	0.53	11.3	0.2	0.21	0.75
3/27/2023	0.67	19.5	0.5	0.19	0.75
4/25/2023	0.46	9.0	0.8	0.61	1.00
5/1/2023	1.44	26.5	0.2	0.41	2.00
5/3/2023	1.04	13.0	0.4	0.02	0.25
6/30/2023	0.35	6.0	0.3	0.01	0.25
7/6/2023	0.77	3.0	1.7	1.09	0.75
7/17/2023	0.67	0.8	1.5	4.64	1.25
7/22/2023	0.96	5.5	1.1	0.17	0.50
8/1/2023	0.25	0.5	0.6	3.38	1.00
8/2/2023	0.09	1.0	0.1	0.65	1.50
8/9/2023	0.16	5.3	0.3	1.68	2.75
8/10/2023	0.93	6.0	1.6	0.46	1.00
8/17/2023	0.13	0.3	0.5	7.02	1.25
9/12/2023	0.74	4.5	0.9	0.15	0.50
9/26/2023	2.89	41.8	0.4	0.66	1.50
11/24/2023	2.15	16.0	0.8	2.07	4.25
12/5/2023	0.56	7.0	0.2	0.04	0.75
12/13/2023	1.77	19.8	0.6	0.04	0.50
12/20/2023	2.27	14.5	0.5	4.25	5.50
12/30/2023	0.88	29.8	0.2	0.68	2.00

Summary of Outfall 019

Number of Occurences	22
Volume (MG)	28.43
Duration (hrs.)	30.25
Total Rainfall Causing Overflow (in)	18.74

**Table A-2: CSO Outfall 020, Royal Street
2023 Rainfall and Overflow Model Summary**

Date of Overflow Started	Storm Total (in.)	Duration of Storm (hrs)	Maximum Storm Intensity (in/hr)	Volume of Overflow (MG)	Duration of Overflow (hrs)
2/16/2023	1.02	13.8	0.2	0.13	2.00
2/20/2023	0.53	11.3	0.2	0.46	1.50
3/27/2023	0.67	19.5	0.5	0.22	2.25
4/25/2023	0.46	9.0	0.8	0.68	3.50
5/2/2023	1.44	26.5	0.2	1.18	3.75
5/3/2023	1.04	13.0	0.4	0.09	2.00
7/6/2023	0.77	3.0	1.7	0.92	2.50
7/10/2023	0.08	0.5	0.2	0.01	1.50
7/17/2023	0.67	0.8	1.5	3.15	1.50
7/22/2023	0.96	5.5	1.1	0.10	0.75
8/1/2023	0.25	0.5	0.6	2.34	1.50
8/2/2023	0.09	1.0	0.1	0.75	1.50
8/9/2023	0.16	5.3	0.3	1.99	3.75
8/10/2023	0.93	6.0	1.6	0.28	2.25
8/17/2023	0.13	0.3	0.5	5.80	3.00
9/12/2023	0.74	4.5	0.9	0.40	3.00
9/26/2023	2.89	41.8	0.4	1.03	5.00
11/24/2023	2.15	16.0	0.8	3.71	8.25
12/5/2023	0.56	7.0	0.2	0.36	2.50
12/13/2023	1.77	19.8	0.6	0.37	3.50
12/20/2023	2.27	14.5	0.5	5.45	7.50
12/30/2023	0.88	29.8	0.2	1.37	4.00

Summary of Outfall 020

Number of Occurrences	22
Volume (MG)	30.78
Duration (hrs.)	67
Total Rainfall Causing Overflow (in)	18.74

