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REPORT

NOVEMBER 2023

CITY OF Rochester New Hampshire

Year One I/I Investigations – Phase 3 – Smoke Testing



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November 3, 2023

100 International Dr., Suite 152, Portsmouth, NH 03801 Tel: 603.431.3937

Peter Nourse Director of City Services City of Rochester 209 Chestnut Hill Road Rochester, NH 03867

Re: Sanitary Sewer Smoke Testing Letter Report

Dear Mr. Nourse:

In Accordance with our July 7, 2022 agreement, Weston & Sampson is pleased to submit the following report for the Sanitary Sewer Smoke Testing Project. This report presents our preliminary findings and analysis of field investigations completed to date.

BACKGROUND

The City of Rochester's Wastewater Collection System is comprised of approximately 84 miles of gravity sewer ranging in size from 4 to 27-inches in diameter. In order to protect the city's substantial capital investment in sewer infrastructure, the City of Rochester is taking a proactive approach towards operating and maintaining the sewer system by implementing a comprehensive annual City-Wide Sewer Investigation & Rehabilitation Program. In addition, the City is operating under an Administrative Order on Consent, dated March 8, 2021. This Order requires that the City conduct a Sewer System Master Plan study by October of 2024.

Smoke testing is a technique used to identify direct and suspected sources of inflow into the wastewater collection system. Inflow is extraneous water that is discharged into the sanitary sewer system during wet weather events from sources such as catch basins, sump pumps, roof leaders, surface drains, holes in manhole covers and other direct or indirect inlets.

Since the New Hampshire Department of Environmental Services (NHDES) does not have a guideline for performing I/I analyses, the Massachusetts Department of Environmental Protection's (MassDEP) Guidelines for Performing I/I Analyses and SSES was used. MassDEP guidelines recommend conducting investigation in areas accounting for 80% of the total inflow in the wastewater collection system. Inflow quantified in gal/LF of sewer and gal/acre of tributary area are accepted industry standards for prioritizing investigations to the highest concentration of inflow. Based on the data collected during the flow metering investigation conducted between April 14, 2021 and July 12, 2021, 80% of the total inflow volume in Rochester occurs in just under half (43%) of the total linear footage of the sewers in the study area, specifically in sub areas 1, 2, 6, 9, 11, 12, 13, 14, 17, 19, 21, 22, and 23, as delineated on the existing sanitary sewer system GIS map.

SMOKE TESTING

Smoke testing consists of blowing white, non-toxic smoke into the sanitary sewer collection system and observing the surrounding area for smoke escaping to the ground surface or drainage structures. The appearance of smoke indicates either a direct or indirect connection through which surface runoff may enter the sewer system. Direct sources include catch basins, driveway drains, patio drains, stairwell drains, yard drains, roof leaders, and central roof drains which discharge directly to the sewer system. Through the complete repair or redirection of these sources, 100 percent of direct inflow may be removed.

Smoke testing was performed by Weston & Sampson on approximately 235,763 LF of sanitary sewer in the project area between August 15 and September 30, 2022. During smoke testing, 27 potential defect inflow sources were identified through the presence of smoke and recorded in Table 1. Defect inflow reports are included in Appendix A.

In cases where an adequate visual of a building's vents and roof drains could not be obtained from ground level, specifically in the Downtown area (subareas 17,19, and 21) Weston & Sampson field staff used an aerial drone

equipped with a high-definition camera to view the building's roof. An example defect inflow source identified by use of the drone is shown in Photo 1.

During the testing period, an additional total of 8 suspect inflow sources were recorded and listed in Table 2. A suspect inflow source is a source that was identified as a potential inflow source through visual observation, such as roof leaders that were directed into the ground and area drains where



the discharge location could not be determined.

In addition, 254 buildings did not have smoke exit a sewer vent pipe. These buildings may be connected to a septic system, have an obstruction in the service line or plumbing systems, have house traps in their service lines, or are improperly connected to drain lines. A table listing buildings with roof vents that did not smoke is included in Table 3.

According to the MassDEP Guidelines, peak design storm inflow is defined as the peak amount of inflow that may enter the sanitary sewer during a one-year, six-hour storm event with an intensity of 0.87 inches per hour. In total, an estimated 1,282,995 GPD of peak inflow is introduced into the wastewater collection system during a 1-year, 6-hour design storm from the identified positive inflow sources. Table 1 shows the calculated direct inflow (GPD) for the estimated drainage area for each defect identified.

On August 26, 2022, The City reported a significant spike in flow at the wastewater treatment facility (WWTF) due to heavy downpours from 4 PM to 5 PM (see photo 2), with an estimated intensity of 2.5-inches of rainfall during this period. For reference, the typical flow at the WWTF is estimated to be approximately 3,600,000 GPD or 2,500 GPM, however the increase in flow at the WWTF during this rain event was measured to be 5,385 GPM (an additional 173,100 gallons) over the 1-hour period. This is an increase of 2,885 GPM from the typical flow. Using the same intensity of 2.5inches over the 1-hour period, the inflow from the defects identified during the smoke testing investigation was calculated to contribute to an additional 3,686,766 GPD (2,561 GPM or 153,660



gallons) increase in flow during the rain event. In other words, the defects identified during the smoke testing contributed to 88.7% of the increase in flow experienced at the WWTF during this rain event. Given how significant the rainfall intensity was during this 1-hour time period, and how quickly the flow increased at the WWTF in a relatively short amount of time, it's reasonable to attribute this increase to inflow.

COST-EFFECTIVENESS ANALYSIS

A cost-effectiveness analysis (CEA) is not warranted for inflow sources, as all inflow sources are considered illicit and must be removed from the wastewater collection system. All inflow defects are considered cost-effective to



repair and remove. The percentage of direct inflow removed is assumed to be 100 percent because these repairs typically redirect all the inflow to drainage structures.

While a CEA is not necessary for inflow removal recommendations, performing a CEA can be useful in prioritizing repairs and for reporting the potential cost savings that can be realized by making the recommended repairs. The present worth of the transportation and treatment (T&T) cost for the City of Rochester was calculated using operation and maintenance (O&M) and capital costs provided by the City. The T&T costs have been extended throughout the projected life-cycle of rehabilitation. The life-cycle is assumed to be 20 years. Using the MassDEP FY22 rate of 2.25% extended over 20 years, the present worth of the City of Rochester's T&T cost equals \$41.88/gpd. A memorandum detailing the methodology and the calculation of T&T costs may be found in Appendix C.

Estimated rehabilitation costs were developed using prices from recent similar projects. The rehabilitation costs used in this report do not include the cost of additional investigation work or engineering services during design and construction.

In Table 4, Recommended Rehabilitations, all defects along with associated T&T costs and rehabilitation costs are shown. This table is useful in ranking and prioritizing repairs.

ADDITIONAL FINDINGS

Throughout the duration of the smoke testing investigation, Weston & Sampson identified a variety of defects outside of the original scope of work. These defects were discovered within manholes while setting up equipment to conduct the smoke testing. The additional findings can be found in Appendix D.

RECOMMENDATIONS

It is recommended that the City continue with its proactive approach towards the removal of I/I through the Annual I/I Program, which contributes to wet weather capacity issues and SSOs. The following recommendations are based on the discoveries found during the smoke testing investigations. The City may wish to conduct some of these recommendations with in-house staff for potential budget savings:

DYE TESTING AND FLOODING - Estimated Cost = \$8,000

Weston & Sampson recommends conducting dye testing and dye flooding of inflow sources identified during the smoke testing investigation to confirm the potential defects entering the sewer system. Dye testing uses less than 10 gallons of water and is conducted by introducing dyed water into a suspected inflow source, such as roof leaders entering the ground, and observing the surrounding sewer and drain lines for the emergence of the dye. Dye flooding uses more than 10 gallons of water for suspected inflow sources such as catch basins. The appearance of dye in the sewer system indicates the inflow source is connected.

