



westonandsampson.com

55 Walkers Brook Drive, Suite 100
Reading, MA 01867
tel: 978.532.1900

REPORT

August 2021

TOWN OF
DEDHAM
MASSACHUSETTS

2021 Sewer Manhole Investigation
Report

Town of Dedham, Massachusetts
Weston & Sampson Project No. 2210030

August 23, 2021

Jason L. Mammone, PE
Director of Engineering
Public Works Facility
55 River Street
Dedham, Massachusetts 02026

Re: 2021 Sewer Manhole Investigation

Dear Mr. Mammone:

In accordance with our January 13, 2021 agreement, Weston & Sampson is pleased to submit our report for the 2021 Sewer Manhole Investigation conducted in spring 2021. This project included topside manhole inspections in subareas BB, GG, UU, XX and YY as delineated in the attached Figure 1.

This report presents our analysis of the manhole inspection results, a cost-effectiveness analysis, and recommendations for sewer system improvements. The Department of Environmental Protection (DEP) *Guidelines for Performing I/I Analyses and Sewer System Evaluation Survey* (DEP Guidelines), updated May 2017, were used as a guide for the analysis.

Area Description and Project Objectives

The Town of Dedham, Massachusetts is a residential community located southwest of Boston. Wastewater collected in the town drains east towards Boston where it enters Massachusetts Water Resources Authority (MWRA) interceptors at multiple locations. The flow is ultimately treated at the Deer Island Wastewater Treatment Plant. The town's wastewater collection system consists of approximately 94 miles of gravity sewer. A summary of the gravity sanitary sewer pipes and manholes is shown in Table 1, *Sewer System Summary*.

The 2021 Sewer Manhole Investigation goal was to identify sources of infiltration and inflow (I/I) in the sewer system. This aligns with one of the Town of Dedham's primary goals of reducing wastewater flow to the MWRA to limit user charges. By removing unnecessary and excessive I/I the sewer system flows will be reduced, leading to increased sewer capacities for future development. Additionally, the manhole inspections would identify and record the location and severity of defects. This is a results-driven approach which seeks to maximize the effectiveness of the investigation through total system maintenance along with I/I removal.

Topside Manhole Inspections

Manhole inspections consist of topside visual inspection of sanitary sewer manholes. Location, diameter, depth, material, casting and cover size, and source of any observed infiltration are recorded for each manhole. The inspections are ideally completed during high groundwater periods in order to identify I/I sources. The inspection also provides data on structural defects in manholes that should be repaired as part of the town's regular maintenance activities.

Weston & Sampson performed the inspection of 508 manholes from March 8 to March 25, 2021. An estimated 28,224 gpd of infiltration was identified in 68 manholes, and an estimated 10,214 gpd of peak design storm inflow was identified in eight manholes. Manholes identified as sources of inflow are

generally subject to ponding or can otherwise collect runoff during wet weather. The results of the manhole inspections are summarized in Table 2, *Manhole Summary* and Table 3, *Manhole Inflow Summary*.

Non-infiltration related structural defects were found in four manholes such as loose or missing bricks in chimney, bench and invert sections, or defective frames and covers. Recommendations for rehabilitation and estimated costs are listed in Table 4, *Manhole Structural Defects*.

Inspections were not performed at 13 locations where the manholes either could not be opened or located. These manholes are listed in Table 5, *Manhole Inspection Status*. Uninspected manholes should be located, opened, and inspected. An electronic copy of manhole inspection logs and photos are included on the attached external hard drive.

Database Development

Weston & Sampson updated the Microsoft Access database designed specifically for the management of sewer manhole data. The database was developed for the 2018 Sewer Manhole Investigations project and updated during subsequent investigation phases. Allowing for a single, comprehensive sewer manhole database to be created over time. The database contains data fields for sewer system information such as manhole location, diameter, depth, material, casting and cover size, condition of manhole components, and source of any observed infiltration. The incoming and outgoing sewer pipe diameter, material, and position within the manhole are also included. An electronic copy of the database is included on the attached external hard drive.

Cost-Effectiveness Analysis

A cost-effectiveness analysis (CEA) was performed for all manhole defects to determine the merit of performing a given rehabilitation. The CEA compares the estimated cost for removing I/I to the estimated savings in transportation and treatment (T&T) costs resulting from I/I removal. T&T costs consist of capital expenditures required to expand and upgrade the wastewater system, plus annual operation and maintenance (O&M) costs. O&M costs are directly related to the quantity of flow being discharged to pump stations and treatment facilities.

The present worth of the T&T cost for the Town of Dedham was calculated using MWRA charges and O&M and capital costs provided by the town. The T&T costs have been extended throughout the projected life-cycle of the rehabilitation of 20 years. Using the DEP FY21 rate of 2.50%, extended over 20 years, the present worth of the Town of Dedham's T&T costs is \$22.49. A memorandum detailing the methodology and the calculation of T&T costs may be found in Appendix A, *MWRA T&T Cost Calculation*. The MWRA portion of the T&T costs are generated using the MWRA's annual Customer Service Report. This Customer Service Report is also attached Appendix A, for your records.

T&T costs can change annually. Therefore, if the recommended rehabilitation program included in this report is not conducted within one year, Weston & Sampson recommends a re-calculation of the T&T costs to assure the design continues to be based on a valid CEA. Typically, when T&T costs increase, the scope of recommended rehabilitation will also increase.

The calculation of T&T costs for a particular I/I source considers only the portion of I/I that can be reduced through rehabilitation. The percentage of I/I that can be reduced depends greatly upon both the individual source and the specified repair method. Due to the potential for infiltration to migrate from a repaired defect to a nearby defect that may not have warranted rehabilitation or could not be identified during the inspection, the percentage of removable I/I is typically estimated to be 50 percent. This percentage of I/I reduction is identified in the CEA as "removable" infiltration. The rehabilitation costs

used in the CEA for each rehabilitation method are actual as-bid construction unit costs from the Town of Dedham's 2021 Sewer On-Call Services Contract with National Water Main Cleaning Company. For all rehabilitations not listed on the On-Call Services, estimated rehabilitation costs were based on prices from recent contracts awarded in this region. The rehabilitation costs listed in this report do not include the cost of additional investigative work or engineering services during design and construction. A list of rehabilitation unit costs used in the CEA is included in Appendix A, *Unit Costs for Rehabilitations*.

The CEA table shows the T&T cost associated with the observed infiltration as well as recommended rehabilitation methods and costs. The analysis produces one of four conclusions:

- **Excessive** indicates the cost to rehabilitate the manhole is less than the associated T&T cost and that rehabilitation is recommended.
- **Value-Effective** indicates the rehabilitation cost is more than the T&T cost, but the rehabilitation is still recommended because of the relative value of the repair.
- **Non-Excessive** indicates the cost to rehabilitate the manhole is more than the T&T cost and rehabilitation is not recommended at this time.
- **Non-Excessive Recommended** indicates the rehabilitation cost is more than the T&T cost, but rehabilitation is recommended due to the severity of the defect. Non-Excessive Recommended rehabilitations include defects that are in need of structural repairs and could become sources of infiltration or result in emergency repairs as the condition of the defect continues to degrade.

The CEA results for manhole infiltration and a summary of the recommended rehabilitation costs are provided in Table 6, *MWRA CEA for Infiltration*. The CEA results for manhole inflow with recommended rehabilitation costs are included in Table 7, *MWRA CEA for Inflow*. A summary of the results of the CEA are as follows:

- 13,320 gpd of excessive removable infiltration at an estimated rehabilitation cost of \$75,003. The associated T&T cost is \$299,567.
- 504 gpd of value-effective removable infiltration at an estimated rehabilitation cost of \$12,078. The associated T&T cost is \$11,335.
- 10,214 gpd of peak design storm inflow at an estimated rehabilitation cost of \$1,200.

In addition, the following structural manhole repairs are not cost-effective but are recommended and included in the Recommended Rehabilitation Program:

- \$1,500 to replace frame and/or cover of one manhole
- \$1,000 to repair the bench and invert of two manholes
- \$500 to repair one manhole chimney

Miscellaneous Findings

Based on the observations made during the 2021 Sewer Manhole Investigation, the following conditions were not recommended for rehabilitations, but are worth noting for potential follow up:

- External drop connection entering XX-50 appears blocked
- Internal drop structure broken in manholes GG-910 and YY-570
- Service drop structure blocked in manhole XX-440

Conclusions & Recommendations

Based on the observations made during the 2021 Sewer Manhole Investigation, Weston & Sampson has developed a Recommended Rehabilitation Program for identified defects and sources of I/I within the inspected manholes. The recommended rehabilitations are provided in Tables 6 and 7, with a summary

provided below.

Recommended Rehabilitation Program:

Perform root treatment of five manholes:	\$ 1,000
Cementitious lining of 64 manholes:	\$ 86,081
Replace one manhole frame and cover:	\$ 1,500
Repair one manhole chimney:	\$ 500
Repair two manhole bench and inverts:	\$ 1,000
Installation of eight inflow dishes:	\$ 1,200
Total Construction Cost:	\$ 91,281

It is important to note that manhole structures may degrade between the time of inspection and the time of rehabilitation. Generally, the more time that elapses the greater the chance of material and structural degradation.

Future Work

Weston & Sampson recommends that the town continue with its proactive approach towards inspection and rehabilitation of its sewer system. Annual sewer system inspection ensures that necessary rehabilitation work is identified and performed on a regular and timely basis to reduce I/I and prevent serious problems requiring costly emergency repairs. It is recommended that manhole inspections of as many as 782 manholes be conducted in sewer subareas AA, CC, FF, HH, PP and ZZ as part of Year 5 of the Annual I/I Program in Spring 2022. We are available to provide a scope and cost for this work at your request.

We wish to thank you and the members of the Engineering Department staff for their assistance while completing this project. We are available to meet with you at your earliest convenience to discuss this report. Please do not hesitate to contact me at (978) 532-1900 with any questions or comments you may have.