**Table A-3: CSO Outfall 021, Duke Street
2023 Rainfall and Overflow Model Summary**

Date of Overflow Started	Storm Total (in.)	Duration of Storm (hrs)	Maximum Storm Intensity (in/hr)	Volume of Overflow (MG)	Duration of Overflow (hrs)
1/15/2023	0.34	9.8	0.3	0.44	5.75
1/22/2023	0.03	4.5	0.0	0.06	1.75
1/25/2023	0.31	20.3	0.1	0.33	5.50
1/28/2023	0.47	8.5	0.2	0.66	8.00
2/3/2023	0.08	8.0	0.0	0.19	3.50
2/15/2023	1.02	13.8	0.2	1.02	9.50
2/19/2023	0.44	2.8	0.3	1.03	9.25
3/2/2023	0.21	11.5	0.2	0.23	2.50
3/6/2023	0.57	12.8	0.3	0.36	5.50
3/13/2023	0.08	8.8	0.1	0.17	1.50
3/15/2023	0.10	13.5	0.0	0.00	0.25
3/27/2023	0.67	19.5	0.5	0.74	7.00
3/28/2023	0.17	3.8	0.2	0.21	1.50
4/4/2023	0.22	10.5	0.4	0.18	2.25
4/25/2023	0.46	9.0	0.8	0.83	3.50
5/1/2023	1.44	26.5	0.2	2.36	19.50
5/3/2023	1.04	13.0	0.4	0.67	5.50
5/16/2023	0.08	5.8	0.0	0.03	1.00
5/23/2023	0.30	2.0	0.3	0.14	2.25
6/1/2023	0.24	2.0	0.2	0.29	2.00
6/1/2023	0.14	1.5	0.2	0.42	5.75
6/24/2023	0.78	27.0	0.1	0.43	5.75
6/25/2023	0.35	16.0	0.1	0.29	3.75
6/30/2023	0.35	6.0	0.3	0.45	3.00
7/3/2023	0.34	1.0	0.3	0.09	2.00
7/4/2023	0.22	0.5	0.8	0.40	2.50
7/6/2023	0.77	3.0	1.7	0.88	2.50
7/12/2023	0.71	0.8	1.6	0.09	1.00
7/17/2023	0.67	0.8	1.5	1.67	5.50
7/18/2023	0.94	3.8	1.8	0.10	2.00
7/22/2023	0.96	5.5	1.1	0.51	2.25
7/24/2023	0.24	1.0	0.4	0.25	2.50
7/30/2023	0.07	0.5	0.2	0.04	1.00
7/31/2023	0.04	2.8	0.1	0.04	1.00
8/1/2023	0.25	0.5	0.6	1.24	5.25
8/2/2023	0.09	1.0	0.1	0.75	2.25
8/6/2023	0.07	7.3	0.1	0.07	1.00

Date of Overflow Started	Storm Total (in.)	Duration of Storm (hrs)	Maximum Storm Intensity (in/hr)	Volume of Overflow (MG)	Duration of Overflow (hrs)
8/9/2023	0.16	5.3	0.3	1.60	6.75
8/10/2023	0.93	6.0	1.6	0.87	4.50
8/13/2023	0.05	5.8	0.2	0.14	1.25
8/17/2023	0.13	0.3	0.5	2.60	4.75
8/18/2023	0.47	2.0	0.7	0.00	0.50
9/11/2023	0.07	0.3	0.3	0.04	1.00
9/12/2023	0.74	4.5	0.9	0.67	2.50
9/14/2023	1.45	1.8	2.2	0.01	0.75
9/26/2023	2.89	41.8	0.4	2.59	26.25
10/10/2023	0.18	6.8	0.2	0.03	0.75
10/17/2023	0.36	22.5	0.3	0.46	7.00
11/13/2023	0.25	6.0	0.1	0.18	3.25
11/24/2023	2.15	16.0	0.8	3.10	18.50
12/4/2023	0.13	6.0	0.1	0.14	3.00
12/5/2023	0.56	7.0	0.2	1.04	9.00
12/13/2023	1.77	19.8	0.6	2.31	19.00
12/20/2023	2.27	14.5	0.5	3.10	17.25
12/29/2023	0.12	4.8	0.1	0.02	0.75
12/29/2023	0.88	29.8	0.2	1.64	14.75