BUILDING INSPECTIONS AND PRIVATE INFLOW INVESTIGATIONS - Estimated Cost = \$389,838

Weston & Sampson recommends conducting internal building inspections of buildings that did not smoke during the smoke testing investigation to identify the presence of sump pumps, dehumidifiers, condensate/water cooler drains, floor drains, pipes coming in from outside, removed sewer cleanout caps, and other illegal sources of inflow that may be connected to the sewer system inside the home/building. In addition, building inspections include an inspection of the exterior of each building for area drains, roof leaders, and other potential sources of inflow that were not found during smoke testing. Weston & Sampson is currently planning to conduct building inspections in sub areas 1, 2, 6, 9, 11, 12, 13, 14, 17, 21, 22, and 23 (representing 80% of the total inflow volume) in approximately 4,500 buildings in the summer of 2023 as part of the Year 3 (FY2024) I&I Investigation work of the Sewer System Master Plan.



INFLOW REHABILITATIONS

The following rehabilitation methods and associated cost estimates are recommended from defects identified during the smoke testing investigation. A more detailed summary of the defects and their locations can be found in "Table 4: Recommended Rehabilitation Costs", and more detail of each defect is provided in "Appendix A: Smoke Testing Defect Reports".

TOTAL COST FOR REHABILITATION	\$ 159,360
Contingency (20% of Rehabilitation Total)	\$ 26,560
REHABILITATION TOTAL	\$ 132,800
Install four (4) Cleanout Caps	\$ 800
Cementitious lining of one (1) sewer manhole	\$ 3,000
Redirect Roof Drains (2 Buildings)	\$ 20,000
Redirect seven (7) Catch Basins	\$ 70,000
Replace thirteen (13) Vented Manhole Frames and Covers	\$ 39,000

SUMMARY

Weston & Sampson performed smoke testing in approximately 235,763 LF of sanitary sewer in the project area between August 15 and September 30, 2022 and identified 27 potential defect inflow sources through the presence of smoke and recorded the defects in Table 1. Defect inflow reports are included in Appendix A. It is recommended further investigation work (dye testing and building inspections) and the rehabilitation methods mentioned above be completed to remove extraneous flow from the collection system and WWTF to prevent potential SSO's during wet weather events, free up capacity for future growth and development, and maintain flows that can meet the City's NPDES permit limits. The City may be able to conduct some of this work with in-house staff for potential cost savings. It should also be noted that Weston & Sampson is currently planning to conduct building inspections in sub areas 1, 2, 6, 9, 11, 12, 13, 14, 17, 21, 22, and 23 (representing 80% of the total inflow volume) in approximately 4,500 buildings during the summer of 2023 as part of the Year 3 (FY2024) I&I Investigation work of the Sewer System Master Plan.

Weston & Sampson wishes to thank you and the members of the Rochester Department of Public Works for the assistance provided while completing the investigation phase of this project. We are available to meet with you at your earliest convenience to discuss this letter report. If you have any questions, please do not hesitate to contact me at (603) 570-6318.

Sincerely, WESTON & SAMPSON ENGINEERS, INC.

John M. Sykora III Senior Team Leader



TABLES

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TABLE 1 CITY OF ROCHESTER, NEW HAMPSHIRE YEAR ONE I/I INVESTIGATION - PHASE #3 2022 SEWER SMOKE TESTING SUMMARY OF SMOKE TESTING DEFECTS

		Мар			Defect		Drainage Area	Surface	Estimated Direct Inflow	Severity		Picture	Sketch	
Date	Crew	No.	Subarea	Location	No.	Description of Defect	(SF)	Туре	(GPD)	Major	Moderate	Minor	No.(s)	No.
08/19/2022	TEL	1	12	Autumn St	1	Broken Cleanout Cap/PS Vent (Autumn St)	64	Grass	248			Х	3 to 5	1
08/22/2022	TEL	2	17	Wakefield St	2	Vented MH Cover Near McDonalds (161 Wakefield St)	850	Asphalt	9,875	Х			6 to 7	2
08/22/2022	TEL	2	17	Wakefield St	3	Vented MH Cover in Sidewalk of Church (57 Wakefield St)	627	Asphalt	7,284		Х		8 to 10	3
08/25/2022	TEL	6	2	Electric Ave	4	Catch Basin (87 Electric Ave)	6650	Grass	25,753	Х			11 to 13	4
08/26/2022	TEL	4	6	N. Main Street	5	Vented MH Cover in Subway Parking Lot (158 North Main St.)	100	Asphalt	1,162			Х	14 to 16	5
08/26/2022	TEL	2	17	Olde Farm Lane	6	Vented MH Cover of MH 0971 (49 Olde Farm Lane)	270	Asphalt	3,137			Х	17 to 19	6
08/26/2022	TEL	2	17	Signal St	7	Vented MH Cover of MH 0967 (25 Signal St)	75	Asphalt	871			Х	20 to 22	7
8/26/2022	TEL	2	17	Signal St	8	Vented MH Cover of MH 0968 (Signal at Olde Farm In)	56	Asphalt	651			Х	23 to 25	
8/31/2022	TEL	1	11	Salmon Falls Rd	9	Broken Cleanout Cap in Driveway (297 Salmon Falls Rd)	32	Asphalt	372			Х	26 to 28	8
9/8/2022	TEL	6	2	Anctill Ct	10	Vented MH Cover of MH 1122 (20 Anctill Ct)	247	Asphalt	2,870		Х		29 to 31	9
9/12/2022	TEL	2	6	Willey St	11	Catch Basin (13 Willey St)	1302	Asphalt	15,126	Х			32 to 34	10
9/21/2022	TEL	4	19	Sidney St	12	Vented MH Cover	15	Asphalt	174			Х	35 to 37	11
9/21/2022	TEL	4	19	Charles Street	13	Catch Basin (147 Charles St)	7685	Asphalt	89,282	Х			38 to 40	10
9/21/2022	TEL	4	19	Charles Street	14	Catch Basin (148 Charles St)	7685	Asphalt	89,282	Х			41 to 43	12
9/27/2022	TEL	5	22	Nola Ave	15	Broken SVC/Cleanout (30 Nola Ave)	20	Grass	77			Х	44 to 46	13
9/28/2022	TEL	5	22	Rochester Hill Rd	16	Vented MH Cover (85 Rochester Hill Rd)	253	Asphalt	2,939		Х		47 to 49	14
9/29/2022	TEL	4	6	Cove St	17	Vented MH Cover (18 Cove)	54	Asphalt	627			Х	53 to 55	15
9/29/2022	TEL	4	6	Dow Ct	18	Vented MH Cover (3 Dow Ct)	105	Asphalt	1,220			Х	56 to 58	16
9/29/2022	TEL	4	19	Gagne St	19	CB (House 14)	34085	Asphalt	395,989	Х			59 to 61	17
9/29/2022	TEI	4	19	Gagne St	20	CB (House 18)	35003	Asphalt	406,654	Х			62 to 64	17
9/29/2022	TEL	4	19	Charles Street	21	CB (147 Yard)	598	Grass	2,316		Х		65 to 67	12
9/29/2022	TEL	4	19	Brickyard Dr	22	Vented MH Cover (Brickyard Dr ROW - SMH2751)	36	Grass	139			Х	68 to 70	18
9/29/2022	TEL	6	1	Pickering Rd ROW	23	Cement broken around MH (1867)	64	Grass	248		Х		71 to 73	19
9/29/2022	TEL	6	1	Nadeau Dr	24	Broken Cap/Cleanout (Durrell Paving Parking Lot)	12	Grass	46			Х	74 to 76	20
9/29/2022	TEL	6	1	Orange Street ROW	25	Vented MH Cover	25	Grass	97			Х	77 to 79	21
9/1/2022	TEL	4	17	Wakefield St	26	Roof Drains (City Hall - 31 Wakefield St)	9664	Concrete	112,273	Х			From Drone	22
9/1/2022	TEL	4	17	Wakefield St	27	Roof Drains (City Hall - 13 Wakefield St)	9837	Concrete	114,283	Х			From Drone	22

