Weston & Sampson SM

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REPORT

September 2019

TOWN OF
DEDHAM
MASSACHUSETTS

2019 Sewer Manhole Investigation Report

55 Walkers Brook Drive, Suite 100, Reading, MA 01867 (HQ)
Tel: 978.532.1900

Town of Dedham, Massachusetts
Weston & Sampson Project No. 2190144

September 12, 2019

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

Re: Report – 2019 Sewer Manhole Investigation

Dear Mr. Mammone:

In accordance with our January 2, 2019 agreement, Weston & Sampson is pleased to submit our report for the 2019 Sewer Manhole Investigation conducted in spring 2019. This project included topside manhole inspections in subareas EE, II, NN, SS, and WW 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 2019 Sewer Manhole Inspections 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 577 manholes from March 11 to April 4, 2019. An estimated 33,120 gpd of infiltration was identified in 98 manholes, and an estimated 12,000 gpd of peak design storm inflow was identified in 12 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.*

Non-infiltration related structural defects were found in 27 manholes such as loose or missing bricks in riser, cone, and bench and invert sections, or defective frames and covers. Recommendations for rehabilitation and estimated costs are listed in Table 3, *Manhole Structural Defects.*

Inspections were not performed at 7 locations where the manholes either could not be opened or located. These manholes are listed in Table 4, *Manhole Inspection Status*. All uninspected manholes should be located, opened, and inspected. Any necessary rehabilitation may then be added to the scope of the next construction phase. An electronic copy of all 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 FY19 rate of 2.875%, extended over 20 years, the present worth of the Town of Dedham's T&T costs is $18.65. A memorandum detailing the methodology and the calculation of T&T costs may be found in Appendix A, *MWRA T&T Costs*.

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 2018 Sewer On-Call Services Contract with Rapid Flow, Inc. 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, *As-Bid Unit Costs for Rehabilitation*.

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

- 15,768 gpd of excessive removable infiltration at an estimated rehabilitation cost of $91,840. The associated T&T cost is $294,073.
- 12,000 gpd of peak design storm inflow at an estimated rehabilitation cost of $1,800.
- 648 gpd of value-effective removable infiltration at an estimated rehabilitation cost of $13,560. The associated T&T cost is $12,085.
- 72 gpd of non-excessive recommended removable infiltration at an estimated rehabilitation cost of $6,698. The associated T&T cost is $1,343.

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

- $21,000 to replace frame and/or cover of 14 manholes
- $1,500 to repair the bench and invert of three manholes
- $6,750 to build the bench and invert of nine manholes
- $250 to repair the wall of one manhole

Miscellaneous Findings

Based on the observations made during the 2019 Sewer Manhole Investigation, the following conditions were not recommended for rehabilitations, but are worth noting for potential follow up:

- Suspected drop connection blockage in manhole II-1230
- Surcharge evidence inside and outside of manhole II-1330
- Utility crosses through manhole II-1340
- Wire or cable entering in manhole SS-271
- Utility crosses through manhole SS-1240

The following manholes have debris (brick, broken manhole cover pieces, concrete, broken clay pipe, etc.) on the bench and/or in the invert:

- EE-570
- EE-630
- II-890
- II-1280
- II-1385
- SS330
- SS-800
- WW-1030

Conclusions & Recommendations

Based on the observations made during the 2019 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 5 and 6, with a summary provided below.

Recommended Rehabilitation Program:

Perform root treatment of 15 manholes:	$	3,750
Cementitious lining of 102 manholes:	$	108,348
Replace 14 manhole frames and covers:	$	21,000
Repair three manhole bench and inverts:	$	1,500
Build nine manhole bench and inverts:	$	6,750
Repair one manhole wall:	$	250
Installation of 12 inflow dishes:	$	1,800
Total Construction Cost:	**$**	**143,398**

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 660 manholes be conducted in sewer subareas DD, JJ, LL, MM and RR as part of Year 3 of the Annual I/I Program in Spring 2020. 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,

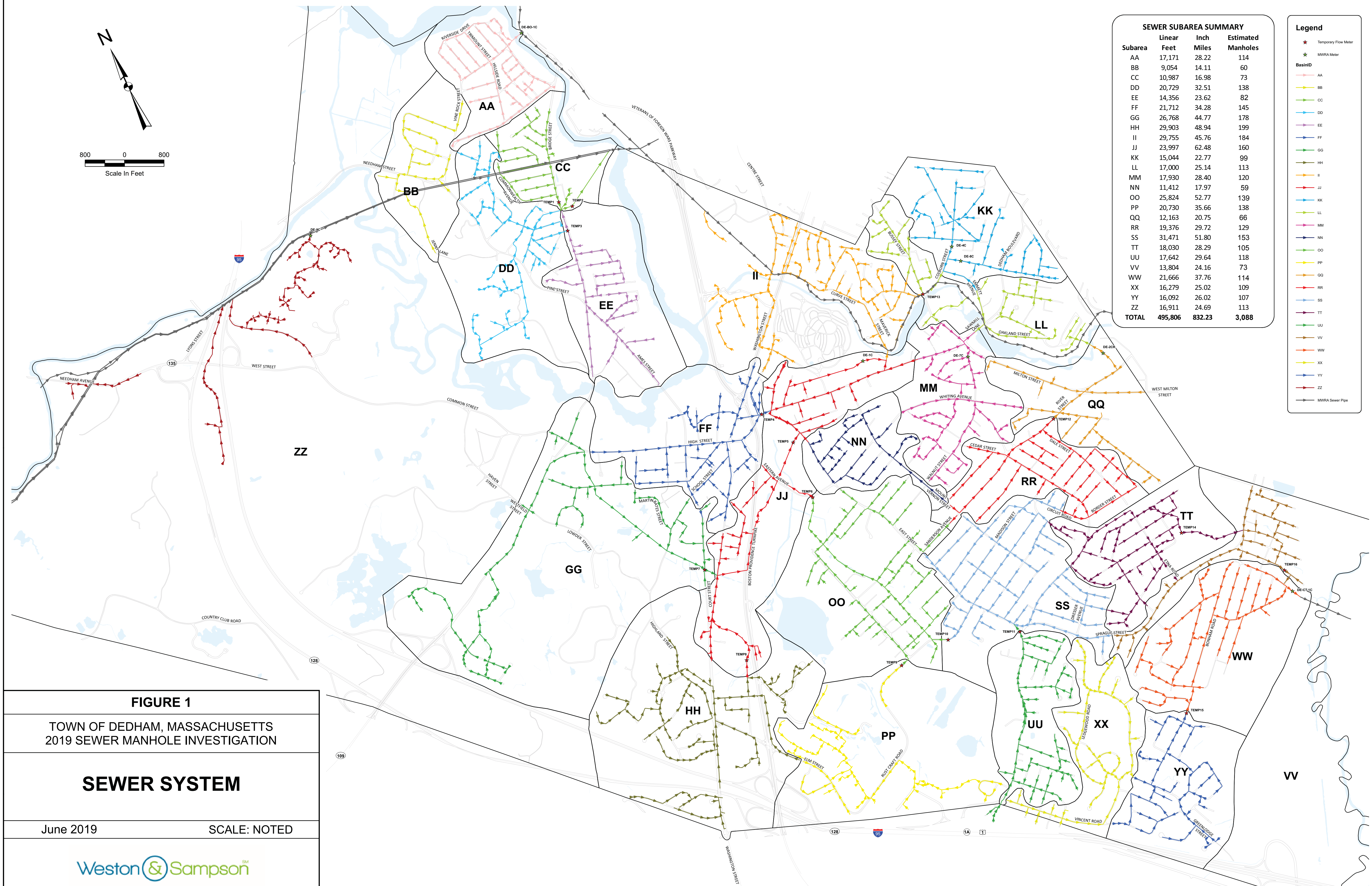
WESTON & SAMPSON

Donald G. Gallucci, PE
Vice President

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

FIGURES

FIGURES 1 – SEWER SYSTEM



SEWER SUBAREA SUMMARY

Subarea	Linear Feet	Inch Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	60
CC	10,987	16.98	73
DD	20,729	32.51	138
EE	14,356	23.62	82
FF	21,712	34.28	145
GG	26,768	44.77	178
HH	29,903	48.94	199
II	29,755	45.76	184
JJ	23,997	62.48	160
KK	15,044	22.77	99
LL	17,000	25.14	113
MM	17,930	28.40	120
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	129
SS	31,471	51.80	153
TT	18,030	28.29	105
UU	17,642	29.64	118
VV	13,804	24.16	73
WW	21,666	37.76	114
XX	16,279	25.02	109
YY	16,092	26.02	107
ZZ	16,911	24.69	113
TOTAL	**495,806**	**832.23**	**3,088**

FIGURE 1

TOWN OF DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

SEWER SYSTEM

June 2019 SCALE: NOTED

Weston & Sampson

TABLES

TABLE 1
SEWER SYSTEM SUMMARY
DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	Estimated Linear Footage (ft)	Inch*Miles	Estimated Manholes
AA	17,171	28.22	114
BB	9,054	14.11	60
CC	10,987	16.98	73
DD	20,729	32.51	138
EE	14,356	23.62	82
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JJ	23,997	62.48	160
KK	15,044	22.77	99
LL	17,000	25.14	113
MM	17,930	28.4	120
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	129
SS	31,471	51.8	153
TT	18,030	28.29	105
UU	17,642	29.64	118
VV	13,804	24.16	73
WW	21,666	37.76	114
XX	16,279	25.02	109
YY	16,092	26.02	107
ZZ	16,911	24.69	113
TOTAL	495,806	832.23	3,088