Summary of Outfall 021

Number of Occurrences	56
Volume (MG)	38.22
Duration (hrs.)	288
Total Rainfall Causing Overflow (in)	29.05

**Table A-4: CSO Outfall 022, Hooffs Run
2023 Rainfall and Overflow Model Summary**

Date of Overflow Started	Storm Total (in.)	Duration of Storm (hrs)	Maximum Storm Intensity (in/hr)	Volume of Overflow (MG)	Duration of Overflow (hrs)
1/16/2023	0.34	9.8	0.3	0.02	1.50
1/25/2023	0.31	20.3	0.1	0.01	1.00
1/28/2023	0.47	8.5	0.2	0.09	4.25
2/15/2023	1.02	13.8	0.2	0.23	7.00
2/19/2023	0.44	2.8	0.3	0.05	2.25
2/20/2023	0.53	11.3	0.2	0.23	3.75
3/2/2023	0.21	11.5	0.2	0.01	1.50
3/6/2023	0.57	12.8	0.3	0.00	0.25
3/13/2023	0.08	8.8	0.1	0.02	1.50
3/27/2023	0.67	19.5	0.5	0.15	4.00
3/28/2023	0.17	3.8	0.2	0.03	1.75
4/4/2023	0.22	10.5	0.4	0.01	1.25
4/25/2023	0.46	9.0	0.8	0.37	4.25
5/1/2023	1.44	26.5	0.2	0.70	15.75
5/3/2023	1.04	13.0	0.4	0.17	4.50
5/23/2023	0.30	2.0	0.3	0.00	0.25
6/1/2023	0.24	2.0	0.2	0.13	2.50
6/1/2023	0.14	1.5	0.2	0.01	1.25
6/24/2023	0.78	27.0	0.1	0.05	2.75
6/26/2023	0.35	16.0	0.1	0.02	1.50
6/30/2023	0.35	6.0	0.3	0.08	3.00
7/4/2023	0.22	0.5	0.8	0.08	2.00
7/6/2023	0.77	3.0	1.7	0.43	3.50
7/12/2023	0.71	0.8	1.6	0.00	0.50
7/17/2023	0.67	0.8	1.5	1.21	5.25
7/22/2023	0.96	5.5	1.1	0.15	3.50
7/24/2023	0.24	1.0	0.4	0.02	2.00
8/1/2023	0.25	0.5	0.6	0.78	4.50
8/2/2023	0.09	1.0	0.1	0.34	3.00
8/9/2023	0.16	5.3	0.3	0.88	6.00
8/10/2023	0.93	6.0	1.6	0.28	5.25
8/13/2023	0.05	5.8	0.2	0.01	1.25
8/17/2023	0.13	0.3	0.5	2.14	4.50
8/18/2023	0.47	2.0	0.7	0.06	1.50
9/12/2023	0.74	4.5	0.9	0.26	3.25
9/26/2023	2.89	41.8	0.4	0.64	16.00
10/17/2023	0.36	22.5	0.3	0.01	1.75
11/24/2023	2.15	16.0	0.8	1.67	14.50
12/5/2023	0.56	7.0	0.2	0.29	7.00
12/13/2023	1.77	19.8	0.6	0.62	16.00
12/20/2023	2.27	14.5	0.5	2.16	10.75
12/30/2023	0.88	29.8	0.2	0.64	6.75

Summary of Outfall 022

Number of Occurrences	42
Volume (MG)	15
Duration (hrs.)	185
Total Rainfall Causing Overflow (in)	25.27