TOTALS: 1,282,995

TABLE 2 CITY OF ROCHESTER, NEW HAMPSHIRE YEAR ONE // INVESTIGATION - PHASE 3 2022 SEWER SMOKE TESTING SUSPECT SOURCES LOG

DATE	WEATHER	CREW	SET UP	MAP NO.	SUBAREA	STREET	ROOF LEADERS	DRIVEWAY DRAINS	AREA DRAINS	VENTS (NO SMOKE)	SMOKE IN HOME	SMOKE ALARM ACTIVATED?	COMMENTS
08/22/2022	Clear 73F	TEL	2	2	9	11 Milton Road	Yes						Hannaford. Roof leaders go into ground
08/22/2022	Clear 73F	TEL	1	2	9	Lilac Mall	Yes						Roof leaders go into ground
09/01/2022	Clear 73F	TEL	2	4	17	6 N. Main Street	Yes						Roof leaders go into ground
09/01/2022	Clear 73F	TEL	2	4	17	13 Wakefield Street	Yes						Roof leaders go into ground
09/01/2022	Clear 73F	TEL	3	4	17	23 Wakefield Street	Yes						Police Department. Roof leaders go into ground
09/01/2022	Clear 73F	TEL	6	4	17	104 S. Main Street	Yes						Wallgreens. Roof leaders go into ground
09/01/2022	Clear 73F	TEL	6	4	17	95 S. Main Street	Yes						Roof leaders go into ground
09/28/2022	Clear 65F	TEL	3	5	1	Old Dover/16 Off Ramp							Rock/Rip Rap Next to Structure (photos 50 to 52)

House NO.	STREET	SUB AREA
22	BRICKYARD DR	1
32	BRICKYARD DR	1
36	CHURCH ST	1
38	CHURCH ST	1
39	CHURCH ST	1
41	CHURCH ST	1
4	LEVI ST	1
5	LEVI ST	1
32	OLD DOVER ROAD	1
38	OLD DOVER ROAD	1
42	OLD DOVER ROAD	1
56	OLD DOVER ROAD	1
58	OLD DOVER ROAD	1
59	OLD DOVER ROAD	1
61	OLD DOVER ROAD	1
8	ORANGE STREET	1
26	RAILROAD AVE	1
39	RAILROAD AVE	1
42	RAILROAD AVE	1
48	RAILROAD AVE	1
50	RAILROAD AVE	1
75	RAILROAD AVE	1
12	ANCTILL CT	2
256	CHELSEY HILL RD	2
260	CHELSEY HILL RD	2
264	CHELSEY HILL RD	2
7	COLBY ROAD	2
10	COLBY ROAD	2
5	CRETEAU ST	2
5	LEDGEVIEW DR	2
25	LEDGEVIEW DR	2
18	OAK ST	2
22	OAK ST	2
24	OAK ST	2
24	OAK ST	2
26	OAK ST	2
28	OAK ST	2
30	OAK ST	2
36	OAK ST	2
38	OAK ST	2
40	OAK ST	2
42	OAK ST	2

House NO.	STREET	SUB AREA
44	OAK ST	2
48	OAK ST	2
67	OAK ST	2
78	OAK ST	2
57	OLD DOVER ROAD	2
8	PATRIOTS WAY	2
13	PATRIOTS WAY	2
20	PATRIOTS WAY	2
39	PICKERING ROAD	2
43	PICKERING ROAD	2
46	PICKERING ROAD	2
101	PICKERING ROAD	2
2	RAMSEY DR	2
4	GLORIA ST	6
7	GLORIA ST	6
14	JENNESSE ST	6
32	JENNESSE ST	6
40	JENNESSE ST	6
106	NORTH MAIN ST	6
107	NORTH MAIN ST	6
109	NORTH MAIN ST	6
177	NORTH MAIN ST	6
198	NORTH/N.MAIN ST	6
44	PARK ST	6
40	PATTON ST	6
1	RAY DR	6
7	RAY DR	6
3	RIVER ST	6
7	RIVER ST	6
9	RIVER ST	6
35	RIVER ST	6
16	RIVERSIDE DR	6
4	RUSSELL ST	6
18	SCHLEY ST	6
2	ST JAMES TER	6
5	ST JAMES TER	6
7	ST JAMES TER	6
9	ST JAMES TER	6
14	ST JAMES TER	6
17	ST JAMES TER	6
19	ST JAMES TER	6
47	ST JAMES TER	6

House NO.	STREET	SUB AREA
29	WILLEY ST	6
10	CHESTNUT HILL ROAD	9
65	CHESTNUT HILL ROAD	9
72	CHESTNUT HILL ROAD	9
80	CHESTNUT HILL ROAD	9
93	CHESTNUT HILL ROAD	9
94	CHESTNUT HILL ROAD	9
104	CHESTNUT HILL ROAD	9
116	CHESTNUT HILL ROAD	9
121	CHESTNUT HILL ROAD	9
150	WAKEFIELD ST	9
190	WAKEFIELD ST	9
374	SALMON FALLS RD	11
379	SALMON FALLS RD	11
383	SALMON FALLS RD	11
384	SALMON FALLS RD	11
387	SALMON FALLS RD	11
8	ABBOT STREET	12
16	ABBOT STREET	12
1	COCHECO AVE	12
3	COCHECO AVE	12
7	COCHECO AVE	12
22	COCHECO AVE	12
35	COCHECO AVE	12
2	CROW HILL ROAD	12
18	GREEN STREET	12
23	GREEN STREET	12
30	GREEN STREET	12
31	GREEN STREET	12
2	GROVE STREET	12
6	GROVE STREET	12
11	GROVE STREET	12
37	GROVE STREET	12
42	GROVE STREET	12
2	HARMONY WAY	12
40	MAGIC AVE	12
905	MAIN STREET	12
7	MILL STREET	12
8	MILL STREET	12
11	MILL STREET	12
16	MILL STREET	12
18	MILL STREET	12

House NO.	STREET	SUB AREA
832	PORTLAND STREET	12
847	PORTLAND STREET	12
853	PORTLAND STREET	12
858	PORTLAND STREET	12
867	PORTLAND STREET	12
868	PORTLAND STREET	12
872	PORTLAND STREET	12
6	RAAB LN	12
15	TRESTLE ROAD	12
34	UNITY STREET	12
38	UNITY STREET	12
12	BIRCHWOOD AVE	13
24	BIRCHWOOD AVE	13
230	EASTERN AVE	13
241	EASTERN AVE	13
18	HAMPSHIRE AVE	13
21	HAMPSHIRE AVE	13
	MONARCH ELM SCHOOL	13
13	PARADISE DRIVE	13
4	ROCHESTER AVE	13
21	ROULX DR	13
445	SALMON FALLS RD	13
460	SALMON FALLS RD	13
461	SALMON FALLS RD	13
5	SANDSTONE RD	13
7	SANDSTONE RD	13
3	VERNON AVE	13
4	VERNON AVE	13
34	VERNON AVE	13
95	WATSON DR	13
13	BRENDA LN	14
17	BRENDA LN	14
15	GIVEN CIR	14
1	McNEIL DR	14
16	McNEIL DR	14
19	McNEIL DR	14
20	McNEIL DR	14
23	McNEIL DR	14
24	McNEIL DR	14
27	McNEIL DR	14
29	McNEIL DR	14
5	CENTRAL STREET	17