TABLE 2
MANHOLE SUMMARY
DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
EE	010	BRIDGE STREET	LINED	12.7	144	0
EE	011	BRIDGE STREET	LINED	10.3	144	0
EE	016	BRIDGE STREET	PRECAST	11	0	0
EE	018	ZOAR AVENUE	PRECAST	8.8	0	0
EE	020	BRIDGE STREET	LINED	11.4	0	0
EE	030	BRIDGE STREET	LINED	12.1	0	0
EE	040	BRIDGE STREET	LINED	13.1	144	0
EE	050	BRIDGE STREET	LINED	13.4	0	0
EE	060	BRIDGE STREET	LINED	12.4	144	0
EE	070	BRIDGE STREET	LINED	11.9	0	0
EE	080	BRIDGE STREET	LINED	11	288	0
EE	090	BRIDGE STREET	LINED	10.8	1,008	0
EE	100	BRIDGE STREET	LINED	10.9	288	0
EE	110	BRIDGE STREET	LINED	10.2	0	0
EE	111	BRIDGE STREET	LINED	8.5	0	0
EE	120	BRIDGE STREET	BRICK	4.8	0	0
EE	130	BRIDGE STREET	PRECAST	5.9	0	0
EE	140	AMES STREET	PRECAST	10.6	0	0
EE	150	AMES STREET	PRECAST	11.6	144	0
EE	160	AMES STREET	LINED	12.8	288	0
EE	170	AMES STREET	LINED	13	144	0
EE	180	AMES STREET	BRICK	9.4	0	0
EE	190	AMES STREET	BRICK	5.9	0	0
EE	200	AMES STREET	BRICK	4.7	0	0
EE	210	AMES STREET	BRICK	7.4	0	0
EE	220	AMES STREET	BRICK	9.3	0	0
EE	230	AMES STREET	PRECAST	9.4	0	0
EE	240	AMES STREET	BRICK	4.5	0	0
EE	245	PLEASANT STREET	BRICK	2.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
EE	250	BRIDGE STREET	PRECAST	5.9	0	0
EE	260	BRIDGE STREET	PRECAST	4.3	0	0
EE	270	BERKELEY ROAD	LINED	14.3	144	0
EE	280	BERKELEY ROAD	PRECAST	12.2	0	0
EE	290	BERKELEY ROAD	LINED	8.6	0	0
EE	300	ARLINGTON ROAD	PRECAST	13	0	0
EE	310	ARLINGTON ROAD	BRICK	12.4	0	0
EE	320	ARLINGTON ROAD	BRICK	8.3	0	0
EE	330	ARLINGTON ROAD	BRICK	4.3	0	0
EE	340	ARLINGTON ROAD	LINED	7.5	0	0
EE	350	FARRINGTON AVENUE	BRICK	9.2	0	0
EE	360	FARRINGTON AVENUE	BRICK	6.9	0	0
EE	370	FARRINGTON AVENUE	BRICK	7.4	0	0
EE	380	CREST AVENUE	BRICK	8.6	0	0
EE	385	CREST AVENUE	BRICK	6.9	288	1,000
EE	390	FARRINGTON AVENUE	BRICK	8.2	0	0
EE	400	CORBETT AVENUE	BRICK	4.8	0	0
EE	410	CORBETT AVENUE	BRICK	6.6	0	0
EE	420	CORBETT AVENUE	BRICK	7.7	0	0
EE	421	CORBETT AVENUE	BRICK	7.2	0	0
EE	430	BINGHAM AVENUE	PRECAST	9.8	0	0
EE	440	BINGHAM AVENUE	BRICK	8.6	0	0
EE	450	CREST AVENUE	PRECAST	7.5	0	0
EE	460	MAYNARD ROAD	LINED	12.6	0	0
EE	470	MAYNARD ROAD	BRICK	13.5	0	0
EE	480	MAYNARD ROAD	BRICK	14.1	0	0
EE	490	MAYNARD ROAD	BRICK	7.4	0	0
EE	500	FISHER ROAD	LINED	13.1	0	0
EE	510	FISHER ROAD	LINED	13.3	0	0
EE	520	FISHER ROAD	PRECAST	10.4	0	0
EE	530	FISHER ROAD	PRECAST	7	0	0
EE	540	FISHER ROAD	BRICK	4.7	0	0
EE	550	FISHER ROAD	LINED	3.6	0	0
EE	560	FISHER ROAD	BRICK	2.5	144	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
EE	570	FISHER ROAD	BRICK	1.4	0	0
EE	580	BINGHAM AVENUE	BRICK	3.6	0	0
EE	590	BINGHAM AVENUE	BRICK	9.5	0	0
EE	600	BINGHAM AVENUE	BRICK	8	0	0
EE	610	SHAW LANE	PRECAST	9.4	0	0
EE	620	FULLER STREET	PRECAST	4.5	0	0
EE	630	FULLER STREET	PRECAST	4.6	0	0
EE	640	FULLER STREET	PRECAST	6.2	0	0
EE	650	FULLER STREET	PRECAST	6.4	0	0
EE	660	CLOUGH ROAD	PRECAST	5.4	0	0
EE	670	CLOUGH ROAD	BRICK	5.8	0	0
EE	671	CLOUGH ROAD	PRECAST	5.9	0	0
EE	680	CLOUGH ROAD	BRICK	2.8	0	0
EE	690	WIGGIN AVENUE	PRECAST	3.5	1,440	0
EE	700	BOW AVENUE	PRECAST	8.1	0	0
EE	710	BOW AVENUE	PRECAST	5.1	0	0
EE	711	BOW AVENUE	LINED	4.5	0	0
EE	720	MANCUSO TERRACE	LINED	4.2	0	0
EE	730	MANCUSO TERRACE	PRECAST	5.2	0	0
II	010	CURVE STREET	LINED	8.8	0	0
II	020	COLBURN STREET	BRICK	13.7	0	0
II	030	COLBURN STREET	BRICK	9.1	0	0
II	040	COLBURN STREET	LINED	7.6	0	0
II	050	COLBURN STREET	LINED	5.1	0	0
II	060	COLBURN STREET	BRICK	6.7	0	0
II	070	DENMARK STREET	LINED	6.8	0	0
II	080	DENMARK STREET	BRICK	8.3	720	0
II	085	DENMARK STREET	BRICK	8.5	0	0
II	090	CURVE STREET	LINED	7.9	0	0
II	100	CURVE STREET	LINED	7.3	0	0
II	110	CURVE STREET	LINED	7.8	0	0
II	120	CURVE STREET	LINED	7.4	0	0
II	130	CURVE STREET	LINED	7.9	0	0
II	140	CURVE STREET	LINED	11.2	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
II	150	CURVE STREET	LINED	11.2	0	0
II	160	CURVE STREET	BRICK	11.3	144	0
II	170	HIRSCH TERRACE	LINED	6.8	0	0
II	180	HIRSCH TERRACE	LINED	3.7	0	1,000
II	190	MT. HOPE STREET	PRECAST	13.5	0	0
II	200	MT. HOPE STREET	PRECAST	8	144	0
II	210	MT. HOPE STREET	PRECAST	6.2	0	0
II	220	MT. HOPE STREET	LINED	6.5	0	0
II	225	COBB LANE	PRECAST	5.1	0	0
II	230	MT. HOPE STREET	LINED	5.9	0	0
II	235	RAVEN HILL	PRECAST	5.4	0	0
II	240	MT. HOPE STREET	LINED	5.7	0	0
II	250	MT. HOPE STREET	PRECAST	6.3	0	0
II	260	WALDO STREET	BRICK	7.2	0	0
II	270	WALDO STREET	BRICK	9	0	0
II	280	WALDO STREET	BRICK	9.6	0	0
II	290	GOULD STREET	BRICK	9.3	0	0
II	300	WALDO STREET	LINED	6.8	0	0
II	310	MAVERICK STREET	PRECAST	8.7	0	0
II	320	MAVERICK STREET	BRICK	8.4	0	0
II	330	MAVERICK STREET	PRECAST	8.8	0	0
II	340	EVERGREEN WAY	PRECAST	4.7	0	0
II	350	MAVERICK STREET	BRICK	8.5	0	0
II	360	MAVERICK STREET	BRICK	17.9	0	0
II	370	MAVERICK STREET	LINED	7.8	0	0
II	380	CURVE STREET	LINED	7.7	0	0
II	390	CURVE STREET	BRICK	7.2	0	0
II	400	CURVE STREET	BRICK	9.4	0	0
II	410	CURVE STREET	LINED	9.2	0	0
II	420	WASHINGTON STREET	LINED	12.1	0	0
II	430	CURVE STREET	BRICK	8.4	0	0
II	440	CURVE STREET	BRICK	7.8	0	0
II	450	CURVE STREET	BRICK	8.6	0	0
II	460	CURVE STREET	BRICK	11.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
II	470	CURVE STREET	LINED	10	0	0
II	480	WASHINGTON STREET	LINED	10	0	0
II	490	LOWER EAST STREET	LINED	11.3	0	0
II	500	LOWER EAST STREET	LINED	16.6	0	0
II	505	LOWER EAST STREET	PRECAST	8.2	0	0
II	510	LOWER EAST STREET	PRECAST	10.3	0	0
II	520	LOWER EAST STREET	BRICK	10.4	0	0
II	550	LOWER EAST STREET	BRICK	11	0	0
II	560	LOWER EAST STREET	BRICK	10.4	0	0
II	570	LOWER EAST STREET	BRICK	9.7	0	0
II	580	LOWER EAST STREET	BRICK	9	0	0
II	590	LOWER EAST STREET	BRICK	8.9	0	0
II	600	LOWER EAST STREET	BRICK	9.2	0	0
II	610	LOWER EAST STREET	BRICK	7.1	0	0
II	620	SUMNER STREET	BRICK	8.8	0	0
II	630	WILLIS STREET	BRICK	9	0	0
II	690	BONAD ROAD	BRICK	8.8	0	0
II	700	BONAD ROAD	BRICK	8.9	0	0
II	710	BONAD ROAD	PRECAST	8.4	0	0
II	720	WINTER STREET	BRICK	9.7	0	0
II	730	WASHINGTON STREET	LINED	8	0	0
II	735	WASHINGTON STREET	BRICK	8	0	0
II	740	WASHINGTON STREET	BRICK	8.5	0	0
II	741	WASHINGTON STREET	BRICK	8.1	0	0
II	750	COLUMBIA TERRACE	BRICK	7.6	0	0
II	760	WASHINGTON STREET	LINED	9.8	0	0
II	770	WASHINGTON STREET	BRICK	9.9	0	0
II	780	WASHINGTON STREET	LINED	8.6	0	0
II	790	OAK STREET	LINED	11.8	0	0
II	800	SCHILLER ROAD	BRICK	9.1	0	0
II	810	OAK STREET	BRICK	5.5	0	0
II	820	OAK STREET	BRICK	5.1	0	0
II	830	OAK STREET	BRICK	11.1	0	0
II	840	SCHILLER ROAD	BRICK	7.8	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
II	850	SCHILLER ROAD	BRICK	7.8	0	0
II	860	SCHILLER ROAD	BRICK	7.6	0	0
II	870	SCHILLER ROAD	BRICK	7.6	0	0
II	880	RIDGE AVENUE	LINED	12.9	0	0
II	890	RIDGE AVENUE	BRICK	10.4	0	0
II	900	RIDGE AVENUE	BRICK	8.4	0	0
II	910	COLUMBIA TERRACE	BRICK	8.1	0	0
II	920	COLUMBIA TERRACE	BRICK	10.2	0	0
II	930	COLUMBIA TERRACE	BRICK	7.5	0	0
II	940	OAK STREET	BRICK	10	0	0
II	950	OAK STREET	BRICK	9.7	0	0
II	960	NANCY ROAD	BRICK	9.1	0	0
II	970	OAK STREET	BRICK	7.4	0	0
II	980	LILAC LANE	BRICK	6.3	288	0
II	990	HITCHINS DRIVE	LINED	12.4	0	0
II	1000	HITCHINS DRIVE	PRECAST	8.6	0	0
II	1010	HARVEY DRIVE	LINED	9.1	288	0
II	1020	CURVE STREET	LINED	5.1	0	0
II	1030	GAFFNEY ROAD	LINED	10.2	288	0
II	1040	GAFFNEY ROAD	LINED	8.2	0	0
II	1050	NANCY ROAD	LINED	5.7	288	0
II	1060	NANCY ROAD	LINED	7.3	576	0
II	1070	NANCY ROAD	LINED	7.4	0	0
II	1080	SUNSET AVENUE	LINED	5.1	0	0
II	1090	SUNSET AVENUE	BRICK	5	0	0
II	1100	SUNSET AVENUE	LINED	7.9	0	0
II	1110	SUNSET AVENUE	BRICK	6.6	0	0
II	1120	GAFFNEY ROAD	PRECAST	4.4	0	0
II	1130	GAFFNEY ROAD	LINED	5.3	0	0
II	1140	GAFFNEY ROAD	PRECAST	5.1	0	0
II	1150	GAFFNEY ROAD	PRECAST	3.9	0	0
II	1160	EASTBROOK ROAD	PRECAST	17.6	432	0
II	1170	EASTBROOK ROAD	LINED	17.7	0	0
II	1180	EASTBROOK ROAD	LINED	21.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
II	1185	INCINERATOR ROAD	PRECAST	17.3	2,880	0
II	1190	EASTBROOK ROAD	PRECAST	8.2	720	0
II	1195	INCINERATOR ROAD	PRECAST	7.4	0	0
II	1205	INCINERATOR ROAD	PRECAST	8.4	0	1,000
II	1210	INCINERATOR ROAD	PRECAST	11.8	3,456	1,000
II	1215	INCINERATOR ROAD	PRECAST	8	0	0
II	1225	INCINERATOR ROAD	PRECAST	8	0	0
II	1230	WASHINGTON STREET	PRECAST	6.8	0	0
II	1240	WASHINGTON STREET	BRICK	3.7	144	0
II	1250	WASHINGTON STREET	BRICK	23	0	0
II	1255	EASTBROOK ROAD	PRECAST	7.7	0	0
II	1260	EASTBROOK ROAD	BRICK	6.4	0	0
II	1270	WASHINGTON STREET	BRICK	4.9	0	0
II	1280	WASHINGTON STREET	BRICK	6.8	0	0
II	1290	WASHINGTON STREET	BRICK	6.3	0	0
II	1300	WASHINGTON STREET	BRICK	11.5	0	0
II	1310	WASHINGTON STREET	BRICK	12.5	0	0
II	1320	WASHINGTON STREET	BRICK	22.6	0	1,000
II	1330	EAST STREET	BRICK	4.1	0	0
II	1340	EAST STREET	BRICK	9.7	0	0
II	1350	EAST STREET	BRICK	9.3	144	0
II	1360	EAST STREET	BRICK	7.5	0	0
II	1370	DEMETRA TERRACE	BRICK	10.6	288	0
II	1380	DEMETRA TERRACE	BRICK	7.7	0	0
II	1385	DEMETRA TERRACE	BRICK	7.2	0	0
II	1390	BROOKDALE AVENUE	LINED	8.4	0	0
II	1392	BROOKDALE AVENUE	BRICK	6	0	0
II	1394	BROOKDALE AVENUE	CNL			
II	1410	BROOKDALE AVENUE	BRICK	8.3	0	0
II	1420	BROOKDALE AVENUE	BRICK	9.7	0	0
II	1430	BROOKDALE AVENUE	BRICK	7.5	0	0
II	1435	EAST STREET	PRECAST	6.4	0	0
II	1440	EAST STREET	PRECAST	6.4	0	0
II	1450	EAST STREET	BRICK	5.8	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
II	1460	EAST STREET	BRICK	6.4	0	0
II	1470	SCHILLER ROAD	BRICK	6.8	0	0
II	1525	INCINERATOR ROAD	PRECAST	10.5	576	0
II	1530	INCINERATOR ROAD	LINED	8.9	576	1,000
II	1533	INCINERATOR ROAD	PRECAST	9.7	0	0
II	1535	INCINERATOR ROAD	PRECAST	9.9	144	0
II	1540	INCINERATOR ROAD	LINED	10	0	0
II	1545	INCINERATOR ROAD	PRECAST	5.1	0	1,000
II	1550	INCINERATOR ROAD	PRECAST	3.8	0	1,000
II	1555	INCINERATOR ROAD	PRECAST	3	0	0
II	1560	INCINERATOR ROAD	CNL			
II	1565	INCINERATOR ROAD	CNL			
II	1570	INCINERATOR ROAD	PRECAST	8.7	288	0
II	1575	INCINERATOR ROAD	PRECAST	9.9	0	0
II	1580	INCINERATOR ROAD	PRECAST	8.5	0	0
II	1585	INCINERATOR ROAD	PRECAST	8.4	0	0
II	1590	INCINERATOR ROAD	PRECAST	7.5	0	0
II	1595	INCINERATOR ROAD	PRECAST	4	0	0
II	1600	INCINERATOR ROAD	PRECAST	3.6	0	0
NN	010	EAST STREET	BRICK	9.4	0	0
NN	020	EAST STREET	BRICK	9.5	0	0
NN	025	ELEANOR STREET	PRECAST	9.2	0	0
NN	030	EAST STREET	BRICK	10	0	0
NN	040	EAST STREET	LINED	10.3	0	0
NN	050	EAST STREET	BRICK	7.4	0	0
NN	055	EAST STREET	LINED	8	0	0
NN	060	EAST STREET	LINED	7.3	0	0
NN	070	EAST STREET	BRICK	7.1	0	0
NN	080	EAST STREET	BRICK	6.2	0	0
NN	090	ELEANOR STREET	BRICK	8.3	288	0
NN	100	ELEANOR STREET	BRICK	8.5	144	0
NN	110	BARROWS STREET	BRICK	9.5	0	0
NN	120	BARROWS STREET	LINED	12.3	0	0
NN	121	DUNN PLACE	PRECAST	5.1	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
NN	130	BARROWS STREET	BRICK	13	432	0
NN	140	BARROWS STREET	BRICK	9.1	144	0
NN	141	CHARLES STREET	LINED	7.4	288	0
NN	150	BARROWS STREET	BRICK	10.8	144	0
NN	160	MT. VERNON STREET	BRICK	10.3	144	0
NN	170	MT. VERNON STREET	LINED	12.5	0	0
NN	180	ELMVIEW PLACE	LINED	8.3	0	0
NN	181	ELMVIEW PLACE	BRICK	81	144	0
NN	190	CHARLES STREET	BRICK	5.9	0	0
NN	200	CHARLES STREET	BRICK	6.4	0	0
NN	220	GALVIN PLACE	PRECAST	8.5	144	0
NN	230	MT. VERNON PLACE	BRICK	8.7	0	0
NN	240	MT. VERNON STREET	LINED	7.6	0	0
NN	250	MT. VERNON STREET	BRICK	8.5	144	0
NN	260	MT. VERNON STREET	PRECAST	9.1	0	0