Sincerely,

WESTON & SAMPSON



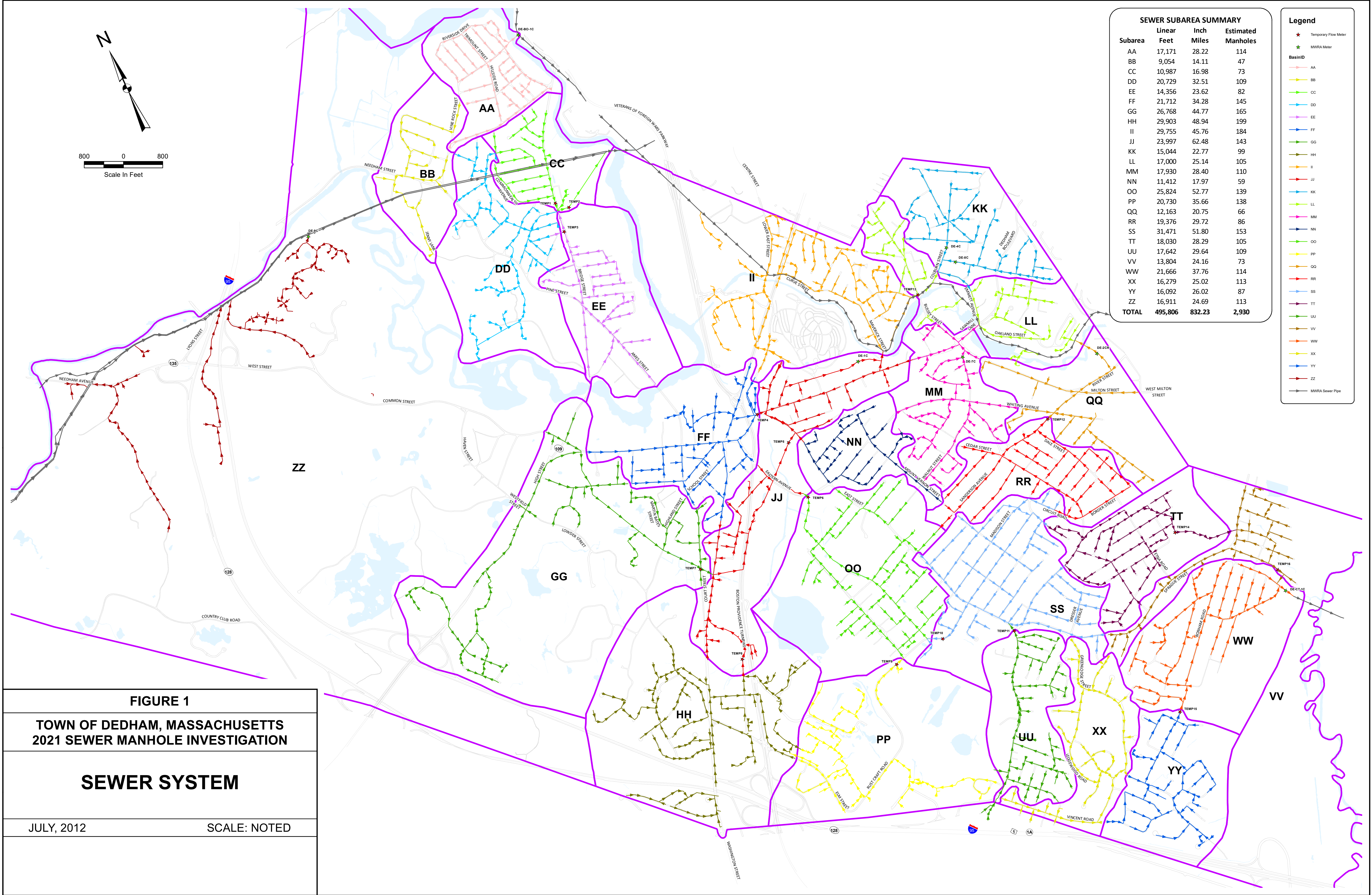
Nathan E. Michael, PE
Team Leader

cc: Nathan S. Buttermore, PE, Infrastructure Engineer
Ronald I. Lawrence, Project Engineer

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FIGURES

FIGURE 1 – SEWER SYSTEM



SEWER SUBAREA SUMMARY			
Subarea	Linear Feet	Inch Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	47
CC	10,987	16.98	73
DD	20,729	32.51	109
EE	14,356	23.62	82
FF	21,712	34.28	145
GG	26,768	44.77	165
HH	29,903	48.94	199
II	29,755	45.76	184
JJ	23,997	62.48	143
KK	15,044	22.77	99
LL	17,000	25.14	105
MM	17,930	28.40	110
NN	11,412	17.97	59
OO	25,824	52.77	139
PP	20,730	35.66	138
QQ	12,163	20.75	66
RR	19,376	29.72	86
SS	31,471	51.80	153
TT	18,030	28.29	105
UU	17,642	29.64	109
VV	13,804	24.16	73
WW	21,666	37.76	114
XX	16,279	25.02	113
YY	16,092	26.02	87
ZZ	16,911	24.69	113
TOTAL	495,806	832.23	2,930

- Legend**
- ★ Temporary Flow Meter
 - ★ MWRA Meter
 - BasinID
 - AA
 - BB
 - CC
 - DD
 - EE
 - FF
 - GG
 - HH
 - II
 - JJ
 - KK
 - LL
 - MM
 - NN
 - OO
 - PP
 - QQ
 - RR
 - SS
 - TT
 - UU
 - VV
 - WW
 - XX
 - YY
 - ZZ
 - MWRA Sewer Pipe

FIGURE 1
TOWN OF DEDHAM, MASSACHUSETTS
2021 SEWER MANHOLE INVESTIGATION

SEWER SYSTEM

JULY, 2012 SCALE: NOTED

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TABLES

TABLE 1 – SEWER SYSTEM SUMMARY

TABLE 2 – MANHOLE SUMMARY

TABLE 3 – MANHOLE INFLOW SUMMARY

TABLE 4 –MANHOLE STRUCTURAL DEFECTS

TABLE 5 – MANHOLE INSPECTION STATUS

TABLE 6 – MWRA CEA FOR INFILTRATION

TABLE 7 – MWRA CEA FOR INFLOW

TABLE 1
SEWER SYSTEM SUMMARY
 DEDHAM, MASSACHUSETTS
 2021 SEWER MANHOLE INVESTIGATION

Subarea	Estimated Linear Footage (ft)	Inch*Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	47
CC	10,987	16.98	73
DD	20,729	32.51	109
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FF	21,712	34.28	145
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HH	29,903	48.94	199
II	29,755	45.76	184
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KK	15,044	22.77	99
LL	17,000	25.14	105
MM	17,930	28.4	110
NN	11,412	17.97	59
OO	25,824	52.77	139
PP	20,730	35.66	138
QQ	12,163	20.75	66
RR	19,376	29.72	86
SS	31,471	51.8	153
TT	18,030	28.29	105
UU	17,642	29.64	109
VV	13,804	24.16	73
WW	21,666	37.76	114
XX	16,279	25.02	113
YY	16,092	26.02	87
ZZ	16,911	24.69	113
TOTAL	495,806	832.23	2,930