House NO.	STREET	SUB AREA
7	CENTRAL STREET	17
35	COLUMBUS AVE	17
50	HANSON ST	17
52	HANSON ST	17
87	NORTH MAIN ST	17
90	NORTH MAIN ST	17
91	NORTH MAIN ST	17
73/77	NORTH MAIN ST	17
23	OLDE FARM LN	17
44	OLDE FARM LN	17
50	OLDE FARM LN	17
5	PLEASANT STREET	17
15	PLEASANT STREET	17
59	SOUTH MAIN STREET	17
7	SUMMER STREET	17
13	SUMMER STREET	17
4	UNION STREET	17
6	UNION STREET	17
12	UNION STREET	17
14	UNION STREET	17
16	UNION STREET	17
21	UNION STREET	17
22	UNION STREET	17
24	UNION STREET	17
50	UNION STREET	17
13	WAKEFIELD ST	17
19	WAKEFIELD ST	17
34	WAKEFIELD ST	17
36	WAKEFIELD ST	17
118	YEAGLEY WAY	17
1	CHARLES STREET	19
19	CHARLES STREET	19
21	CHARLES STREET	19
23	CHARLES STREET	19
34	CHARLES STREET	19
147	CHARLES STREET	19
149	CHARLES STREET	19
169	CHARLES STREET	19
3	GAGNE ST	19
7	GAGNE ST	19
9	GAGNE ST	19
13	GAGNE ST	19

15 GAGNE ST 19 17 GAGNE ST 19 19 GAGNE ST 19 23 GAGNE ST 19 9 MYRTLE STREET 19 1 OLD DOVER ROAD 19 1 OLD DOVER ROAD 19 7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 15 WOODMAN STREET 19 16 WOODMAN STREET 19 18 WOODMAN STREET 19 23 WOODMAN STREET 19 39 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 69 CONGRESS STREET 21 7 GERMAIN ST 22 20 ANITA STREET 12 7 GERMAIN ST 22 51 ROCHESTER HILL RD 22 55 ROCHESTER HILL RD 22 56 ROCHESTER HILL RD 2	House NO.	STREET	SUB AREA
17 GAGNE ST 19 19 GAGNE ST 19 23 GAGNE ST 19 9 MYRTLE STREET 19 1 OLD DOVER ROAD 19 49 RIVER ST 19 7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 15 WOODMAN STREET 19 16 WOODMAN STREET 19 23 WOODMAN STREET 19 23 WOODMAN STREET 19 24 WOODMAN STREET 19 27 WOODMAN STREET 19 28 WOODMAN STREET 19 39 CONGRESS STREET 21 68 CONGRESS STREET 21 71 GERMAIN ST <t< td=""><td>15</td><td>GAGNE ST</td><td>19</td></t<>	15	GAGNE ST	19
19 GAGNE ST 19 23 GAGNE ST 19 9 MYRTLE STREET 19 1 OLD DOVER ROAD 19 49 RIVER ST 19 7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 15 WOODMAN STREET 19 16 WOODMAN STREET 19 23 WOODMAN STREET 19 24 WOODMAN STREET 19 25 WOODMAN STREET 19 26 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 74 GERMAIN ST 22 75 ROCHESTER HILL RD 22 76 GERMAIN ST 22 51 ROCHESTER HILL RD 22 55 ROCHESTER HILL RD 22 56 ROCHESTER HILL RD 22 100 ROCHESTER HILL RD<	17	GAGNE ST	19
23 GAGNE ST 19 9 MYRTLE STREET 19 1 OLD DOVER ROAD 19 49 RIVER ST 19 7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 15 WOODMAN STREET 19 16 WOODMAN STREET 19 18 WOODMAN STREET 19 23 WOODMAN STREET 19 23 WOODMAN STREET 19 24 WOODMAN STREET 19 25 WOODMAN STREET 19 26 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 74 GERMAIN ST 22 75 ROCHESTER HILL RD 22 70 GERMAIN ST 22 100 ROCHESTER HILL RD 22 100 ROCHESTER HILL RD 22 100 ROCHESTER HIL	19	GAGNE ST	19
9 MYRTLE STREET 19 1 OLD DOVER ROAD 19 49 RIVER ST 19 7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 18 WOODMAN STREET 19 16 WOODMAN STREET 19 23 WOODMAN STREET 19 23 WOODMAN STREET 19 23 WOODMAN STREET 19 24 WOODMAN STREET 19 25 WOODMAN STREET 19 26 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 74 GERMAIN ST 22 75 ROCHESTER HILL RD 22 76 RECMAIN ST 22 57 ROCHESTER HILL RD 22 56 ROCHESTER HILL RD 22 100 ROCHESTER HILL RD 22 100 ROCHE	23	GAGNE ST	19
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7 SHERIDAN AVE 19 17 SHERIDAN AVE 19 19 SHERIDAN AVE 19 15 WOODMAN STREET 19 16 WOODMAN STREET 19 18 WOODMAN STREET 19 23 WOODMAN STREET 19 24 WOODMAN STREET 19 39 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 ALL ELA COURT 21 20 GERMAIN ST 22 21 ALL ELA COURT 22 55 ROCHESTER HILL RD 22 22 56 ROCHESTER HILL RD 22 22 100 ROCHESTER HILL RD 22 <td>49</td> <td>RIVER ST</td> <td>19</td>	49	RIVER ST	19
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15 WOODMAN STREET 19 16 WOODMAN STREET 19 18 WOODMAN STREET 19 23 WOODMAN STREET 19 27 WOODMAN STREET 19 39 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 ALL ELA COURT 21 ALL ELA COURT 21 20 ANITA STREET 22 7 GERMAIN ST 22 20 GERMAIN ST 22 51 ROCHESTER HILL RD 22 55 ROCHESTER HILL RD 22 100 ROCHESTER HILL RD 22 102 ROCHESTER HILL RD 22 103 RCHESTER HILL RD 22 104 ROCHESTER HILL RD 22 105 RYAN CIR 22 13 RYAN CIR 22 14 VILLAN	19	SHERIDAN AVE	19
16 WOODMAN STREET 19 18 WOODMAN STREET 19 23 WOODMAN STREET 19 27 WOODMAN STREET 19 39 CONGRESS STREET 21 68 CONGRESS STREET 21 69 CONGRESS STREET 21 71 CONGRESS STREET 21 ALL ELA COURT 21 20 ANITA STREET 22 7 GERMAIN ST 22 20 GERMAIN ST 22 51 ROCHESTER HILL RD 22 55 ROCHESTER HILL RD 22 57 ROCHESTER HILL RD 22 100 ROCHESTER HILL RD 22 102 ROCHESTER HILL RD 22 103 RYAN CIR 22 13 RYAN CIR 22 14 VILLANOVA LN 22 37 CRIMSON LN 23 41 CRIMSON LN 23 61 LAREDO LN	15	WOODMAN STREET	19
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17 RYAN CIR 22 14 VILLANOVA LN 22 37 CRIMSON LN 23 41 CRIMSON LN 23 47 CRIMSON LN 23 61 LAREDO LN 23 606 SALMON FALLS RD 23 648 SALMON FALLS RD 23 651 SALMON FALLS RD 23	15	RYAN CIR	22
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37 CRIMSON LN 23 41 CRIMSON LN 23 47 CRIMSON LN 23 61 LAREDO LN 23 606 SALMON FALLS RD 23 648 SALMON FALLS RD 23 651 SALMON FALLS RD 23	14	VILLANOVA LN	22
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606SALMON FALLS RD23648SALMON FALLS RD23651SALMON FALLS RD23	61	LAREDO LN	23
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651 SALMON FALLS RD 23	648	SALMON FALLS RD	23
	651	SALMON FALLS RD	23

TABLE 4 CITY OF ROCHESTER, NEW HAMPSHIRE YEAR ONE I/I INVESTIGATION - PHASE #3 2022 SEWER SMOKE TESTING RECOMMENDED REHABILITATION COSTS