NN	270	MT. VERNON STREET	LINED	9.4	0	0
NN	280	MT. VERNON STREET	BRICK	9.9	0	0
NN	290	MT. VERNON STREET	BRICK	9.7	0	0
NN	300	MT. VERNON STREET	LINED	8.8	0	0
NN	310	MT. VERNON STREET	BRICK	9.3	0	0
NN	320	MT. VERNON STREET	BRICK	7.9	0	0
NN	330	WOODLEIGH ROAD	BRICK	4.4	0	0
NN	340	WOODLEIGH ROAD	LINED	11.1	0	0
NN	350	WOODLEIGH ROAD	LINED	5.7	0	0
NN	355	WOODLEIGH ROAD	PRECAST	5.7	0	0
NN	360	WOODLEIGH ROAD	BRICK	6.9	0	0
NN	370	WOODLEIGH ROAD	BRICK	6.9	0	0
NN	380	WHITING AVENUE	BRICK	12.3	144	0
NN	390	WHITING AVENUE	BRICK	8.4	288	0
NN	400	WHITING AVENUE	BRICK	9.5	0	0
NN	410	WHITING AVENUE	BRICK	7.8	0	0
NN	420	WHITING AVENUE	BRICK	7.7	0	0
NN	430	ABBOTT ROAD	BRICK	7.2	288	0
NN	440	VAN BRUNT AVENUE	BRICK	8.8	144	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
NN	450	VAN BRUNT AVENUE	BRICK	7.9	576	0
NN	460	ABBOTT ROAD	BRICK	7.9	432	0
NN	470	ABBOTT ROAD	BRICK	7.3	144	0
NN	480	ABBOTT ROAD	LINED	8.2	0	0
NN	490	ABBOTT ROAD	LINED	7.7	0	0
NN	500	EAST STREET	PRECAST	9.4	0	0
NN	510	EAST STREET	PRECAST	7.1	0	0
NN	520	EAST STREET	BRICK	9	0	1,000
NN	530	EAST STREET	LINED	7.6	144	0
NN	540	EAST STREET	PRECAST	5	0	0
SS	010	RUSTCRAFT ROAD	BRICK	8.6	432	0
SS	015	RUSTCRAFT ROAD	LINED	10.1	0	0
SS	025	RUSTCRAFT ROAD	LINED	9.9	0	0
SS	035	RUSTCRAFT ROAD	LINED	10	0	0
SS	045	RUSTCRAFT ROAD	LINED	10.1	0	0
SS	051	IVERSON WAY	LINED	8.9	0	0
SS	055	IVERSON WAY	PRECAST	4.3	144	0
SS	065	IVERSON WAY	PRECAST	4.3	576	0
SS	070	RUSTCRAFT ROAD	LINED	8.2	0	0
SS	075	HOBART STREET	LINED	5.7	0	0
SS	077	HOBART STREET	LINED	7.2	0	0
SS	085	RUSTCRAFT ROAD	LINED	8.6	0	0
SS	095	RUSTCRAFT ROAD	PRECAST	9	0	0
SS	100	FORD STREET	PRECAST	6.5	0	0
SS	110	FORD STREET	BRICK	12	0	0
SS	120	FORD STREET	LINED	8.6	0	0
SS	130	MADISON STREET	BRICK	10.1	0	0
SS	135	EAST STREET	LINED	11.5	0	0
SS	140	EAST STREET	BRICK	8.4	0	0
SS	150	EAST STREET	BRICK	9.2	0	0
SS	160	EAST STREET	BRICK	9.7	0	0
SS	170	EAST STREET	LINED	8.5	0	0
SS	180	EAST STREET	BRICK	9.4	0	0
SS	190	CEDAR STREET	BRICK	10.3	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
SS	200	CEDAR STREET	LINED	9.2	0	0
SS	210	SPRAGUE STREET	BRICK	7.8	0	0
SS	220	SPRAGUE STREET	LINED	8	0	0
SS	230	SPRAGUE STREET	LINED	9	0	0
SS	240	SPRAGUE STREET	LINED	8.9	144	0
SS	250	SPRAGUE STREET	BRICK	9.4	0	0
SS	260	SPRAGUE STREET	BRICK	9.9	576	0
SS	270	SPRAGUE STREET	BRICK	11	0	0
SS	271	SPRAGUE STREET	BRICK	6.8	0	0
SS	280	NOBEL ROAD	LINED	12.8	0	0
SS	290	NOBEL ROAD	BRICK	4.5	0	0
SS	300	CEDAR STREET	LINED	8	0	0
SS	310	CEDAR STREET	LINED	9.1	0	0
SS	320	CEDAR STREET	LINED	7.6	0	0
SS	330	CEDAR STREET	PRECAST	18	0	0
SS	340	CEDAR STREET	BRICK	17.3	0	0
SS	350	CEDAR STREET	LINED	13	0	0
SS	360	BEECH STREET	BRICK	11.3	0	0
SS	370	BEECH STREET	BRICK	11.7	0	0
SS	380	BEECH STREET	BRICK	10.8	0	0
SS	390	BEECH STREET	BRICK	9.9	0	0
SS	400	BEECH STREET	BRICK	7.2	0	0
SS	410	BEECH STREET	BRICK	5	0	0
SS	420	KIMBALL ROAD	BRICK	8.1	0	0
SS	430	KIMBALL ROAD	BRICK	8.5	0	0
SS	440	DRESSER AVENUE	BRICK	10.9	0	0
SS	450	KIMBALL ROAD	BRICK	7.6	0	0
SS	460	KIMBALL ROAD	BRICK	7.7	0	0
SS	470	KIMBALL ROAD	BRICK	4.9	0	0
SS	480	DRESSER AVENUE	BRICK	10	0	0
SS	490	TAYLOR AVENUE	LINED	10.7	0	0
SS	500	TAYLOR AVENUE	LINED	8.6	0	0
SS	510	TAYLOR AVENUE	BRICK	2.9	0	0
SS	520	TAYLOR AVENUE	BRICK	8.7	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
SS	530	TAYLOR AVENUE	BRICK	8.9	0	0
SS	540	TAYLOR AVENUE	BRICK	8.6	0	0
SS	550	TAYLOR AVENUE	BRICK	9.7	0	0
SS	560	GREENWOOD AVENUE	BRICK	6.7	0	0
SS	570	GREENWOOD AVENUE	BRICK	6.8	0	0
SS	580	GRANT AVENUE	BRICK	8	0	0
SS	590	GRANT AVENUE	BRICK	8.4	0	0
SS	600	GRANT AVENUE	BRICK	10.4	0	0
SS	610	GRANT AVENUE	CNL			
SS	620	ADAMS STREET	BRICK	9.8	0	0
SS	630	ADAMS STREET	CNL			
SS	640	ELMWOOD AVENUE	BRICK	7.2	0	0
SS	650	ADAMS STREET	LINED	8.6	0	0
SS	660	ELMWOOD AVENUE	BRICK	6.2	0	0
SS	670	JEFFERSON STREET	LINED	9	0	0
SS	680	ELMWOOD AVENUE	BRICK	9.5	288	0
SS	690	ELMWOOD AVENUE	BRICK	7.3	0	0
SS	700	ADAMS STREET	BRICK	10.2	0	0
SS	710	ADAMS STREET	BRICK	9.8	0	0
SS	725	JEFFERSON STREET	PRECAST	8.6	0	0
SS	730	JEFFERSON STREET	BRICK	8.5	0	0
SS	740	JEFFERSON STREET	LINED	9.8	0	0
SS	750	JEFFERSON STREET	LINED	10.7	0	0
SS	760	MT. VERNON STREET	BRICK	11.7	0	0
SS	770	JEFFERSON STREET	BRICK	16	288	0
SS	780	JEFFERSON STREET	LINED	13.3	144	0
SS	790	JEFFERSON STREET	BRICK	4.6	0	0
SS	795	JEFFERSON STREET	LINED	4.9	0	0
SS	800	SHIRETOWN ROAD	BRICK	3.5	0	0
SS	810	SHIRETOWN ROAD	BRICK	9.3	0	0
SS	820	ADAMS STREET	BRICK	5.4	0	0
SS	830	ADAMS STREET	BRICK	7.4	288	0
SS	840	ADAMS STREET	BRICK	13.6	0	0
SS	850	ADAMS STREET	BRICK	8.5	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
SS	860	ADAMS STREET	BRICK	6.8	0	0
SS	870	NETTA ROAD	BRICK	10.2	0	0
SS	880	NETTA ROAD	BRICK	8.5	0	0
SS	890	NETTA ROAD	BRICK	9.2	0	0
SS	900	MT. VERNON STREET	BRICK	8.1	0	0
SS	910	MT. VERNON STREET	BRICK	10.7	0	0
SS	920	MT. VERNON STREET	BRICK	9.1	0	0
SS	930	GRANT AVENUE	BRICK	7.6	0	0
SS	940	GRANT AVENUE	BRICK	9.6	0	0
SS	950	MT. VERNON STREET	BRICK	11	0	0
SS	960	MT. VERNON STREET	LINED	10.9	0	0
SS	970	MT. VERNON STREET	LINED	8.9	0	0
SS	980	MADISON STREET	BRICK	10.6	0	0
SS	990	MADISON STREET	BRICK	10.9	0	0
SS	1000	MADISON STREET	BRICK	6.9	0	0
SS	1010	LILLY LANE	PRECAST	3.3	0	0
SS	1020	LILLY LANE	PRECAST	3.1	0	0
SS	1030	JEFFERSON STREET	BRICK	4.3	288	0
SS	1040	MADISON STREET	LINED	6.7	0	0
SS	1050	MADISON STREET	LINED	13	0	0
SS	1060	CIRCUIT ROAD	LINED	9.9	144	0
SS	1070	CIRCUIT ROAD	BRICK	11.6	0	0
SS	1080	FALES ROAD	BRICK	6.2	288	0
SS	1090	WOOD ROAD	BRICK	8.2	144	0
SS	1100	WOOD ROAD	BRICK	8.2	0	0
SS	1110	MADISON STREET	LINED	8.7	0	0
SS	1120	MONROE STREET	LINED	6.2	0	0
SS	1130	MONROE STREET	BRICK	5.5	144	0
SS	1140	MONROE STREET	LINED	7.9	0	0
SS	1150	MONROE STREET	LINED	6.6	0	0
SS	1160	MONROE STREET	LINED	10	144	0
SS	1170	MT. VERNON STREET	LINED	13.3	144	0
SS	1180	MT. VERNON STREET	LINED	8.6	0	0
SS	1190	MT. VERNON STREET	BRICK	9	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
SS	1200	MONROE STREET	LINED	10.5	0	0
SS	1210	MONROE STREET	LINED	8.2	0	0
SS	1220	MONROE STREET	LINED	8.3	144	0
SS	1230	MONROE STREET	LINED	11	144	0
SS	1240	BOULEVARD ROAD	BRICK	8.7	0	0
SS	1250	BOULEVARD ROAD	LINED	7.6	144	0
SS	1260	BOULEVARD ROAD	LINED	8.2	0	0
SS	1270	BOULEVARD ROAD	LINED	6.4	0	0
SS	1280	MADISON STREET	LINED	9.1	0	0
SS	1290	MADISON STREET	BRICK	8.1	0	0
SS	1300	MADISON STREET	BRICK	7.3	0	0
SS	1370	EAST STREET	LINED	10.3	0	0
SS	1380	EAST STREET	LINED	11.8	0	0
SS	1390	EAST STREET	CNO			
SS	1400	EAST STREET	LINED	9.9	0	0
SS	1410	EAST STREET	LINED	11.2	0	0
SS	1420	EAST STREET	LINED	13.1	288	0
SS	1430	EAST STREET	BRICK	8.3	0	0
SS	1440	EAST STREET	BRICK	8.7	0	0
SS	1450	EAST STREET	BRICK	4.4	0	0
SS	1490	GLEN WAY	PRECAST	9	288	0
SS	1500	HAMILTON AVENUE	PRECAST	11.5	0	0
SS	1510	HAMILTON AVENUE	PRECAST	9.2	0	0
SS	1520	HAMILTON AVENUE	PRECAST	7.9	0	0
SS	1530	HAMILTON AVENUE	PRECAST	7.9	0	0
SS	1540	HAMILTON AVENUE	PRECAST	7.7	0	0
WW	010	SHERMAN ROAD	LINED	8.4	0	1,000
WW	020	SHERMAN ROAD	LINED	11.7	0	0
WW	030	SHERMAN ROAD	LINED	12.9	288	0
WW	040	SHERMAN ROAD	BRICK	8	0	0
WW	050	SHERMAN ROAD	BRICK	8.6	0	0
WW	060	SHERMAN ROAD	BRICK	8.5	0	0
WW	070	SHERMAN ROAD	BRICK	8.6	0	0
WW	080	TRENTON ROAD	LINED	11	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
WW	090	TRENTON ROAD	LINED	10.4	720	0
WW	100	TRENTON ROAD	LINED	9.7	288	0
WW	110	TRENTON ROAD	LINED	9.6	144	0
WW	120	TRENTON ROAD	LINED	9.2	0	0
WW	130	TRENTON ROAD	LINED	7.9	144	0
WW	140	TRENTON ROAD	BRICK	7.7	144	0
WW	150	TRENTON ROAD	LINED	7.1	432	0
WW	155	TRENTON ROAD	BRICK	7.6	288	0
WW	160	TRENTON ROAD	LINED	8	144	0
WW	170	TRENTON ROAD	LINED	8.7	144	0
WW	180	BONHAM ROAD	LINED	10.3	0	0
WW	190	BELOIT ROAD	LINED	9.6	288	0
WW	200	BELOIT ROAD	LINED	8.1	144	0
WW	210	HELENA ROAD	BRICK	2.7	288	0
WW	220	ARDMORE ROAD	LINED	7.4	144	0
WW	230	ARDMORE ROAD	BRICK	7.9	0	0
WW	240	ARDMORE ROAD	BRICK	8.1	0	0
WW	250	ALTOONA ROAD	LINED	7.4	144	0
WW	260	ALTOONA ROAD	BRICK	8.4	0	0
WW	270	ALTOONA ROAD	BRICK	8.1	0	0
WW	280	ALTOONA ROAD	BRICK	8.3	0	0
WW	290	HASTINGS ROAD	PRECAST	5.5	288	0
WW	300	HASTINGS ROAD	BRICK	3.5	144	1,000
WW	310	HASTINGS ROAD	LINED	5.6	0	0
WW	320	HASTINGS ROAD	BRICK	2.1	0	1,000
WW	330	GOSHEN ROAD	LINED	8.3	144	0
WW	340	GOSHEN ROAD	LINED	7.7	432	0
WW	350	GOSHEN ROAD	LINED	11.5	0	0
WW	360	GOSHEN ROAD	LINED	7.2	0	0
WW	370	HOLMES ROAD	LINED	8	0	0
WW	380	HOLMES ROAD	BRICK	8.2	0	0
WW	390	HOLMES ROAD	BRICK	8.3	0	0
WW	400	HOLMES ROAD	BRICK	7.5	0	0
WW	410	BONHAM ROAD	LINED	6.3	432	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
WW	420	BONHAM ROAD	LINED	4.6	0	0
WW	430	BONHAM ROAD	LINED	3.6	0	0
WW	440	BONHAM ROAD	LINED	3	0	0
WW	450	GREENSBORO ROAD	LINED	3.6	0	0
WW	460	GREENSBORO ROAD	LINED	3.2	0	0
WW	470	GREENSBORO ROAD	BRICK	7	0	0
WW	480	COLWELL DRIVE	BRICK	6.3	0	0
WW	490	COLWELL DRIVE	BRICK	5.9	0	0
WW	500	BONNEY LANE	BRICK	6.9	0	0
WW	510	BONNEY LANE	BRICK	6.6	0	0
WW	520	BONNEY LANE	LINED	6.8	0	0
WW	540	BONNEY LANE	BRICK	6.8	144	0
WW	550	COLWELL DRIVE	BRICK	6.1	0	0
WW	560	COLWELL DRIVE	BRICK	4.5	0	0
WW	570	COLWELL DRIVE	BRICK	6.6	0	0
WW	580	COLWELL DRIVE	LINED	5.7	0	0
WW	600	GREENSBORO ROAD	BRICK	4.3	0	0
WW	610	GREENSBORO ROAD	LINED	6.5	144	0
WW	620	GREENSBORO ROAD	BRICK	11.6	0	0
WW	630	GREENSBORO ROAD	LINED	9.9	0	0
WW	640	GREENSBORO ROAD	LINED	9.7	0	0
WW	650	GREENSBORO ROAD	BRICK	8.7	0	0
WW	660	GREENSBORO ROAD	LINED	13	0	0
WW	670	GREENSBORO ROAD	LINED	9.5	0	0
WW	680	GREENSBORO ROAD	CNL			
WW	690	GREENSBORO ROAD	LINED	8.5	0	0
WW	700	WESTCHESTER CIRCLE	LINED	10	0	0
WW	710	WESTCHESTER CIRCLE	LINED	9.6	0	0
WW	720	WESTCHESTER CIRCLE	BRICK	10.1	0	0
WW	740	WESTCHESTER CIRCLE	BRICK	6.6	0	0
WW	745	WESTCHESTER CIRCLE	BRICK	2.3	0	0
WW	750	GAINSVILLE ROAD	LINED	6.7	576	0
WW	760	GAINSVILLE ROAD	LINED	12.1	0	0
WW	770	GAINSVILLE ROAD	BRICK	11.2	0	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
WW	780	GAINSVILLE ROAD	PRECAST	9	0	0
WW	790	GLEN ROAD	BRICK	6.2	0	0
WW	800	BONHAM ROAD	LINED	8.4	0	0
WW	810	BONHAM ROAD	LINED	8.6	144	0
WW	820	BONHAM ROAD	LINED	8.8	0	0
WW	830	BONHAM ROAD	BRICK	8.9	0	0
WW	840	BONHAM ROAD	BRICK	8.8	0	0
WW	850	BONHAM ROAD	BRICK	9.1	0	0
WW	860	BONHAM ROAD	BRICK	9	0	0
WW	870	HILLSDALE ROAD	BRICK	9.7	0	0
WW	880	HILLSDALE ROAD	LINED	9.8	144	0
WW	890	HILLSDALE ROAD	PRECAST	8.3	0	0
WW	900	HILLSDALE ROAD	PRECAST	8.6	0	0
WW	910	HILLSDALE ROAD	PRECAST	6.6	0	0
WW	920	HILLSDALE ROAD	PRECAST	14.7	0	0
WW	930	GREENSBORO ROAD	PRECAST	14	0	0
WW	940	GREENSBORO ROAD	BRICK	8.5	0	0
WW	950	GREENSBORO ROAD	BRICK	5.5	0	0
WW	960	GREENSBORO ROAD	LINED	7.2	0	0
WW	970	GREENSBORO ROAD	BRICK	6.7	0	0
WW	980	GREENSBORO ROAD	BRICK	5.2	0	0
WW	990	FRESNO ROAD	PRECAST	5.9	0	0
WW	1000	FRESNO ROAD	PRECAST	5.6	0	0
WW	1010	HILLSDALE ROAD	LINED	7	0	0
WW	1020	CARLISLE ROAD	LINED	7.9	0	0
WW	1030	CARLISLE ROAD	BRICK	4.5	0	0
WW	1040	CARLISLE ROAD	LINED	4.7	0	0
WW	1050	CARLISLE ROAD	PRECAST	5.9	0	0
WW	1070	NELSON DRIVE	PRECAST	10.9	0	0
WW	1080	NELSON DRIVE	PRECAST	11.2	0	0
WW	1090	NELSON DRIVE	PRECAST	6.4	0	0
WW	1100	BONHAM ROAD	BRICK	4.2	0	0
WW	1110	BONHAM ROAD	LINED	3.1	0	0
WW	1120	GAINSVILLE ROAD	LINED	8.4	288	0