TABLE 2
MANHOLE SUMMARY
DEDHAM, MASSACHUSETTS
2021 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
BB	010	CLAY BANK ROAD	LINED	13.4	0	0
BB	011	CLAY BANK ROAD	LINED	7.8	0	0
BB	020	CLAY BANK ROAD	LINED	6.6	0	0
BB	030	JENNEY LANE	PRECAST	18.3	0	0
BB	035	JENNEY LANE	CNL			0
BB	040	JENNEY LANE	LINED	11.8	2,880	0
BB	050	JENNEY LANE	PRECAST	12.1	0	0
BB	060	JENNEY LANE	PRECAST	7.8	0	0
BB	070	JENNEY LANE	PRECAST	7.6	0	0
BB	075	JENNEY LANE	CNL			0
BB	080	CLAY BANK ROAD	LINED	5.1	0	0
BB	090	CLAY BANK ROAD	LINED	9.4	0	0
BB	100	NEEDHAM STREET	LINED	10.2	0	0
BB	110	NEEDHAM STREET	LINED	14.4	0	0
BB	130	NEEDHAM STREET	PRECAST	7.8	0	0
BB	140	NEEDHAM STREET	PRECAST	8	288	0
BB	150	PINE STREET	BRICK	6.5	0	0
BB	160	PINE STREET	LINED	5.7	0	0
BB	170	PINE STREET	PRECAST	6.2	0	0
BB	190	NEEDHAM STREET	PRECAST	9	0	0
BB	200	NEEDHAM STREET	PRECAST	9.6	0	0
BB	210	NEEDHAM STREET	PRECAST	4.8	0	0
BB	220	ROSEMARY ROAD	LINED	19.7	288	0
BB	230	ROSEMARY ROAD	LINED	15.5	144	0
BB	240	ROSEMARY ROAD	BRICK	12.1	0	0
BB	250	ROSEMARY ROAD	BRICK	8.8	0	0
BB	260	ROSEMARY ROAD	LINED	6.5	0	0
BB	270	ROSEMARY ROAD	BRICK	5.3	0	0
BB	280	ROSEMARY ROAD	BRICK	5.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
BB	290	ROSEMARY ROAD	BRICK	5.3	0	0
BB	300	ROSEMARY ROAD	BRICK	7.6	288	0
BB	310	ROSEMARY ROAD	BRICK	6.8	0	0
BB	320	ROSEMARY ROAD	BRICK	8	0	0
BB	330	VINE ROCK STREET	PRECAST	7.2	0	0
BB	340	VINE ROCK STREET	PRECAST	8.1	0	0
BB	350	VINE ROCK STREET	CNL			0
BB	360	VINE ROCK STREET	PRECAST	5.8	0	0
BB	370	CUNNINGHAM ROAD	BRICK	4	0	0
BB	380	CUNNINGHAM ROAD	BRICK	3.3	0	0
BB	390	LYNCH AVENUE	BRICK	5.5	0	0
BB	400	LYNCH AVENUE	BRICK	4.6	0	0
BB	410	LYNCH AVENUE	LINED	7.5	0	0
BB	430	CUNNINGHAM ROAD	LINED	5.6	0	0
BB	440	CUNNINGHAM ROAD	LINED	7.7	0	0
BB	450	CUNNINGHAM ROAD	LINED	5.4	0	0
BB	460	CUNNINGHAM ROAD	BRICK	6.5	0	0
BB	470	NEEDHAM STREET	CNL			0
GG	010	COURT STREET	PRECAST	10.2	0	0
GG	020	COURT STREET	PRECAST	11.9	0	0
GG	030	COURT STREET	LINED	10.7	0	0
GG	040	COURT STREET	CNL			0
GG	050	HIGHLAND STREET	CNL			0
GG	070	HIGHLAND STREET	LINED	7.4	0	0
GG	080	HIGHLAND STREET	CNL			0
GG	090	HIGHLAND STREET	LINED	9.1	0	0
GG	091	LOWDER STREET EASEMENT	LINED	4.2	0	0
GG	092	LOWDER STREET EASEMENT	PRECAST	3.8	0	0
GG	093	LOWDER STREET EASEMENT	PRECAST	4.1	0	0
GG	093 A	LOWDER STREET EASEMENT	PRECAST	3.6	0	0
GG	094	LOWDER STREET EASEMENT	PRECAST	12.1	0	0
GG	095	LOWDER STREET EASEMENT	BRICK	9	0	0
GG	096	LOWDER STREET EASEMENT	PRECAST	5.1	0	0
GG	097	LOWDER STREET EASEMENT	PRECAST	5.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
GG	098	LOWDER STREET EASEMENT	PRECAST	3.5	0	0
GG	099	LOWDER STREET EASEMENT	PRECAST	5.2	0	0
GG	100	HIGHLAND STREET	CNL			0
GG	105	HIGHLAND STREET	CNL			0
GG	110	VILLAGE AVENUE	CNL			0
GG	120	VILLAGE AVENUE	CNL			0
GG	130	VILLAGE AVENUE	LINED	19.9	0	0
GG	140	VILLAGE AVENUE	BRICK	19.1	0	0
GG	160	WIGWAM BROOK LINE	LINED	6.6	0	0
GG	170	HIGH STREET	BRICK	20	0	1,728
GG	180	HIGH STREET	BRICK	17	0	0
GG	190	HIGH STREET	LINED	15.9	0	0
GG	200	HIGH STREET	LINED	13.2	0	0
GG	210	HIGH STREET	LINED	13.7	0	0
GG	220	HIGH STREET	LINED	14.9	0	0
GG	230	HIGH STREET	LINED	12.3	0	0
GG	240	HIGH STREET	LINED	13.1	0	0
GG	250	HIGH STREET	BRICK	11.2	0	0
GG	260	HIGH STREET	LINED	10.2	0	0
GG	270	HIGH STREET	LINED	14.9	0	0
GG	280	HIGH STREET	LINED	13.9	0	0
GG	282	HIGH STREET	PRECAST	9.1	0	0
GG	290	HIGH STREET	LINED	10.1	0	0
GG	300	HIGH STREET	LINED	6.3	0	0
GG	310	HIGH STREET	LINED	8.2	0	0
GG	320	HIGH STREET	LINED	14.6	0	0
GG	330	HIGH STREET	LINED	14.6	0	0
GG	340	HIGH STREET	LINED	9.4	0	0
GG	350	HIGH STREET	PRECAST	9.4	0	0
GG	352	HIGH STREET	PRECAST	5.4	0	0
GG	360	HIGH STREET EASEMENT	PRECAST	15	0	0
GG	370	HIGH STREET EASEMENT	PRECAST	16.9	0	0
GG	380	HIGH STREET EASEMENT	PRECAST	13.1	0	0
GG	382	HIGH STREET EASEMENT	PRECAST	3.9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
GG	390	HIGH STREET EASEMENT	PRECAST	9.6	0	0
GG	392	HIGH STREET EASEMENT	PRECAST	7.6	0	0
GG	394	HIGH STREET EASEMENT	PRECAST	6.4	0	0
GG	400	HIGH STREET EASEMENT	PRECAST	6.5	720	0
GG	410	HIGH STREET EASEMENT	LINED	6.2	0	0
GG	420	HIGH STREET EASEMENT	LINED	8.9	0	0
GG	430	HIGH STREET EASEMENT	LINED	4.9	0	0
GG	440	HIGH STREET EASEMENT	LINED	5.2	0	0
GG	450	ROBERT ROAD	LINED	7.7	0	0
GG	460	ROBERT ROAD	LINED	5.4	0	0
GG	470	ROBERT ROAD	LINED	5.8	0	0
GG	480	BOOTH ROAD	LINED	7.9	0	0
GG	490	ROBERT ROAD	LINED	7	0	0
GG	500	ROBERT ROAD	LINED	6	0	0
GG	510	ROBERT ROAD	LINED	6	0	0
GG	520	ROBERT ROAD	LINED	5.8	0	0
GG	530	ROBERT ROAD	PRECAST	5.8	0	0
GG	540	BOOTH ROAD	PRECAST	7.5	144	0
GG	550	BOOTH ROAD	PRECAST	6.1	0	0
GG	560	BOOTH ROAD	LINED	11.8	144	0
GG	570	BOOTH ROAD	PRECAST	14.3	0	0
GG	580	DEERPATH ROAD	LINED	7.1	0	0
GG	585	DEERPATH ROAD	LINED	8.5	0	0
GG	590	DEERPATH ROAD	LINED	7.2	144	0
GG	595	DEERPATH ROAD	LINED	7.2	0	0
GG	600	DEERPATH ROAD	LINED	7.2	0	0
GG	602	MEADOWBROOK ROAD	PRECAST	4.5	0	0
GG	605	MEADOWBROOK ROAD	PRECAST	6.1	0	0
GG	608	MEADOWBROOK ROAD	PRECAST	6.1	0	0
GG	611	MEADOWBROOK ROAD	PRECAST	6.8	0	0
GG	612	MEADOWBROOK ROAD	PRECAST	6.8	0	0
GG	614	MEADOWBROOK ROAD	PRECAST	5.3	0	0
GG	617	MEADOWBROOK ROAD	PRECAST	5.3	0	0
GG	620	MEADOWBROOK ROAD	PRECAST	5.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
GG	630	BOOTH ROAD	PRECAST	6.5	0	0
GG	640	BOOTH ROAD	PRECAST	6.6	0	0
GG	650	BOOTH ROAD	PRECAST	6.9	0	0
GG	660	BOOTH ROAD	PRECAST	5.1	0	0
GG	670	ROBERT ROAD	LINED	5.7	0	0
GG	680	ROBERT ROAD	LINED	9.7	0	0
GG	690	BOOTH ROAD	LINED	6.6	0	0
GG	700	BOOTH ROAD	PRECAST	6.6	0	0
GG	710	BOOTH ROAD	LINED	7.3	0	0
GG	720	RIDLEY ROAD	PRECAST	4.9	0	0
GG	730	RIDLEY ROAD	PRECAST	5.9	0	0
GG	740	BOOTH ROAD	LINED	4.8	0	0
GG	750	BOOTH ROAD	PRECAST	7.1	0	0
GG	760	BOOTH ROAD	LINED	6.8	0	0
GG	770	ROBERT ROAD	LINED	8.3	0	0
GG	780	ROBERT ROAD	PRECAST	6.4	0	0
GG	790	ROBERT ROAD	LINED	7	0	0
GG	800	ROBERT ROAD	PRECAST	8.7	0	0
GG	810	ROBERT ROAD	PRECAST	7.5	0	0
GG	820	ROBERT ROAD	PRECAST	6	0	0
GG	830	ROBERT ROAD	PRECAST	5.4	0	0
GG	840	LOWDER STREET	LINED	8.1	0	0
GG	842	LOWDER STREET	PRECAST	5.2	0	0
GG	850	LOWDER STREET	LINED	8	0	0
GG	860	LOWDER STREET	PRECAST	3.3	0	0
GG	865	COMMON STREET	BRICK	17.1	0	0
GG	870	BRIDGE STREET	PRECAST	18.9	0	0
GG	880	BRIDGE STREET	LINED	16.9	0	3,460
GG	890	BRIDGE STREET	LINED	4.7	0	0
GG	910	COMMON STREET	LINED	19.6	0	0
GG	920	COMMON STREET	LINED	11.9	0	0
GG	930	DEXTER STREET	PRECAST	7.2	0	0
GG	940	VILLAGE AVENUE	LINED	10.5	0	0
GG	941	VILLAGE AVENUE	BRICK	10.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
GG	950	VILLAGE AVENUE	LINED	10.2	0	0
GG	960	VILLAGE AVENUE	LINED	10.7	144	0
GG	970	VILLAGE AVENUE	LINED	8.6	0	0
GG	980	VILLAGE AVENUE	LINED	10.1	0	0
GG	990	VILLAGE AVENUE	LINED	10.2	0	0
GG	1000	RODMAN PLACE	BRICK	8.1	0	0
GG	1010	ALLINDALE WAY	BRICK	14.5	0	0
GG	1020	WAMPATUCK ROAD	BRICK	12.5	0	0
GG	1030	WAMPATUCK ROAD	LINED	8.9	0	0
GG	1035	LOWDER STREET	PRECAST	5	0	0
GG	1040	WAMPATUCK ROAD	LINED	13.3	0	0
GG	1050	WAMPATUCK ROAD	BRICK	11.3	0	0
GG	1060	WAMPATUCK ROAD	BRICK	7.7	0	0
GG	1070	VILLAGE AVENUE	LINED	10.6	0	0
GG	1080	VILLAGE AVENUE	BRICK	9.2	0	0
GG	1090	VILLAGE AVENUE	BRICK	11.2	0	0
GG	1100	VILLAGE AVENUE	LINED	9.2	0	0
GG	1110	OLD FARM ROAD	BRICK	8.7	0	0
GG	1120	OLD FARM ROAD	BRICK	8.4	0	0
GG	1130	HIGHLAND STREET	LINED	8.2	0	0
GG	1140	HIGHLAND STREET	LINED	11.8	0	0
GG	1150	HIGHLAND STREET	LINED	9.2	0	0
GG	1170	HIGHLAND STREET	LINED	10.4	0	0
GG	1180	HIGHLAND STREET	BRICK	8	0	0
GG	1190	RICHARDS STREET	LINED	11.7	0	0
GG	1200	RICHARDS STREET	BRICK	9.3	0	0
GG	1220	MARTIN BATES STREET	LINED	5.9	0	0
GG	1230	MARTIN BATES STREET	LINED	5.4	432	0
GG	1240	MARTIN BATES STREET	LINED	4.8	144	0
GG	1250	MARTIN BATES STREET	LINED	6.9	0	0
GG	1260	MARTIN BATES STREET	LINED	8.2	0	0
GG	1270	MARTIN BATES STREET	LINED	10.1	0	0
GG	1280	MARTIN BATES STREET	BRICK	8.8	0	0
GG	1290	MARTIN BATES STREET	BRICK	9.2	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
GG	1300	COURT STREET	LINED	7	144	0
GG	1310	COURT STREET	BRICK	4.4	0	0
GG	1320	COURT STREET	LINED	12.9	0	0
GG	1330	COURT STREET	BRICK	9.1	0	0
GG	1340	COURT STREET	BRICK	9	0	0
GG	1350	COURT STREET	BRICK	10	0	0
GG	1360	COURT STREET	BRICK	8.8	0	0
GG	1365	COURT STREET	BRICK	9.3	0	0
GG	1370	COURT STREET	BRICK	8.9	0	0
GG	1380	NEWCOURT LANE	BRICK	5.9	0	1,000
GG	1390	RICHARDS STREET	BRICK	8.5	0	0
GG	1400	RICHARDS STREET	BRICK	8	0	0
GG	1410	WEATHERBEE LANE	BRICK	8.5	0	0
UU	010	EAST STREET	BRICK	9.9	0	0
UU	020	EAST STREET	PRECAST	10.3	288	0
UU	030	EAST STREET	LINED	12.7	0	0
UU	040	EAST STREET	LINED	13	720	0
UU	050	EAST STREET	LINED	13	0	0
UU	060	EAST STREET	LINED	8.8	0	0
UU	070	EAST STREET	LINED	7.9	0	0
UU	071	BROWN TERRACE	PRECAST	4	0	0
UU	072	BROWN TERRACE	PRECAST	6.5	0	0
UU	080	EAST STREET	LINED	8.5	288	0
UU	085	EAST STREET	PRECAST	9.6	144	0
UU	090	EAST STREET	PRECAST	9	0	0
UU	100	EAST STREET	LINED	11.1	144	0
UU	110	EAST STREET	BRICK	10.4	0	0
UU	120	EAST STREET	BRICK	8.6	0	0
UU	130	EAST STREET	PRECAST	6.8	0	0
UU	140	EAST STREET	PRECAST	5.5	432	0
UU	150	EAST STREET	LINED	6.7	0	0
UU	160	EAST STREET	PRECAST	11.7	0	0
UU	162	LIANA LANE	PRECAST	11	0	0
UU	164	LIANA LANE	PRECAST	10.8	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
UU	166	LIANA LANE	PRECAST	9.9	144	0
UU	168	LIANA LANE	PRECAST	9.8	0	0
UU	170	EAST STREET	BRICK	13	0	0
UU	180	EAST STREET	BRICK	13.6	0	0
UU	190	EAST STREET	BRICK	12	0	0
UU	200	EAST STREET	BRICK	11.9	0	0
UU	210	EAST STREET	PRECAST	11.9	0	0
UU	220	EAST STREET	PRECAST	12.8	0	0
UU	222	DELAPA CIRCLE	PRECAST	5.3	0	0
UU	230	EAST STREET	PRECAST	14.8	0	0
UU	240	EAST STREET	PRECAST	17.6	0	0
UU	250	EAST STREET	PRECAST	10.1	0	0
UU	251	EAST STREET	PRECAST	11.2	0	0
UU	252	EAST STREET	PRECAST	11.3	0	0
UU	260	TOP HILL AVENUE	PRECAST	7.7	0	0
UU	270	TOP HILL AVENUE	BRICK	8.4	0	0
UU	280	TOP HILL AVENUE	BRICK	8.1	0	0
UU	290	TOP HILL AVENUE	LINED	8.3	0	0
UU	295	UPLAND ROAD	PRECAST	7	0	0
UU	300	HERMAINE AVENUE	BRICK	7.8	144	0
UU	310	HERMAINE AVENUE	BRICK	6.9	0	0
UU	320	HERMAINE AVENUE	BRICK	7.3	0	0
UU	330	HERMAINE AVENUE	BRICK	4.6	0	0
UU	340	UPLAND ROAD	BRICK	11	0	0
UU	350	UPLAND ROAD	BRICK	9	720	0
UU	360	UPLAND ROAD	LINED	7.7	0	0
UU	370	UPLAND ROAD	LINED	8.5	0	0
UU	380	UPLAND ROAD	BRICK	7.2	432	0
UU	390	WALTERS AVENUE	BRICK	3.8	0	0