No.	Location	Description of Defect Estimated Direct T&T Cost (20 Year Rehab Life Cycle) (20 Year Rehab Life Cycle)		Recommended Rehabilitation	Estimated Rehabilitation Cost	
1	Autumn St	Broken Cleanout Cap/PS Vent (Autumn St)	248	\$10,386.24	Install Cleanout Cap	\$200.00
2	Wakefield St	Vented MH Cover Near McDonalds (161 Wakefield St)	9,875	\$413,565.00	Replace MH Cover	\$3,000.00
3	Wakefield St	Vented MH Cover in Sidewalk of Church (57 Wakefield St)	7,284	\$305,053.92	Replace MH Cover	\$3,000.00
4	Electric Ave	Catch Basin (87 Electric Ave)	25,753	\$1,078,535.64	Redirect CB to Drain	\$10,000.00
5	N. Main Street	Vented MH Cover in Subway Parking Lot (158 North Main St.)	1,162	\$48,664.56	Replace MH Cover	\$3,000.00
6	Olde Farm Lane	Vented MH Cover of MH 0971 (49 Olde Farm Lane)	3,137	\$131,377.56	Replace MH Cover	\$3,000.00
7	Signal St	Vented MH Cover of MH 0967 (25 Signal St)	871	\$36,477.48	Replace MH Cover	\$3,000.00
8	Signal St	Vented MH Cover of MH 0968 (Signal at Olde Farm In)	651	\$27,263.88	Replace MH Cover	\$3,000.00
9	Salmon Falls Rd	Broken Cleanout Cap in Driveway (297 Salmon Falls Rd)	372	\$15,579.36	Install Cleanout Cap	\$200.00
10	Anctill Ct	Vented MH Cover of MH 1122 (20 Anctill Ct)	2,870	\$120,195.60	Replace MH Cover	\$3,000.00
11	Willey St	Catch Basin (13 Willey St)	15,126	\$633,476.88	Redirect CB to Drain	\$10,000.00
12	Sidney St	Vented MH Cover	174	\$7,287.12	Replace MH Cover	\$3,000.00
13	Charles Street	Catch Basin (147 Charles St)	89,282	\$3,739,130.16	Redirect CB to Drain	\$10,000.00
14	Charles Street	Catch Basin (148 Charles St)	89,282	\$3,739,130.16	Redirect CB to Drain	\$10,000.00
15	Nola Ave	Broken SVC/Cleanout (30 Nola Ave)	77	\$3,224.76	Install Cleanout Cap	\$200.00
16	Rochester Hill Rd	Vented MH Cover (85 Rochester Hill Rd)	2,939	\$123,085.32	Replace MH Cover	\$3,000.00
17	Cove St	Vented MH Cover (18 Cove)	627	\$26,258.76	Replace MH Cover	\$3,000.00
18	Dow Ct	Vented MH Cover (3 Dow Ct)	1,220	\$51,093.60	Replace MH Cover	\$3,000.00
19	Gagne St	CB (House 14)	395,989	\$16,584,019.32	Redirect CB to Drain	\$10,000.00
20	Gagne St	CB (House 18)	406,654	\$17,030,669.52	Redirect CB to Drain	\$10,000.00
21	Charles Street	CB (147 Yard)	2,316	\$96,994.08	Redirect CB to Drain	\$10,000.00
22	Brickyard Dr	Vented MH Cover (Brickyard Dr ROW - SMH2751)	139	\$5,821.32	Replace MH Cover	\$3,000.00
23	Pickering Rd ROW	Cement broken around MH (1867)	248	\$10,386.24	Cementitious Line	\$3,000.00
24	Nadeau Dr	Broken Cap/Cleanout (Durrell Paving Parking Lot)	46	\$1,926.48	Install Cleanout Cap	\$200.00
25	Orange Street ROW	Vented MH Cover	97	\$4,062.36	Replace MH Cover	\$3,000.00
26	Wakefield St	Roof Drains (City Hall - 31 Wakefield St)	112,273	\$4,701,993.24	Redirect Roof Drain	\$10,000.00
27	Wakefield St	Roof Drains (City Hall - 13 Wakefield St)	114,283	\$4,786,172.04	Redirect Roof Drain	\$10,000.00
L			1,282,995	\$53,731,830.60		\$132,800.00

APPENDIX A

Smoke Testing Defect Reports





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ENGINEER:	Weston & Sampson	DATE:	08/19/22	Page Defect No.	1	of	1
OWNER:	Rochester, NH	REPORT NO .:	1	Map No.:		1	
	Veer 1 1/1 lowestigation Dhase	#0		Subarea:		12	
PROJECT NAME:	rear 1 // investigation - Phase	#3		CREW:		IEL	

LOCATION:

Autumn Street Pump Station

Defect No.	Parcel ID or	DESCRIPTION	CRIPTION		Severity			Picture No (s)
Delete No.	Asset ID	BEGGHI HON	Area (SF)	Туре	Major	Mod	Trace	1 10101 (0.(3)
1	PS	Broken Cap, Smoke From Edges of Cover	64	Grass			Х	3 to 5

SKETCH:



DEFECT SOURCE DRAINAGE AREA \bigcirc

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #1 - Autumn St PS.xlsx]Report (Defect) (2)

ENGINEER:	Weston & Sampson	DATE:	08/22/22	Page Defect No.	2	ot	22
OWNER:	Rochester, NH	REPORT NO .:	2	Map No.:		2	
PROJECT NAME:	Year 1 I/I Investigation - Phase a	#3	-	Subarea: CREW:		17 TEL	

LOCATION:

: 161 Wakefield Street (McDonalds Exit)

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	0	Severity		Picture No.(s)
Delect NO.	Asset ID	Asset ID		Туре	Major	Mod	Trace	1 ICIUIE NO.(S)
2	SP02226	Vented MH Cover with 91 Holes	2,470	Pavement	Х			6 to 7

SKETCH



DEFECT SOURCE DRAINAGE AREA \bigcirc

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports/[Defect #2 - Wakefield St - McDonalds.xlsx]Report (Defect) (2)

				Page	3	of	22	
ENGINEER:	Weston & Sampson	DATE:	08/22/22	Defect No.	3	thru	3	
OWNER:	Rochester, NH	REPORT NO .:	3	Map No.:		2		
				Subarea:		17		
PROJECT NAME:	Year 1 I/I Investigation - Phase	e #3		CREW:		TEL		

LOCATION:

57 Wakefield Street - Church Walkway

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	ç	Severity		Picture No (s)
Delect NO.	Asset ID			Туре	Major	Mod	Trace	1 ICIUIE NO.(S)
3		Vented MH Cover in Walkway of Church	627	Surface + Grass		Х		8 to 10

SKETCH:



DEFECT SOURCE	
DRAINAGE AREA	

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P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder\Smoke Testing/Defect Reports\[Defect #3 - Wakefield St - Church MH with holes.xixx]Report (Defect) (2)

		SMORE LESTING DELL		_				
ENGINEER:	Weston & Sampson	DATE:	08/25/22	Page Defect No.	4	ot thru	22 4	
OWNER:	Rochester, NH	REPORT NO .:	4	Map No.:		6		
PROJECT NAME:	Year 1 I/I Investigation - Phase	e #3		Subarea: CREW:		2 TEL		
			—	—				

LOCATION: 87 Electric Ave - Easement Between Rt. 125

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	Severity			Picture No. (s)
Delect NO.	Asset ID DESCRIPTION		Area (SF)	Туре	Major	Mod	Trace	Picture No.(s)
4		Catch Basin	6,650	Grass	Х			11 to 13

SKETCH:



DEFECT SOURCE	
DRAINAGE AREA	

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #4 - Electric Ave - CB.xlsx]Report (Defect) (2)

ENGINEER:	Weston & Sampson	DATE:	08/26/22	Page Defect No.	5 5	ot thru	22 5
OWNER:	Rochester, NH	REPORT NO .:	5	Map No.:		4	
PROJECT NAME:	Year 1 I/I Investigation - Ph	nase #3		CREW:		TEL	

LOCATION: 158 N. Main Street - Subway Parking Lot

Defect No.	Parcel ID or	DESCRIPTION	Drainage	Surface	Severity			Picture No.(s)
Delect No.	Asset ID		Area (SF)	Туре	Major	Mod	Trace	1 10101 10.(3)
5		Vented Cover in Subway Parking Lot	100	Surface			Х	14 to 16