Subarea	MH #	Street Name	Material	Manhole Depth (ft)	Infiltration (gpd)	Inflow (gpd)
WW	1130	GAINSVILLE ROAD	LINED	9.1	0	0
WW	1140	GAINSVILLE ROAD	BRICK	8.8	0	0
WW	1150	GAINSVILLE ROAD	BRICK	6.8	0	0
WW	1160	GAINSVILLE ROAD	LINED	10.4	0	0
TOTAL MANHOLE INFILTRATION					33,120	12,000
TOTAL NUMBER OF MANHOLES					577	
TOTAL NUMBER OF MANHOLES INSPECTED					570	

TABLE 3
MANHOLE STRUCTURAL DEFECTS
DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
EE	160	AMES STREET	REPLACE FRAME AND COVER	$1,500
EE	370	FARRINGTON AVENUE	REPLACE FRAME AND COVER	$1,500
EE	390	FARRINGTON AVENUE	REPLACE FRAME AND COVER	$1,500
EE	450	CREST AVENUE	BUILD BENCH AND INVERT	$750
II	010	CURVE STREET	REPLACE FRAME AND COVER	$1,500
II	060	COLBURN STREET	BUILD BENCH AND INVERT	$750
II	200	MT. HOPE STREET	REPLACE FRAME AND COVER	$1,500
II	240	MT. HOPE STREET	REPAIR BENCH/INVERT	$500
II	250	MT. HOPE STREET	BUILD BENCH AND INVERT	$750
II	1040	GAFFNEY ROAD	REPLACE FRAME AND COVER	$1,500