UU	400	PINE GROVE AVENUE	BRICK	2.1	0	0
UU	410	PRESTON STREET	BRICK	9.6	2,880	0
UU	420	PRESTON STREET	BRICK	7.3	0	0
UU	430	PRESTON STREET	BRICK	9.6	0	0
UU	440	PRESTON STREET	PRECAST	9.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
UU	450	CYNTHIA ROAD	BRICK	9.4	0	0
UU	460	JUDITH CIRCLE	LINED	8.1	0	0
UU	470	JUDITH CIRCLE	PRECAST	7	0	0
UU	480	JUDITH CIRCLE	PRECAST	6.5	432	0
UU	490	CYNTHIA ROAD	PRECAST	8.4	0	0
UU	500	CYNTHIA ROAD	LINED	9	0	0
UU	510	ROSEN ROAD	PRECAST	9.3	0	0
UU	520	CYNTHIA ROAD	PRECAST	8.6	0	0
UU	530	ROSEN ROAD	PRECAST	8.5	0	0
UU	540	LAMOINE STREET	BRICK	9.3	0	0
UU	550	LAMOINE STREET	BRICK	6.3	288	0
UU	560	NORWICH STREET	PRECAST	7.9	0	1,000
UU	570	NORWICH STREET	PRECAST	8.1	0	0
UU	580	EAST STREET	BRICK	9.4	0	0
UU	590	EAST STREET	LINED	7.6	0	0
UU	600	EAST STREET	LINED	4.9	0	0
UU	610	EAST STREET	BRICK	5	0	0
UU	620	EAST STREET	BRICK	7	0	0
UU	640	SOUTHGATE STREET	BRICK	8.1	0	0
UU	650	SOUTHGATE STREET	BRICK	8	144	0
UU	660	SOUTHGATE STREET	BRICK	9.6	288	0
UU	670	CRESTON AVENUE	BRICK	5.1	144	0
UU	680	RIDGEWAY STREET	BRICK	4.1	0	0
UU	690	CRESTON AVENUE	BRICK	3.7	0	0
UU	700	RIDGEWAY STREET	BRICK	5.4	0	0
UU	710	RIDGEWAY STREET	BRICK	8.4	288	0
UU	720	RIDGEWAY STREET	BRICK	8.8	0	0
UU	730	RIDGEWAY STREET	BRICK	7.5	144	0
UU	740	RIDGEWAY STREET	BRICK	6.3	0	0
UU	750	RIDGEWAY STREET	BRICK	5.9	0	0
UU	760	CAREY LANE	PRECAST	6.4	0	0
UU	765	CAREY LANE	PRECAST	5.4	0	0
UU	770	GRANITE STREET	BRICK	8.2	0	0
UU	775	GRANITE STREET	PRECAST	6.9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
UU	780	WINSTEAD AVENUE	BRICK	7.9	0	0
UU	790	SOUTHGATE STREET	PRECAST	6.5	0	0
UU	800	WINSTEAD AVENUE	LINED	6.7	0	0
UU	810	WINSTEAD AVENUE	BRICK	3.5	0	0
UU	820	WINSTEAD AVENUE	BRICK	4.1	0	0
UU	830	MALONE STREET	BLOCK	3.6	0	0
UU	840	SOUTHGATE STREET	BRICK	3.2	0	0
UU	850	WINFIELD STREET	LINED	13.7	0	0
UU	860	WINFIELD STREET	BRICK	9.7	432	0
UU	870	CHESTER AVENUE	BRICK	5.5	0	0
UU	880	OVERLOOK ROAD	LINED	10.4	0	0
UU	890	OVERLOOK ROAD	BRICK	5.8	0	0
UU	900	CRESTON AVENUE	BRICK	8.8	0	0
UU	920	ALPENA AVENUE	BRICK	2.3	0	0
UU	930	ALPENA AVENUE	BRICK	8	0	0
UU	940	ALPENA AVENUE	BRICK	8.1	0	0
UU	950	CHESTER AVENUE	BRICK	5.5	0	0
UU	960	CHESTER AVENUE	BRICK	6.8	0	0
UU	970	CHESTER AVENUE	BRICK	5.9	0	0
UU	980	EAST STREET	PRECAST	8.3	0	0
XX	010	GREENLODGE STREET	LINED	10.3	0	0
XX	020	FOX MEADOW LANE	BRICK	10.9	0	0
XX	030	GREENLODGE STREET	LINED	10.1	0	0
XX	040	GREENLODGE STREET	LINED	9.1	0	0
XX	050	GREENLODGE STREET	BRICK	8.8	0	0
XX	060	GREENLODGE STREET	BRICK	13.5	144	0
XX	070	GREENLODGE STREET	BRICK	10	0	0
XX	080	GREENLODGE STREET	BRICK	8.7	0	0
XX	090	GREENLODGE STREET	BRICK	7.3	0	0
XX	100	GREENLODGE STREET	BRICK	10	0	0
XX	110	GREENLODGE STREET	PRECAST	12.1	0	0
XX	120	GREENLODGE STREET	BRICK	12.5	144	0
XX	130	GREENLODGE STREET	BRICK	11.4	0	0
XX	140	GREENLODGE STREET	BRICK	12.5	144	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
XX	150	GREENLODGE STREET	LINED	13.7	0	0
XX	160	GREENLODGE STREET	BRICK	15.2	0	0
XX	170	GREENLODGE STREET	BRICK	6.6	0	0
XX	180	GREENLODGE STREET	BRICK	6.3	0	0
XX	190	GREENLODGE STREET	LINED	7.1	0	0
XX	200	GREENLODGE STREET	BRICK	11.4	0	0
XX	210	GREENLODGE STREET	PRECAST	9.5	0	0
XX	220	GREENLODGE STREET	BRICK	8.2	576	0
XX	230	GREENLODGE STREET	LINED	8.1	0	0
XX	240	GREENLODGE STREET	BRICK	8.1	144	0
XX	250	FOX MEADOW LANE	BRICK	7.5	144	0
XX	260	FOX MEADOW LANE	LINED	11.3	0	0
XX	270	INTERVALE ROAD	BRICK	10.8	0	0
XX	280	FOX MEADOW LANE	BRICK	6.2	432	0
XX	290	FOX MEADOW LANE	BRICK	6.6	432	0
XX	300	VINCENT ROAD	BRICK	6.8	0	0
XX	310	VINCENT ROAD	BRICK	6.7	0	0
XX	320	VINCENT ROAD	CNL			0
XX	330	VINCENT ROAD	BRICK	6.5	0	0
XX	340	VINCENT ROAD	LINED	5.5	0	0
XX	350	VINCENT ROAD	BRICK	7.8	288	0
XX	360	VINCENT ROAD	BRICK	7.7	0	0
XX	370	VINCENT ROAD	BRICK	8.5	432	0
XX	375	ALPENA AVENUE	BRICK	7.6	0	0
XX	380	VINCENT ROAD	BRICK	8.8	0	0
XX	390	VINCENT ROAD	BRICK	8.2	0	0
XX	400	INTERVALE ROAD	BRICK	6	0	0
XX	410	INTERVALE ROAD	BRICK	5.2	144	0
XX	420	INTERVALE ROAD	LINED	5	0	0
XX	430	HERITAGE HILL	LINED	8.3	0	0
XX	440	HERITAGE HILL	BRICK	7.6	0	0
XX	450	HERITAGE HILL	BRICK	9.7	288	0
XX	460	HERITAGE HILL	PRECAST	14.4	144	0
XX	470	HERITAGE HILL	PRECAST	13.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
XX	480	HERITAGE HILL	LINED	12.3	0	0
XX	490	HERITAGE HILL	PRECAST	12.3	0	0
XX	500	HERITAGE HILL	PRECAST	11	288	0
XX	510	HERITAGE HILL	PRECAST	10.2	0	0
XX	520	HERITAGE HILL	PRECAST	11	0	0
XX	530	LEDGEWOOD ROAD	BRICK	5.7	0	0
XX	540	LEDGEWOOD ROAD	BRICK	9.2	288	0
XX	550	LEDGEWOOD ROAD	LINED	9.2	0	0
XX	560	LEDGEWOOD ROAD	BRICK	6.6	0	0
XX	570	LEDGEWOOD ROAD	BRICK	8.3	0	0
XX	580	LEDGEWOOD ROAD	BRICK	7.8	0	0
XX	590	LEDGEWOOD ROAD	BRICK	9.9	0	0
XX	600	LEDGEWOOD ROAD	LINED	14.3	0	0
XX	610	LEDGEWOOD ROAD	LINED	11.1	0	0
XX	620	LEDGEWOOD ROAD	BRICK	5.3	0	0
XX	630	LEDGEWOOD ROAD	BRICK	5.9	0	0
XX	640	LEDGEWOOD ROAD	BRICK	7.7	0	0
XX	650	LEDGEWOOD ROAD	BRICK	10.3	0	0
XX	660	LEDGEWOOD ROAD	LINED	7.4	0	0
XX	670	LEDGEWOOD ROAD	BRICK	7.1	0	0
XX	680	LEDGEWOOD ROAD	BRICK	7	0	0
XX	700	BLUEBERRY HILL	BRICK	5.7	288	0
XX	710	BLUEBERRY HILL	PRECAST	9	0	0
XX	720	INTERVALE ROAD	LINED	8.1	0	0
XX	730	INTERVALE ROAD	BRICK	6.7	1,008	0
XX	740	INTERVALE ROAD	BRICK	6.2	864	0
XX	750	CORONATION DRIVE	BRICK	5.9	0	0
XX	760	CORONATION DRIVE	BRICK	4.6	0	0
XX	770	CORONATION DRIVE	BRICK	7.8	0	0
XX	780	CORONATION DRIVE	BRICK	4.2	0	0
XX	790	CORONATION DRIVE	BRICK	4.8	0	0
XX	800	INTERVALE ROAD	BRICK	5.8	0	0
XX	810	INTERVALE ROAD	BRICK	6.4	0	0
XX	820	INTERVALE ROAD	BRICK	8.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
XX	830	INTERVALE ROAD	BRICK	8.7	0	0
XX	840	INTERVALE ROAD	BRICK	6.2	0	0
XX	850	INTERVALE ROAD	BRICK	5.8	288	0
XX	860	INTERVALE ROAD	BRICK	6.1	0	0
XX	870	CORONATION DRIVE	BRICK	7.8	0	0
XX	880	CORONATION DRIVE	BRICK	7.8	0	0
XX	890	CORONATION DRIVE	BRICK	6	0	0
XX	900	CORONATION DRIVE	BRICK	7.4	0	0
XX	910	CORONATION DRIVE	BRICK	8.1	0	0
XX	930	MARGARET ROAD	PRECAST	4.8	0	0
XX	940	STOUGHTON ROAD	CNO			0
XX	950	STOUGHTON ROAD	BRICK	8.6	0	0
XX	960	STOUGHTON ROAD	BRICK	7.9	288	0
XX	970	STOUGHTON ROAD	BRICK	7	288	0
XX	980	STOUGHTON ROAD	BRICK	9.3	576	0
XX	985	NOBEL ROAD	PRECAST	4.3	0	0
XX	990	STOUGHTON ROAD	BRICK	9.6	1,296	0
XX	1000	STOUGHTON ROAD	LINED	6.8	144	0
XX	1010	STEPHEN LANE	PRECAST	6.4	0	0
XX	1020	STEPHEN LANE	PRECAST	4.8	0	0
XX	1030	STEPHEN LANE	PRECAST	3.4	0	0
XX	1040	COLWELL DRIVE	BRICK	6.9	0	0
XX	1050	COLWELL DRIVE	BRICK	6.7	0	0
XX	1060	SMITH CIRCLE	PRECAST	8.1	0	0
XX	1070	OVERLOOK ROAD	BRICK	3	0	0
XX	1075	GAIL LANE	PRECAST	3.9	0	0
XX	1080	CRANSTON AVENUE	LINED	2.1	0	0
XX	1090	CRESTON AVENUE	BRICK	6.4	0	0
XX	1100	CHESTER AVENUE	LINED	7.3	288	432
XX	1110	CHESTER AVENUE	BRICK	6.8	0	0
XX	1120	OVERLOOK ROAD	BRICK	4.4	0	0
YY	010	COLWELL DRIVE	BRICK	7.1	288	0
YY	020	SCOTT CIRCLE	BRICK	8.1	0	0
YY	030	COLWELL DRIVE	LINED	8.9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
YY	040	COLWELL DRIVE	LINED	9.7	0	0
YY	050	COLWELL DRIVE	LINED	10.5	0	0
YY	060	COLWELL DRIVE	LINED	11.2	0	0
YY	070	COLWELL DRIVE	LINED	10	144	0
YY	080	COLWELL DRIVE	LINED	9.9	0	0
YY	090	COLWELL DRIVE	LINED	10.7	0	0
YY	100	GREENLODGE STREET	LINED	11	0	0
YY	120	SCOTT CIRCLE	LINED	8.3	0	0
YY	130	SCOTT CIRCLE	BRICK	8.4	288	0
YY	140	SCOTT CIRCLE	BRICK	9.4	0	0
YY	150	SCOTT CIRCLE	BRICK	9.4	0	0
YY	160	LAURIE LANE	BRICK	7.1	0	0
YY	170	CALVIN ROAD	BRICK	5.5	0	0
YY	180	CALVIN ROAD	BRICK	5	0	0
YY	190	CALVIN ROAD	PRECAST	2.6	0	0
YY	200	SCOTT CIRCLE	LINED	5.9	0	0
YY	210	SCOTT CIRCLE	LINED	6.4	0	0
YY	220	SCOTT CIRCLE	LINED	10	0	0
YY	230	CAROL DRIVE	BRICK	5	0	0
YY	240	CAROL DRIVE	BRICK	9.8	0	0
YY	250	CAROL DRIVE	BRICK	7	0	0
YY	260	CAROL DRIVE	BRICK	6.3	0	0
YY	270	CAROL DRIVE	BRICK	4.3	0	0
YY	280	CAROL DRIVE	BRICK	3.5	0	0
YY	290	CAROL DRIVE	BRICK	3.2	0	0
YY	300	WESLEY STREET	BRICK	4.5	0	0
YY	310	WESLEY STREET	BRICK	3.5	0	0
YY	320	CAROL DRIVE	LINED	8.5	0	0
YY	330	CAROL DRIVE	LINED	6.7	144	0
YY	340	CAROL DRIVE	BRICK	5.2	0	0
YY	350	CAROL DRIVE	BRICK	5.2	0	0
YY	360	CAROL DRIVE	BRICK	4.1	0	0
YY	370	FILLMORE ROAD	LINED	9.1	288	0
YY	380	FILLMORE ROAD	PRECAST	2.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
YY	390	CAROL DRIVE	LINED	8.8	0	0
YY	400	GREENLODGE STREET	PRECAST	8.9	0	0
YY	410	GREENLODGE STREET	LINED	10.7	0	0
YY	420	GREENLODGE STREET	LINED	12.1	0	0
YY	422	FILLMORE RD	PRECAST	8.3	144	0
YY	424	ROOSEVELT ROAD	PRECAST	7.1	0	0
YY	426	ROOSEVELT ROAD	PRECAST	2.3	0	0
YY	426 A	ROOSEVELT ROAD	PRECAST	5.3	0	0
YY	430	GREENLODGE STREET	PRECAST	7.6	0	0
YY	440	GREENLODGE STREET	BRICK	3.1	0	0
YY	450	GREENLODGE STREET	BRICK	1.7	0	0
YY	460	TRUMAN ROAD	BRICK	2.6	0	0
YY	470	TRUMAN ROAD	BRICK	2.7	0	0
YY	480	GREENLODGE STREET	PRECAST	4	0	0
YY	490	COACH LANE	PRECAST	4.4	0	0
YY	500	COACH LANE	PRECAST	3.3	0	0
YY	510	COACH LANE	PRECAST	4.4	0	0
YY	520	FLINTLOCKE LANE	BRICK	4.8	0	0
YY	530	FLINTLOCKE LANE	PRECAST	5.6	0	0
YY	540	FLINTLOCKE LANE	PRECAST	7.9	1,584	432
YY	550	COLWELL DRIVE	PRECAST	7.5	0	0
YY	560	BRIARWOOD LANE	LINED	9	0	0
YY	570	BRIARWOOD LANE	PRECAST	10.7	0	0
YY	580	BRIARWOOD LANE	PRECAST	7.8	0	432
YY	590	BRIARWOOD LANE	PRECAST	3.9	0	0
YY	610	GREENLODGE STREET	BRICK	10.7	0	0
YY	620	GREENLODGE STREET	BRICK	9.2	0	0
YY	630	GREENLODGE STREET	PRECAST	7	0	0
YY	640	GREENLODGE STREET	BRICK	3.6	0	0
YY	650	GREENLODGE STREET	BRICK	4.6	0	0
YY	660	PATTY LEE LANE	BRICK	4.1	0	0
YY	670	PATTY LEE LANE	BRICK	3.7	0	0
YY	680	MAYFAIR ROAD	LINED	6.4	144	0
YY	700	MAYFAIR ROAD	BRICK	6.5	432	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
YY	710	MAYFAIR ROAD	BRICK	8.7	720	0
YY	720	CRANBERRY LANE	BRICK	11	0	0
YY	730	VINCENT ROAD	BRICK	11.6	0	0
YY	740	VINCENT ROAD	BRICK	8.3	0	0
YY	750	VINCENT ROAD	BRICK	8.8	0	0
YY	760	VINCENT ROAD	BRICK	6.3	0	0
YY	770	INDIAN PATH	BLOCK	6.6	0	0
YY	780	VINCENT ROAD	BRICK	7.7	0	0
YY	790	VINCENT ROAD	PRECAST	5.2	0	0
YY	800	VINCENT ROAD	LINED	8.4	0	0
YY	810	VINCENT ROAD	PRECAST	8.3	0	0
YY	820	VINCENT ROAD	PRECAST	8.4	0	0
YY	830	VINCENT ROAD	PRECAST	9.6	0	0
YY	840	QUARRY ROAD	LINED	7.7	0	1,730
YY	850	QUARRY ROAD	LINED	8.4	0	0
YY	860	QUARRY ROAD	LINED	6.7	288	0
TOTAL MANHOLE INFILTRATION					28,224	10,214
TOTAL NUMBER OF MANHOLES					521	
TOTAL NUMBER OF MANHOLES INSPECTED					508	