SKETCH:



DEFECT SOURCE DRAINAGE AREA



P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #5 - N. Main St - Subway MH.xisx]Report (Defect) (2)

		SWORE LESTING DI		_			~~	
				Page	6	ot	22	
ENGINEER:	Weston & Sampson	DATE:	08/26/22	Defect No.	6	thru	6	
OWNER:	Rochester, NH	REPORT NO .:	6	Map No.:		2		
				Subarea:		17		-
PROJECT NAME:	Year 1 I/I Investigation - Phas	e #3		CREW:		TEL		
				_				

LOCATION:

49 Olde Farm Lane

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	0	Severity		Picture No. (s)
Delect NO.	Asset ID	DESCHIENDER	Area (SF)	Туре	Major	Mod	Trace	1 ICIUIE NO.(S)
6		Vented MH Cover	270	Surface			Х	17 to 19

SKETCH:



DEFECT SOURCE DRAINAGE AREA 0

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports\[Defect #6 - Old Farm Lane - MH.xlsx]Report (Defect) (2)

ENGINEER:	Weston & Sampson	DATE:	08/26/22	Page Defect No.	7 7+8	ot thru	8
OWNER:	Rochester, NH	REPORT NO .:	7	Map No.:		2	
				Subarea:		17	
PROJECT NAME:	Year 1 I/I Investigation - Phase	#3		CREW:		IEL	

LOCATION:

25 Signal Street and Signal at Olde Farm

Defect No.	Parcel ID or	DESCRIPTION	Drainage	Drainage Surface		Severity		Picture No.(s)
Delect No.	Asset ID	DESCRIFTION	Area (SF)	Туре	Major	Mod	Trace	FICILITE NO.(S)
7		Vented Cover (25 Signal)	75	Surface			Х	20 to 22
8		Vented Cover (Signal at Olde Farm)	56	Surface			Х	23 to 25

SKETCH:



DRAINAGE AREA

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports/(Defect #7+8 - Signal Street xisx)Report (Defect) (2)

ENGINEER:	Weston & Sampson	DATE:	08/31/22	Page Defect No.	8 9	of	9
OWNER:	Rochester, NH	REPORT NO .:	8	Map No.:		1	
PROJECT NAME:	Year 1 I/I Investigation - Phase	#3		CREW:		TEL	

LOCATION:

Driveway of 297 Salmon Falls Road

Defect No.	Parcel ID or	DESCRIPTION	Drainage	Surface		Severity	I	Picture No.(s)
	Asset ID		Area (SF)	Туре	Major	Mod	Trace	
9		Broken Cleanout Cap in Driveway	32	Surface			Х	26 to 28

SKETCH:



DEFECT SOURCE DRAINAGE AREA



P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #9 - Salmon Falls Rd - Broken Cleanout.visx|Report (Defect) (2)

ENGINEER:	Weston & Sampson	DATE:	09/08/22	Page Defect No.	9 10	ot	10
OWNER:	Rochester, NH	REPORT NO .:	9	Map No.: Subarea		6	
PROJECT NAME:	Year 1 I/I Investigation - Phase	#3		CREW:		TEL	

LOCATION:

20 Anctill Court

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	ç	Severity		Picture No (s)
Bolootilloi	Asset ID		Area (SF)	Туре	Major	Mod	Trace	1 101010 1101(0)
10	SMH1122	Vented Cover	247			Х		29 to 31

SKETCH:



DEFECT SOURCE DRAINAGE AREA P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #10 - Anctill Ct - Hole in Cover.xlsx]Report (Defect) (2)

		SWORE LESTING DE						
				Page	10	of	22	
ENGINEER:	Weston & Sampson	DATE:	09/12/22	Defect No.	11	thru	11	
OWNER:	Rochester, NH	REPORT NO .:	10	Map No.:		2		
				Subarea:		6		
PROJECT NAME:	Year 1 I/I Investigation - Phase	e #3		CREW:		TEL		

LOCATION:

13 Willey Street Driveway

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	c,	Severity		Picturo No. (c)
Delect NO.	Asset ID	DESCITI HON	Area (SF)	Туре	Major	Mod	Trace	1 ICIUIE NO.(S)
11		Catch Basin	1,900	Surface	Х			32 to 34

SKETCH:



DEFECT SOURCE DRAINAGE AREA P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #11 - Willey St - CB.xlsx]Report (Defect) (2)

				Page	11	of	22	
ENGINEER:	Weston & Sampson	DATE:	09/21/22	Defect No.	12	thru	12	
OWNER:	Rochester, NH	REPORT NO .:	11	Map No.:		4		
				Subarea:		19		
PROJECT NAME:	Year 1 I/I Investigation - Phase	e #3		CREW:		TEL		
				-				

LOCATION:

14 Sidney Street

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	S	Severity		Picture No. (s)
Delect No.	Asset ID		Area (SF)	Туре	Major	Mod	Trace	1 101010 110.(3)
12		Vented Cover	15	Surface			Х	35 to 37

SKETCH:



DRAINAGE AREA



P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #12 - Sidney Street MH Hole.xlsx]Report (Defect) (2)

		SMOKE LESTING	DEFECT REPORT			
ENGINEER:	Weston & Sampson	DATE:	09/21/22	Page 12 Defect No. 13, 14	of	22
OWNER:	Rochester, NH	REPORT NO .:	12	Map No.:	4	
PROJECT NAME:	Year 1 I/I Investigation - Pl	hase #3		Subarea: CREW:	19 TEL	

I OCAT	
LUCAI	IUN.

147/148 Charles Street

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface		Severity		Picture No. (s)	
Delect NO.	Asset ID	DESCI II HON	Area (SF)	Туре	Major	Mod	Trace	1 ICIUIE NO.(S)	
13		Catch Basin	20 135	Surface	Х			38 to 40	
14		Catch Basin	20,100	Surface	Х			41 to 43	
21		Catch Basin in Yard of 147	598	Grass		Х		65 to 67	

SKETCH:



P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #13,14, 21 - Charles Street.xlsx]Report (Defect) (2)

				Page	13	of	22	
ENGINEER:	Weston & Sampson	DATE:	09/27/22	Defect No.	15	thru	15	
OWNER:	Rochester, NH	REPORT NO .:	13	Map No.:		5		
				Subarea:		22		
PROJECT NAME:	Year 1 I/I Investigation - Phas	se #3		CREW:		TEL		
				-			-	

LOCATION:

30 Nola Avenue

Defect No.	Parcel ID or	DESCRIPTION	Drainage	Surface		Severity	-	Picture No.(s)
	Asset ID		Area (SF)	Type	Major	Mod	Irace	()
15		Broken SVC Cleanout	20	Grass			Х	44 to 46

SKETCH:



DEFECT SOURCE DRAINAGE AREA



P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #15 - Nola - Cleanout.xlsx]Report (Defect) (2)

				Page	14	of	22	
ENGINEER:	Weston & Sampson	DATE:	09/28/22	Defect No.	16	thru	16	
OWNER:	Rochester, NH	REPORT NO .:	14	Map No.:		5		
				Subarea:		22		
PROJECT NAME:	Year 1 I/I Investigation - Phase	e #3		CREW:		TEL		

LOCATION:

85 Rochester Hill Road

Defect No	Parcel ID or	DESCRIPTION	Drainage	Surface	c,	Severity		Picture No. (s)	
Delect NO.	Asset ID	DESCRIPTION	Area (SF)	Туре	Major	Mod	Trace	FICILITE NO.(S)	
16	SMH1538	Vented Cover	253	Surface		Х		47 to 49	

SKETCH:



DRAINAGE AREA

P:\NH\Rochester, NHIENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #16 - Rochester Hill Rd - Vented cover.xlsx]Report (Defect) (2)