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
II	1150	GAFFNEY ROAD	BUILD BENCH AND INVERT	$750
II	1470	SCHILLER ROAD	BUILD BENCH AND INVERT	$750
II	1535	INCINERATOR ROAD	REPLACE FRAME AND COVER	$1,500
NN	020	EAST STREET	REPLACE FRAME AND COVER	$1,500
NN	050	EAST STREET	REPLACE FRAME AND COVER	$1,500
NN	170	MT. VERNON STREET	REPLACE FRAME AND COVER	$1,500
NN	250	MT. VERNON STREET	REPLACE FRAME AND COVER	$1,500
NN	420	WHITING AVENUE	BUILD BENCH AND INVERT	$750
SS	150	EAST STREET	REPAIR BENCH/INVERT	$500
SS	550	TAYLOR AVENUE	BUILD BENCH AND INVERT	$750
SS	600	GRANT AVENUE	REPAIR WALL	$250
SS	880	NETTA ROAD	REPLACE FRAME AND COVER	$1,500
SS	1000	MADISON STREET	BUILD BENCH AND INVERT	$750

Subarea	Manhole #	Street Name	Rehabilitation	Rehabilitation Cost
SS	1390	EAST STREET	REPLACE FRAME AND COVER	$1,500
WW	460	GREENSBORO ROAD	REPAIR BENCH/INVERT	$500
WW	650	GREENSBORO ROAD	REPLACE FRAME AND COVER	$1,500
WW	1090	NELSON DRIVE	BUILD BENCH AND INVERT	$750
TOTAL REHABILITATION COST				$29,500
TOTAL NUMBER OF MANHOLES				27

TABLE 4
MANHOLE INSPECTION STATUS

DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inspection Status
II	1394	BROOKDALE AVENUE	CNL
II	1560	INCINERATOR ROAD	CNL
II	1565	INCINERATOR ROAD	CNL
SS	610	GRANT AVENUE	CNL
SS	630	ADAMS STREET	CNL
SS	1390	EAST STREET	CNO
WW	680	GREENSBORO ROAD	CNL
TOTAL NUMBER OF MANHOLES			7

TABLE 5
MWRA COST EFFECTIVE ANALYSIS FOR INFILTRATION MANHOLES
DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
EE	010	BRIDGE STREET	12.7	144	72	$1,343	Cementitious Lining	$1,524	VALUE EFFECTIVE RECOMMENDED
EE	011	BRIDGE STREET	10.3	144	72	$1,343	Cementitious Lining	$1,236	EXCESSIVE RECOMMENDED
EE	040	BRIDGE STREET	13.1	144	72	$1,343	Cementitious Lining	$1,572	VALUE EFFECTIVE RECOMMENDED
EE	060	BRIDGE STREET	12.4	144	72	$1,343	Cementitious Lining	$1,488	VALUE EFFECTIVE RECOMMENDED
EE	080	BRIDGE STREET	11	288	144	$2,686	Cementitious Lining	$1,320	EXCESSIVE RECOMMENDED
EE	090	BRIDGE STREET	10.8	1,008	504	$9,400	Cementitious Lining	$1,296	EXCESSIVE RECOMMENDED
EE	100	BRIDGE STREET	10.9	288	144	$2,686	Cementitious Lining	$1,308	EXCESSIVE RECOMMENDED
EE	150	AMES STREET	11.6	144	72	$1,343	Cementitious Lining	$1,392	VALUE EFFECTIVE RECOMMENDED
EE	160	AMES STREET	12.8	288	144	$2,686	Cementitious Lining	$1,536	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
EE	170	AMES STREET	13	144	72	$1,343	Cementitious Lining	$1,560	VALUE EFFECTIVE RECOMMENDED
EE	250	BRIDGE STREET	5.9	0	0	$0	Root Treatment, Cementitious Lining	$958	NON-EXCESSIVE RECOMMENDED
EE	270	BERKELEY ROAD	14.3	144	72	$1,343	Cementitious Lining	$1,716	NON-EXCESSIVE RECOMMENDED
EE	385	CREST AVENUE	6.9	288	144	$2,686	Cementitious Lining	$828	EXCESSIVE RECOMMENDED
EE	560	FISHER ROAD	2.5	144	72	$1,343	Root Treatment, Cementitious Lining	$550	EXCESSIVE RECOMMENDED
EE	690	WIGGIN AVENUE	3.5	1,440	720	$13,428	Cementitious Lining	$420	EXCESSIVE RECOMMENDED
II	080	DENMARK STREET	8.3	720	360	$6,714	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
II	160	CURVE STREET	11.3	144	72	$1,343	Cementitious Lining	$1,356	VALUE EFFECTIVE RECOMMENDED
II	200	MT. HOPE STREET	8	144	72	$1,343	Cementitious Lining	$960	EXCESSIVE RECOMMENDED
II	235	RAVEN HILL	5.4	0	0	$0	Root Treatment, Cementitious Lining	$898	NON-EXCESSIVE
II	980	LILAC LANE	6.3	288	144	$2,686	Root Treatment, Cementitious Lining	$1,006	EXCESSIVE RECOMMENDED
II	1010	HARVEY DRIVE	9.1	288	144	$2,686	Cementitious Lining	$1,092	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
II	1030	GAFFNEY ROAD	10.2	288	144	$2,686	Cementitious Lining	$1,224	EXCESSIVE RECOMMENDED
II	1050	NANCY ROAD	5.7	288	144	$2,686	Cementitious Lining	$684	EXCESSIVE RECOMMENDED
II	1060	NANCY ROAD	7.3	576	288	$5,371	Cementitious Lining	$876	EXCESSIVE RECOMMENDED
II	1130	GAFFNEY ROAD	5.3	0	0	$0	Root Treatment, Cementitious Lining	$886	NON-EXCESSIVE
II	1160	EASTBROOK ROAD	17.6	432	216	$4,028	Root Treatment, Cementitious Lining	$2,362	EXCESSIVE RECOMMENDED
II	1185	INCINERATOR ROAD	17.3	2,880	1,440	$26,856	Root Treatment, Cementitious Lining	$2,326	EXCESSIVE RECOMMENDED
II	1190	EASTBROOK ROAD	8.2	720	360	$6,714	Cementitious Lining	$984	EXCESSIVE RECOMMENDED
II	1210	INCINERATOR ROAD	11.8	3,456	1,728	$32,227	Cementitious Lining	$1,416	EXCESSIVE RECOMMENDED
II	1240	WASHINGTON STREET	3.7	144	72	$1,343	Root Treatment, Cementitious Lining	$694	EXCESSIVE RECOMMENDED
II	1350	EAST STREET	9.3	144	72	$1,343	Cementitious Lining	$1,116	EXCESSIVE RECOMMENDED
II	1370	DEMETRA TERRACE	10.6	288	144	$2,686	Cementitious Lining	$1,272	EXCESSIVE RECOMMENDED
II	1392	BROOKDALE AVENUE	6	0	0	$0	Root Treatment, Cementitious Lining	$970	NON-EXCESSIVE