TABLE 3
MANHOLE INFLOW SUMMARY
 DEDHAM, MASSACHUSETTS
 2021 MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inflow Type	Vent Holes	Diam. (in)	Number	Inflow (gpd)
GG	170	HIGH STREET	SHEET FLOW	YES	1/2	4	1,728
GG	880	BRIDGE STREET	SHEET FLOW	YES	1	2	3,460
GG	1380	NEWCOURT LANE	PONDING	NO			1,000
UU	560	NORWICH STREET	PONDING	NO			1,000
XX	1100	CHESTER AVENUE	SHEET FLOW	YES	1/2	1	432
YY	540	FLINTLOCKE LANE	SHEET FLOW	YES	1/2	1	432
YY	580	BRIARWOOD LANE	SHEET FLOW	YES	1/2	1	432
YY	840	QUARRY ROAD	SHEET FLOW	YES	1	1	1,730
TOTAL							10,214
TOTAL NUMBER OF MANHOLES							8

NOTES:

1. Manholes located in an easement will have a "Street Name" designation of an adjacent street.

TABLE 4
MANHOLE STRUCTURAL DEFECTS
 DEDHAM, MASSACHUSETTS
 2021 SEWER MANHOLE INVESTIGATION

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
GG	140	VILLAGE AVENUE	REPAIR BENCH/INVERT	\$500
XX	070	GREENLODGE STREET	REPAIR BENCH/INVERT	\$500
YY	060	COLWELL DRIVE	REPLACE FRAME AND COVER	\$1,500
YY	170	CALVIN ROAD	REPAIR CHIMNEY	\$500
TOTAL REHABILITATION COST				\$3,000
TOTAL NUMBER OF MANHOLES				4

TABLE 5
MANHOLE INSPECTION STATUS
 DEDHAM, MASSACHUSETTS
 2021 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inspection Status
BB	035	JENNEY LANE	CNL
BB	075	JENNEY LANE	CNL
BB	350	VINE ROCK STREET	CNL
BB	470	NEEDHAM STREET	CNL
GG	040	COURT STREET	CNL
GG	050	HIGHLAND STREET	CNL
GG	080	HIGHLAND STREET	CNL
GG	100	HIGHLAND STREET	CNL
GG	105	HIGHLAND STREET	CNL
GG	110	VILLAGE AVENUE	CNL
GG	120	VILLAGE AVENUE	CNL
XX	320	VINCENT ROAD	CNL
XX	940	STOUGHTON ROAD	CNO
TOTAL NUMBER OF MANHOLES			13