			Page	15	of	22
Weston & Sampson	DATE:	09/28/22	Defect No.	17	thru	17
			_			
Rochester, NH	REPORT NO.:	15	Map No.:		4	
			Subarea:		6	
Year 1 I/I Investigation - Phase	#3		CREW:		TEL	
			_			
	Weston & Sampson Rochester, NH Year 1 I/I Investigation - Phase	Weston & Sampson DATE: Rochester, NH REPORT NO.: Year 1 I/I Investigation - Phase #3	Weston & Sampson DATE: 09/28/22 Rochester, NH REPORT NO.: 15 Year 1 I/I Investigation - Phase #3	Weston & Sampson DATE: 09/28/22 Defect No. Rochester, NH REPORT NO.: 15 Map No.: Year 1 I/I Investigation - Phase #3 CREW:	Weston & Sampson DATE: 09/28/22 Page 15 Rochester, NH REPORT NO.: 15 Map No.: Year 1 I/I Investigation - Phase #3 CREW:	Weston & Sampson DATE: 09/28/22 Page 15 of Rochester, NH REPORT NO.: 15 Map No.: 4 Year 1 I/I Investigation - Phase #3 CREW: TEL

LOCATION:

18 Cove Court

Defect No.	Parcel ID or	DESCRIPTION	Drainage	Surface	ç	Severity	I	Picture No.(s)
	Asset ID		Area (SF)	Туре	Major	Mod	Trace	
17		Vented MH Cover	54	Surface			Х	53 to 55

SKETCH:



DEFECT SOURCE DRAINAGE AREA P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports\[Defect #17 - Cove Ct - MH Cover.xisx]Report (Defect) (2)

			Page	16	of	22	
Weston & Sampson	DATE:	09/28/22	Defect No.	18	thru	18	
			_				
Rochester, NH	REPORT NO .:	16	Map No.:		4		
			Subarea:		6		
Year 1 I/I Investigation - Phase	#3		CREW:		TEL		
	Weston & Sampson Rochester, NH Year 1 I/I Investigation - Phase	Weston & Sampson DATE: Rochester, NH REPORT NO.: Year 1 I/I Investigation - Phase #3	Weston & Sampson DATE: 09/28/22 Rochester, NH REPORT NO.: 16 Year 1 I/I Investigation - Phase #3	Weston & Sampson DATE: 09/28/22 Page Rochester, NH REPORT NO.: 16 Map No.: Year 1 I/I Investigation - Phase #3 CREW:	Weston & Sampson DATE: 09/28/22 Page 16 Rochester, NH REPORT NO.: 16 Map No.: Subarea: Year 1 I/I Investigation - Phase #3 CREW: CREW: CREW:	Weston & Sampson DATE: 09/28/22 Page 16 of Rochester, NH REPORT NO.: 16 Map No.: 4 Year 1 I/I Investigation - Phase #3 CREW: TEL	Weston & SampsonDATE:09/28/22Page16of22Defect No.18thru18Rochester, NHREPORT NO.:16Map No.:4Year 1 I/I Investigation - Phase #3CREW:TEL

LOCATION:

3 Dow Court

Defect No	Parcel ID or		Drainage	Surface	c.	Severity		Picturo No. (c)
Delect NO.	Asset ID	DESCRIPTION	Area (SF)	Туре	Major	Mod	Trace	1 ICIUIE NO.(S)
18		Vented Cover	105	Surface			х	56 to 58

SKETCH:



DEFECT SOURCE DRAINAGE AREA

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports\[Defect #18 - Dow Ct - MH Cover.xisx]Report (Defect) (2)

. .

ENGINEER:	Weston & Sampson	DATE:	09/28/22	Page Defect No.	17 19	ot thru	22 20
OWNER:	Rochester, NH	REPORT NO .:	17	Map No.:		4	
				Subarea:		19	
PROJECT NAME:	Year 1 I/I Investigation - Phas	e #3		CREW:		TEL	
				_			

LOCATION:

14 and 18 Gagne Street

Defect No	Parcel ID or	DESCRIPTION Dr	Drainage	Surface	0	Severity		Picture No. (s)
Delect NO.	Asset ID	DESCRIPTION	Area (SF)	Туре	Major	Mod	Trace	FICILITE NO.(S)
19		Catch Basin	34,085	Surface	Х			59 to 61
20		Catch Basin	35,003	Surface	Х			62 to 64

SKETCH:



DRAINAGE AREA

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #19, 20 - Gagne Street CB.xisx]Report (Defect) (2)

ENGINEER.	Weston & Sampson	DATE.	09/29/22	Page Defect No	18 22	of	22	
	Hoston & eampoon	5, (12)						
OWNER:	Rochester, NH	REPORT NO .:	18	Map No.:		6		
				Subarea:		1		
PROJECT NAME:	Year 1 I/I Investigation - Pl	hase #3		CREW:		TEL		
				_				

LOCATION:

Brickyard Drive ROW (SMH 2751)

Defect No.	Parcel ID or	DESCRIPTION	Drainage Area (SF)	Surface Type	Severity			Picture No. (s)
	Asset ID				Major	Mod	Trace	1 ICIUIE NO.(3)
22	SMH 2751	Vented Cover	36	Grass			Х	68 to 70

SKETCH:



DEFECT SOURCE DRAINAGE AREA P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #22 - Brickyard ROW.xisx]Report (Defect) (2)

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				Page	19 0	T	22
ENGINEER:	Weston & Sampson	DATE:	09/29/22	Defect No.	23 thr	ſu	23
OWNER:	Rochester, NH	REPORT NO .:	19	Map No.:		6	
				Subarea:		1	
PROJECT NAME:	Year 1 I/I Investigation - Ph	ase #3		CREW:		TEL	

LOCATION:

Pickering Road ROW

Defect No.	Parcel ID or	DESCRIPTION	Drainage Area (SF)	Surface Type	Severity			Picture No. (a)
	Asset ID				Major	Mod	Trace	FICILITE NO.(S)
23	SMH1867	Cement Broken Around Manhole	64	Grass		Х		71 to 73

SKETCH:



DEFECT SOURCE DRAINAGE AREA

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #23 - Pickering Rd ROW - MH.xisx]Report (Defect) (2)
WESTON AND SAMPSON SMOKE TESTING DEFECT REPORT

P	age 20	of 22	
ENGINEER: Weston & Sampson DATE: 09/29/22 D	efect No. 24	thru 24	
OWNER: Rochester, NH REPORT NO.: 20 M	1ap No.:	6	
Si	ubarea:	1	
PROJECT NAME: Year 1 I/I Investigation - Phase #3 C	REW:	TEL	

LOCATION: 99 Nadeau Drive - Durell Paving Parking Lot

Defect No	Parcel ID or		Drainage	Surface	Severity			Picture No. (a)
Delect NO.	Asset ID	DESCRIPTION	Area (SF)	Туре	Major	Mod	Trace	Tictule No.(3)
24		Broken Cleanout	12	Grass			Х	74 to 76

SKETCH:



DEFECT SOURCE DRAINAGE AREA \bigcirc

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Defect Reports\[Defect #24 - Nadeau Dr - Cleanout.xisx]Report (Defect) (2)

WESTON AND SAMPSON SMOKE TESTING DEFECT REPORT

				Page	21	of	22	
ENGINEER:	Weston & Sampson	DATE:	09/29/22	Defect No.	25	thru	25	
OWNER:	Rochester, NH	REPORT NO .:	21	Map No.:		6		
				Subarea:		1		
PROJECT NAME:	ME: Year 1 I/I Investigation - Phase #3			CREW:		TEL		
				_				

LOCATION:

Orange Street ROW - Eastern Propane Tank Rehab Facility

Defect No	Parcel ID or	OF		Surface	c.	Severity		Picturo No. (c)	
Delect NO.	Asset ID	DESCITI HON	Area (SF)	Туре	Major	Mod	Trace	ricture NO.(S)	
25		Vented Manhole Cover	25	Grass			Х	77 to 79	