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
II	1525	INCINERATOR ROAD	10.5	576	288	$5,371	Cementitious Lining	$1,260	EXCESSIVE RECOMMENDED
II	1530	INCINERATOR ROAD	8.9	576	288	$5,371	Cementitious Lining	$1,068	EXCESSIVE RECOMMENDED
II	1535	INCINERATOR ROAD	9.9	144	72	$1,343	Cementitious Lining	$1,188	EXCESSIVE RECOMMENDED
II	1570	INCINERATOR ROAD	8.7	288	144	$2,686	Root Treatment, Cementitious Lining	$1,294	EXCESSIVE RECOMMENDED
NN	090	ELEANOR STREET	8.3	288	144	$2,686	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
NN	100	ELEANOR STREET	8.5	144	72	$1,343	Cementitious Lining	$1,020	EXCESSIVE RECOMMENDED
NN	130	BARROWS STREET	13	432	216	$4,028	Cementitious Lining	$1,560	EXCESSIVE RECOMMENDED
NN	140	BARROWS STREET	9.1	144	72	$1,343	Cementitious Lining	$1,092	EXCESSIVE RECOMMENDED
NN	141	CHARLES STREET	7.4	288	144	$2,686	Cementitious Lining	$888	EXCESSIVE RECOMMENDED
NN	150	BARROWS STREET	10.8	144	72	$1,343	Cementitious Lining	$1,296	EXCESSIVE RECOMMENDED
NN	160	MT. VERNON STREET	10.3	144	72	$1,343	Cementitious Lining	$1,236	EXCESSIVE RECOMMENDED
NN	181	ELMVIEW PLACE	81	144	72	$1,343	Cementitious Lining	$9,720	NON-EXCESSIVE

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
NN	220	GALVIN PLACE	8.5	144	72	$1,343	Cementitious Lining	$1,020	EXCESSIVE RECOMMENDED
NN	250	MT. VERNON STREET	8.5	144	72	$1,343	Cementitious Lining	$1,020	EXCESSIVE RECOMMENDED
NN	380	WHITING AVENUE	12.3	144	72	$1,343	Cementitious Lining	$1,476	VALUE EFFECTIVE RECOMMENDED
NN	390	WHITING AVENUE	8.4	288	144	$2,686	Cementitious Lining	$1,008	EXCESSIVE RECOMMENDED
NN	430	ABBOTT ROAD	7.2	288	144	$2,686	Cementitious Lining	$864	EXCESSIVE RECOMMENDED
NN	440	VAN BRUNT AVENUE	8.8	144	72	$1,343	Cementitious Lining	$1,056	EXCESSIVE RECOMMENDED
NN	450	VAN BRUNT AVENUE	7.9	576	288	$5,371	Cementitious Lining	$948	EXCESSIVE RECOMMENDED
NN	460	ABBOTT ROAD	7.9	432	216	$4,028	Cementitious Lining	$948	EXCESSIVE RECOMMENDED
NN	470	ABBOTT ROAD	7.3	144	72	$1,343	Cementitious Lining	$876	EXCESSIVE RECOMMENDED
NN	530	EAST STREET	7.6	144	72	$1,343	Cementitious Lining	$912	EXCESSIVE RECOMMENDED
SS	010	RUSTCRAFT ROAD	8.6	432	216	$4,028	Root Treatment, Cementitious Lining	$1,282	EXCESSIVE RECOMMENDED
SS	055	IVERSON WAY	4.3	144	72	$1,343	Cementitious Lining	$516	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
SS	065	IVERSON WAY	4.3	576	288	$5,371	Cementitious Lining	$516	EXCESSIVE RECOMMENDED
SS	070	RUSTCRAFT ROAD	8.2	0	0	$0	Root Treatment, Cementitious Lining	$1,234	NON-EXCESSIVE
SS	240	SPRAGUE STREET	8.9	144	72	$1,343	Cementitious Lining	$1,068	EXCESSIVE RECOMMENDED
SS	260	SPRAGUE STREET	9.9	576	288	$5,371	Cementitious Lining	$1,188	EXCESSIVE RECOMMENDED
SS	600	GRANT AVENUE	10.4	0	0	$0	Root Treatment, Cementitious Lining	$1,498	NON-EXCESSIVE RECOMMENDED
SS	680	ELMWOOD AVENUE	9.5	288	144	$2,686	Cementitious Lining	$1,140	EXCESSIVE RECOMMENDED
SS	770	JEFFERSON STREET	16	288	144	$2,686	Cementitious Lining	$1,920	EXCESSIVE RECOMMENDED
SS	780	JEFFERSON STREET	13.3	144	72	$1,343	Cementitious Lining	$1,596	VALUE EFFECTIVE RECOMMENDED
SS	830	ADAMS STREET	7.4	288	144	$2,686	Cementitious Lining	$888	EXCESSIVE RECOMMENDED
SS	1030	JEFFERSON STREET	4.3	288	144	$2,686	Root Treatment, Cementitious Lining	$766	EXCESSIVE RECOMMENDED
SS	1060	CIRCUIT ROAD	9.9	144	72	$1,343	Cementitious Lining	$1,188	EXCESSIVE RECOMMENDED
SS	1080	FALES ROAD	6.2	288	144	$2,686	Cementitious Lining	$744	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
SS	1090	WOOD ROAD	8.2	144	72	$1,343	Cementitious Lining	$984	EXCESSIVE RECOMMENDED
SS	1130	MONROE STREET	5.5	144	72	$1,343	Cementitious Lining	$660	EXCESSIVE RECOMMENDED
SS	1160	MONROE STREET	10	144	72	$1,343	Cementitious Lining	$1,200	EXCESSIVE RECOMMENDED
SS	1170	MT. VERNON STREET	13.3	144	72	$1,343	Cementitious Lining	$1,596	VALUE EFFECTIVE RECOMMENDED
SS	1220	MONROE STREET	8.3	144	72	$1,343	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
SS	1230	MONROE STREET	11	144	72	$1,343	Cementitious Lining	$1,320	EXCESSIVE RECOMMENDED
SS	1250	BOULEVARD ROAD	7.6	144	72	$1,343	Cementitious Lining	$912	EXCESSIVE RECOMMENDED
SS	1420	EAST STREET	13.1	288	144	$2,686	Cementitious Lining	$1,572	EXCESSIVE RECOMMENDED
SS	1490	GLEN WAY	9	288	144	$2,686	Cementitious Lining	$1,080	EXCESSIVE RECOMMENDED
WW	030	SHERMAN ROAD	12.9	288	144	$2,686	Cementitious Lining	$1,548	EXCESSIVE RECOMMENDED
WW	090	TRENTON ROAD	10.4	720	360	$6,714	Cementitious Lining	$1,248	EXCESSIVE RECOMMENDED
WW	100	TRENTON ROAD	9.7	288	144	$2,686	Cementitious Lining	$1,164	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
WW	110	TRENTON ROAD	9.6	144	72	$1,343	Cementitious Lining	$1,152	EXCESSIVE RECOMMENDED
WW	130	TRENTON ROAD	7.9	144	72	$1,343	Cementitious Lining	$948	EXCESSIVE RECOMMENDED
WW	140	TRENTON ROAD	7.7	144	72	$1,343	Cementitious Lining	$924	EXCESSIVE RECOMMENDED
WW	150	TRENTON ROAD	7.1	432	216	$4,028	Cementitious Lining	$852	EXCESSIVE RECOMMENDED
WW	155	TRENTON ROAD	7.6	288	144	$2,686	Cementitious Lining	$912	EXCESSIVE RECOMMENDED
WW	160	TRENTON ROAD	8	144	72	$1,343	Cementitious Lining	$960	EXCESSIVE RECOMMENDED
WW	170	TRENTON ROAD	8.7	144	72	$1,343	Cementitious Lining	$1,044	EXCESSIVE RECOMMENDED
WW	190	BELOIT ROAD	9.6	288	144	$2,686	Cementitious Lining	$1,152	EXCESSIVE RECOMMENDED
WW	200	BELOIT ROAD	8.1	144	72	$1,343	Cementitious Lining	$972	EXCESSIVE RECOMMENDED
WW	210	HELENA ROAD	2.7	288	144	$2,686	Root Treatment, Cementitious Lining	$574	EXCESSIVE RECOMMENDED
WW	220	ARDMORE ROAD	7.4	144	72	$1,343	Cementitious Lining	$888	EXCESSIVE RECOMMENDED
WW	250	ALTOONA ROAD	7.4	144	72	$1,343	Cementitious Lining	$888	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
WW	280	ALTOONA ROAD	8.3	0	0	$0	Root Treatment, Cementitious Lining	$1,246	NON-EXCESSIVE RECOMMENDED
WW	290	HASTINGS ROAD	5.5	288	144	$2,686	Cementitious Lining	$660	EXCESSIVE RECOMMENDED
WW	300	HASTINGS ROAD	3.5	144	72	$1,343	Cementitious Lining	$420	EXCESSIVE RECOMMENDED
WW	330	GOSHEN ROAD	8.3	144	72	$1,343	Cementitious Lining	$996	EXCESSIVE RECOMMENDED
WW	340	GOSHEN ROAD	7.7	432	216	$4,028	Cementitious Lining	$924	EXCESSIVE RECOMMENDED
WW	410	BONHAM ROAD	6.3	432	216	$4,028	Cementitious Lining	$756	EXCESSIVE RECOMMENDED
WW	470	GREENSBORO ROAD	7	0	0	$0	Root Treatment, Cementitious Lining	$1,090	NON-EXCESSIVE
WW	540	BONNEY LANE	6.8	144	72	$1,343	Root Treatment, Cementitious Lining	$1,066	EXCESSIVE RECOMMENDED
WW	610	GREENSBORO ROAD	6.5	144	72	$1,343	Cementitious Lining	$780	EXCESSIVE RECOMMENDED
WW	745	WESTCHESTER CIRCLE	2.3	0	0	$0	Root Treatment, Cementitious Lining	$526	NON-EXCESSIVE RECOMMENDED
WW	750	GAINSVILLE ROAD	6.7	576	288	$5,371	Cementitious Lining	$804	EXCESSIVE RECOMMENDED
WW	810	BONHAM ROAD	8.6	144	72	$1,343	Cementitious Lining	$1,032	EXCESSIVE RECOMMENDED