TABLE 6
MWRA COST EFFECTIVE ANALYSIS FOR INFILTRATION
MANHOLES

DEDHAM, MASSACHUSETTS
2021 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
BB	040	JENNEY LANE	11.8	2,880	1,440	\$32,386	Cementitious Lining	\$1,947	EXCESSIVE RECOMMENDED
BB	140	NEEDHAM STREET	8	288	144	\$3,239	Cementitious Lining	\$1,320	EXCESSIVE RECOMMENDED
BB	220	ROSEMARY ROAD	19.7	288	144	\$3,239	Cementitious Lining	\$3,251	VALUE-EFFECTIVE RECOMMENDED
BB	230	ROSEMARY ROAD	15.5	144	72	\$1,619	Cementitious Lining	\$2,558	NON-EXCESSIVE
BB	300	ROSEMARY ROAD	7.6	288	144	\$3,239	Cementitious Lining	\$1,254	EXCESSIVE RECOMMENDED
GG	091	LOWDER STREET EASEMENT	4.2	0	0	\$0	Root Treatment, Cementitious Lining	\$893	NON-EXCESSIVE
GG	092	LOWDER STREET EASEMENT	3.8	0	0	\$0	Root Treatment, Cementitious Lining	\$827	NON-EXCESSIVE
GG	400	HIGH STREET EASEMENT	6.5	720	360	\$8,096	Cementitious Lining	\$1,073	EXCESSIVE RECOMMENDED
GG	540	BOOTH ROAD	7.5	144	72	\$1,619	Cementitious Lining	\$1,238	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
GG	560	BOOTH ROAD	11.8	144	72	\$1,619	Cementitious Lining	\$1,947	VALUE-EFFECTIVE RECOMMENDED
GG	590	DEERPATH ROAD	7.2	144	72	\$1,619	Cementitious Lining	\$1,188	EXCESSIVE RECOMMENDED
GG	960	VILLAGE AVENUE	10.7	144	72	\$1,619	Cementitious Lining	\$1,766	VALUE-EFFECTIVE RECOMMENDED
GG	1035	LOWDER STREET	5	0	0	\$0	Root Treatment, Cementitious Lining	\$1,025	NON-EXCESSIVE
GG	1230	MARTIN BATES STREET	5.4	432	216	\$4,858	Cementitious Lining	\$891	EXCESSIVE RECOMMENDED
GG	1240	MARTIN BATES STREET	4.8	144	72	\$1,619	Cementitious Lining	\$792	EXCESSIVE RECOMMENDED
GG	1300	COURT STREET	7	144	72	\$1,619	Cementitious Lining	\$1,155	EXCESSIVE RECOMMENDED
UU	020	EAST STREET	10.3	288	144	\$3,239	Cementitious Lining	\$1,700	EXCESSIVE RECOMMENDED
UU	040	EAST STREET	13	720	360	\$8,096	Cementitious Lining	\$2,145	EXCESSIVE RECOMMENDED
UU	080	EAST STREET	8.5	288	144	\$3,239	Cementitious Lining	\$1,403	EXCESSIVE RECOMMENDED
UU	085	EAST STREET	9.6	144	72	\$1,619	Cementitious Lining	\$1,584	EXCESSIVE RECOMMENDED
UU	100	EAST STREET	11.1	144	72	\$1,619	Cementitious Lining	\$1,832	VALUE-EFFECTIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
UU	140	EAST STREET	5.5	432	216	\$4,858	Cementitious Lining	\$908	EXCESSIVE RECOMMENDED
UU	166	LIANA LANE	9.9	144	72	\$1,619	Cementitious Lining	\$1,634	VALUE-EFFECTIVE RECOMMENDED
UU	300	HERMAINE AVENUE	7.8	144	72	\$1,619	Cementitious Lining	\$1,287	EXCESSIVE RECOMMENDED
UU	350	UPLAND ROAD	9	720	360	\$8,096	Cementitious Lining	\$1,485	EXCESSIVE RECOMMENDED
UU	380	UPLAND ROAD	7.2	432	216	\$4,858	Cementitious Lining	\$1,188	EXCESSIVE RECOMMENDED
UU	410	PRESTON STREET	9.6	2,880	1,440	\$32,386	Cementitious Lining	\$1,584	EXCESSIVE RECOMMENDED
UU	480	JUDITH CIRCLE	6.5	432	216	\$4,858	Cementitious Lining	\$1,073	EXCESSIVE RECOMMENDED
UU	520	CYNTHIA ROAD	8.6	0	0	\$0	Root Treatment, Cementitious Lining	\$1,619	NON-EXCESSIVE
UU	550	LAMOINE STREET	6.3	288	144	\$3,239	Cementitious Lining	\$1,040	EXCESSIVE RECOMMENDED
UU	650	SOUTHGATE STREET	8	144	72	\$1,619	Cementitious Lining	\$1,320	EXCESSIVE RECOMMENDED
UU	660	SOUTHGATE STREET	9.6	288	144	\$3,239	Cementitious Lining	\$1,584	EXCESSIVE RECOMMENDED
UU	670	CRESTON AVENUE	5.1	144	72	\$1,619	Cementitious Lining	\$842	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
UU	710	RIDGEWAY STREET	8.4	288	144	\$3,239	Cementitious Lining	\$1,386	EXCESSIVE RECOMMENDED
UU	730	RIDGEWAY STREET	7.5	144	72	\$1,619	Cementitious Lining	\$1,238	EXCESSIVE RECOMMENDED
UU	860	WINFIELD STREET	9.7	432	216	\$4,858	Cementitious Lining	\$1,601	EXCESSIVE RECOMMENDED
XX	060	GREENLODGE STREET	13.5	144	72	\$1,619	Cementitious Lining	\$2,228	NON-EXCESSIVE
XX	120	GREENLODGE STREET	12.5	144	72	\$1,619	Cementitious Lining	\$2,063	NON-EXCESSIVE
XX	140	GREENLODGE STREET	12.5	144	72	\$1,619	Cementitious Lining	\$2,063	NON-EXCESSIVE
XX	220	GREENLODGE STREET	8.2	576	288	\$6,477	Cementitious Lining	\$1,353	EXCESSIVE RECOMMENDED
XX	240	GREENLODGE STREET	8.1	144	72	\$1,619	Cementitious Lining	\$1,337	EXCESSIVE RECOMMENDED
XX	250	FOX MEADOW LANE	7.5	144	72	\$1,619	Cementitious Lining	\$1,238	EXCESSIVE RECOMMENDED
XX	280	FOX MEADOW LANE	6.2	432	216	\$4,858	Root Treatment, Cementitious Lining	\$1,223	EXCESSIVE RECOMMENDED
XX	290	FOX MEADOW LANE	6.6	432	216	\$4,858	Cementitious Lining	\$1,089	EXCESSIVE RECOMMENDED
XX	350	VINCENT ROAD	7.8	288	144	\$3,239	Cementitious Lining	\$1,287	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
XX	370	VINCENT ROAD	8.5	432	216	\$4,858	Cementitious Lining	\$1,403	EXCESSIVE RECOMMENDED
XX	410	INTERVALE ROAD	5.2	144	72	\$1,619	Cementitious Lining	\$858	EXCESSIVE RECOMMENDED
XX	450	HERITAGE HILL	9.7	288	144	\$3,239	Cementitious Lining	\$1,601	EXCESSIVE RECOMMENDED
XX	460	HERITAGE HILL	14.4	144	72	\$1,619	Cementitious Lining	\$2,376	NON-EXCESSIVE
XX	500	HERITAGE HILL	11	288	144	\$3,239	Root Treatment, Cementitious Lining	\$2,015	EXCESSIVE RECOMMENDED
XX	540	LEDGEWOOD ROAD	9.2	288	144	\$3,239	Cementitious Lining	\$1,518	EXCESSIVE RECOMMENDED
XX	700	BLUEBERRY HILL	5.7	288	144	\$3,239	Cementitious Lining	\$941	EXCESSIVE RECOMMENDED
XX	730	INTERVALE ROAD	6.7	1,008	504	\$11,335	Cementitious Lining	\$1,106	EXCESSIVE RECOMMENDED
XX	740	INTERVALE ROAD	6.2	864	432	\$9,716	Cementitious Lining	\$1,023	EXCESSIVE RECOMMENDED
XX	850	INTERVALE ROAD	5.8	288	144	\$3,239	Cementitious Lining	\$957	EXCESSIVE RECOMMENDED
XX	960	STOUGHTON ROAD	7.9	288	144	\$3,239	Cementitious Lining	\$1,304	EXCESSIVE RECOMMENDED
XX	970	STOUGHTON ROAD	7	288	144	\$3,239	Cementitious Lining	\$1,155	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
XX	980	STOUGHTON ROAD	9.3	576	288	\$6,477	Cementitious Lining	\$1,535	EXCESSIVE RECOMMENDED
XX	990	STOUGHTON ROAD	9.6	1,296	648	\$14,574	Cementitious Lining	\$1,584	EXCESSIVE RECOMMENDED
XX	1000	STOUGHTON ROAD	6.8	144	72	\$1,619	Cementitious Lining	\$1,122	EXCESSIVE RECOMMENDED
XX	1100	CHESTER AVENUE	7.3	288	144	\$3,239	Cementitious Lining	\$1,205	EXCESSIVE RECOMMENDED
YY	010	COLWELL DRIVE	7.1	288	144	\$3,239	Cementitious Lining	\$1,172	EXCESSIVE RECOMMENDED
YY	020	SCOTT CIRCLE	8.1	0	0	\$0	Root Treatment, Cementitious Lining	\$1,537	NON-EXCESSIVE
YY	070	COLWELL DRIVE	10	144	72	\$1,619	Cementitious Lining	\$1,650	VALUE-EFFECTIVE RECOMMENDED
YY	130	SCOTT CIRCLE	8.4	288	144	\$3,239	Cementitious Lining	\$1,386	EXCESSIVE RECOMMENDED
YY	230	CAROL DRIVE	5	144	72	\$1,619	Root Treatment, Cementitious Lining	\$1,025	EXCESSIVE RECOMMENDED
YY	330	CAROL DRIVE	6.7	144	72	\$1,619	Cementitious Lining	\$1,106	EXCESSIVE RECOMMENDED
YY	370	FILLMORE ROAD	9.1	288	144	\$3,239	Root Treatment, Cementitious Lining	\$1,702	EXCESSIVE RECOMMENDED
YY	422	FILLMORE RD	8.3	144	72	\$1,619	Cementitious Lining	\$1,370	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
YY	460	TRUMAN ROAD	2.6	0	0	\$0	Root Treatment, Cementitious Lining	\$629	NON-EXCESSIVE
YY	540	FLINTLOCKE LANE	7.9	1,584	792	\$17,812	Cementitious Lining	\$1,304	EXCESSIVE RECOMMENDED
YY	650	GREENLODGE STREET	4.6	0	0	\$0	Root Treatment, Cementitious Lining	\$959	NON-EXCESSIVE
YY	680	MAYFAIR ROAD	6.4	144	72	\$1,619	Cementitious Lining	\$1,056	EXCESSIVE RECOMMENDED
YY	700	MAYFAIR ROAD	6.5	432	216	\$4,858	Cementitious Lining	\$1,073	EXCESSIVE RECOMMENDED
YY	710	MAYFAIR ROAD	8.7	720	360	\$8,096	Cementitious Lining	\$1,436	EXCESSIVE RECOMMENDED
YY	860	QUARRY ROAD	6.7	288	144	\$3,239	Root Treatment, Cementitious Lining	\$1,306	EXCESSIVE RECOMMENDED
TOTAL				28,368	14,184	\$318,998		\$105,855	
TOTAL NON-EXCESSIVE				720	360	\$8,096		\$18,775	
TOTAL EXCESSIVE RECOMMENDED				26,640	13,320	\$299,567		\$75,003	
TOTAL VALUE-EFFECTIVE RECOMMENDED				1,008	504	\$11,335		\$12,078	
TOTAL NON-EXCESSIVE RECOMMENDED				0	0	\$0		\$0	
TOTAL RECOMMENDED				27,648	13,824	\$310,902		\$87,081	
TOTAL RECOMMENDED MANHOLES								64	