SKETCH:



DEFECT SOURCE DRAINAGE AREA P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing/Field Binder/Smoke Testing/Defect Reports/[Defect #25 - Orange Street ROW - Vented Cover.xlsx]Report (Defect) (2)

WESTON AND SAMPSON SMOKE TESTING DEFECT REPORT

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ENGINEER:	Weston & Sampson	DATE:	09/01/22	Page Defect No.	22 26 th	or nru	22 27	
OWNER:	Rochester, NH	REPORT NO .:	22	Map No.:		4		
				Subarea:		17		-
PROJECT NAME:	Year 1 I/I Investigation - Phase #3			CREW:		TEL		
LOCATION:	31 and 13 Wakefield Stree	t						

LOCATION:

Parcel ID or Drainage Surface Severity Defect No DESCRIPTION Picture No.(s) Asset ID Area (SF) Туре Major Mod Trace Roof Leader (City Hall - 31 Wakefield Street) 26 9,664 Х From Drone 27 Roof Leader (13 Wakefield Street) 9,837 Х From Drone

SKETCH:



DEFECT SOURCE DRAINAGE AREA

P:\NH\Rochester, NH\ENG22-0860 Rochester, NH Smoke Testing\Field Binder\Smoke Testing\Delect Reports\[Delect #26, 27 - City Hall.xisx]Report (Defect) (2)

APPENDIX B

Smoke Testing Defect Photos

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Defect #1 – Autumn Street Pump Station



Defect #2 - 161 Wakefield Street (McDonalds Exit)



Defect #3 - 57 Wakefield Street (Church Walkway)



Defect #4 – 87 Electric Ave



Defect # 5 – 158 N. Main Street (Subway Parking Lot)



Defect #6 – 49 Olde Farm Lane



Defect #7 – 25 Signal Street



Defect #8 – Signal at Olde Farm



Defect #9 - 297 Salmon Falls Road (driveway)



Defect #10 – 20 Anctill Court



Defect #11 - 13 Willey Street (driveway)



Defect #12 – 14 Sidney Street



Defect #13 – 147 Charles Street



Defect #14 – 148 Charles Street



Defect #15 - 30 Nola Ave



Defect #16 - 85 Rochester Hill Road



Defect #17 – 18 Cove Court



Defect #18 - 3 Dow Court



Defect # 19 – 14 Gagne Street



Defect #20 – 18 Gagne Street



Defect #21 - 147 Charles Street (yard)



Defect # 22 - Brickyard Drive ROW (SMH 2751)



Defect #23 - Pickering Road ROW (SMH 1867)





Defect #24 - 99 Nadeau Drive (Durrell Paving Parking Lot)

Defect #25 - Orange Street ROW (Eastern Propane Tank Lot)



Defect #26 - 31 Wakefield Street (City Hall Roof Drains)



Defect #27 - 13 Wakefield Street (Roof Drains)



APPENDIX C

Transportation and Treatment Cost

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T&T Cost Calculation Rochester, New Hampshire May 2023

Fiscal year 2022 Transportation and Treatment (T&T) costs for sewage in the City of Rochester can be calculated using the City's O&M and Capital costs. Table A shows Rochester's FY22 O&M and Capital costs.

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	ROCHESTER COST	COST (\$/GPD)
Administration + O&M	1,110,549,000	3,042,600	\$2,991,153	\$0.9831
Capital Improvement Expendatures (WWTF, PS, & Collections Maintenance and Upgrades)	1,110,549,000	3,042,600	\$2,381,000	\$0.7826
Debt Services (Capital Costs)	1,110,549,000	3,042,600	\$2,610,003	\$0.8578
TOTAL			\$7,982,156	\$2.6235

TABLE A - CITY OF ROCHESTER SEWERAGE COSTS FY22

Therefore, the total FY22 T&T cost for the City of Rochester's costs is \$2.6235/GPD

According to the Department of Environmental Protection's (DEP) Guidelines for Performing I/I Analyses and SSES this cost of \$2.6235/GPD needs to be extended throughout the life of a rehabilitative measure. The life cycle for a rehabilitative measure can be set by good engineering judgment as well as backup documentation, depending on the type of rehabilitation. For this study, Weston & Sampson will use a life cycle of 20 years.

To find the present worth of a rehabilitative measure over a twenty-year period, a discount rate, or annual percentage rate, is required. According to the DEP, the discount rate for FY22 is 2.25%. To calculate the T&T cost in order to account for this twenty-year period, a present worth analysis must be done. The following formula will calculate the present worth of the T&T cost for the next twenty years.

PRESENT WORTH ANALYSIS:

Discount Rate = 2.25% (DEP FY22 Information)

Present Worth Factor:

<u>(1+i) ⁿ -1</u>	where:	i = discount rate, or interest rate
i (1+i) ⁿ		n = number of years

$$\frac{(1+0.0225)^{20} \cdot 1}{0.0225 (1+0.0225)^{20}} = 15.96$$

Present Worth T&T Cost (Using DEP FY22 Discount Rate):

(Present Worth Factor) x (FY22 T&T cost)

15.96 x \$2.6235/GPD = \$41.88/GPD

Therefore, the T&T cost for the City of Rochester, using a present worth of the rehabilitation over a twenty-year period and a discount rate of 2.25% is \$41.88/GPD.

APPENDIX D

Additional Findings

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<u>SMH 0017 – Wakefield Street – Debris in MH Invert</u>



SMH 0187 – Hampshire Ave – Heavy Debris Buildup and Surcharging



SMH 0509 – Charles Street – Cracked Cover



<u>SMH 0590 – Dewey Street – Surcharged MH (upstream of pump station)</u>



SMH 0984 – Carson Street – Infiltration on Bench



SMH 0992 – Railroad Avenue – Heavy Debris Build Up in MH



SMH 0995 – Brickyard Drive – US line Blocked or Possibly Abandoned. Possible Infiltration on Bench



 GIS did not have any record of the lines that tie in from Harry Street. Additionally, none of the lines upstream of SMH0095 smoked during the test. Line may have been abandoned, or it has a blockage.



SMH 1005 – Ledgeview Drive – Cracked Cover



SMH 1017 – Ledgeview Drive – Cracked Frame



SMH 1086 – Henrietta Street – Infiltration on Bench/Pipe Connection



SMH 1087 – Nola Avenue – Heavy Infiltration on Bench



SMH 1163 – Maplewood Avenue – Broken Frame



SMH 1248 – Anita Street – Infiltration on Bench



SMH 1374 – Salmon Falls Road – Signs of H²S, No Bench/Invert in Manhole



SMH 1481 – North Main Street – Broken Rim



<u>SMH 0017 – Wakefield Street – Debris in MH Invert</u>



SMH 0187 – Hampshire Ave – Heavy Debris Buildup and Surcharging



SMH 0509 – Charles Street – Cracked Cover



<u>SMH 0590 – Dewey Street – Surcharged MH (upstream of pump station)</u>



SMH 0984 – Carson Street – Infiltration on Bench



SMH 0992 – Railroad Avenue – Heavy Debris Build Up in MH



SMH 0995 – Brickyard Drive – US line Blocked or Possibly Abandoned. Possible Infiltration on Bench



 GIS did not have any record of the lines that tie in from Harry Street. Additionally, none of the lines upstream of SMH0095 smoked during the test. Line may have been abandoned, or it has a blockage.



SMH 1005 – Ledgeview Drive – Cracked Cover



SMH 1017 – Ledgeview Drive – Cracked Frame


SMH 1086 – Henrietta Street – Infiltration on Bench/Pipe Connection



SMH 1087 – Nola Avenue – Heavy Infiltration on Bench



SMH 1163 – Maplewood Avenue – Broken Frame



SMH 1248 – Anita Street – Infiltration on Bench



SMH 1374 – Salmon Falls Road – Signs of H²S, No Bench/Invert in Manhole



SMH 1481 – North Main Street – Broken Rim