Subarea	MH #	Street Name	Manhole Depth (ft)	Infiltration (gpd)	Removable Infiltration (gpd)	MWRA T+T Cost	Rehabilitation	Rehab. Cost	Cost-Effectiveness
WW	880	HILLSDALE ROAD	9.8	144	72	$1,343	Cementitious Lining	$1,176	EXCESSIVE RECOMMENDED
WW	1070	NELSON DRIVE	10.9	0	0	$0	Root Treatment, Cementitious Lining	$1,558	NON-EXCESSIVE
WW	1100	BONHAM ROAD	4.2	0	0	$0	Root Treatment, Cementitious Lining	$754	NON-EXCESSIVE RECOMMENDED
WW	1120	GAINSVILLE ROAD	8.4	288	144	$2,686	Cementitious Lining	$1,008	EXCESSIVE RECOMMENDED
TOTAL				33,120	16,560	$308,844		$128,454	
TOTAL NON-EXCESSIVE				144	72	$1,343		$16,356	
TOTAL EXCESSIVE RECOMMENDED				31,536	15,768	$294,073		$91,840	
TOTAL VALUE EFFECTIVE RECOMMENDED				1,296	648	$12,085		$13,560	
TOTAL NON-EXCESSIVE RECOMMENDED				144	72	$1,343		$6,698	
TOTAL RECOMMENDED				32,976	16,488	$307,501		$112,098	
TOTAL RECOMMENDED MANHOLES								102	

TABLE 6
MWRA COST EFFECTIVE ANALYSIS FOR INFLOW MANHOLES

DEDHAM, MASSACHUSETTS
2019 SEWER MANHOLE INVESTIGATION

Subarea	MH #	Street Name	Inflow (gpd)	Rehabilitation
EE	385	CREST AVENUE	1,000	Install Inflow Dish
II	180	HIRSCH TERRACE	1,000	Install Inflow Dish
II	1205	INCINERATOR ROAD	1,000	Install Inflow Dish
II	1210	INCINERATOR ROAD	1,000	Install Inflow Dish
II	1320	WASHINGTON STREET	1,000	Install Inflow Dish
II	1530	INCINERATOR ROAD	1,000	Install Inflow Dish
II	1545	INCINERATOR ROAD	1,000	Install Inflow Dish
II	1550	INCINERATOR ROAD	1,000	Install Inflow Dish
NN	520	EAST STREET	1,000	Install Inflow Dish
WW	010	SHERMAN ROAD	1,000	Install Inflow Dish
WW	300	HASTINGS ROAD	1,000	Install Inflow Dish
WW	320	HASTINGS ROAD	1,000	Install Inflow Dish
TOTAL			12,000	
TOTAL NUMBER OF MANHOLES			12	
TOTAL ESTIMATED COST			$1,800	

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

APPENDIX A

AS-BID UNIT COSTS

MWRA T&T COST CALCULATION

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

				Engineer's Estimate		Rapid Flow, Inc.		National Water Main		Diverisified Infrastructure Services		Municipal Sales, Inc.	
ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
1			*Hourly Rate for Emergency Cleaning*										
1a	20	wo	Emergency Cleaning of Sewers	$ 800.00	$ 16,000.00	$ 500.00	$ 10,000.00	$ 1,200.00	$ 24,000.00	nb	No Bid	nb	No Bid
1b	20	hr	Emergency Cleaning of Sewers	$ 275.00	$ 5,500.00	$ 100.00	$ 2,000.00	$ 175.00	$ 3,500.00	nb	No Bid	nb	No Bid
1c	30	tn	Storage, Testing, and Disposal of Sewer Debris	$ 1.00	$ 30.00	$ 0.01	$ 0.30	$ 0.01	$ 0.30	nb	No Bid	nb	No Bid
			Total Contract #1		**$ 21,530.00**		**$ 12,000.30**		**$ 27,500.30**		**No Bid**		**No Bid**
2			*Hourly Rate for Cleaning & Inspection*										
2a	30	wo	Cleaning & Inspection of Sewers	$ 3,200.00	$ 96,000.00	$ 2,600.00	$ 78,000.00	$ 2,600.00	$ 78,000.00	nb	No Bid	nb	No Bid
2b	40	hr	Cleaning & Inspection of Sewers	$ 50.00	$ 2,000.00	$ 100.00	$ 4,000.00	$ 0.01	$ 0.40	nb	No Bid	nb	No Bid
2c	30	tn	Storage, Testing, and Disposal of Sewer Debris	$ 1.00	$ 30.00	$ 0.01	$ 0.30	$ 120.00	$ 3,600.00	nb	No Bid	nb	No Bid
			Total Contract #2		**$ 98,030.00**		**$ 82,000.30**		**$ 81,600.40**		**No Bid**		**No Bid**
3			*Heavy Cleaning of Sewers*										
3a	600	lf	Heavy Cleaning of 6-inch sewers	$ 1.50	$ 900.00	$ 0.50	$ 300.00	$ 0.01	$ 6.00	$ 2.50	$ 1,500.00	nb	No Bid
3b	7000	lf	Heavy Cleaning of 8-inch sewers	$ 1.00	$ 7,000.00	$ 0.50	$ 3,500.00	$ 0.75	$ 5,250.00	$ 2.50	$ 17,500.00	nb	No Bid
3c	1000	lf	Heavy Cleaning of 10-inch sewers	$ 1.50	$ 1,500.00	$ 0.50	$ 500.00	$ 0.25	$ 250.00	$ 3.00	$ 3,000.00	nb	No Bid
3d	4000	lf	Heavy Cleaning of 12-inch sewers	$ 1.50	$ 6,000.00	$ 1.00	$ 4,000.00	$ 0.25	$ 1,000.00	$ 3.50	$ 14,000.00	nb	No Bid
3e	1000	lf	Heavy Cleaning of 15-inch sewers	$ 3.00	$ 3,000.00	$ 2.00	$ 2,000.00	$ 5.25	$ 5,250.00	$ 6.00	$ 6,000.00	nb	No Bid
3f	500	lf	Heavy Cleaning of 18-inch sewers	$ 3.00	$ 1,500.00	$ 2.00	$ 1,000.00	$ 0.75	$ 375.00	$ 10.00	$ 5,000.00	nb	No Bid
3g	250	lf	Heavy Cleaning of 20-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 0.75	$ 187.50	$ 15.00	$ 3,750.00	nb	No Bid
3h	250	lf	Heavy Cleaning of 21-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 5.25	$ 1,312.50	$ 15.00	$ 3,750.00	nb	No Bid
3i	250	lf	Heavy Cleaning of 22-inch sewers	$ 3.00	$ 750.00	$ 4.00	$ 1,000.00	$ 0.75	$ 187.50	$ 15.00	$ 3,750.00	nb	No Bid
3j	500	lf	Heavy Cleaning of 24-inch sewers	$ 3.00	$ 1,500.00	$ 4.00	$ 2,000.00	$ 5.25	$ 2,625.00	$ 18.50	$ 9,250.00	nb	No Bid
4			*Inspection of Sewers*										
4a	1600	lf	Inspection of 6-inch sewers	$ 1.60	$ 2,560.00	$ 0.75	$ 1,200.00	$ 1.20	$ 1,920.00	$ 1.75	$ 2,800.00	nb	No Bid
4b	80000	lf	Inspection of 8-inch sewers	$ 1.60	$ 128,000.00	$ 0.75	$ 60,000.00	$ 1.00	$ 80,000.00	$ 1.50	$ 120,000.00	nb	No Bid
4c	4000	lf	Inspection of 10-inch sewers	$ 1.60	$ 6,400.00	$ 0.75	$ 3,000.00	$ 1.00	$ 4,000.00	$ 1.50	$ 6,000.00	nb	No Bid
4d	13000	lf	Inspection of 12-inch sewers	$ 1.60	$ 20,800.00	$ 0.75	$ 9,750.00	$ 1.00	$ 13,000.00	$ 1.50	$ 19,500.00	nb	No Bid
4e	7000	lf	Inspection of 15-inch sewers	$ 1.70	$ 11,900.00	$ 0.75	$ 5,250.00	$ 1.00	$ 7,000.00	$ 1.75	$ 12,250.00	nb	No Bid
4f	3000	lf	Inspection of 18-inch sewers	$ 1.70	$ 5,100.00	$ 0.75	$ 2,250.00	$ 1.00	$ 3,000.00	$ 1.75	$ 5,250.00	nb	No Bid
4g	500	lf	Inspection of 20-inch sewers	$ 1.70	$ 850.00	$ 0.75	$ 375.00	$ 1.00	$ 500.00	$ 2.50	$ 1,250.00	nb	No Bid
4h	2200	lf	Inspection of 21-inch sewers	$ 1.70	$ 3,740.00	$ 0.75	$ 1,650.00	$ 1.00	$ 2,200.00	$ 2.50	$ 5,500.00	nb	No Bid
4i	500	lf	Inspection of 22-inch sewers	$ 1.70	$ 850.00	$ 0.75	$ 375.00	$ 1.00	$ 500.00	$ 2.75	$ 1,375.00	nb	No Bid
4j	7000	lf	Inspection of 24-inch sewers	$ 1.70	$ 11,900.00	$ 0.75	$ 5,250.00	$ 1.00	$ 7,000.00	$ 3.00	$ 21,000.00	nb	No Bid
4k	125	ea	Clean & Inspection of 4 to 6-inch laterals			$ 100.00	$ 12,500.00	$ 250.00	$ 31,250.00	$ 460.00	$ 57,500.00		
5			*Mobilization*										
5a	1	ls	Mobilization for Items 3-4, lump sum (not to exceed 5% of total)	$ 10,787.50	$ 10,787.50	$ 2,500.00	$ 2,500.00	$ 1,000.00	$ 1,000.00	$ 12,617.00	$ 12,617.00	nb	No Bid
			Total Contract #3		**$ 226,537.50**		**$ 120,400.00**		**$ 167,813.50**		**$ 332,542.00**		**No Bid**
6			*On-Call Sewer Repair*										
6a	10	lf	Structural short liners of 6-inch sewers	$ 425.00	$ 4,250.00	$ 350.00	$ 3,500.00	$ 300.00	$ 3,000.00	nb	No Bid	nb	No Bid
6b	50	lf	Structural short liners of 8-inch sewers	$ 425.00	$ 21,250.00	$ 350.00	$ 17,500.00	$ 400.00	$ 20,000.00	nb	No Bid	nb	No Bid
6c	10	lf	Structural short liners of 10-inch sewers	$ 475.00	$ 4,750.00	$ 350.00	$ 3,500.00	$ 450.00	$ 4,500.00	nb	No Bid	nb	No Bid
6d	10	lf	Structural short liners of 12-inch sewers	$ 525.00	$ 5,250.00	$ 350.00	$ 3,500.00	$ 500.00	$ 5,000.00	nb	No Bid	nb	No Bid
6e	10	lf	Structural short liners of 15-inch sewers	$ 625.00	$ 6,250.00	$ 400.00	$ 4,000.00	$ 400.00	$ 4,000.00	nb	No Bid	nb	No Bid
6f	10	lf	Structural short liners of 18-inch sewers	$ 725.00	$ 7,250.00	$ 400.00	$ 4,000.00	$ 300.00	$ 3,000.00	nb	No Bid	nb	No Bid