TABLE 7
MWRA COST EFFECTIVE ANALYSIS FOR INFLOW
MANHOLES

DEDHAM, MASSACHUSETTS
2021 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inflow (gpd)	Rehabilitation
GG	170	HIGH STREET	1,728	Install Inflow Dish
GG	880	BRIDGE STREET	3,460	Install Inflow Dish
GG	1380	NEWCOURT LANE	1,000	Install Inflow Dish
UU	560	NORWICH STREET	1,000	Install Inflow Dish
XX	1100	CHESTER AVENUE	432	Install Inflow Dish
YY	540	FLINTLOCKE LANE	432	Install Inflow Dish
YY	580	BRIARWOOD LANE	432	Install Inflow Dish
YY	840	QUARRY ROAD	1,730	Install Inflow Dish
TOTAL			10,214	
TOTAL NUMBER OF MANHOLES			8	
TOTAL ESTIMATED COST			\$1,200	

NOTES:

1. Manholes located in an easement will have a "Street Name" designation of an adjacent street.

APPENDIX A

ON-CALL SERVICES AS-BID UNIT COSTS

UNIT COSTS FOR REHABILITATION

MWRA CUSTOMER SERVICE REPORT

MWRA T&T COST CALCULATION

Bid Comparison
2021 Sewer On-Call Services
Dedham, Massachusetts
February 4, 2021

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	National Water Main		Green Mountain	
				UNIT COST	TOTAL	UNIT COST	TOTAL
1			<i>Hourly Rate for Emergency Cleaning</i>				
1a	20	wo	Emergency Cleaning of Sewers	\$ 800.00	\$ 16,000.00	\$ 800.00	\$ 16,000.00
1b	20	hr	Emergency Cleaning of Sewers	\$ 400.00	\$ 8,000.00	\$ 200.00	\$ 4,000.00
1c	30	tn	Storage, Testing, and Disposal of Sewer Debris	\$ 0.01	\$ 0.30	\$ 1.00	\$ 30.00
2			<i>Hourly Rate for Cleaning & Inspection</i>				
2a	30	wo	Cleaning & Inspection of Sewers	\$ 2,600.00	\$ 78,000.00	\$ 1,600.00	\$ 48,000.00
2b	40	hr	Cleaning & Inspection of Sewers	\$ 0.01	\$ 0.40	\$ 215.00	\$ 8,600.00
2c	30	tn	Storage, Testing, and Disposal of Sewer Debris	\$ 100.00	\$ 3,000.00	\$ 1.00	\$ 30.00
3			<i>Heavy Cleaning of Sewers</i>				
3a	50	lf	Heavy Cleaning of 4-inch sewers	\$ 0.01	\$ 0.50	\$ 0.10	\$ 5.00
3b	250	lf	Heavy Cleaning of 6-inch sewers	\$ 0.01	\$ 2.50	\$ 0.10	\$ 25.00
3c	5000	lf	Heavy Cleaning of 8-inch sewers	\$ 0.50	\$ 2,500.00	\$ 0.10	\$ 500.00
3d	1000	lf	Heavy Cleaning of 10-inch sewers	\$ 0.25	\$ 250.00	\$ 0.10	\$ 100.00
3e	2000	lf	Heavy Cleaning of 12-inch sewers	\$ 5.00	\$ 10,000.00	\$ 0.10	\$ 200.00
3f	1000	lf	Heavy Cleaning of 15-inch sewers	\$ 5.00	\$ 5,000.00	\$ 3.00	\$ 3,000.00
3g	250	lf	Heavy Cleaning of 18-inch sewers	\$ 0.50	\$ 125.00	\$ 4.00	\$ 1,000.00
3h	50	lf	Heavy Cleaning of 20-inch sewers	\$ 0.50	\$ 25.00	\$ 5.00	\$ 250.00
3i	250	lf	Heavy Cleaning of 21-inch sewers	\$ 0.50	\$ 125.00	\$ 5.00	\$ 1,250.00
3j	50	lf	Heavy Cleaning of 22-inch sewers	\$ 0.50	\$ 25.00	\$ 5.00	\$ 250.00
3k	1000	lf	Heavy Cleaning of 24-inch sewers	\$ 5.00	\$ 5,000.00	\$ 6.00	\$ 6,000.00
4			<i>Inspection of Sewers</i>				
4a	200	lf	Inspection of 4-inch sewers	\$ 5.00	\$ 1,000.00	\$ 2.00	\$ 400.00
4b	1750	lf	Inspection of 6-inch sewers	\$ 1.50	\$ 2,625.00	\$ 2.00	\$ 3,500.00
4c	70000	lf	Inspection of 8-inch sewers	\$ 1.50	\$ 105,000.00	\$ 3.00	\$ 210,000.00
4d	7250	lf	Inspection of 10-inch sewers	\$ 1.50	\$ 10,875.00	\$ 3.00	\$ 21,750.00
4e	18000	lf	Inspection of 12-inch sewers	\$ 1.50	\$ 27,000.00	\$ 3.00	\$ 54,000.00
4f	8250	lf	Inspection of 15-inch sewers	\$ 1.50	\$ 12,375.00	\$ 3.00	\$ 24,750.00
4g	3500	lf	Inspection of 18-inch sewers	\$ 1.50	\$ 5,250.00	\$ 4.00	\$ 14,000.00
4h	500	lf	Inspection of 20-inch sewers	\$ 1.50	\$ 750.00	\$ 4.00	\$ 2,000.00
4i	2250	lf	Inspection of 21-inch sewers	\$ 1.50	\$ 3,375.00	\$ 4.00	\$ 9,000.00
4j	500	lf	Inspection of 22-inch sewers	\$ 1.50	\$ 750.00	\$ 6.00	\$ 3,000.00
4k	7250	lf	Inspection of 24-inch sewers	\$ 1.50	\$ 10,875.00	\$ 6.00	\$ 43,500.00
5			<i>Mobilization</i>				
5a	1	ls	Mobilization for Items 3-4, lump sum (not to exceed 5% of total)	\$ 5,000.00	\$ 5,000.00	\$ 8,000.00	\$ 8,000.00
6			<i>On-Call Sewer Repair</i>				
6a	10	lf	Structural short liners of 6-inch sewers	\$ 300.00	\$ 3,000.00	\$ 410.00	\$ 4,100.00
6b	25	lf	Structural short liners of 8-inch sewers	\$ 400.00	\$ 10,000.00	\$ 445.00	\$ 11,125.00
6c	10	lf	Structural short liners of 10-inch sewers	\$ 400.00	\$ 4,000.00	\$ 445.00	\$ 4,450.00
6d	25	lf	Structural short liners of 12-inch sewers	\$ 400.00	\$ 10,000.00	\$ 490.00	\$ 12,250.00
6e	10	lf	Structural short liners of 15-inch sewers	\$ 450.00	\$ 4,500.00	\$ 550.00	\$ 5,500.00
6f	10	lf	Structural short liners of 18-inch sewers	\$ 800.00	\$ 8,000.00	\$ 700.00	\$ 7,000.00
6g	250	lf	Structural line pipe (cured-in-place) of 6-inch sewers	\$ 75.00	\$ 18,750.00	\$ 32.00	\$ 8,000.00
6h	4000	lf	Structural line pipe (cured-in-place) of 8-inch sewers	\$ 50.00	\$ 200,000.00	\$ 31.00	\$ 124,000.00
6i	250	lf	Structural line pipe (cured-in-place) of 10-inch sewers	\$ 75.00	\$ 18,750.00	\$ 31.00	\$ 7,750.00
6j	1000	lf	Structural line pipe (cured-in-place) of 12-inch sewers	\$ 50.00	\$ 50,000.00	\$ 33.00	\$ 33,000.00
6k	250	lf	Structural line pipe (cured-in-place) of 15-inch sewers	\$ 55.00	\$ 13,750.00	\$ 47.00	\$ 11,750.00
6l	250	lf	Structural line pipe (cured-in-place) of 18-inch sewers	\$ 75.00	\$ 18,750.00	\$ 49.00	\$ 12,250.00
6m	250	lf	Structural line pipe (cured-in-place) of 20-inch sewers	\$ 75.00	\$ 18,750.00	\$ 70.00	\$ 17,500.00
6n	250	lf	Structural line pipe (cured-in-place) of 24-inch sewers	\$ 120.00	\$ 30,000.00	\$ 86.00	\$ 21,500.00
7			<i>Manhole Rehabilitation</i>				
7a	650	vf	Exterior chemical grouting and interior cementitious	\$ 165.00	\$ 107,250.00	\$ 165.00	\$ 107,250.00
8			<i>Mobilization</i>				
8a	1	ls	Mobilization for Items 6-7, (not to exceed 5% of total)	\$ 15,000.00	\$ 15,000.00	\$ 5,000.00	\$ 5,000.00
12			<i>Chemical Root Treatment</i>				
12a	500	lf	Chemical root treatment of 6-inch sewers	\$ 1.75	\$ 875.00	\$ 2.35	\$ 1,175.00
12b	25000	lf	Chemical root treatment of 8-inch sewers	\$ 1.75	\$ 43,750.00	\$ 2.35	\$ 58,750.00
12c	1000	lf	Chemical root treatment of 10-inch sewers	\$ 1.90	\$ 1,900.00	\$ 2.45	\$ 2,450.00
12d	1000	lf	Chemical root treatment of 12-inch sewers	\$ 2.00	\$ 2,000.00	\$ 2.65	\$ 2,650.00
12e	300	lf	Chemical root treatment of 15-inch sewers	\$ 2.85	\$ 855.00	\$ 3.50	\$ 1,050.00
12f	300	lf	Chemical root treatment of 18-inch sewers	\$ 4.10	\$ 1,230.00	\$ 4.50	\$ 1,350.00
12g	300	lf	Chemical root treatment of 20-inch sewers	\$ 6.95	\$ 2,085.00	\$ 5.00	\$ 1,500.00
12h	10	ea	Chemical root treatment of manholes	\$ 200.00	\$ 2,000.00	\$ 400.00	\$ 4,000.00

Town of Dedham
 Engineering Department
 55 River Street
 Dedham, MA

Bid Comparison
2021 Sewer On-Call Services
Dedham, Massachusetts
February 4, 2021

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	National Water Main		Green Mountain	
				UNIT COST	TOTAL	UNIT COST	TOTAL
12			<i>Mobilization</i>				
12a	1	ea	Mobilization for Item 12, (not to exceed 5% of total)	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00	\$ 1,000.00
			Total Contract		\$ 899,123.70		\$ 949,490.00

ESTIMATED UNIT COSTS FOR REHABILITATION

2021 Sewer Manhole Investigation

RECOMMENDED REHABILITATION METHOD	ESTIMATED COST
MANHOLE REHABILITATION	
Repair Chimney	\$500.00 /mh
Repair manhole bench and invert	\$500.00 /mh
Replace frame & cover	\$1,500.00 / mh
Install inflow dish	\$150.00 / mh