**Table A-5
Summary of Modeled Results for Alexandria Combined Sewer Overflows 1997-2023**

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Rainfall:	33.82	35.94	40.35	38.59	29.95	33.17	59.12	42.36	41.63	46.99	32.94	46.04	45.34	39.69	45.70	32.06	44.30	42.73	44.16	31.55	35.65	66.60	42.72	57.78	44.25	43.88	35.13
CSO 019 Pendleton Street:																											
Number of Occurrences:	27	28	27	41	23	28	48	30	26	28	22	31	27	32	30	29	43	46	33	33	29	49	46	34	26	26	22
Volume (MG):	24.23	23.68	48.07	39.69	21.03	23.31	69.45	40.82	44.26	61.71	23.61	49.99	20.26	31.43	35.21	33.62	77.55	59.03	58.79	24.56	38.64	111.39	56.21	67.67	58.8	42.02	28.43
Average Volume (MG):	0.9	0.8	1.8	1.0	0.9	0.8	1.4	1.4	1.7	2.2	1.1	1.6	0.8	1.0	1.2	1.2	1.8	1.3	1.8	0.7	1.3	2.3	1.2	2.0	2.3	1.6	1.3
Duration (hrs.):	72	74	81	98	52	76	137	99	137	106	84	128	93	95	66	90	192	216	85	57	104	109	79	63	43	40	30
Average Duration (hrs.):	2.7	2.6	3.0	2.4	2.3	2.7	2.9	3.3	5.3	3.8	3.8	4.1	3.4	3.0	2.2	3.1	4.5	4.7	2.6	1.7	3.6	2.2	1.7	1.8	1.6	1.5	1.4
Total Rainfall Causing Overflow (in):	22.39	26.48	28.65	31.19	17.99	24.49	48.02	31.73	32.25	37.13	24.28	36.14	26.52	32.57	30.05	23.12	34.00	37.55	29.59	22.62	28.80	49.38	28.34	34.72	25.01	22.6	18.74
CSO 020 Royal Street:																											
Number of Occurrences:	58	46	56	58	49	47	75	47	38	49	35	45	48	41	25	37	43	44	34	28	27	46	40	31	29	28	22
Volume (MG):	41.79	41.70	62.80	53.49	32.75	39.22	89.25	74.08	80.66	99.19	52.20	87.85	50.61	59.32	31.27	36.31	36.99	34.80	46.76	19.01	34.55	88.75	41.39	69.06	52.36	42.33	30.78
Average Volume (MG):	0.7	0.9	1.1	0.9	0.7	0.8	1.2	1.6	2.1	2.0	1.5	2.0	1.1	1.4	1.3	1.0	0.9	0.8	1.4	0.7	1.3	1.9	1.0	2.2	1.8	1.5	1.4
Duration (hrs.):	252	253	256	215	187	224	356	210	238	287	202	248	242	227	47	65	189	291	89	85	124	134	105	123	92	92	67
Average Duration (hrs.):	4.3	5.5	4.6	3.7	3.8	4.8	4.7	4.5	6.3	5.9	5.8	5.5	5.0	5.5	1.9	1.8	4.4	6.6	2.6	3.0	4.6	2.9	2.6	4.0	3.2	3.3	3.0
Total Rainfall Causing Overflow (in):	31.21	32.94	38.61	36.18	25.03	33.35	55.86	39.95	37.83	45.13	29.04	41.5	39.88	36.42	26.17	27.4	33.47	37.71	31.72	21.11	27.87	54.79	24.34	29.45	27.26	26.32	18.74
CSO 021 Duke Street:																											
Number of Occurrences:	19	24	25	38	19	24	41	42	35	45	28	42	48	41	67	63	43	43	41	60	44	72	72	84	70	73	56
Volume (MG):	9.62	8.82	22.50	15.34	8.08	8.65	30.52	34.78	36.79	50.64	21.23	41.74	14.83	21.02	36.67	38.77	18.82	13.06	14.35	9.17	14.00	107.96	48.23	71.00	52.18	53.34	38.22