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	Engineer's Estimate		Rapid Flow, Inc.		National Water Main		Diverisified Infrastructure Services		Municipal Sales, Inc.	
				UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL	UNIT COST	TOTAL
6g	250	lf	Structural line pipe (cured-in-place) of 6-inch sewers	$ 55.00	$ 13,750.00	$ 40.00	$ 10,000.00	$ 35.00	$ 8,750.00	nb	No Bid	nb	No Bid
6h	5500	lf	Structural line pipe (cured-in-place) of 8-inch sewers	$ 45.00	$ 247,500.00	$ 30.00	$ 165,000.00	$ 46.30	$ 254,650.00	nb	No Bid	nb	No Bid
6i	800	lf	Structural line pipe (cured-in-place) of 10-inch sewers	$ 50.00	$ 40,000.00	$ 34.00	$ 27,200.00	$ 49.55	$ 39,640.00	nb	No Bid	nb	No Bid
6j	500	lf	Structural line pipe (cured-in-place) of 12-inch sewers	$ 60.00	$ 30,000.00	$ 44.00	$ 22,000.00	$ 52.75	$ 26,375.00	nb	No Bid	nb	No Bid
6k	250	lf	Structural line pipe (cured-in-place) of 15-inch sewers	$ 70.00	$ 17,500.00	$ 50.00	$ 12,500.00	$ 50.00	$ 12,500.00	nb	No Bid	nb	No Bid
6l	250	lf	Structural line pipe (cured-in-place) of 18-inch sewers	$ 80.00	$ 20,000.00	$ 75.00	$ 18,750.00	$ 80.00	$ 20,000.00	nb	No Bid	nb	No Bid
6m	250	lf	Structural line pipe (cured-in-place) of 20-inch sewers	$ 90.00	$ 22,500.00	$ 85.00	$ 21,250.00	$ 55.00	$ 13,750.00	nb	No Bid	nb	No Bid
6n	300	lf	Structural line pipe (cured-in-place) of 24-inch sewers	$ 200.00	$ 60,000.00	$ 125.00	$ 37,500.00	$ 80.00	$ 24,000.00	nb	No Bid	nb	No Bid
6o	15	ea	Full Wrap Lateral Liner (cured-in-place) of 4 to 6-inch laterals	$ 4,000.00	$ 60,000.00	$ 1,850.00	$ 27,750.00	$ 1,100.00	$ 16,500.00	nb	No Bid	nb	No Bid
6p	15	ea	Clean & Inspection of 4 to 6-inch laterals	$ 1,000.00	$ 15,000.00	$ 500.00	$ 7,500.00	$ 700.00	$ 10,500.00	nb	No Bid	nb	No Bid
7			*Manhole Rehabilitation*										
7a	400	vf	Exterior chemical grouting and interior cementitous	$ 150.00	$ 60,000.00	$ 120.00	$ 48,000.00	$ 130.00	$ 52,000.00	nb	No Bid	nb	No Bid
8			*Mobilization*										
8a	1	ls	Mobilization for Items 6-7, (not to exceed 5% of total)	$ 17,959.37	$ 17,959.37	$ 15,000.00	$ 15,000.00	$ 5,500.00	$ 5,500.00	nb	No Bid	nb	No Bid
9			*Alternate Bid #1*										
9a	1	ls	Structural line pipe (cured-in-place) of 12-inch sewer segment AA10-AA5	$ 25,000.00	$ 25,000.00	$ 75,000.00	$ 75,000.00	$ 44,350.00	$ 44,350.00	nb	No Bid		
10			*Alternate Bid #2*										
10a	1	ls	Structural line pipe (cured-in-place) of 24-inch sewer segment JJ460-JJ370	$ 25,000.00	$ 25,000.00	$ 75,000.00	$ 75,000.00	$ 73,650.00	$ 73,650.00	nb	No Bid		
11			*Alternate Bid #3*										
11a	1	ls	Structural line pipe (cured-in-place) of 8-inch sewer segments HH930-HH920, HH920-HH910 & HH910-HH900	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 25,000.00	$ 44,350.00	$ 44,350.00	nb	No Bid		
			Total Contract #4 BASE BID (Items 6 - 8)		**$ 653,209.37**		**$ 448,450.00**		**$ 523,665.00**		**No Bid**		**No Bid**
			BASE BID plus ALTERNATE BID No. 1 (Items 6 - 9)		**$ 678,209.37**		**$ 523,450.00**		**$ 568,015.00**		**No Bid**		
			BASE BID plus ALTERNATE BID Nos. 1 & 2 (Items 6 - 10)		**$ 703,209.37**		**$ 598,450.00**		**$ 641,665.00**		**No Bid**		
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3 (Items 6 - 11)		**$ 728,209.37**		**$ 623,450.00**		**$ 686,015.00**		**No Bid**		
12			*Chemical Root Treatment*										
12a	500	lf	Chemical root treatment of 6-inch sewers	$ 1.80	$ 900.00	$ 2.00	$ 1,000.00	$ 1.75	$ 875.00	nb	No Bid	$ 1.20	$ 600.00
12b	25000	lf	Chemical root treatment of 8-inch sewers	$ 1.80	$ 45,000.00	$ 2.00	$ 50,000.00	$ 1.75	$ 43,750.00	nb	No Bid	$ 1.25	$ 31,250.00
12c	1000	lf	Chemical root treatment of 10-inch sewers	$ 2.00	$ 2,000.00	$ 2.00	$ 2,000.00	$ 1.75	$ 1,750.00	nb	No Bid	$ 1.30	$ 1,300.00
12d	1000	lf	Chemical root treatment of 12-inch sewers	$ 2.30	$ 2,300.00	$ 2.00	$ 2,000.00	$ 1.75	$ 1,750.00	nb	No Bid	$ 1.40	$ 1,400.00
12e	300	lf	Chemical root treatment of 15-inch sewers	$ 2.95	$ 885.00	$ 3.00	$ 900.00	$ 2.00	$ 600.00	nb	No Bid	$ 1.55	$ 465.00
12f	300	lf	Chemical root treatment of 18-inch sewers	$ 4.20	$ 1,260.00	$ 3.00	$ 900.00	$ 3.00	$ 900.00	nb	No Bid	$ 1.75	$ 525.00
12g	300	lf	Chemical root treatment of 20-inch sewers	$ 4.20	$ 1,260.00	$ 3.00	$ 900.00	$ 3.00	$ 900.00	nb	No Bid	$ 2.00	$ 600.00
12h	10	ea	Chemical root treatment of manholes	$ 250.00	$ 2,500.00	$ 250.00	$ 2,500.00	$ 250.00	$ 2,500.00	nb	No Bid	$ 150.00	$ 1,500.00
12			*Mobilization*										
12a	1	ea	Mobilization for Item 12, (not to exceed 5% of total)	$ 2,805.25	$ 2,805.25	$ 1,500.00	$ 1,500.00	$ 500.00	$ 500.00	nb	No Bid	$ -	$ -
			Total Contract #5		**$ 58,910.25**		**$ 61,700.00**		**$ 53,525.00**		**No Bid**		**$ 37,640.00**

Town of Dedham
Engineering Department
55 River Street
Dedham, MA

Bid Comparison
2018 Sewer On-Call Services
Dedham, Massachusetts
December 21, 2017

ITEM NO.	QUANTITY	UNIT	ITEM DESCRIPTION	Engineer's Estimate UNIT COST	Engineer's Estimate TOTAL	Rapid Flow, Inc. UNIT COST	Rapid Flow, Inc. TOTAL	National Water Main UNIT COST	National Water Main TOTAL	Diverisified Infrastructure Services UNIT COST	Diverisified Infrastructure Services TOTAL	Municipal Sales, Inc. UNIT COST	Municipal Sales, Inc. TOTAL
			Total Contract #1		$ 21,530.00		$ 12,000.30		$ 27,500.30		No Bid		No Bid
			Total Contract #2		$ 98,030.00		$ 82,000.30		$ 81,600.40		No Bid		No Bid
			Total Contract #3		$ 226,537.50		$ 120,400.00		$ 167,813.50		$ 332,542.00		No Bid
			Total Contract #4 BASE BID (Items 6 - 8)		$ 653,209.37		$ 448,450.00		$ 523,665.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID No. 1 (Items 6-9)		$ 678,209.37		$ 523,450.00		$ 568,015.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID Nos. 1 & 2 (Items 6-10		$ 703,209.37		$ 598,450.00		$ 641,665.00		No Bid		No Bid
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3 (Items 6-11)		$ 728,209.37		$ 623,450.00		$ 686,015.00		No Bid		No Bid
			Total Contract #5		$ 58,910.25		$ 61,700.00		$ 53,525.00		No Bid		$ 37,640.00
			Total Contract 1-5 BASE BID		$ 1,058,217.12		$ 724,550.60		$ 854,104.20		NA		NA
			BASE BID plus ALTERNATE BID No. 1		$ 1,083,217.12		$ 799,550.60		$ 898,454.20		NA		NA
			BASE BID plus ALTERNATE BID Nos. 1 & 2		$ 1,108,217.12		$ 874,550.60		$ 972,104.20		NA		NA
			BASE BID plus ALTERNATE BID Nos. 1, 2 & 3		$ 1,133,217.12		$ 899,550.60		$ 1,016,454.20		NA		NA

MEMORANDUM

DATE: May 29, 2019

FROM: Emily Sadoway

TO: File

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

Fiscal year 2019 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 FY19 sewerage charges to the Town of Dedham are shown in Table A, and Table B shows Dedham's FY20 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	1,184,504,000	3,245,216	$1,246,015	$0.3840
Total Suspended Solids (O & M and Capital)	1,184,504,000	3,245,216	$417,910	$0.1288
Biochemical Oxygen Demand (O & M and Capital)	1,184,504,000	3,245,216	$331,845	$0.1023
Maximum Monthly Flow	N/A	5,767,000	$958,552	$0.1662
Population **	1,184,504,000	3,245,216	$2,644,254	N/A
TOTAL			**$5,598,576**	**$0.7813**

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)	1,184,504,000	3,245,216	$300,000	$0.0924
O & M	1,184,504,000	3,245,216	$1,186,480	$0.3656
TOTAL			**$1,486,480**	**$0.4580**

Therefore, the total FY19-20 T&T cost for both the MWRA charges and the Town of Dedham's costs are $1.2393 /GPD ($0.7813 + $0.4580).

According to the Department of Environmental Protection's (DEP) Guidelines for Performing I/I Analyses and SSES this cost of $1.2393 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 FY19 is 2.875%. 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 = 2.875% (DEP FY19 Information)

Present Worth Factor:

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

$$\frac{(1 + 0.02875)^{20} - 1}{0.02875\,(1 + 0.02875)^{20}} = 15.05$$

Present Worth T&T Cost:

(Present Worth Factor) x (FY19 T & T cost)

15.05 x $1.2393/GPD = $18.65/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 2.875%, is $18.65/GPD.

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