MWRA SYSTEM

	Annual Wastewater Volume			Total Suspended Solids (TSS)		Biochemical Oxygen Demand (BOD)		Maximum Month Flow			Population			Total Assessment
	Rate Basis MG per year	Rate Basis % share of System	Total Volume Charge	Rate Basis 1000 Lbs. per year	Total TSS Charge	Rate Basis 1000 Lbs. per year	Total BOD Charge	Rate Basis Volume MGD	Rate Basis % share of System	Total Max. Month Charge	Rate Basis Population	Rate Basis % share of System	Total Population Charge	
Operation & Maintenance (O&M) Charges														
Average Strength Flow	118,266.884	100%	\$122,101,894	200,944.879	\$32,571,898	183,847.659	\$27,740,238			\$0			\$0	\$182,414,031
High Strength Flow	184.790	100%	190,782	109.000	17,668	3,616.386	545,666			0			0	754,116
Septage Contributions	5.967	100%	6,160	640.059	103,749	322.468	48,656			0			0	158,566
Sub-total	118,457.641	100%	\$122,298,837	201,693.937	\$32,693,316	187,786.513	\$28,334,560			\$0			\$0	\$183,326,713

Basis of O&M Charges

\$1,032.43 per MG.	\$162.09 per 1000 Lbs.	\$150.89 per 1000 Lbs.
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Capital (Debt Service) Charges

Average Strength Flow	\$0	200,944.879	\$5,820,952	183,847.659	\$3,948,796	\$0	\$0	\$9,769,749			
High Strength Flow	0	109.000	3,158	3,616.386	77,675	0	0	80,833			
Septage	0	640.059	18,541	322.468	6,926	0	0	25,467			
Maximum Month Flow	0	0	0	436.590	100%	69,620,674	0	69,620,674			
Sewered Population	0	0	0	0	0	2,300,115	100%	119,245,084			
Census Population	0	0	0	0	0	2,367,208	100%	119,245,084			
Sub-total	\$0	201,693.937	\$5,842,651	187,786.513	\$4,033,398	436.590	100%	\$69,620,674	100%	\$238,490,167	\$317,986,890

Basis of Capital Charges

\$28.97 per 1000 Lbs.	\$21.48 per 1000 Lbs.	Proportional Share	Proportional Share
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Total Rate Revenue

Average Strength Flow	\$122,101,894	\$38,392,851	\$31,689,034	\$0	\$0	\$192,183,779
High Strength Flow	190,782	20,826	623,341	0	0	834,948.83
Septage Contributions	6,160	122,291	55,582	0	0	184,033
Maximum Month Flow	0	0	0	69,620,674	0	69,620,674
Sewered Population	0	0	0	0	119,245,084	119,245,084
Census Population	0	0	0	0	119,245,084	119,245,084
Total	\$122,298,837	\$38,535,967	\$32,367,958	\$69,620,674	\$238,490,167	\$501,313,603

DEDHAM

	Annual Wastewater Volume			Total Suspended Solids (TSS)		Biochemical Oxygen Demand (BOD)		Maximum Month Flow			Population			Total Assessment
	Rate Basis MG per year	Rate Basis % share of System	Total Volume Charge	Rate Basis 1000 Lbs. per year	Total TSS Charge	Rate Basis 1000 Lbs. per year	Total BOD Charge	Rate Basis Volume MGD	Rate Basis % share of System	Total Max. Month Charge	Rate Basis Population	Rate Basis % share of System	Total Population Charge	
Operation & Maintenance (O&M) Charges														
Average Strength Flow	1,460.952	1.24%	\$1,508,326	2,482.274	\$402,361	2,271.072	\$342,675			\$0			\$0	\$2,253,363
High Strength Flow	0.000	0.00%	0	0.000	0	0.000	0			0			0	0
Septage Contributions	0.000	0.00%	0	0.000	0	0.000	0			0			0	0
Sub-total	1,460.952	1.23%	\$1,508,326	2,482.274	\$402,361	2,271.072	\$342,675			\$0			\$0	\$2,253,363

Capital (Debt Service) Charges

Average Strength Flow	\$0	2,482.274	\$71,906	2,271.072	\$48,780	\$0	\$0	\$120,686			
High Strength Flow	0	0.000	0	0.000	0	0	0	0			
Septage	0	0.000	0	0.000	0	0	0	0			
Maximum Month Flow	0	0	0	5.990	1.37%	955,193	0	955,193			
Sewered Population	0	0	0	0	0	24,528	1.07%	1,271,627			
Census Population	0	0	0	0	0	25,334	1.07%	1,276,168			
Sub-total	\$0	2,482.274	\$71,906	2,271.072	\$48,780	5.990	1.37%	\$955,193	1.07%	\$2,547,795	\$3,623,674

* Does not include prior fiscal year assessment adjustments.

MWRA SYSTEM

	Annual Wastewater Volume			Total Suspended Solids (TSS)		Biochemical Oxygen Demand (BOD)		Maximum Month Flow			Population			Total Assessment
	Rate Basis MG per year	Rate Basis % share of System	Total Volume Charge	Rate Basis 1000 Lbs. per year	Total TSS Charge	Rate Basis 1000 Lbs. per year	Total BOD Charge	Rate Basis Volume MGD	Rate Basis % share of System	Total Max. Month Charge	Rate Basis Population	Rate Basis % share of System	Total Population Charge	
Operation & Maintenance (O&M) Charges														
Average Strength Flow	118,266.884	100%	\$122,101,894	200,944.879	\$32,571,898	183,847.659	\$27,740,238			\$0			\$0	\$182,414,031
High Strength Flow	184.790	100%	190,782	109.000	17,668	3,616.386	545,666			0			0	754,116
Septage Contributions	5.967	100%	6,160	640.059	103,749	322.468	48,656			0			0	158,566
Sub-total	118,457.641	100%	\$122,298,837	201,693.937	\$32,693,316	187,786.513	\$28,334,560			\$0			\$0	\$183,326,713

Basis of O&M Charges

\$1,032.43 per MG.	\$162.09 per 1000 Lbs.	\$150.89 per 1000 Lbs.
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Capital (Debt Service) Charges

Average Strength Flow	\$0	200,944.879	\$5,820,952	183,847.659	\$3,948,796	\$0			\$0	\$9,769,749		
High Strength Flow	0	109.000	3,158	3,616.386	77,675	0			0	80,833		
Septage	0	640.059	18,541	322.468	6,926	0			0	25,467		
Maximum Month Flow	0		0		0	436.590	100%	69,620,674	0	69,620,674		
Sewered Population	0		0		0				2,300,115	100%	119,245,084	119,245,084
Census Population	0		0		0				2,367,208	100%	119,245,084	119,245,084
Sub-total	\$0	201,693.937	\$5,842,651	187,786.513	\$4,033,398	436.590	100%	\$69,620,674	100%	\$238,490,167	\$317,986,890	

Basis of Capital Charges

\$28.97 per 1000 Lbs.	\$21.48 per 1000 Lbs.	Proportional Share	Proportional Share
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Total Rate Revenue

Average Strength Flow	\$122,101,894	\$38,392,851	\$31,689,034	\$0	\$0	\$192,183,779
High Strength Flow	190,782	20,826	623,341	0	0	834,948.83
Septage Contributions	6,160	122,291	55,582	0	0	184,033
Maximum Month Flow	0	0	0	69,620,674	0	69,620,674
Sewered Population	0	0	0	0	119,245,084	119,245,084
Census Population	0	0	0	0	119,245,084	119,245,084
Total	\$122,298,837	\$38,535,967	\$32,367,958	\$69,620,674	\$238,490,167	\$501,313,603

Total Rate Revenue

Average Strength Flow	\$1,508,326	\$474,267	\$391,455	\$0	\$0	\$2,374,049
High Strength Flow	0	0	0	0	0	0
Septage Contributions	0	0	0	0	0	0
Maximum Month Flow	0	0	0	955,193	0	955,193
Sewered Population	0	0	0	0	1,271,627	1,271,627
Census Population	0	0	0	0	1,276,168	1,276,168
Total	\$1,508,326	\$474,267	\$391,455	\$955,193	\$2,547,955	\$5,877,037

MEMORANDUM

DATE: May 18, 2021

FROM: Justin Consentino

TO: File

SUBJECT: T&T costs for Dedham, Massachusetts using MWRA methodology

Fiscal year 2021 Transportation & Treatment (T&T) costs for sewerage in the Town of Dedham can be calculated using both the MWRA Operation & Maintenance (O & M) and Capital charges, and the town's O & M and Capital costs. Therefore, MWRA charges are based mainly on sewage flow exiting the Town of Dedham. MWRA's FY21 sewerage charges to the Town of Dedham are shown in Table A, and Table B shows Dedham's FY21 O & M and Capital costs.

TABLE A - MWRA CHARGES TO THE TOWN OF DEDHAM

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	MWRA CHARGE	COST (\$/GPD)
Average Strength Flow*				
Annual Wastewater Volume	1,460,952,000	4,002,608	\$1,508,326	\$0.3768
Total Suspended Solids (O & M and Capital)	1,460,952,000	4,002,608	\$474,267	\$0.1185
Biochemical Oxygen Demand (O & M and Capital)	1,460,952,000	4,002,608	\$391,455	\$0.0978
Maximum Monthly Flow	N/A	5,990,000	\$955,193	\$0.1595
Population **	1,460,952,000	4,002,608	\$2,547,795	N/A
TOTAL			\$5,877,037	\$0.7526

NOTE:

*MWRA's charges only apply to average strength flow.

**MWRA's population charges are not flow based, so it is not to be included in T & T cost.

TABLE B – TOWN OF DEDHAM SEWERAGE COSTS

ITEM	FLOW (gallons/year)	FLOW (gallons/day)	DEDHAM COST	COST (\$/GPD)
Debt Service (Capital Costs)	1,460,952,000	4,002,608	\$1,600,000	\$0.3997
O & M	1,460,952,000	4,002,608	\$1,162,727	\$0.2905
TOTAL			\$2,762,727	\$0.6902

Therefore, the total FY21 T&T cost for both the MWRA charges and the Town of Dedham's costs are \$1.4428/GPD (\$0.7526 + \$0.6902).

According to the Department of Environmental Protection's (DEP) Guidelines for Performing I/I Analyses and SSES this cost of \$1.4428 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 judgement as well as backup documentation, depending on the type of rehabilitation. For this study, Weston & Sampson will use a life cycle of twenty 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 FY21 is 2.50%. 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 = 2.50% (DEP FY21 Information)

Present Worth Factor:

$$\frac{(1+i)^n - 1}{i (1+i)^n} \quad \text{where: } i = \text{discount rate, or interest rate}$$

$$\qquad \qquad \qquad n = \text{number of years}$$

$$\frac{(1 + 0.0250)^{20} - 1}{0.0250 (1 + 0.0250)^{20}} = 15.59$$

Present Worth T&T Cost:

$$(\text{Present Worth Factor}) \times (\text{FY21 T \& T cost})$$

$$15.59 \times \$1.4428/\text{GPD} = \$22.49/\text{GPD}$$

Therefore, the T&T cost for the Town of Dedham, utilizing a present worth of the rehabilitation for a twenty-year period, with a discount rate of 2.50%, is \$22.49/GPD.

Town of Dedham T&T costs were derived using MWRA sewerage costs.