Average Volume (MG):	0.5	0.4	0.9	0.4	0.4	0.4	0.7	0.8	1.1	1.1	0.8	1.0	0.3	0.5	0.5	0.6	0.4	0.3	0.4	0.2	0.3	1.5	0.7	0.8	0.7	0.7	0.7
Duration (hrs.):	50	51	66	73	42	49	108	175	201	220	153	198	203	315	356	329	188	143	151	340	264	718	525	579	414	417	288
Average Duration (hrs.):	2.6	2.1	2.6	1.9	2.2	2.0	2.6	4.2	5.7	4.9	5.5	4.7	4.2	7.7	5.3	5.2	4.4	3.3	3.7	5.7	6.0	10.0	7.3	6.9	5.9	5.7	5.1
Total Rainfall Causing Overflow (in):	17.49	24.67	27.27	30.31	15.43	22.43	42.15	36.88	36.87	44.11	27.24	40.94	38.20	36.24	39.15	28.82	33.87	36.47	34.57	29.48	32.75	54.48	36.56	51.65	38.66	34.76	29.05
CSO 022 Hooffs Run:																											
Number of Occurrences:	0	0	0	0	0	0	0	15	11	10	4	10	2	36	20	48	38	39	44	45	35	51	55	64	51	58	42
Volume (MG):	0	0	0	0	0	0	0	0.91	0.09	0.19	0.07	0.18	0.01	8.81	9.63	4.12	3.55	3.20	11.96	4.19	7.83	20.03	12.73	38.08	27.48	23.75	15.05
Average Volume (MG):	0	0	0	0	0	0	0	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.2	0.5	0.1	0.1	0.1	0.3	0.1	0.2	0.4	0.2	0.6	0.5	0.4	0.4
Duration (hrs.):	0	0	0	0	0	0	0	35	38	24	20	23	2.0	398	237	183	158	345	119	136	171	179	157	316	222	243	185
Average Duration (hrs.):	0	0	0	0	0	0	0	2.3	3.5	2.4	5.0	2.3	1.0	11.1	11.9	3.8	4.1	8.8	2.7	3.0	4.9	3.5	2.9	4.9	4.4	4.2	4.4
Total Rainfall Causing Overflow (in):	0	0	0	0	0	0	0	17.35	22.43	20.29	6.96	19.46	3.03	34.7	22.42	30.85	29.88	35.3	36.32	26.51	31.03	52.11	30.52	45.07	33.69	31.04	25.27
CSO Average, Each Event:																											
Cumulative Overflow Volume (MG):	2.1	2.1	3.8	2.3	2.0	2.0	3.3	3.8	4.9	5.4	2.7	4.6	2.1	3.2	3.5	2.8	3.2	2.5	3.8	1.7	3.2	6.1	3.2	5.7	5.4	4.3	3.7
Average Duration (hrs.):	3.2	3.4	3.4	2.7	2.8	3.2	3.4	3.6	5.2	4.2	5.0	4.2	3.4	6.8	5.3	3.5	4.3	5.9	2.9	3.4	4.8	4.6	3.6	4.4	3.8	3.7	3.5

¹ Note: Prior to 2004, the Sewer Overflow Model (SOM) was used to estimate annual overflows. Beginning in 2004, the system was modeled using PCSWMM RUNOFF, TRANSPORT, and EXTRAN.

² Note: The model was recalibrated in 2009 (using ASA flows and King / West CSS area)

³ Note: The model was recalibrated in 2010 using monitored flows at CSO-022 as well as survey data collected as part of a separate effort.

⁴ Note: The model was updated to XPSWMM for the 2012 annual report. Recalibration was performed on all 4 CSOs during the update

⁵ Note: Recalibration was performed on all 4 CSOs using existing meter data

⁶ Note: Recalibration was performed on CSO 021 and CSO 022 as part of the flow metering efforts in 2015.

⁷ Note: Recalibration was performed on CSO 021 as part of the flow metering efforts in 2018.